

Working memory effects in locally and globally ambiguous sentences

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Introduction

The effects of working memory (WM) in the resolution of ambiguous sentences have been established since MacDonald, Just and Carpenter’s seminal 1992 study.

Background: Locally ambiguous, garden path sentences

Daneman & Carpenter (1980) found differences in garden path resolution due to WM (reading span).
Waters & Caplan (1996) did not find the same result.

Example sentences:

- (1) The student accepted by the school was very pleased.
(locally ambiguous: ‘accepted’)
- (2) The money taken by the student was finally returned.
(matched unambiguous control)

Background: Globally ambiguous sentences

- Attachment preferences in globally ambiguous sentences may be due to working memory differences (Kim & Christianson, 2017)
- Low WM may lead to high attachment preferences (Swets et al 2007).

Example sentence –

- (3) The grandmother of the heiress who bankrupted herself last year still made risky investments.
- ‘herself’ can refer to either the grandmother (NP1 or high attachment) or the heiress (NP2 or low attachment):

Research Questions

- What is the effect of working memory on the resolution of locally ambiguous, garden-path sentences.
- What is the effect of working memory on attachment preferences in globally ambiguous sentences?

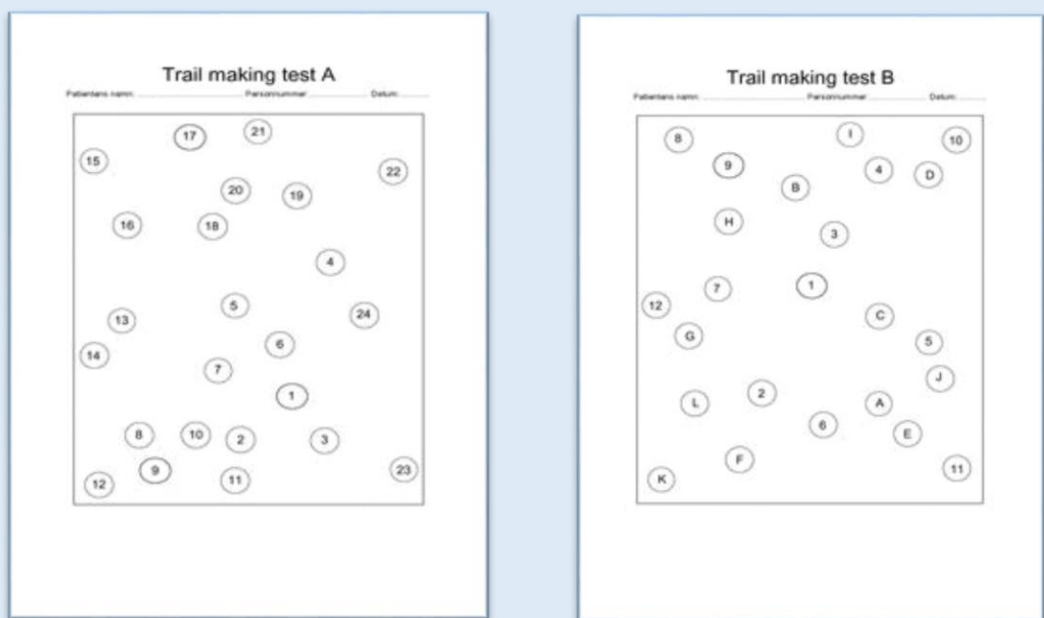
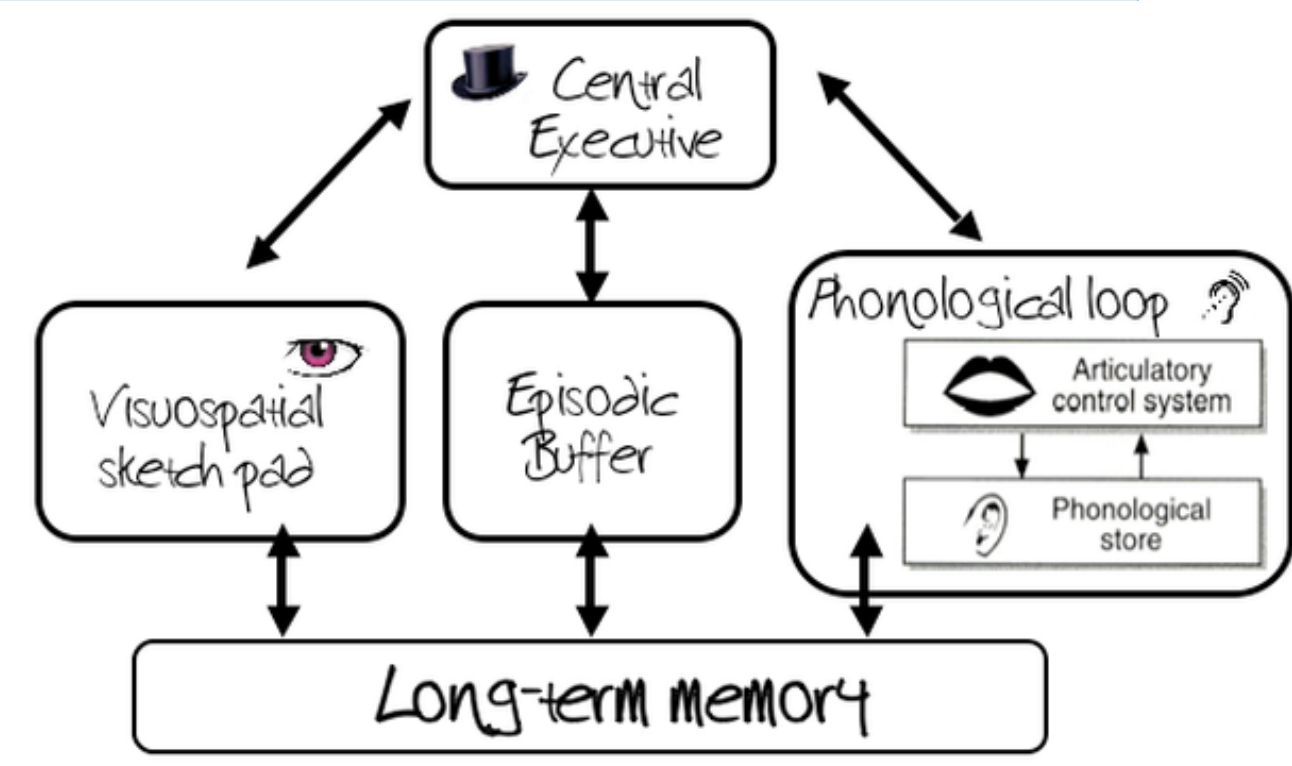
Participants

- n=142 (male = 46, female = 96)
- Age range: 18-85 (M=35.5, SD = 18.1, mode = 21)
- L1 English = 119 , Bilingual with English = 18, L2 English = 7

Tasks: Working memory

Four WM tests using PEBL (Mueller & Piper 2014)

- Corsi Block test
 - Test visuo-spatial sketchpad
- forwards auditory digit span tasks
 - Test phonological loop
- backwards auditory digit span tasks
 - Test phonological loop & CE
- reading span
 - Test central executive

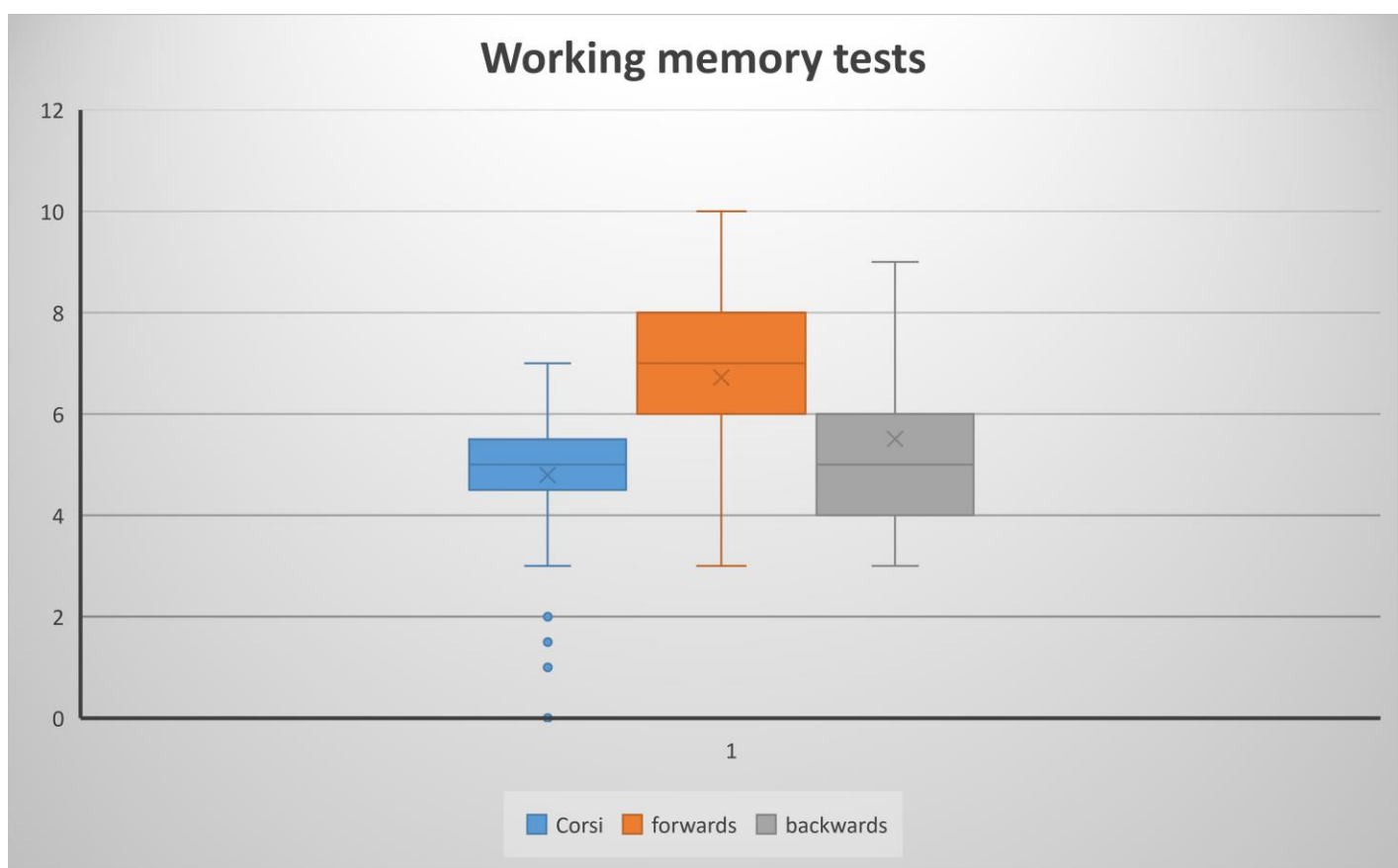
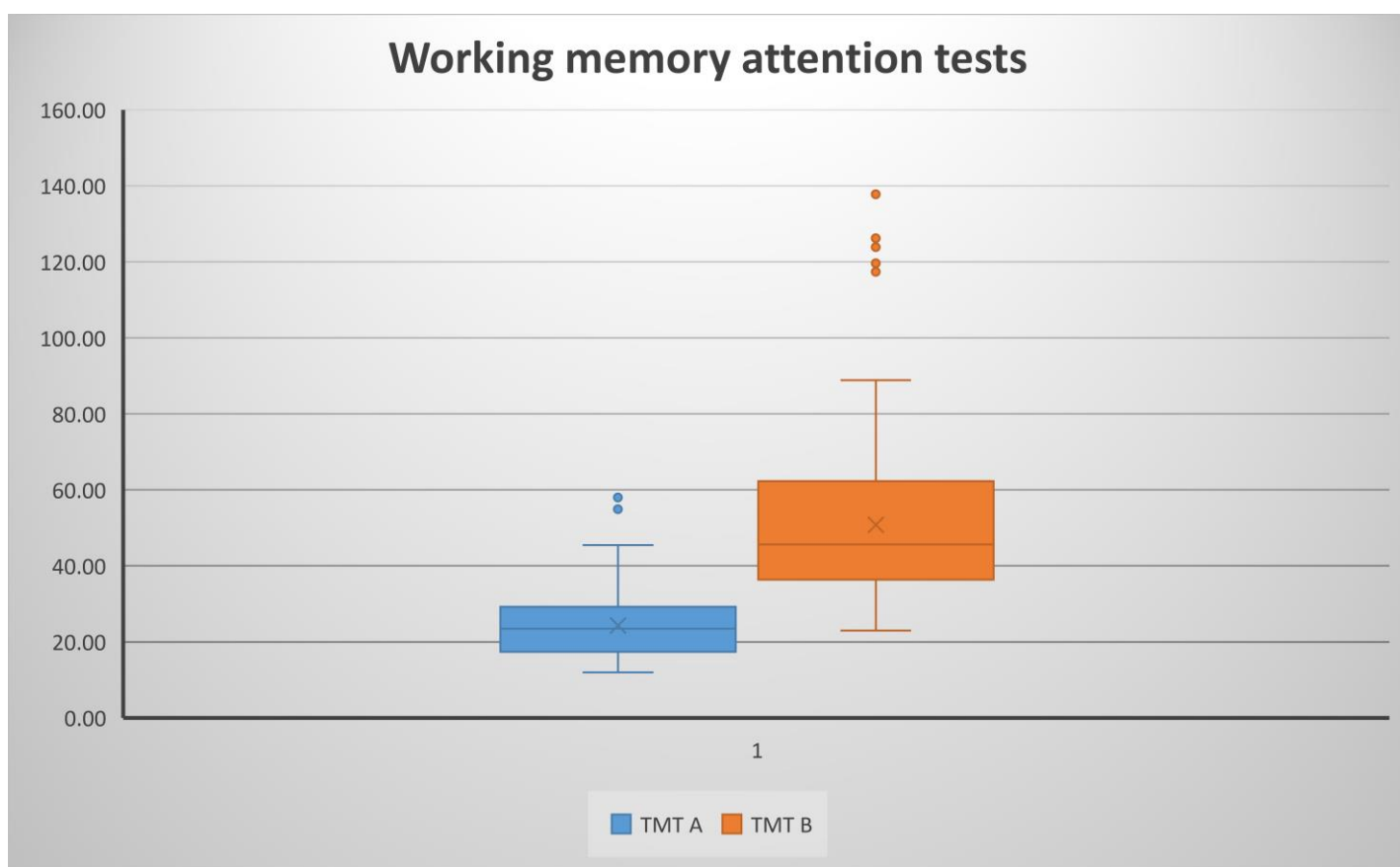


Fifth WM task:

- Trail Making Tests parts A & B
 - Measure of attention

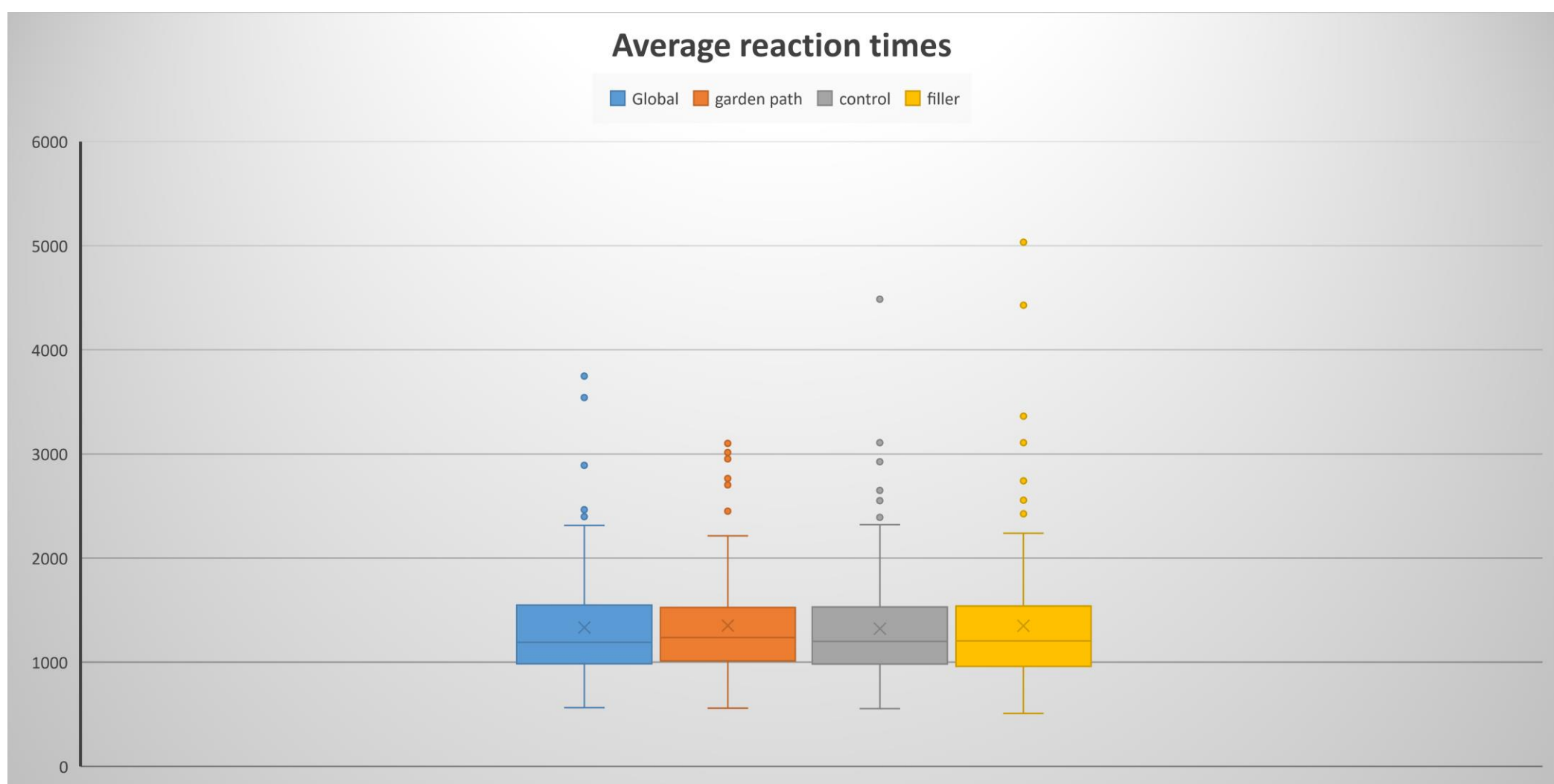
Tasks: Self paced reading

- Using OpenSesame (Mathot et al 2012)
- 10 locally ambiguous items as in (1)
 - matched with 10 control sentences as in (2),
 - adapted from Trueswell et al. (1994)
- 20 globally ambiguous items as in (3)
 - Adapted from Swets et al., (2007)
- 10 general fillers.
- Each sentence was followed with a yes/no question to ensure attention.



Results: Locally ambiguity

- Significant difference between control and target locally ambiguous sentences ($W=6114.0$, $p=.035$, $r_{pb}=.204$).
- Backwards linear regression showed all WM tests accounted for 5.1% of the variance.
 - TMT B was the best predictor: 3% of variance



	Global	Garden Path	Control	Filler
Mean	1333.68	1352.46	1322.02	1350.26
S.D	550.57	528.48	541.40	633.94

	high	low
Mean	9.33	10.67
S.D	4.54	4.54

Results: global ambiguity

- No significant differences between high & low attachment
- Backwards linear regression showed all WM tests accounted for 5.9% of the variance in global reaction time.
 - TMT B was the best predictor: 4.1% of variance
- Backwards linear regression showed all WM tests accounted for 7.5% of the variance in high attachment preferences.
 - TMT A & B combined were the best predictor: 5.4% of variance

Discussion

- Both types of ambiguous sentences seem to be most affected by TMT B (attentional control) results:
 - Longer TMT B times = longer reaction times and preference for high attachment.
- Similar findings to Swets et al (2007)
- However, WM only accounts for small variance.