

# Commentary (and addendum)

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# Cognitive Benefits

- What are the benefits of knowing more than one language?
  - Reserve capacity
  - Delay of cognitive decline
  - Executive function
- A central concern in bilingualism research?
  - Variability across studies
  - Especially in executive functioning
- Likely we are missing important variables?

# Two possibilities for disagreement

- Circadian rhythms/ **synchrony effects**
- Mood
  
- Both impact executive functioning
  - Best at a peak/synchronous time of day
    - adolescents, young & older adults
  - Better when NOT in a good mood
    - young & older adults

# The Morningness-Eveningness Questionnaire

(MEQ; Horne & Ostberg, 1976)

- 18 questions

1) Considering only your own “feeling best” rhythm, at what time would you get up if you were entirely free to plan your day?

AM 5---6---7---8---9---10---11---12---1 PM

2) If you went to bed at 11 PM, at what level of tiredness would you be?

Not at all tired       A little tired  
 Fairly tired       Very tired

**Categories:**

**Definitely morning (DM)**

**Moderately morning (MM)**

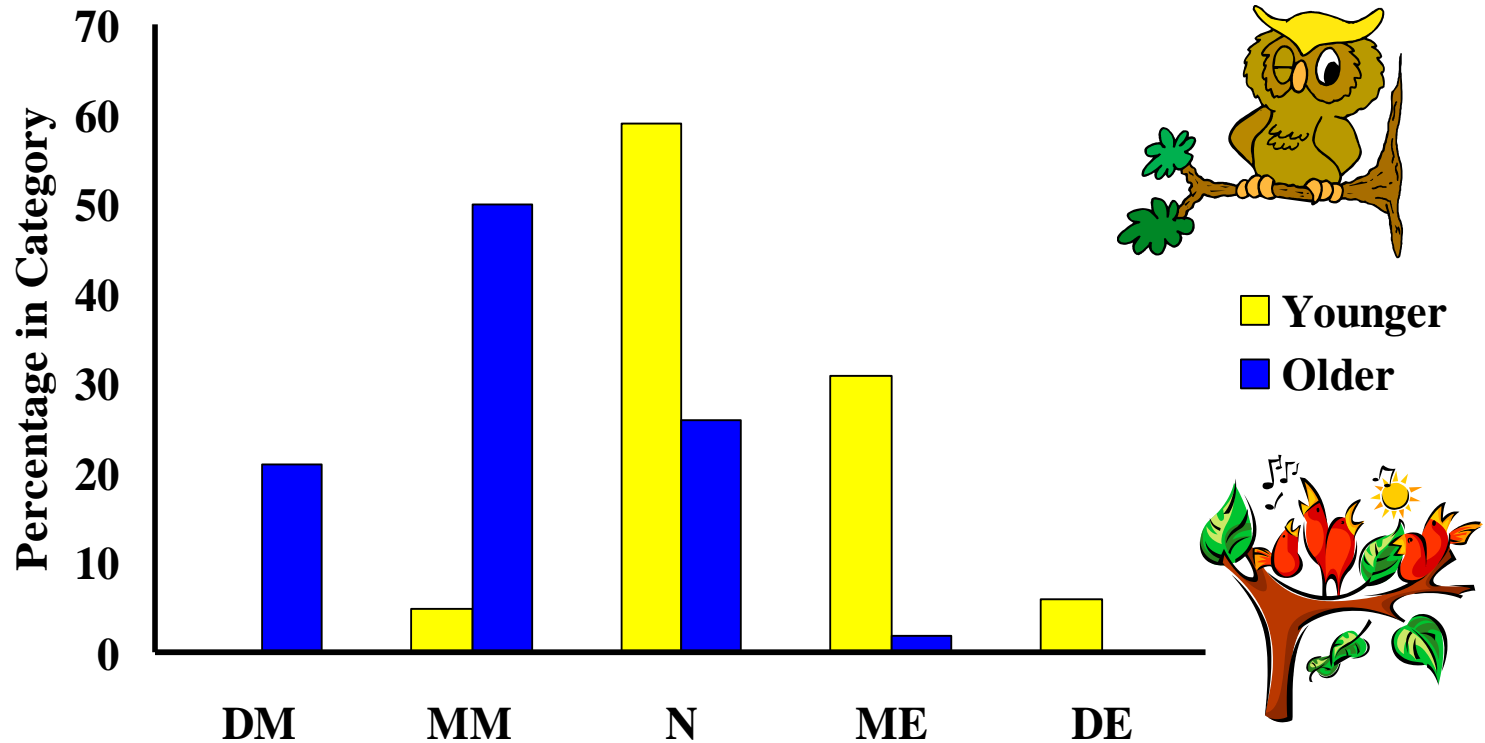
**Neutral (N)**

**Moderately evening (ME)**

**Definitely evening (DE)**

# Morningness-Eveningness Scores

(Yoon May & Hasher, 2000)

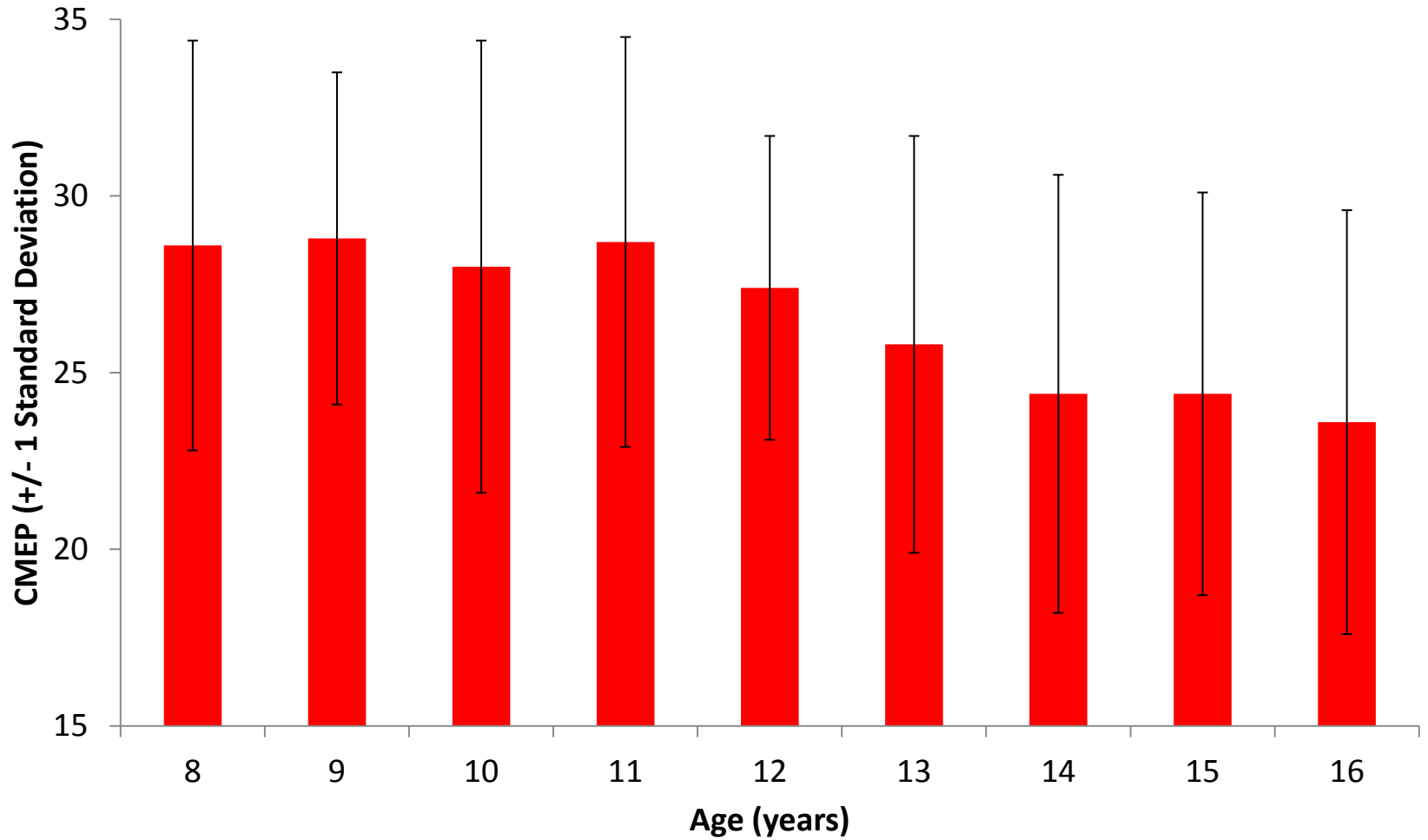


Younger  
Older



And, there's a childrens' version

CMEQ (Kim et al., 2002, Pers and Indiv Diff) n=989



# Our Executive Functions

## Inhibitory Theory

(Hasher & Zacks, 1988; Hasher, Zacks & May, 1999; Healey et al., 2014; Lustig et al., 2007)

- Access (control over distraction)
  - Reading with distraction
  - 1-back tasks with distraction
- Deletion (of no longer relevant info)
  - Complex span tasks
  - Availability of no longer relevant ideas, inferences, words
  - Competition at retrieval (PI)
- Restraint (strong responses)
  - Stroop
  - Stop signal



# Methods & Participants

- Young Evening types
- Older Morning types
  
- Tested at AM times
  - Good for old, bad for young
- Tested at PM times
  - Good for young, bad for old

# Access

- Control over distraction
  - Remote Associates

# Problem solving: with versus without distractors

(May, 1999)

SEA

HOME

STOMACH

*With Misleading Distractors:*

SEA

HOME

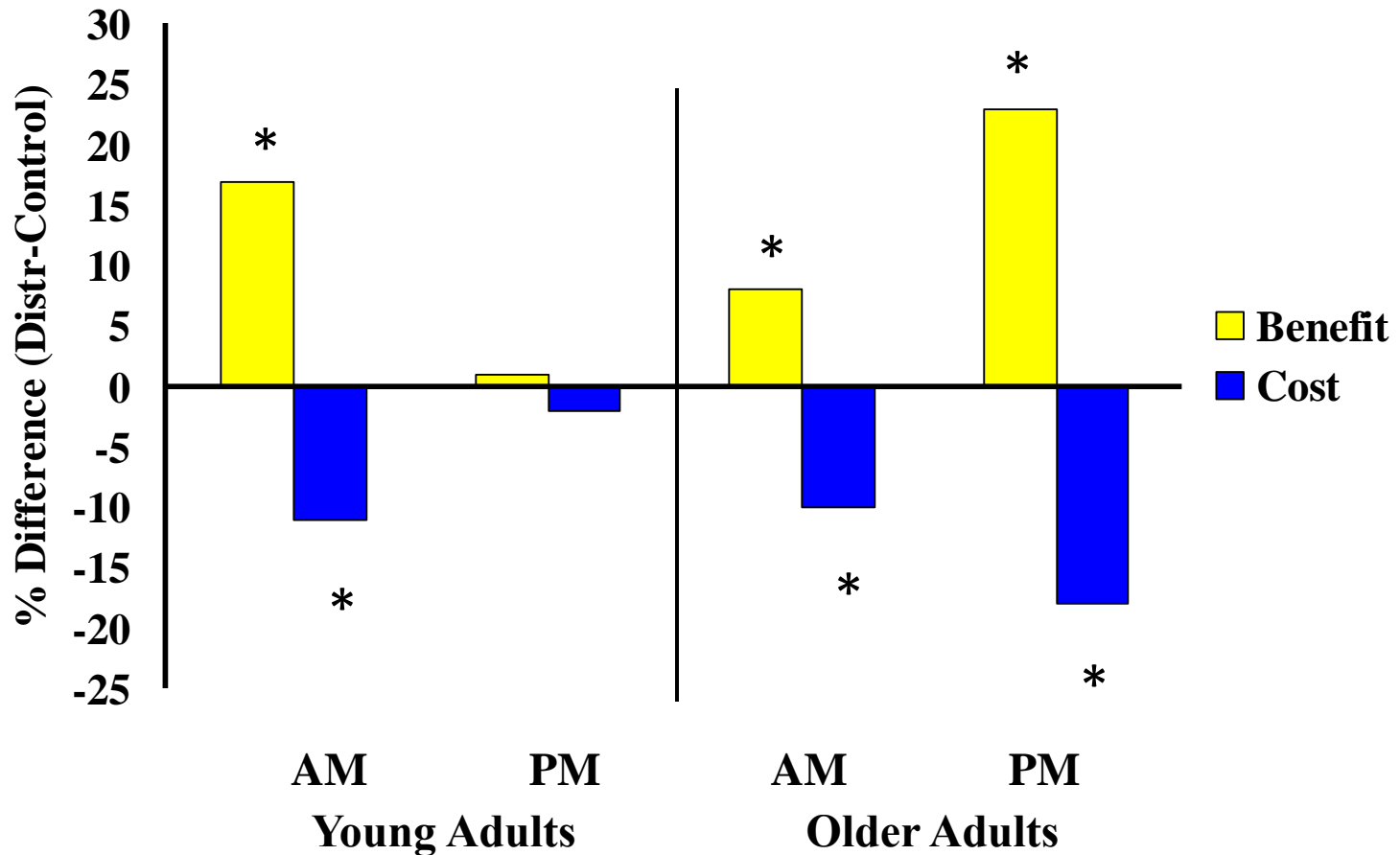
STOMACH

horse

house

liver

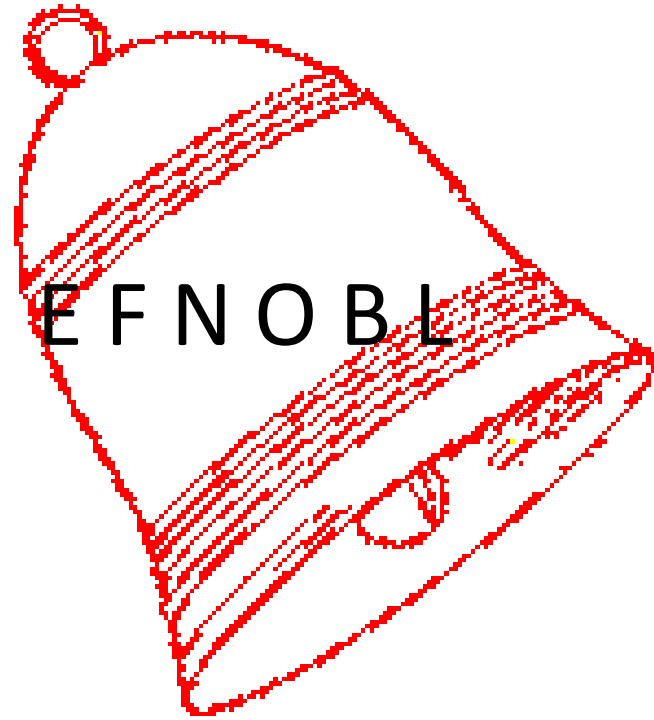
# RAT Performance: Costs and Benefits (May, 1999)



# Access & Deletion

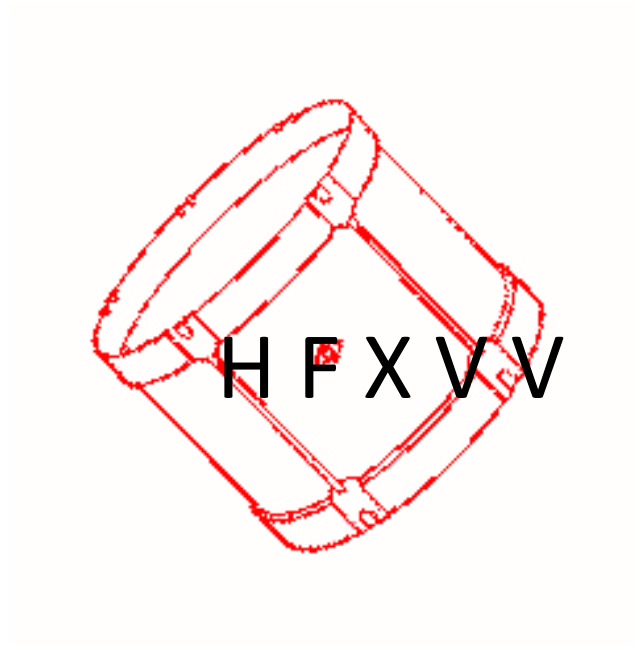
# Priming from distraction

- Phase 1: see distraction
  - (here 1-back task on pictures)
- Phase 2: delay (filler tasks)
- Phase 3: test for distraction
  - Here, fragment completion









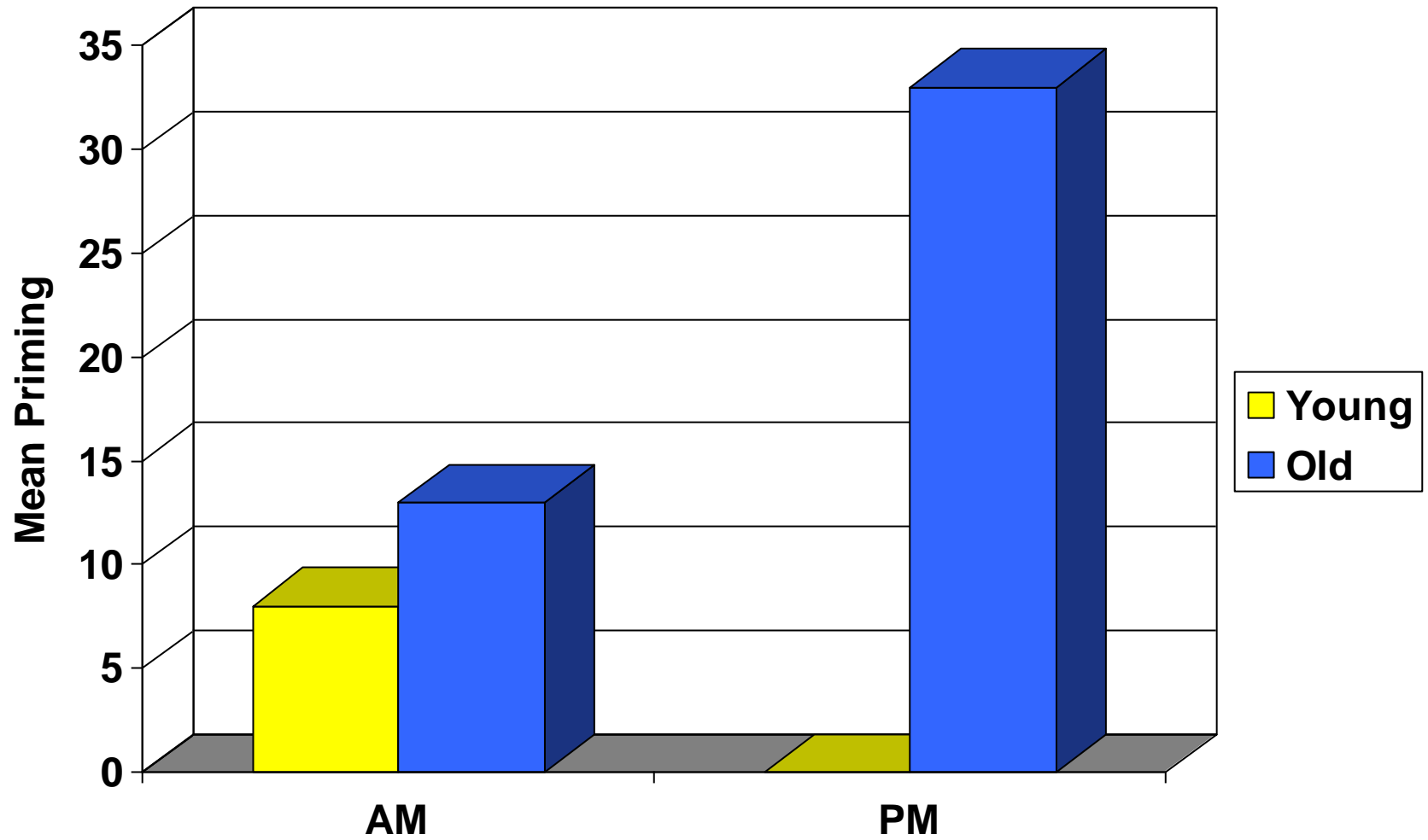




# Test Task: Word-Fragment Completion

E _ _ _ ER	ERASER
SU _ _ LY	<b>SUPPLY</b>
WI _ _ ER	WINNER
LI _ _ R	<b>LIVER</b>
A _ _ IT _ ON	AMBITION
E _ _ _ EM	EMBLEM
_ _ AM _	STAMP
L _ T _ E _ Y	<b>LOTTERY</b>
_ R _ V _	GRAVY

# Implicit Use of Distraction



Data from Rowe et al, 2006

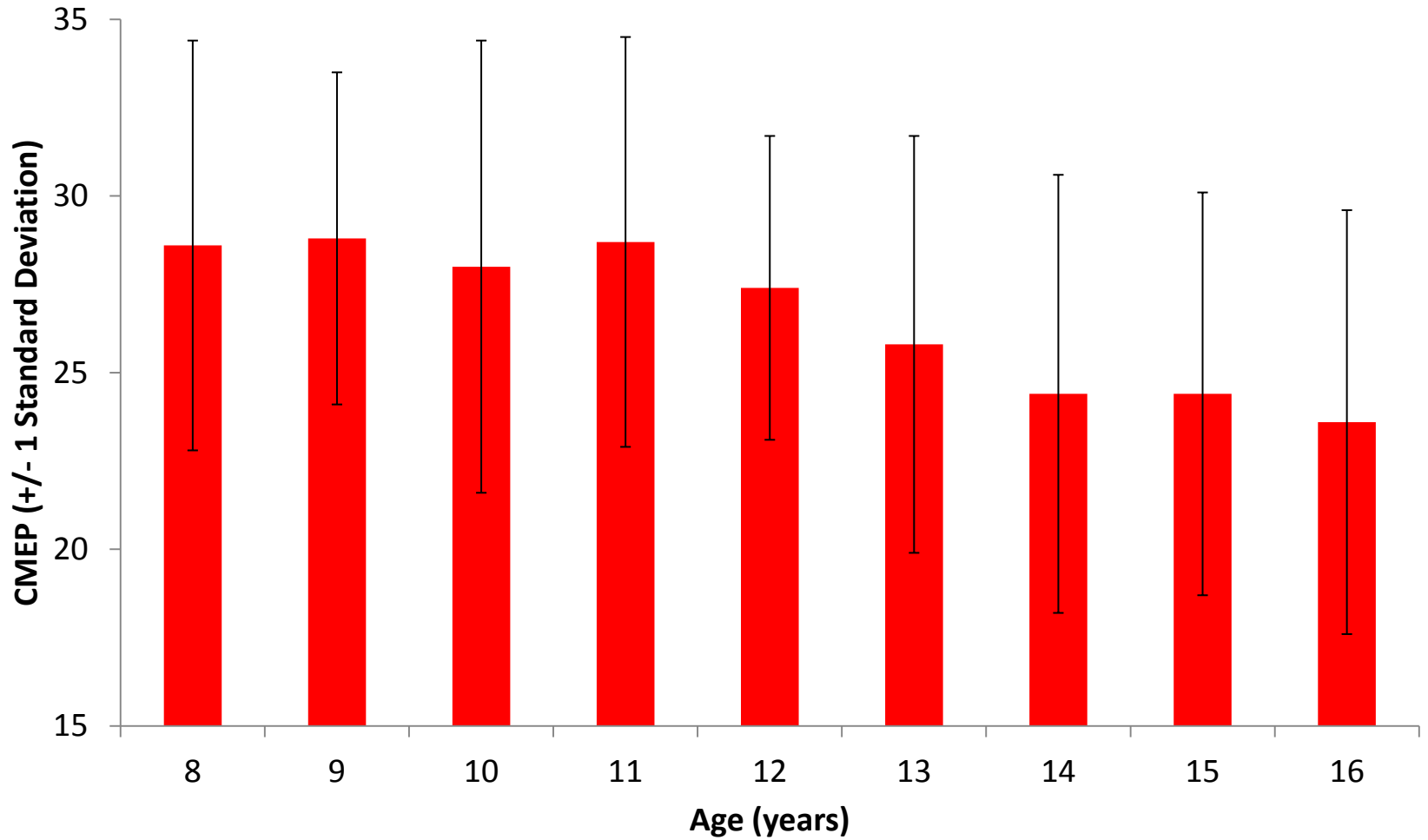
# Synchrony Effects in Aging

- Figure/Ground (Anderson et al., submitted a)
- Eye movements (Campbell et al., 2009)
  
- Spatial Span (Rowe et al., 2009)
- Word Span (Yoon et al., 1999)
- Recognition Memory (May et al., 1993)
- Story Recall (Winocur & Hasher, 2004)
- Deletion of irrelevant info (May & Hasher, 1998)
- Excessive binding of targets and distractors (Campbell et al., 2010; 2014)
- Proactive Interference (Hasher et al., 2002; Ngo et al., in prep)
- Reliance on schemas (Bodenhausen, 1990; Intons-Peterson et al, 1998)
- False memory (Intons-Peterson et al., 1998)
- Stop Signal (May & Hasher, 1998)
- **Brain changes across the day in regulation of distraction** (Anderson et al., 2014; Anderson et al., submitted b)

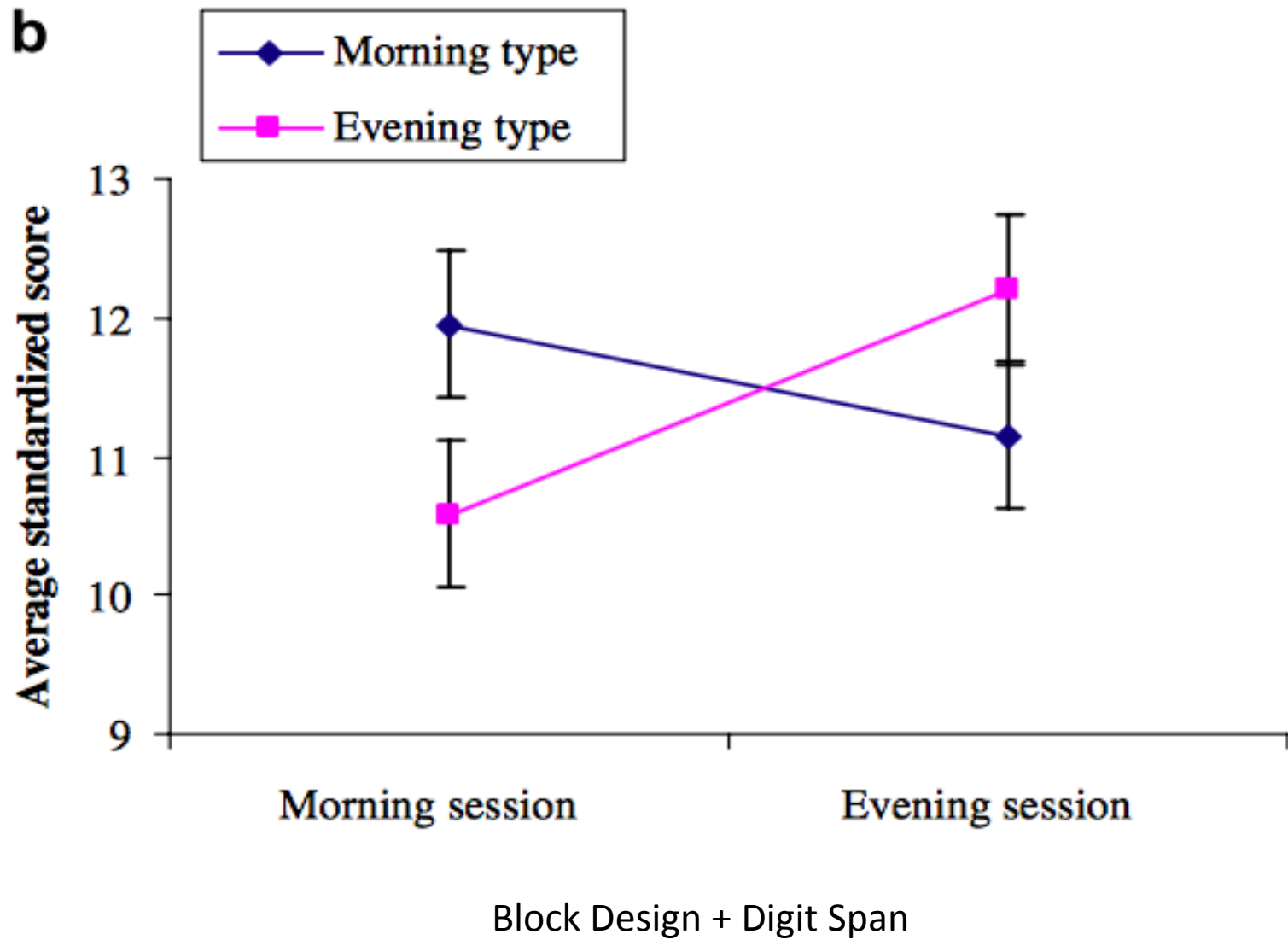
# Circadian Rhythms/Chronotypes and Cognition: Adolescence

- Aged 11-16

CMEQ (Kim et al., 2002, Pers and Indiv Diff) n=989





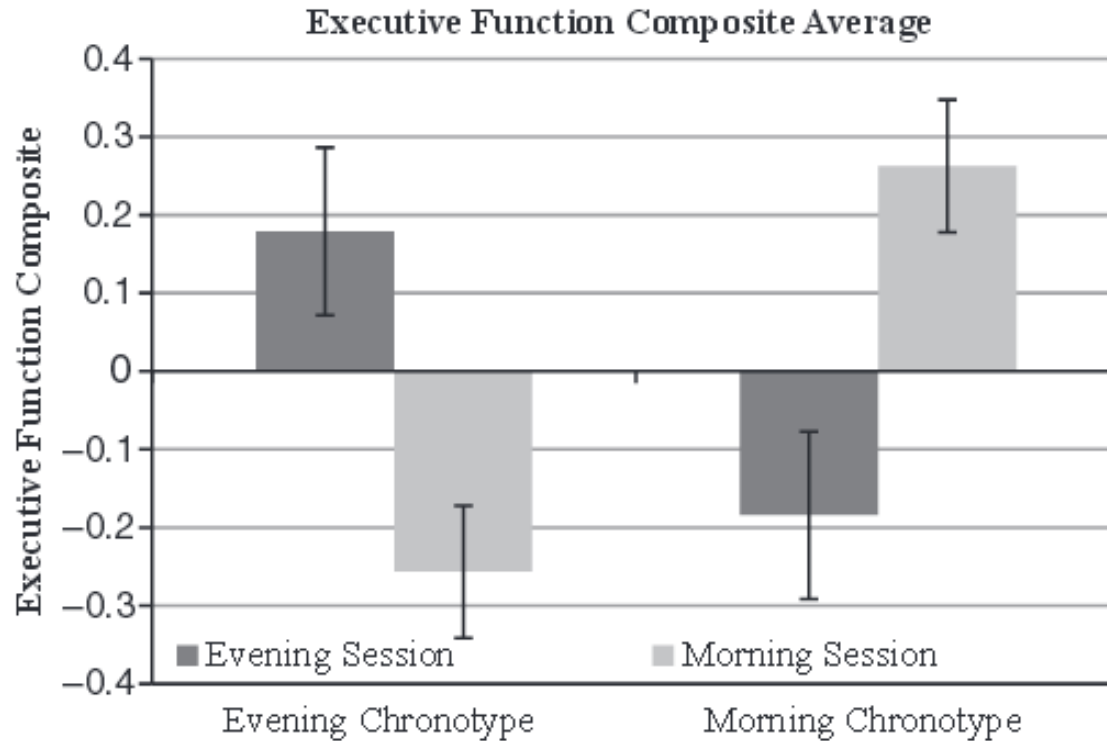


# Combined scores scale to

- 6 point IQ advantage for being tested at a synchronous time

## EXECUTIVE FUNCTIONING IN ADOLESCENTS:

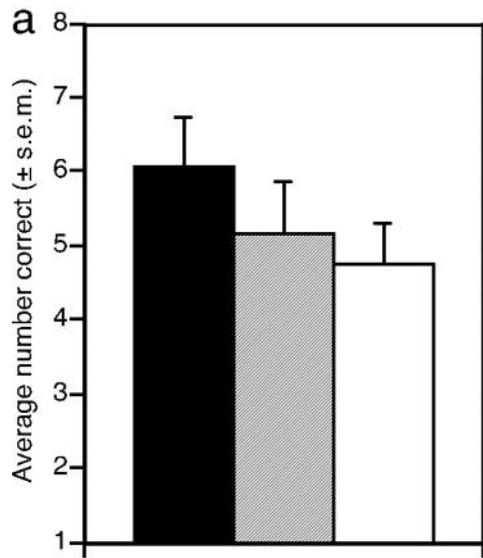
Hahn et al., (2012, *Developmental Science*)



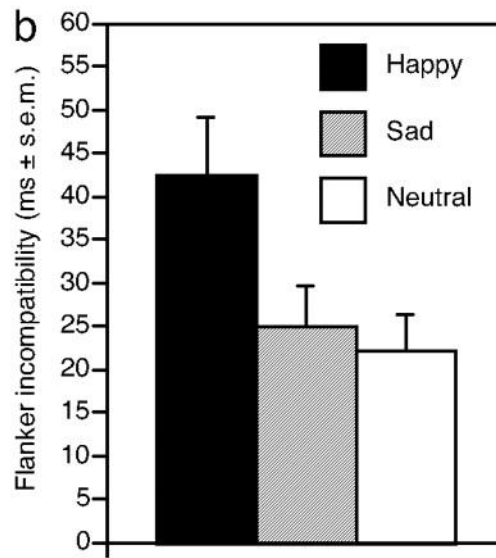
# And, that's not all

- Mood (good mood is bad for EFs)

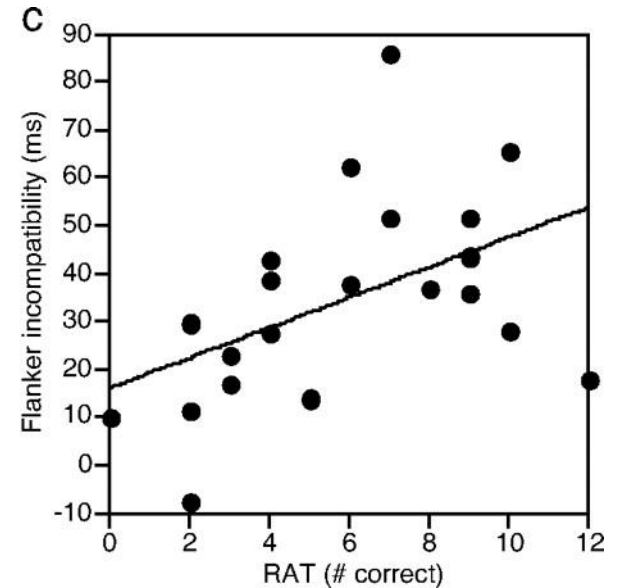
# Effect of mood manipulation on task performance.



Remote Assoc Task



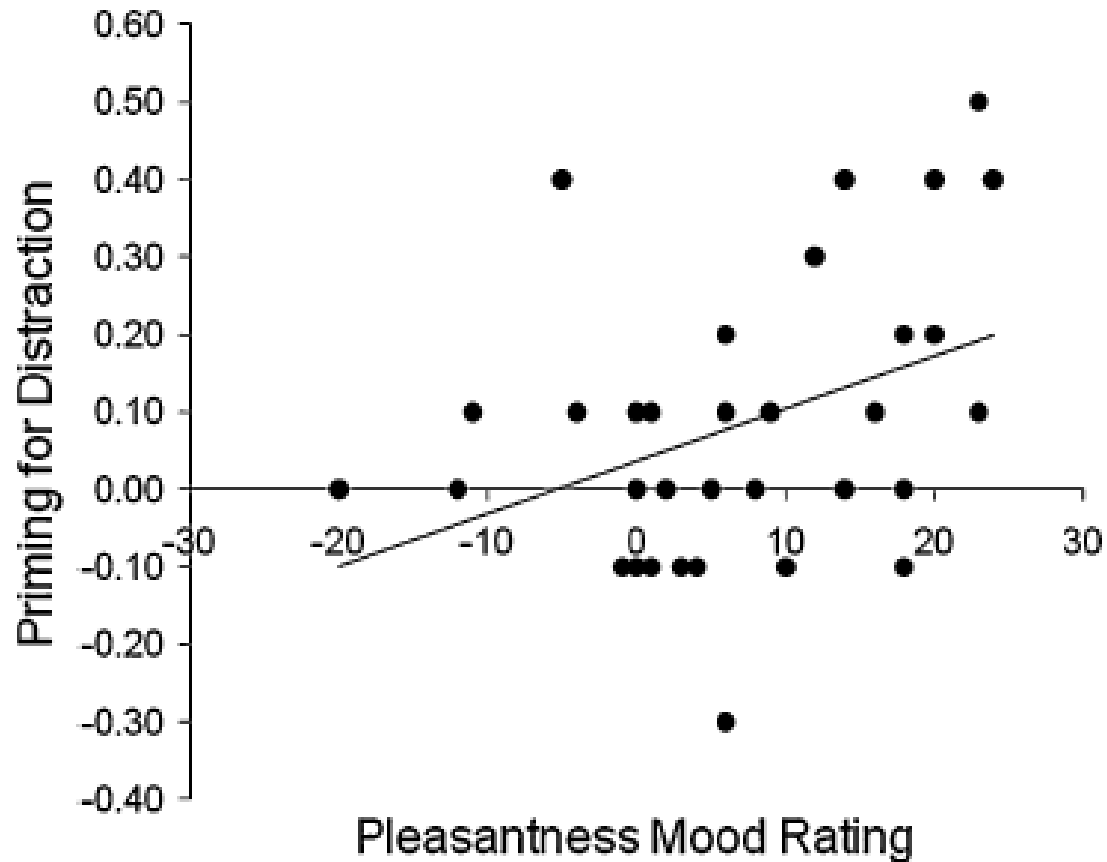
Flanker Effect



G. Rowe et al. PNAS 2007;104:383-388

# Priming from distraction

Biss et al., 2010 (*Motiv Emot*)



# Bilingualism, Executive function and Time of day

- The data are variable
- Time of testing (and likely mood) matter for executive functioning (IQ, cognitive control)
  - better at peak times of day
  - Better in a neutral mood
- Will bilingualism be even more of an advantage at nonoptimal times of day? Are there mood differences in bilingual/monolingual people?
- Bottom line: these factors play a role in **inhibitory function/attention regulation** as we conceive it and all cognitive tasks that depend on these functions.
- Perhaps these are sources of inconsistent results in the literature?

Thanks