Adult Age Differences in the Attention Network Test

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Introduction

QUESTION: Does attention, as assessed by the Attention Network Test (ANT), differ between young and older adults?
Are there differences in RT Difference score vs. Proportional scores?

Attention Network Test (ANT ; Fan, McCandliss, Sommer, Raz & Posner, 2002)
- Combines flanker and cued reaction time tasks
- Measures Executive (EA), Orienting (OA), and Alerting (AA) types of attention

Findings in the ANT with aging are mixed:

	Absolute RT			Proportional RT		
	EA	AA	OA	EA	AA	OA
Fernandez-Duque & Black, 2006*	Y = O	Y < O	Y = O	Y < O	Y < O	Y = O
Gamboz, Zamarian & Cavallero, 2010*	Y > O	Y > O	Y < O	Y = O	Y > O	Y = O
Jennings, Dagenbach, Engle & Funke, 2007	Y > O	Y > O	Y = O	Y = O	Y > O	Y = O

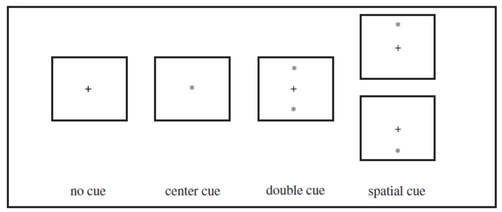
Method

Participants
- 32 Older (*M* age = 73.06 ± 6.19; 18 female)
- 35 Young adults (*M* age = 20.17 ± 1.95; 10 female)

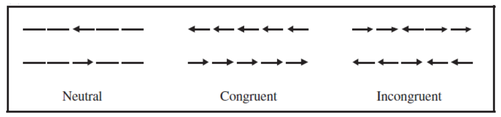
Attention Network Test
- Participants respond to a central target amidst four flanking arrows
- **Executive attention (EA)**: RT on Incongruent minus Congruent trials
- **Alerting attention (AA):** RT on non-cued minus centrally cued (asterisk) trials
- **Orienting attention (OA)**: RT on centrally cued minus spatially cued trials
- 96 trials/block, 3 blocks/session

Proportional score = Absolute RT difference / Overall mean RT*

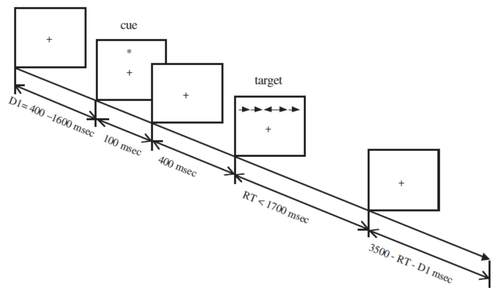
Cue type



Flanker type

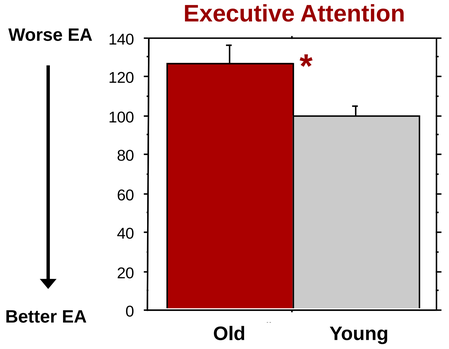


Trial Sequence



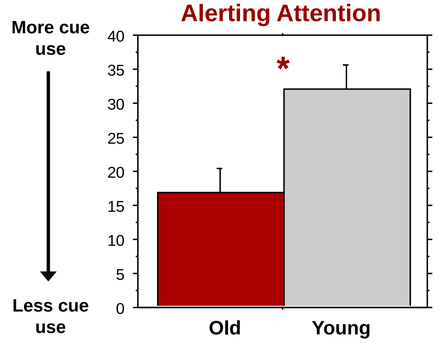
Results: Absolute RT Differences

Executive Attention



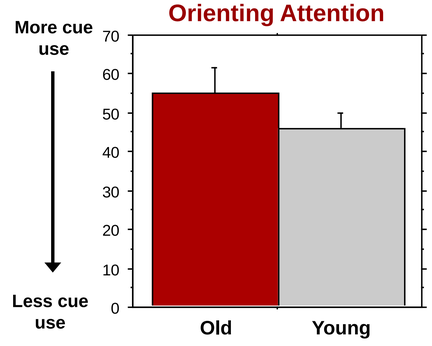
t(65) = 2.51, *p* = .015

Alerting Attention



t(65) = -2.98, *p* = .004

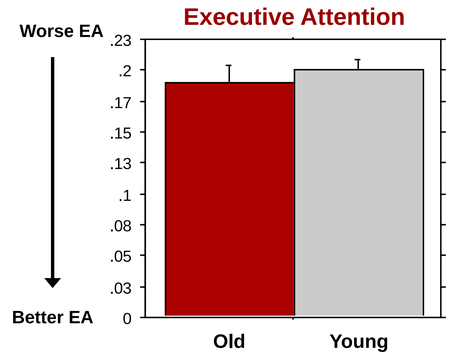
Orienting Attention



t(65) = 1.22, *p* > .05

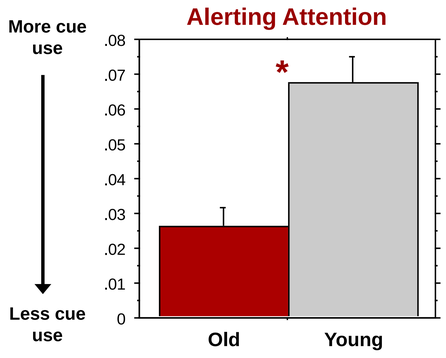
Results: RT Proportional scores

Executive Attention



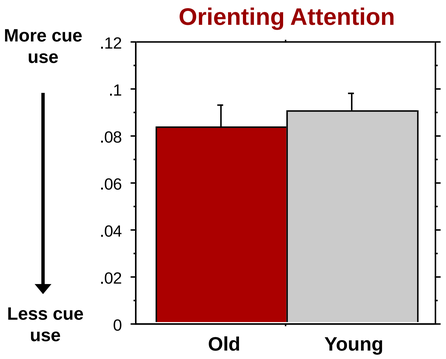
t(65) = -0.60, *p* > .05

Alerting Attention



t(65) = -4.30, *p* < .001

Orienting Attention



t(65) = -0.60, *p* > .05

Discussion

- Controlling for processing speed by using proportional RT scores affects conclusions regarding Executive, but not Alerting or Orienting attention
  - Older adults had poorer **Executive Attention** than young adults when absolute RT difference scores were used, but not when a proportional measure was used to control for age differences in speed
- Age differences in tasks involving cognitive control have been shown previously with absolute RT differences (Verhaeghen, 2011)
  - 14 studies show a greater Flanker effect for older adults
  - 49 studies show a greater Stroop effect for older adults
- Age differences in cognitive control have also been shown using tasks other than the ANT, even when speed is controlled
  - 18 studies used a proportional RT measure in the Stroop task, and found consistent age differences (Guerreiro, Murphy & van Gerven, 2010)
  - Age differences are seen in a Simon task using a proportional RT analysis (Bialystok, Craik & Luk, 2008)

Implications

- The Attention Network Test may not be an ideal task for measuring age differences in Executive Attention
  - Most literature investigating age differences in cognitive control show that older adults have worse inhibitory control than young adults
- Age-related reductions in useful field of view may reduce the extent to which older adults need to use cognitive control to avoid interference in the ANT
  - Older adults show greater interference on a flanker task when targets and flankers are closer together than when they are more spread out (c.f. Jennings et al., 2007)

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