



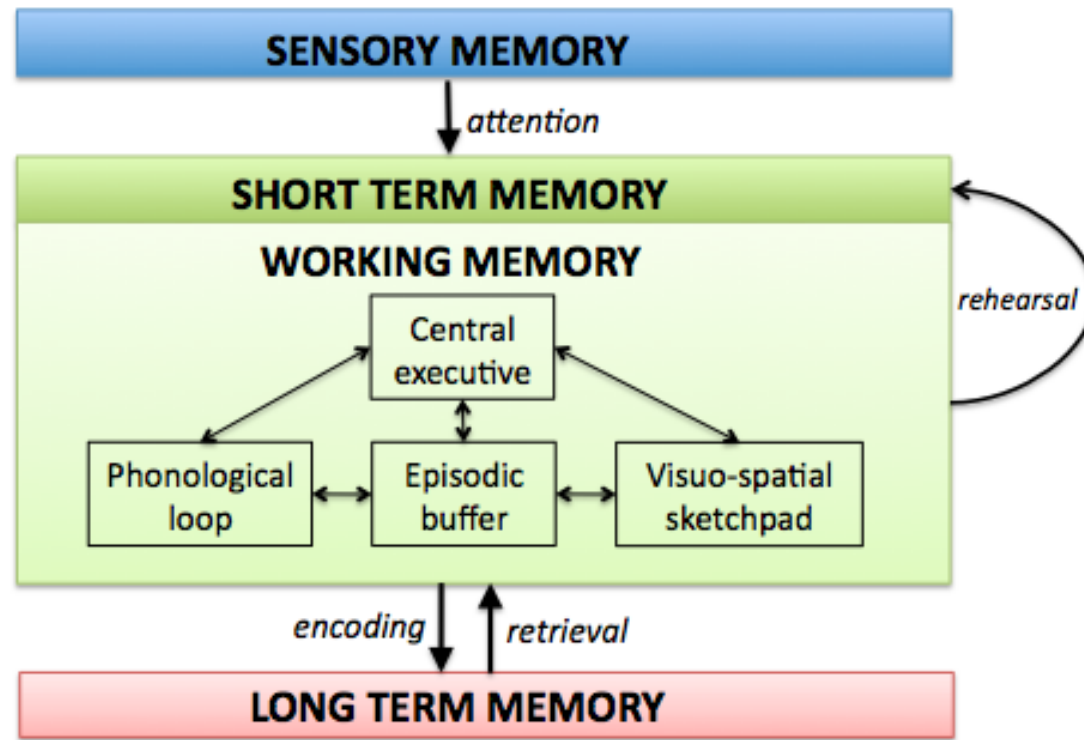
Cognition

PSYC 2040

W3: Cognitive limitations

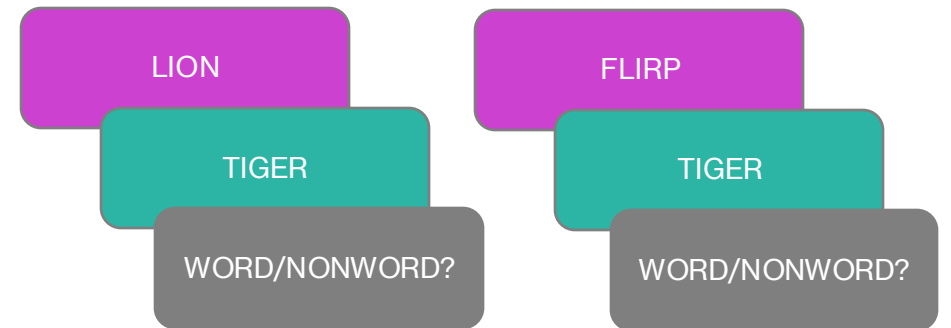


recap

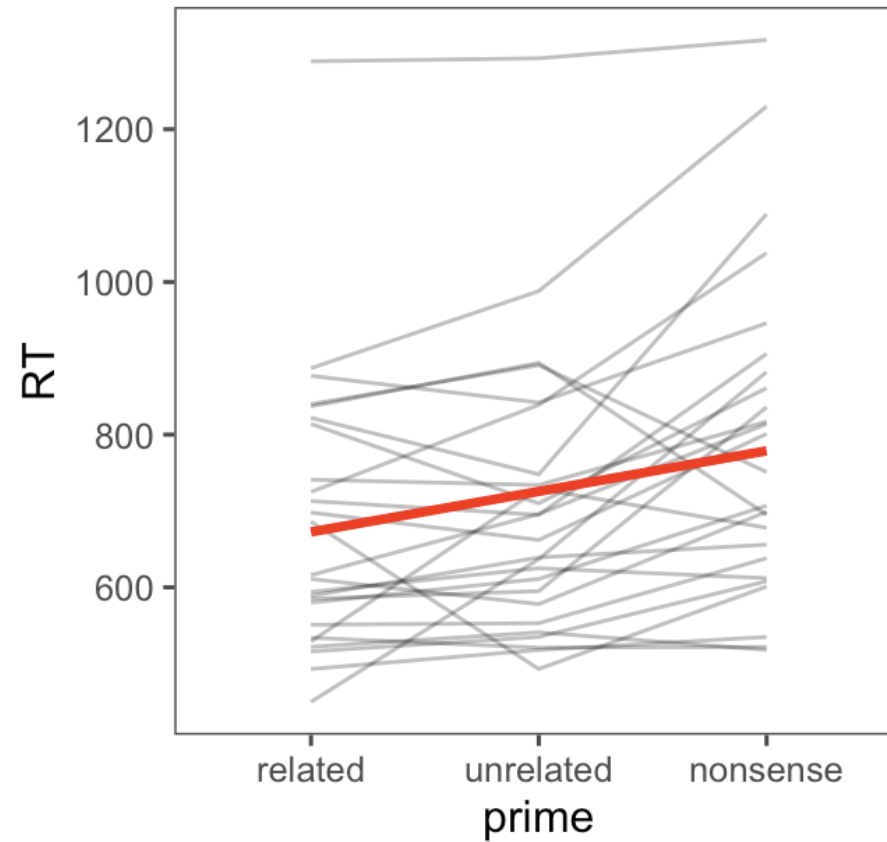


recap: semantic priming

- semantic priming tasks involve presenting a **prime** that may be related / unrelated to the upcoming **target** word
 - lexical decision task: deciding whether a target word is a word/non-word
 - relatedness judgment task: deciding whether two words are related or unrelated
- processing a related word speeds up or facilitates processing of the target word

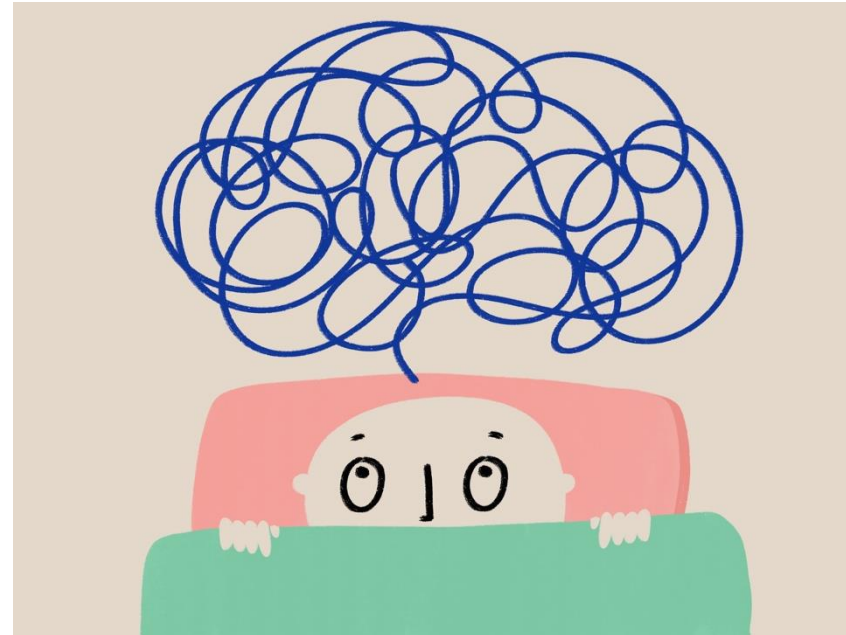


your data: lexical decision task



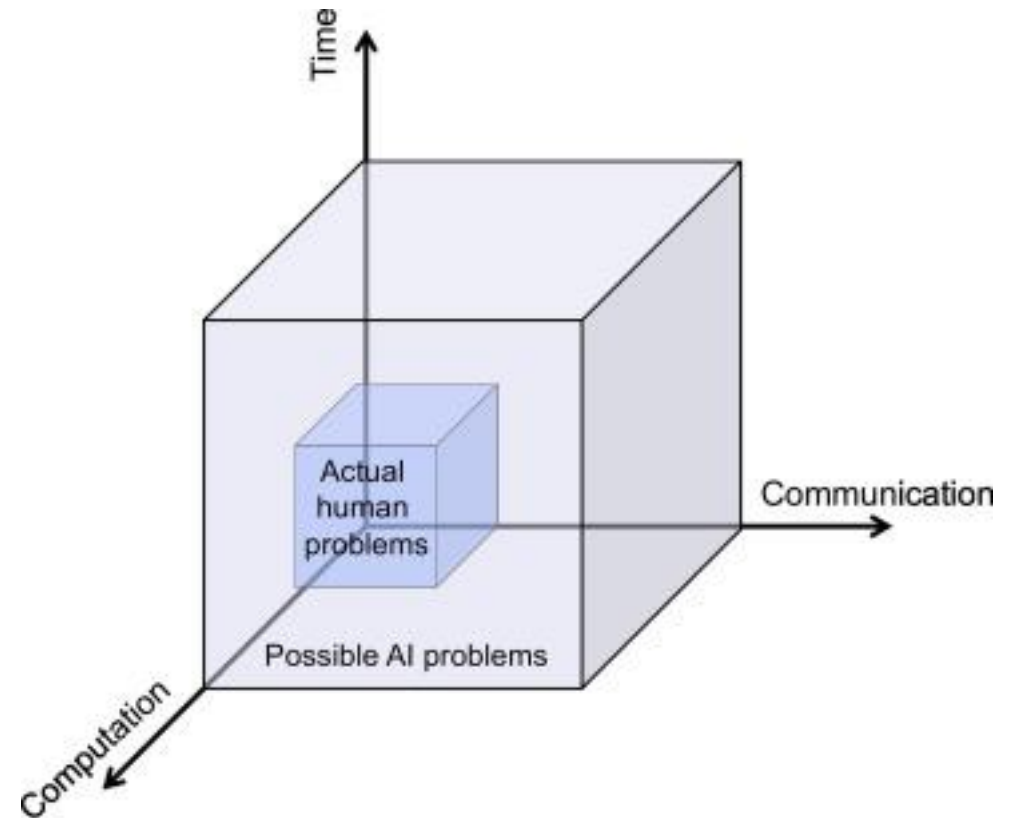
today's agenda

- cognitive limitations
- attention
- multitasking
- mind wandering

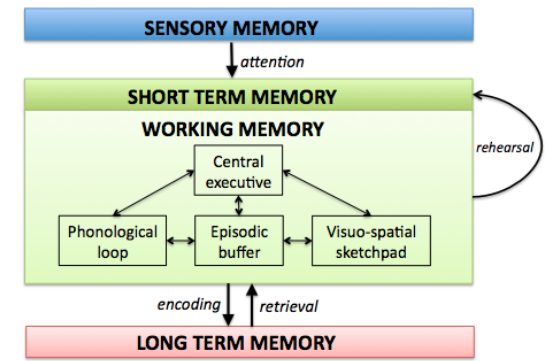


three broad human limitations

- limited computation
- limited time / data we can accumulate
- limited communication



directing attention



exogenous

spontaneous
reflexive
capture



endogenous

voluntary
goal-driven
preparatory

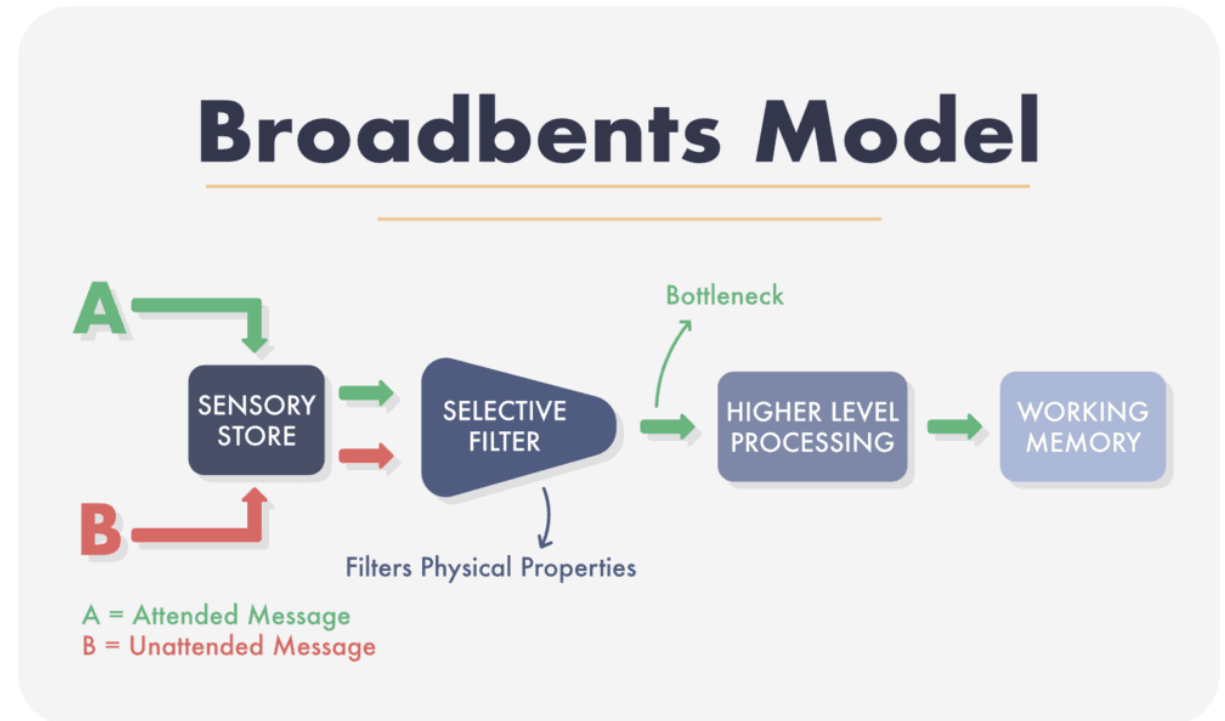
shadowing task

- Cherry (1953)
- during shadowing, the unattended signal was changed
- change detected?
 - language (English to German) ✗
 - voice/gender ✓
 - content (speech to non-speech/tone) ✓
 - direction of speech (forward/backward) ✗



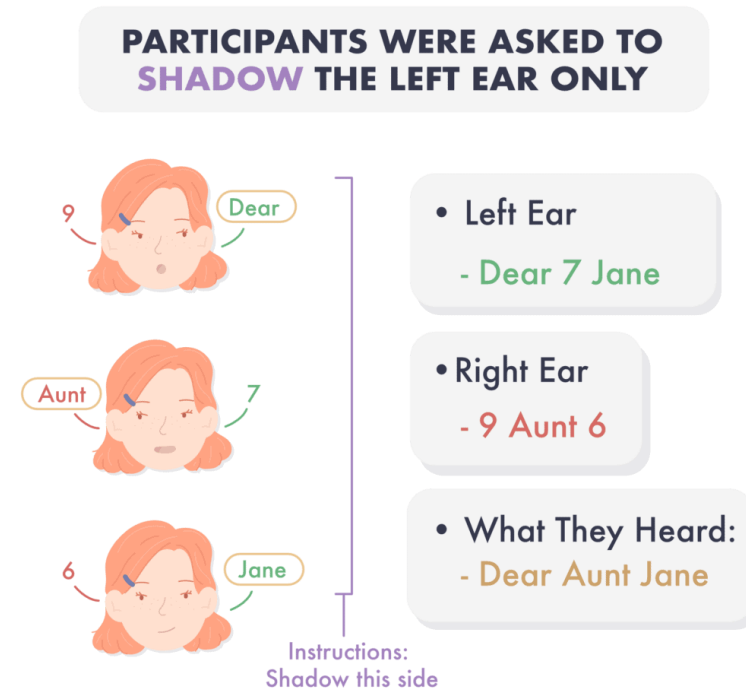
when does selection occur?

- unattended information is only processed at a sensory/perceptual level
- higher order processing, i.e., processing for meaning, only occurs for attended material



counterevidence: cocktail party effect

- Moray (1959) presented evidence that people detected their own name in the unattended channel 30% of the time
- names are not exogenous cues and not perceptually salient – they are meaningful

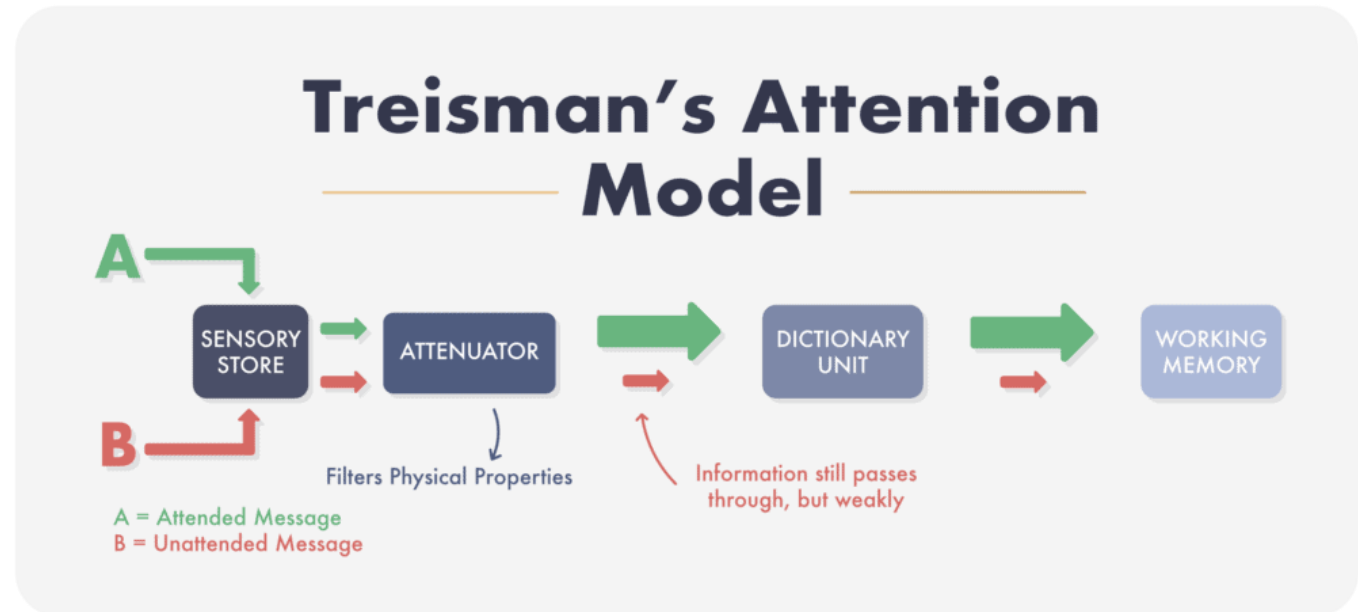


Gray & Wedderburn (1960)

attenuation model

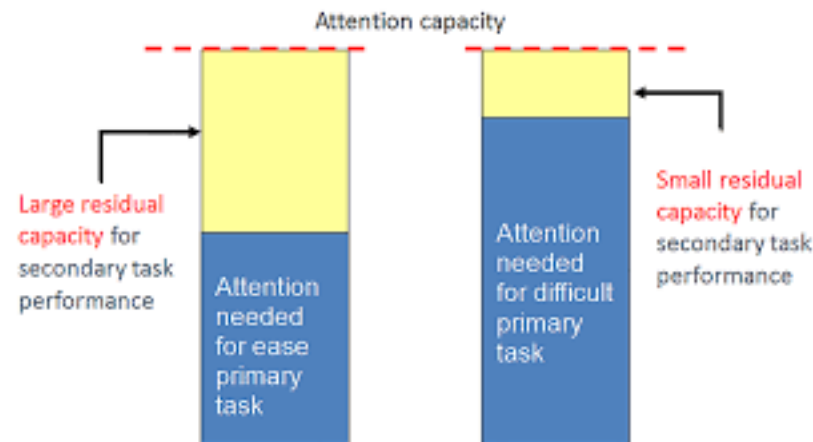


- Anne Treisman (1960)
- some information passes through in an attenuated form

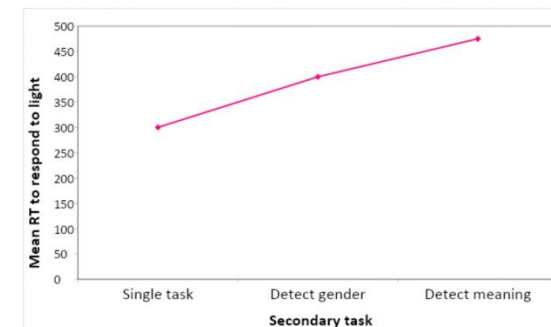
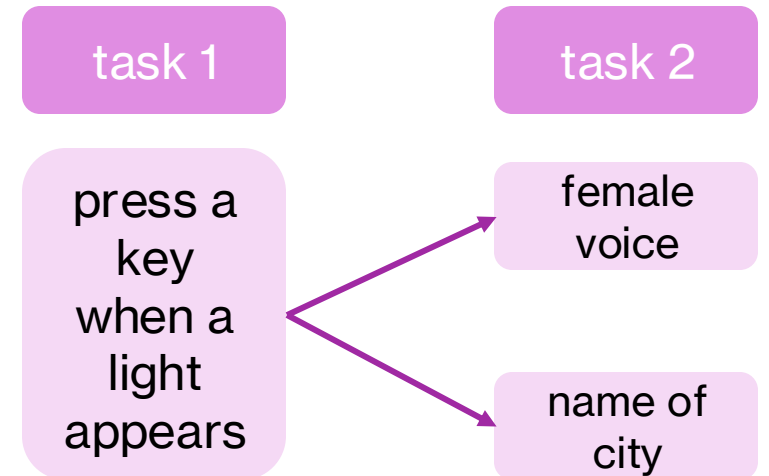


how much attention: capacity models

- attention is a finite resource
- dual task paradigms assess relative slowdown in task performance



dichotic listening



driving

single task:
drive only

dual task: drive +
talk on cell phone
(hands-free)

record eye
movements

recognition test



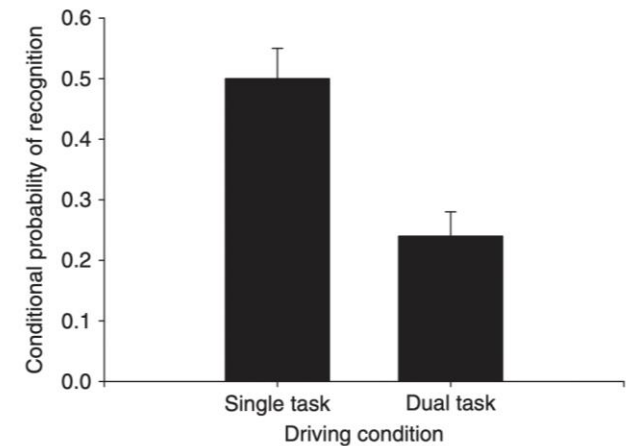
Figure 2 A participant driving in the Patrol-Sim driving simulator.

Maine's Hands-Free Driving Law



What is the new Hands-Free Driving Law?

Starting September 19th, 2019, the new law under Title 29-A section 2121 prohibits you from holding any electronic device not part of the operating equipment of the motor vehicle, unless specifically exempted.



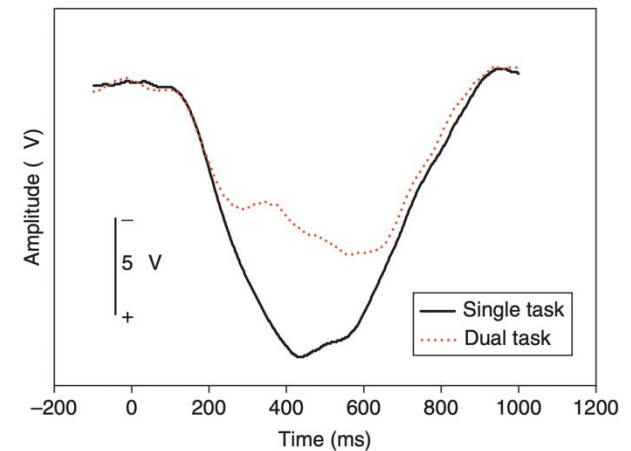
inattention blindness



Figure 8 A representation of what a driver might perceive when they are not talking on the phone (left panel) and when they are talking on a hands-free cell phone (right panel).



Figure 10 An illustration of how visual scanning is disrupted when drivers are talking on a hands-free cell phone. The left panel represents the scanning pattern of an undistracted driver and the right panel represents the scanning pattern when the driver is talking on a hands-free cell phone.



multitasking has costs

- group 1: pen and paper
- group 2: text messaging
- group 3: facebook browsing
- pre/post test scores for IT questions

Table 1. Summary of mean and SDs for pretest scores by groups.

Groups	Test	N	M	SD
Control	Pre	41	23.60	10.38
	Post		74.82	11.60
Experiment I	Pre	41	27.51	11.90
	Post		63.90	15.03
Experiment II	Pre	40	24.40	12.93
	Post		54.90	16.75

SD: standard deviation.

The effect of social media multitasking on classroom performance

Muhammet Demirbilek
Süleyman Demirel University, Turkey


Tarik Talan
Kilis 7 Aralik University, Turkey

Abstract

The purpose of this study is to investigate whether off-task multitasking activities with mobile technologies, specifically social networking sites and short messaging services, used during real-time lectures have an effect on grade performance in higher education students. Two experimental groups and one control group were used in this research. While participants in experimental groups 1 and 2 were allowed to navigate Facebook and to exchange short messaging service messages via mobile phones during real time in class lecturing, the control group participants were allowed to take notes using only pen and paper in the same lecturing conditions during three consecutive experimental sessions. The results showed that when students were given the opportunity of non-lecture-related multitasking using mobile phones writing/sending short messaging services and looking at Facebook profiles/reading news feed/looking at shared multimedia/reading wall messages during the lecture, their grade performance was hindered compared to traditional pen and paper note-taking. Engaging in social media use while trying to follow instruction may reduce learners' capacity for cognitive processing causing poor academic performance.

<https://doi.org/10.1177/1469787417721382>

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Active Learning in Higher Education
2018, Vol. 19(2) 117–129
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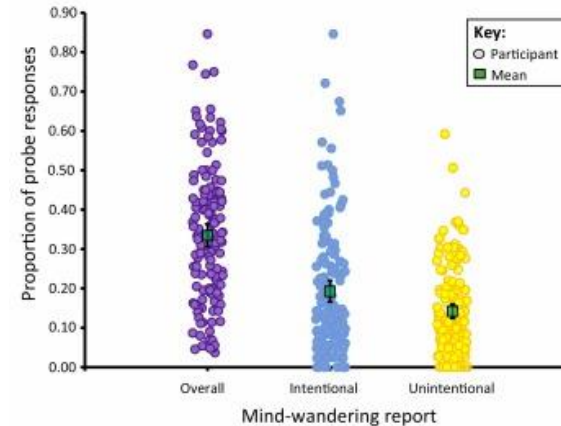


activity

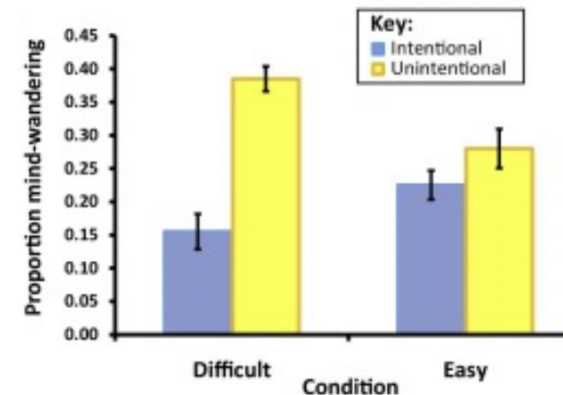
- complete the [SART](#)

studying mind wandering

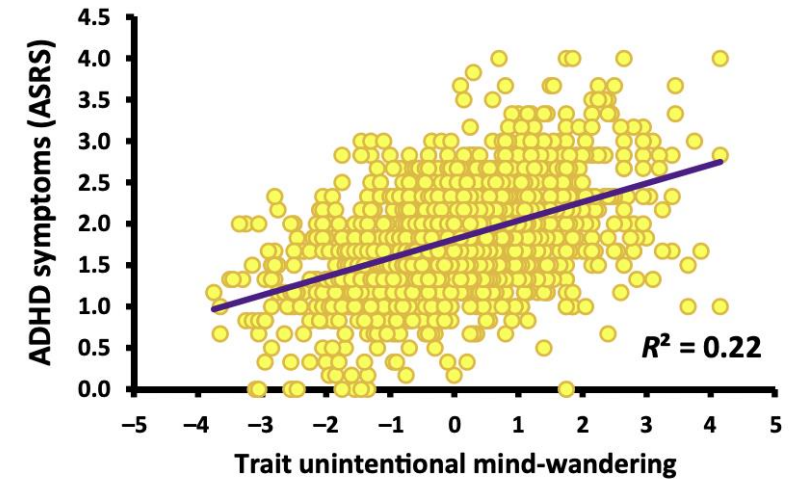
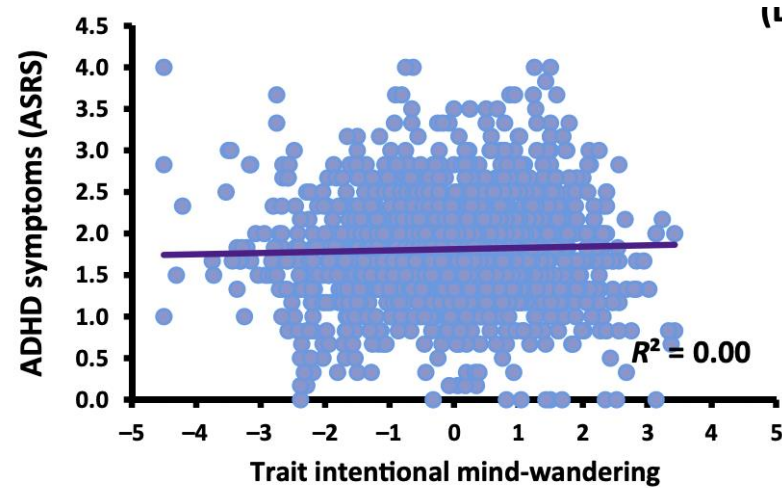
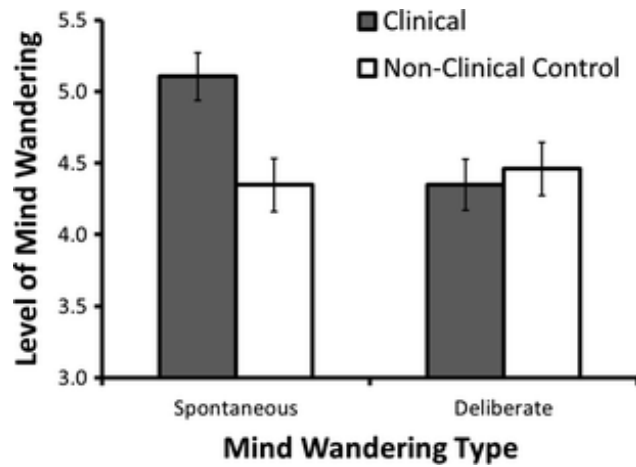
- measures:
 - sustained attention to response (SART) task
 - working memory (OSPAN)
- types:
 - unintentional (uncontrolled) vs. intentional (controlled) shift
 - subjective differences: surprise vs. intentionality



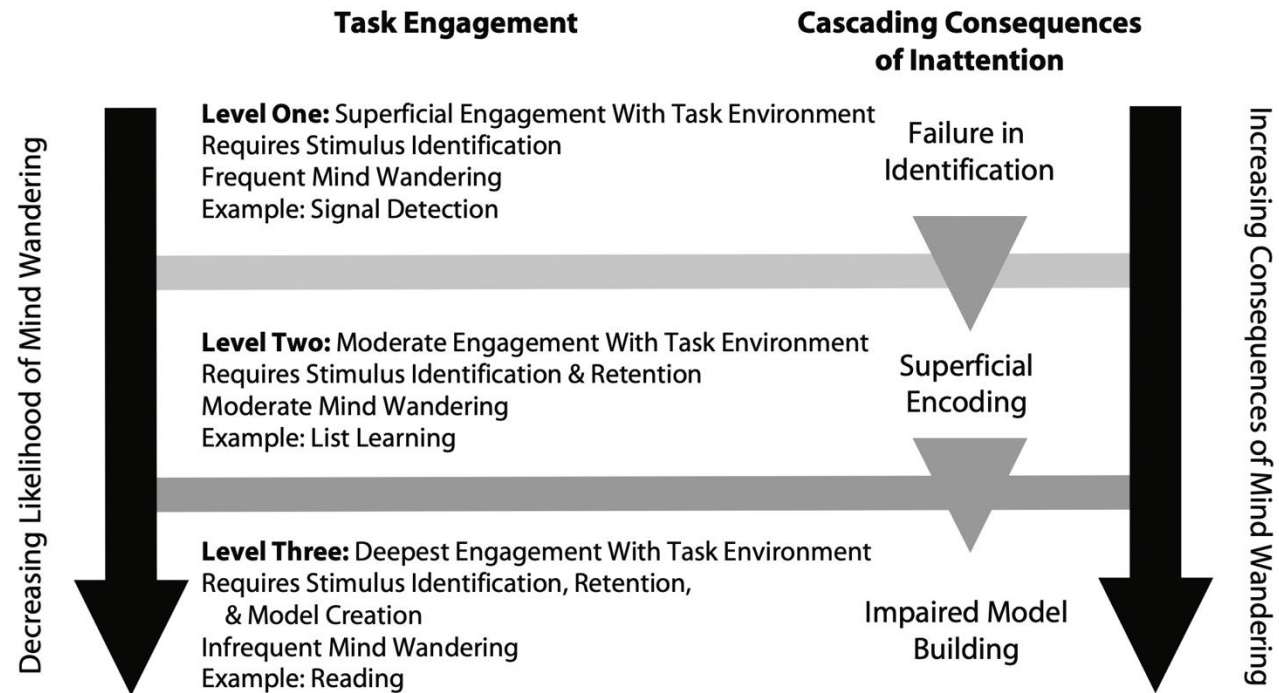
Trends in Cognitive Sciences



mind wandering & ADHD



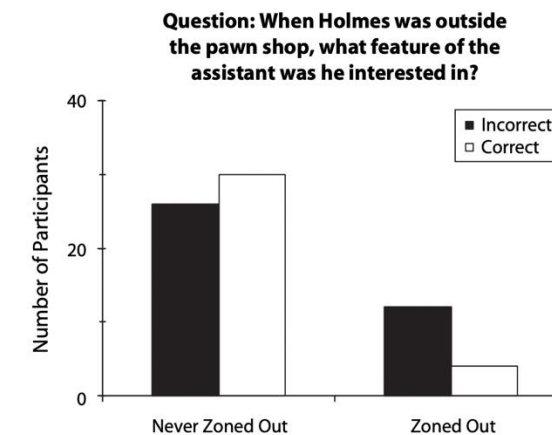
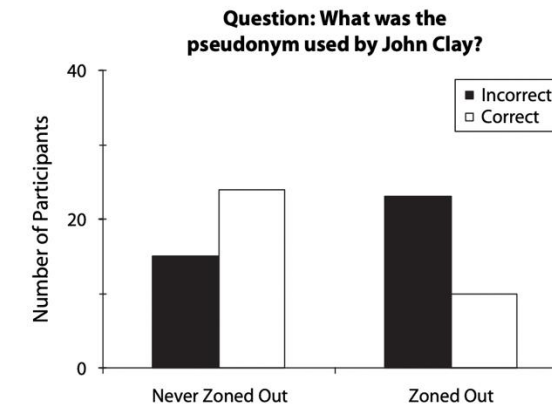
costs of mind wandering



costs of mind wandering



- undergraduate students read *The Red-Headed League* (Conan-Doyle, 1892/2001a)
- four inference critical episodes (key: identity of villain never mentioned)
- “Just prior to being asked, was your attention **on** or off-task (**tuning out** vs. **zoning out**)?”
- comprehension questions (fact + inference)



mind wandering in the brain

- involvement of the default mode network
- but also the frontoparietal control network

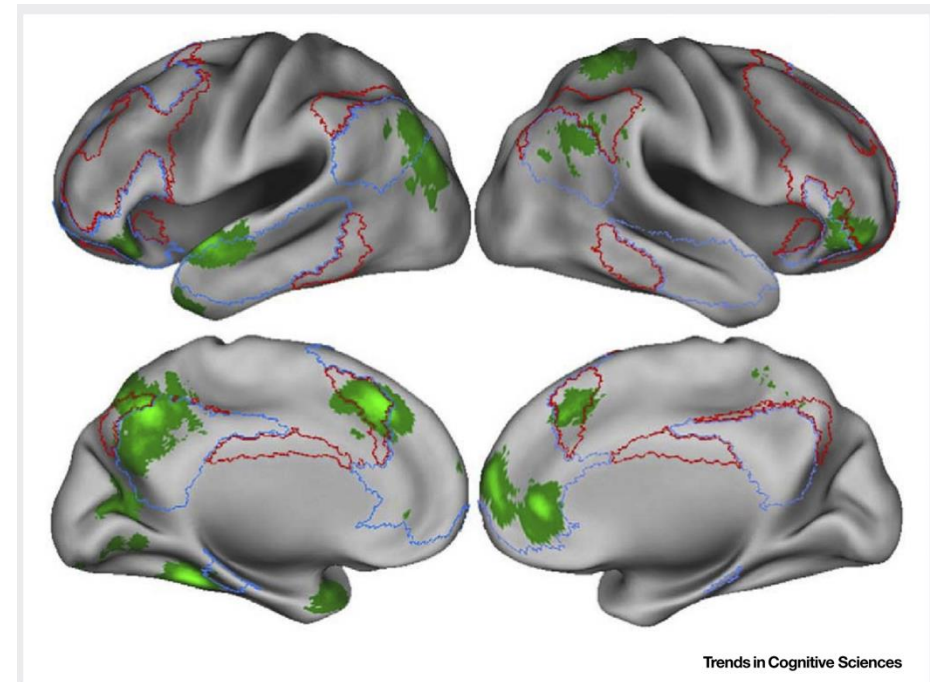


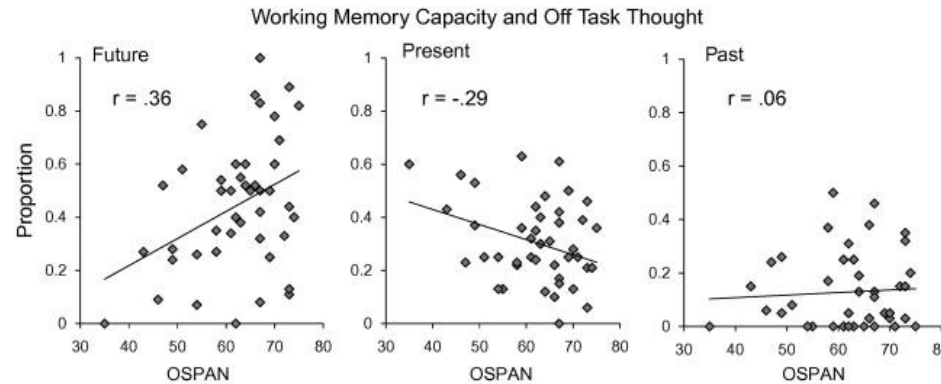
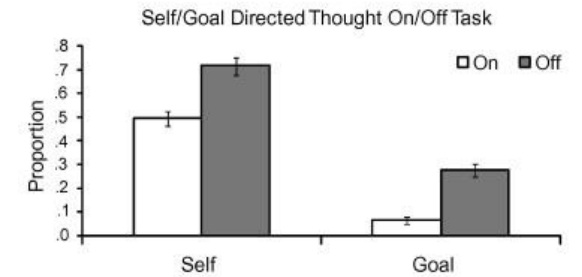
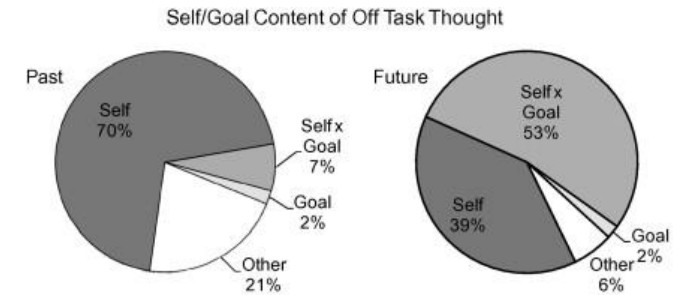
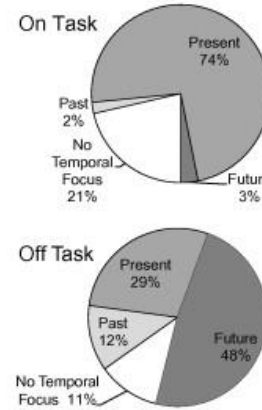
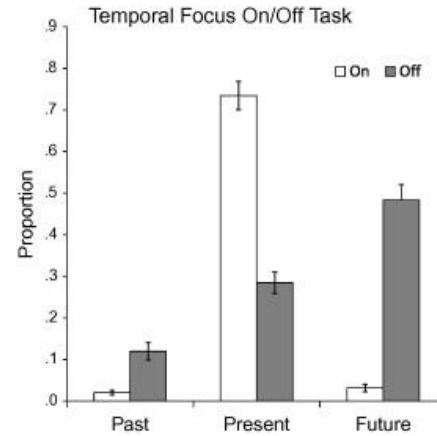
Figure 1. Brain Activations during Periods of Mind-Wandering Contrasted with the Default Mode Network (DMN) and the Frontoparietal Control Network. Significant meta-analytic clusters of brain activity associated with periods of mind-wandering (green clusters) contrasted with the DMN (blue) and the frontoparietal control network (red). Meta-analytic activity associated with mind-wandering shows marked overlap with both the DMN and frontoparietal control network. DMN and frontoparietal control network masks are based on aggregate data from 1000 subjects, as reported by [100]. Reproduced, with permission, from [35].

why wander?

choice RT

thought probes

O-SPAN



automatic and controlled processes

facilitation
or
inhibition

controlled

slow

effortful

demands resources

novelty

facilitation
or
no effect

automatic

fast

effortless

practiced

few resources

Stroop task

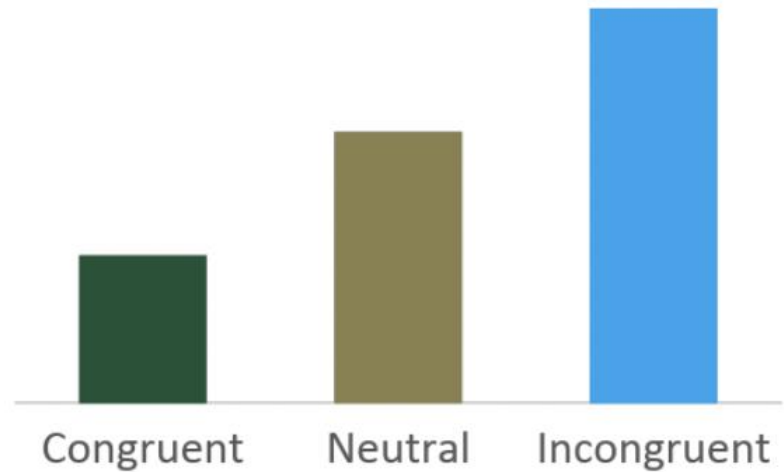
- competition between perceptual and semantic information
- reading is automatic but naming the color is a controlled process

blue yellow red
purple black

blue yellow red
purple black

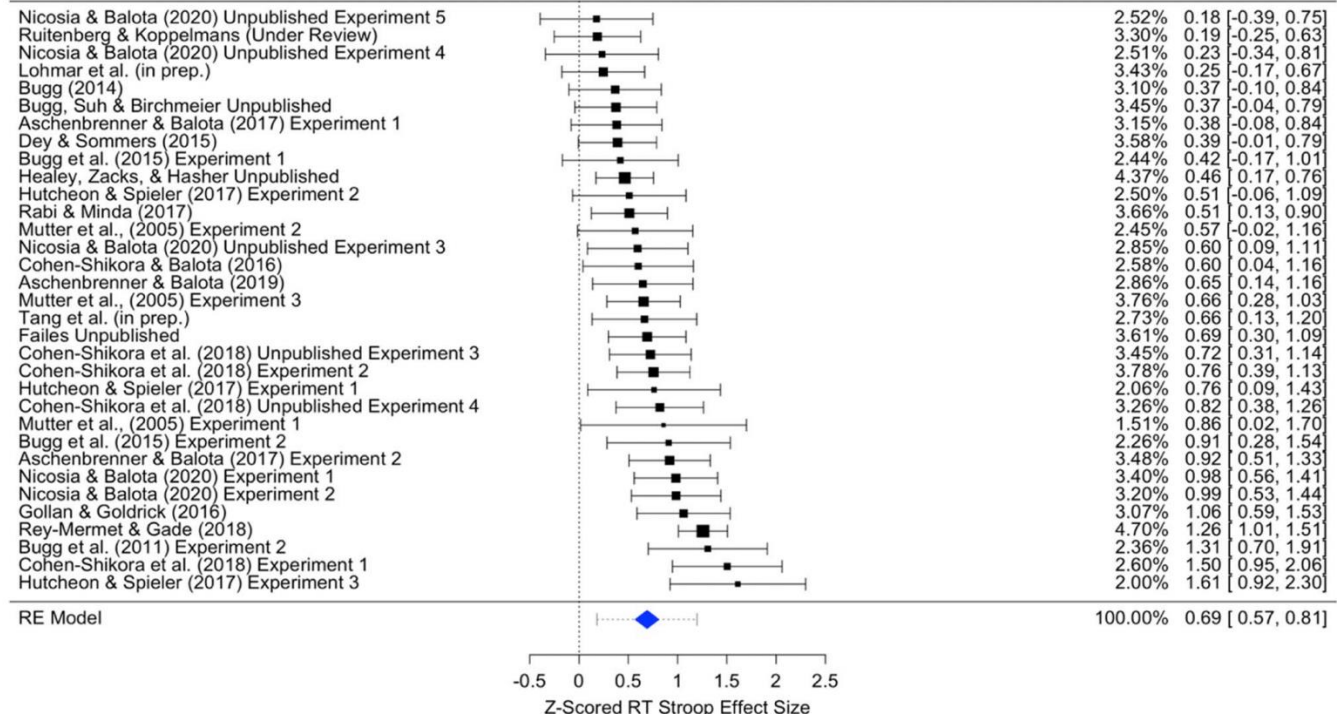
Stroop task

- competition between perceptual and semantic information
- reading is automatic but naming the color is a controlled process
- Stroop effect = incongruent - congruent



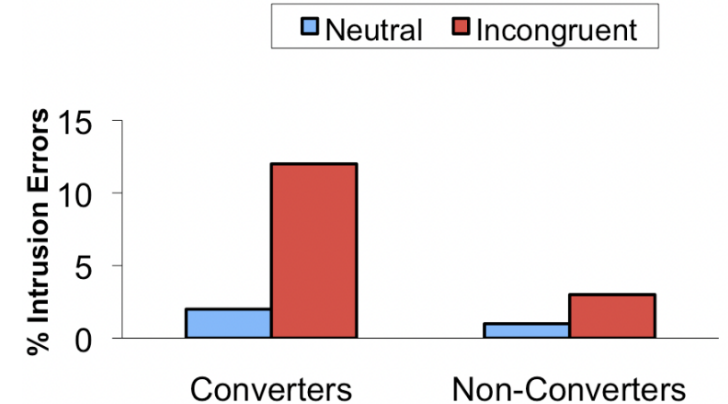
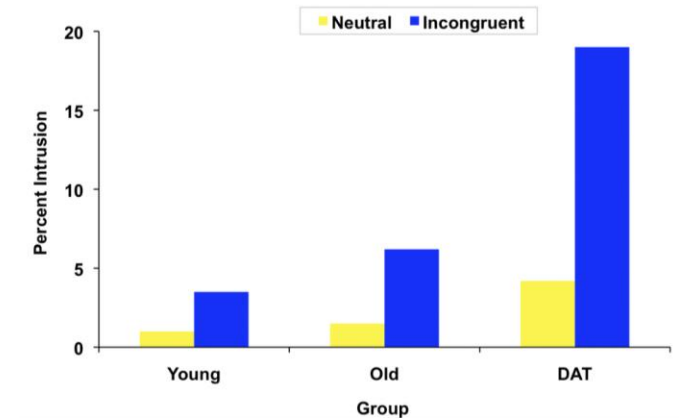
Stroop task and aging

- Nicosia, Cohen-Shikora, and Balota (2021)
- large meta-analysis of reaction times



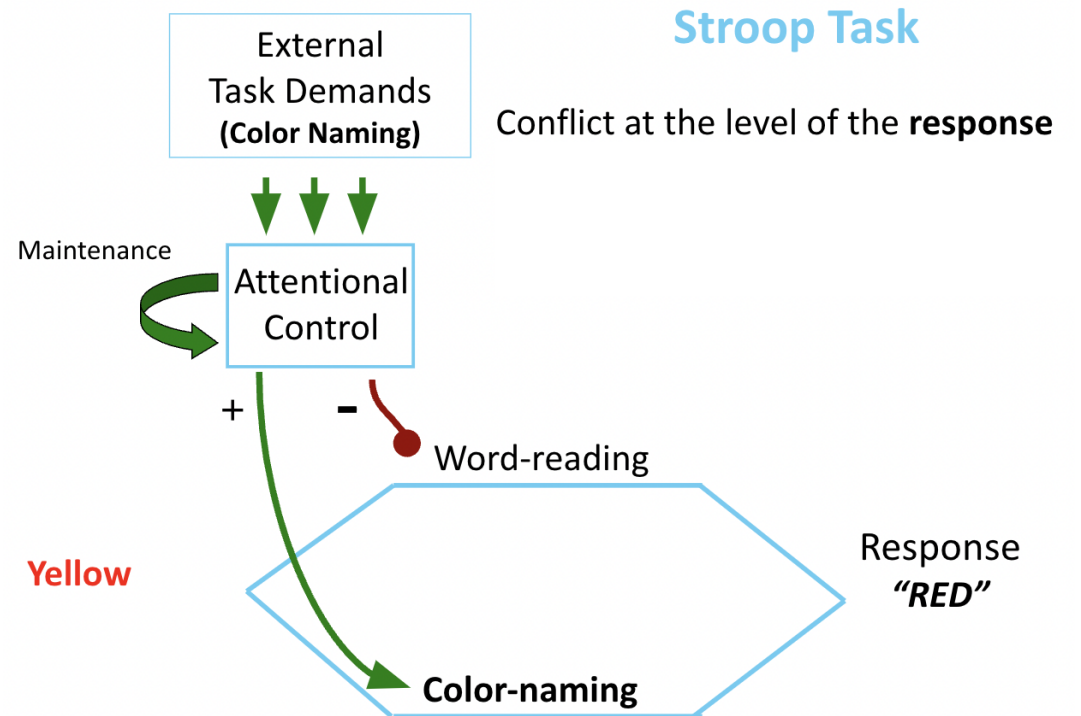
Stroop task and cognitive impairment

- Spieler, Balota, & Faust, 1996
- measured intrusion rates in individuals with dementia of the Alzheimer type (DAT)



Stroop task and cognitive impairment

- Spieler, Balota, & Faust, 1996
- measured intrusion rates in individuals with dementia of the Alzheimer type (DAT)



exit ticket + next class



- more limitations!

Here are the to-do's for the week:

- [Week 3 Exit Ticket \(due Thursday\)](#).
- [Week 3 Quiz \(due Sunday\)](#).
- Post any lingering questions [here](#)
- Extra credit opportunities:
 - Submit [Extra Credit Questions](#) (1 point for 8 submissions)
 - Submit [Optional Meme Submission](#) (1 point for winners!)

Before Tuesday

- [Complete W3 Activity 1](#)

Before Thursday

- [Complete W3 Activity 2](#)

After Thursday

- See the [Apply](#) section