

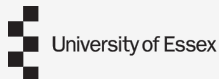
There Is No Age-Related Sentence Processing Deficit

Experimental Evidence and Implications for Aphasiology

Willem S. van Boxtel Laurel A. Lawyer

Academy of Aphasia Annual Meeting

October 24th, 2022



Contents / Introduction

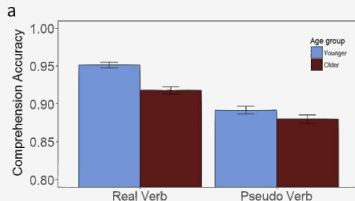
- 1 Sentence processing and healthy aging
- 2 A new look at Working Memory: RC disambiguation
- 3 Implicit learning: structural priming
- 4 Neuroimaging: structural priming
- 5 General discussion

Language and Aging (1)

Impairment-focused discourse in linguistic aging studies:

Language and Aging (1)

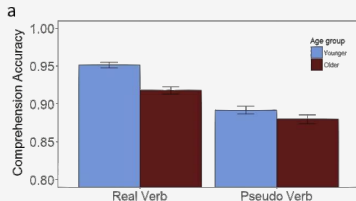
Impairment-focused discourse in linguistic aging studies:



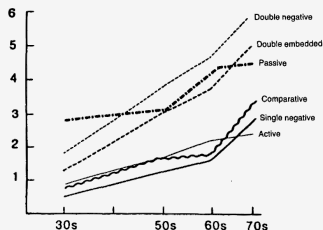
From Poulisse et al. (2019)

Language and Aging (1)

Impairment-focused discourse in linguistic aging studies:



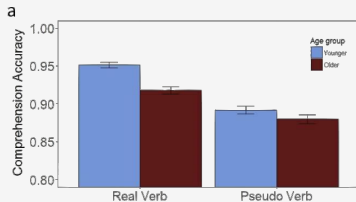
From Poulisse et al. (2019)



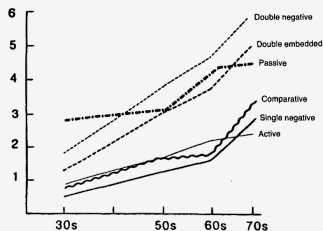
From Obler et al. (1991)

Language and Aging (1)

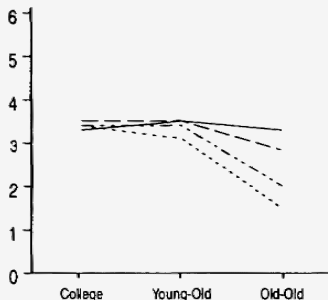
Impairment-focused discourse in linguistic aging studies:



From Poulisse et al. (2019)



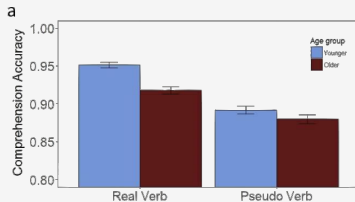
From Obler et al. (1991)



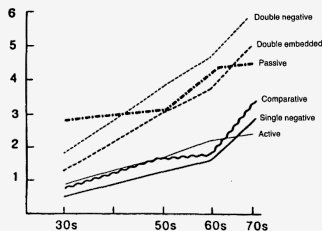
From Norman et al. (1991)

Language and Aging (1)

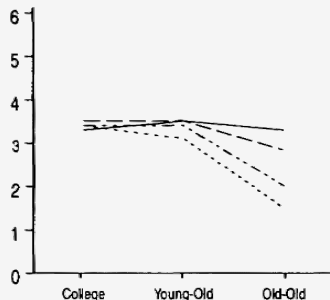
Impairment-focused discourse in linguistic aging studies:



From Poulisse et al. (2019)



From Obler et al. (1991)

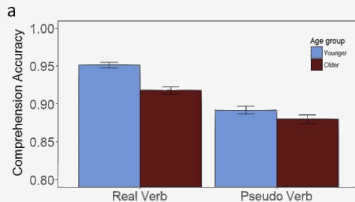


From Norman et al. (1991)

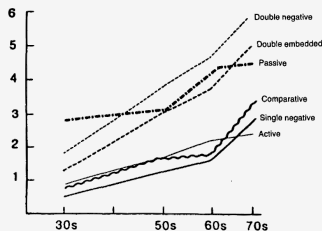
- Smaller WM spans / Slower processing / Inefficient inhibition

Language and Aging (1)

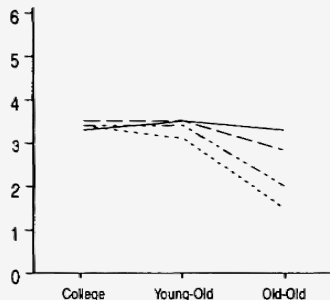
Impairment-focused discourse in linguistic aging studies:



From Poulisse et al. (2019)



From Obler et al. (1991)

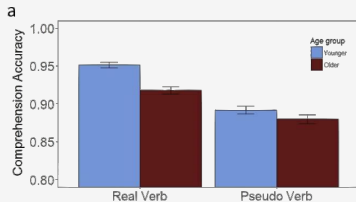


From Norman et al. (1991)

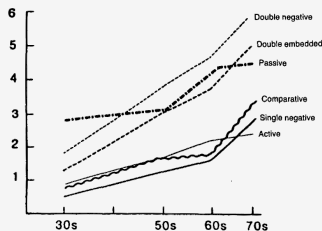
- Smaller WM spans / Slower processing / Inefficient inhibition

Language and Aging (1)

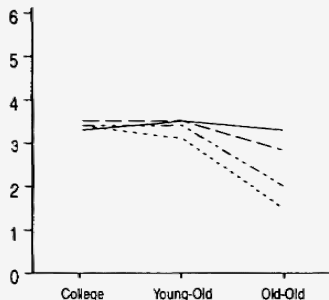
Impairment-focused discourse in linguistic aging studies:



From Poulisse et al. (2019)



From Obler et al. (1991)



From Norman et al. (1991)

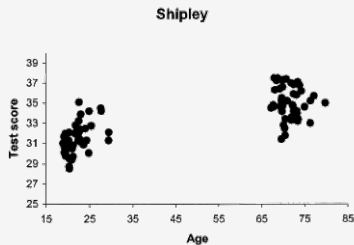
- Smaller WM spans / Slower processing / Inefficient inhibition

Language and Aging (2)

However:

Language and Aging (2)

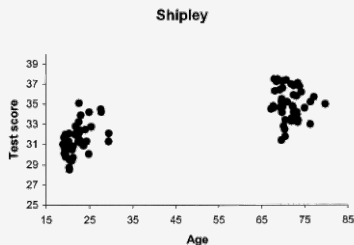
However:



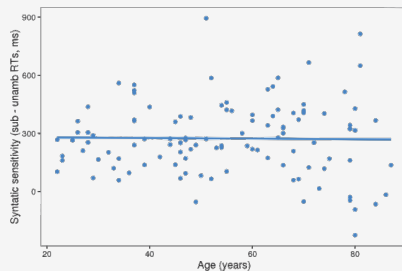
Verhaeghen (2003)

Language and Aging (2)

However:



Verhaeghen (2003)



Campbell et al. (2016)

Language and Aging (4)

So ...

Language and Aging (4)

So ...

- How do we expose what aspects of language processing decline (if any)

Language and Aging (4)

So ...

- How do we expose what aspects of language processing decline (if any)
 - And what role does memory play? (Martin et al., 2018)

Language and Aging (4)

So ...

- How do we expose what aspects of language processing decline (if any)
 - And what role does memory play? (Martin et al., 2018)
- How do we take into account possible explicit/implicit distinctions and variable performance by older adults in past language studies?

Language and Aging (4)

So ...

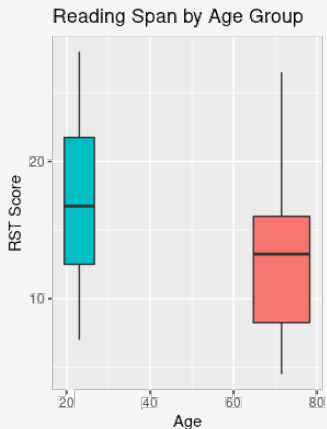
- How do we expose what aspects of language processing decline (if any)
 - And what role does memory play? (Martin et al., 2018)
- How do we take into account possible explicit/implicit distinctions and variable performance by older adults in past language studies?
- How can answering these questions for typical aging inform studies of aphasia?

Study 1: Methods (1)

FIRST: By looking at memory from a wider perspective.

Study 1: Methods (1)

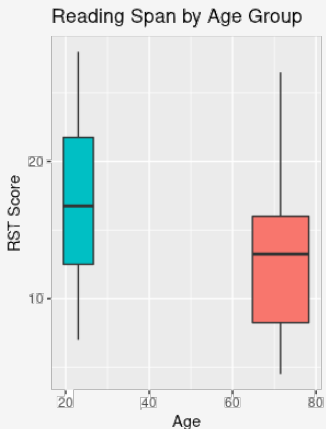
FIRST: By looking at memory from a wider perspective.



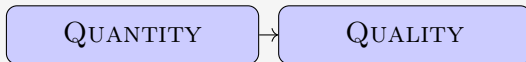
Van Boxtel & Lawyer (2022)

Study 1: Methods (1)

FIRST: By looking at memory from a wider perspective.

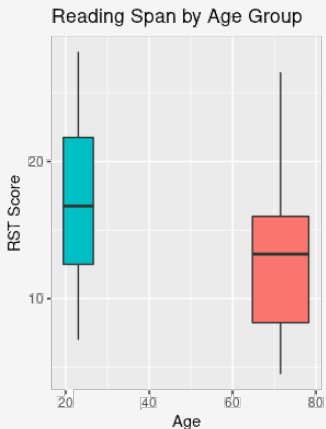


Van Boxtel & Lawyer (2022)

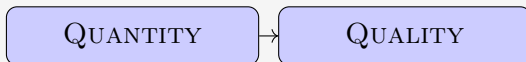


Study 1: Methods (1)

FIRST: By looking at memory from a wider perspective.



Van Boxtel & Lawyer (2022)

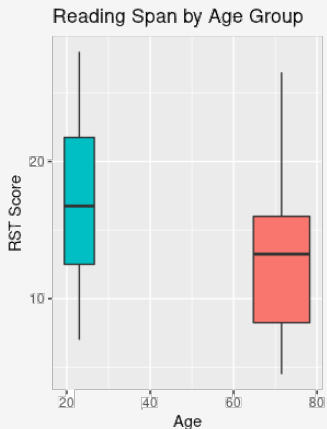


Similarity-based interference

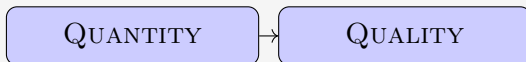
Gordon et al. (2002); Van Dyke & McElree (2006)

Study 1: Methods (1)

FIRST: By looking at memory from a wider perspective.

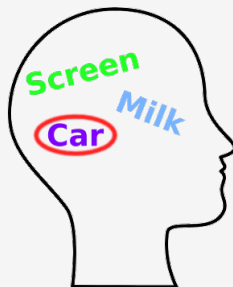


Van Boxtel & Lawyer (2022)



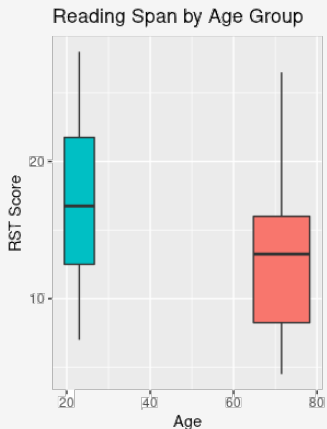
Similarity-based interference

Gordon et al. (2002); Van Dyke & McElree (2006)

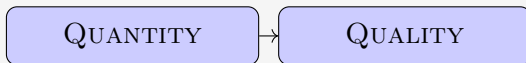


Study 1: Methods (1)

FIRST: By looking at memory from a wider perspective.

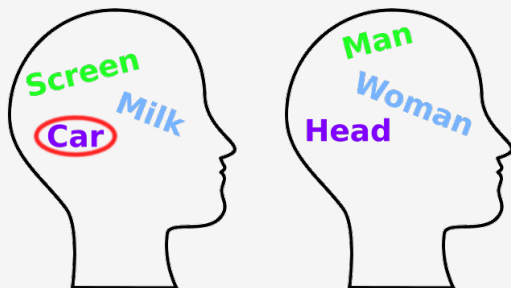


Van Boxtel & Lawyer (2022)



Similarity-based interference

Gordon et al. (2002); Van Dyke & McElree (2006)



Study 1: Methods (2)

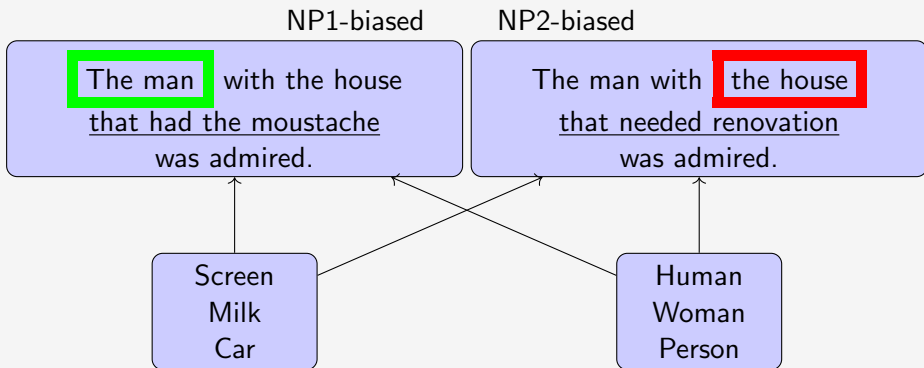
NP1-biased

The man with the house
that had the moustache
was admired.

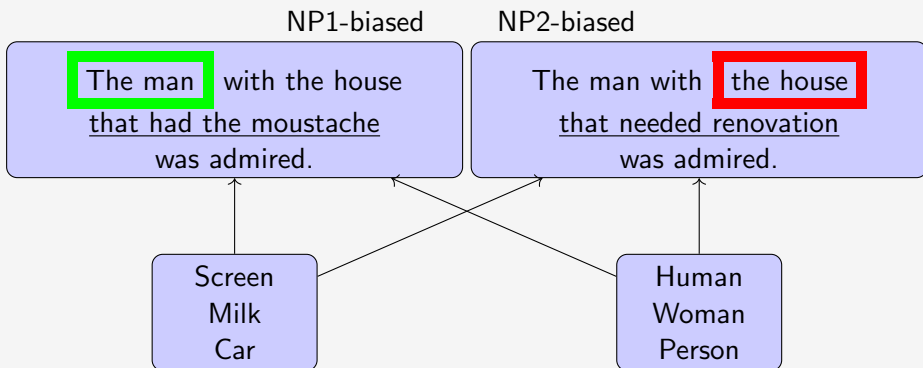
NP2-biased

The man with the house
that needed renovation
was admired.

Study 1: Methods (2)

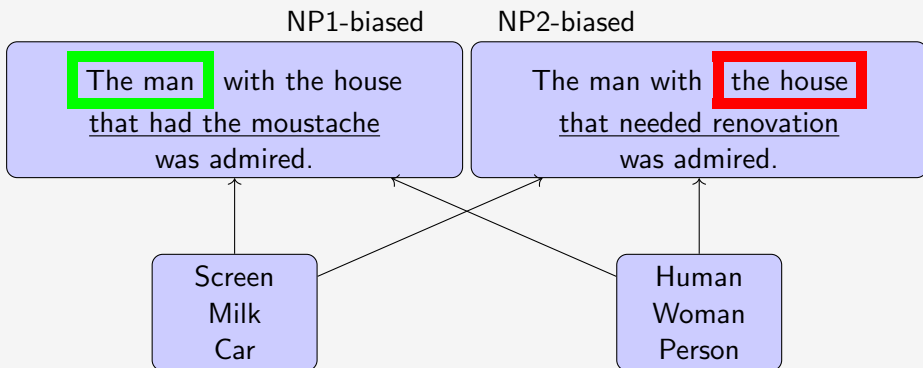


Study 1: Methods (2)



- Older and younger adults ($n = 65$) ($M_Y \text{ Age} = 21.8, [18, 25]$; $M_O \text{ Age} = 68.5, [65, 76]$) presented with disambiguated relative clauses (RC)

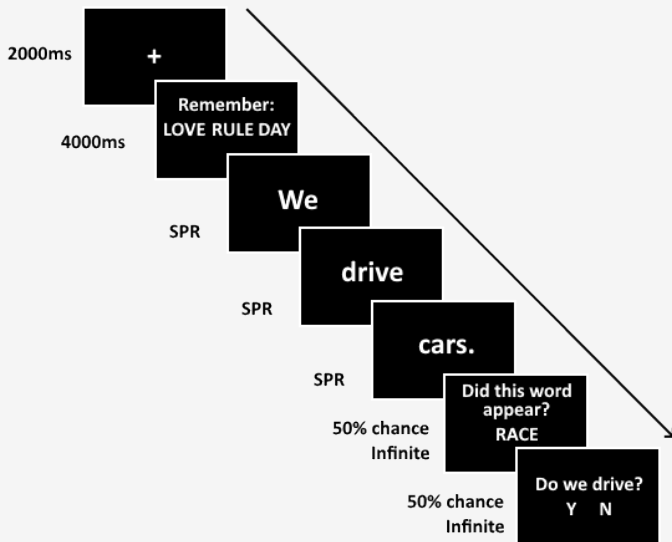
Study 1: Methods (2)



- Older and younger adults ($n = 65$) ($M_{Y\text{ Age}} = 21.8, [18, 25]$; $M_{O\text{ Age}} = 68.5, [65, 76]$) presented with disambiguated relative clauses (RC)
- Interfering or non-interfering memory load before *every* RC sentence
→ prompted for recall;

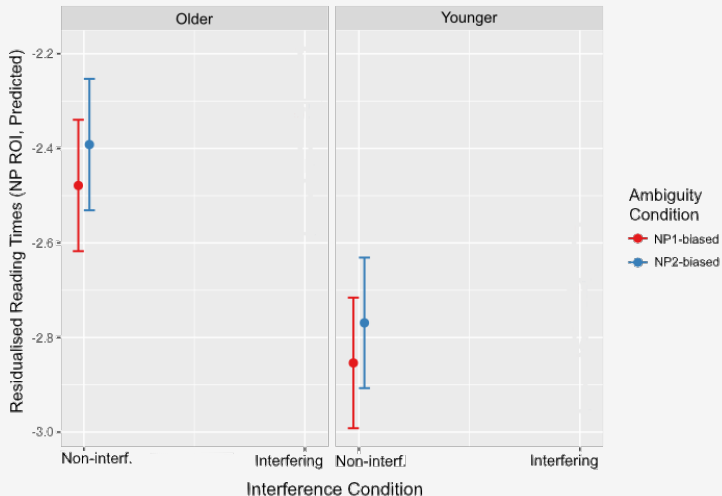
Van Boxtel & Lawyer (*in prep.* (a)). <https://osf.io/eympz/>

Study 1: Procedure



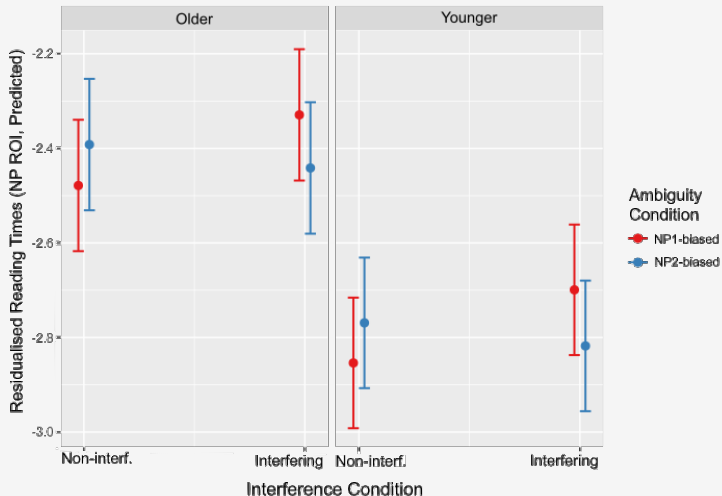
Study 1: Results (1)

Predicted Residualised Reading Times in the NP ROI
by Interference and Ambiguity Condition



Study 1: Results (1)

Predicted Residualised Reading Times in the NP ROI
by Interference and Ambiguity Condition



Study 1: Results (2)



Study 2: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

Study 2: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

- Structural priming: Repeated structures are read faster and used more
Bock (1986)

Study 2: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

- Structural priming: Repeated structures are read faster and used more

Bock (1986)

- Verb match: additional facilitation

Study 2: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

- Structural priming: Repeated structures are read faster and used more

Bock (1986)

- Verb match: additional facilitation

Study 2: Methods (1)

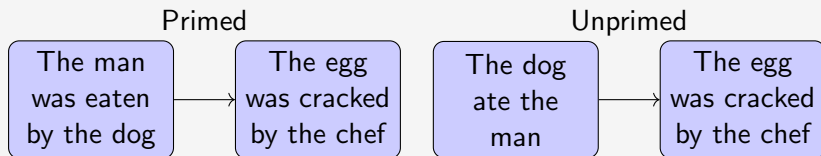
FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

- Structural priming: Repeated structures are read faster and used more

Bock (1986)

- Verb match: additional facilitation



Study 2: Methods (1)

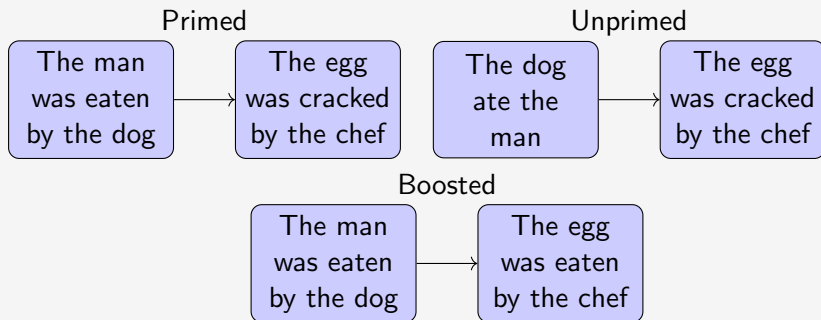
FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

- Structural priming: Repeated structures are read faster and used more

Bock (1986)

- Verb match: additional facilitation



Study 2: Methods (2)

The lawyer insulted by the judge quit her profession.

	Older	Younger
Age	$M = 68.8 (3.7)$	$M = 21.6 (2.4)$
Gender	13 F, 12 M	18 F, 12 M
Years in Edu	$M = 15 (3.4)$	$M = 15.4 (2.4)$
LCT	$M = 16.4 (5.3)$	$M = 26.6 (5.3)$
RST	$M = 22 (6.9)$	$M = 23 (5.9)$

Van Boxtel & Lawyer (2022), *Language, Cognition, Neuroscience*;
<https://doi.org/10.1080/23273798.2022.2091151>

Study 2: Methods (2)

The lawyer insulted | by the judge | quit her | profession.

	Older	Younger
Age	$M = 68.8 (3.7)$	$M = 21.6 (2.4)$
Gender	13 F, 12 M	18 F, 12 M
Years in Edu	$M = 15 (3.4)$	$M = 15.4 (2.4)$
LCT	$M = 16.4 (5.3)$	$M = 26.6 (5.3)$
RST	$M = 22 (6.9)$	$M = 23 (5.9)$

Van Boxtel & Lawyer (2022), *Language, Cognition, Neuroscience*;
<https://doi.org/10.1080/23273798.2022.2091151>

Study 2: Methods (2)

The lawyer insulted | by the judge | quit her | profession.

	Older	Younger
Age	$M = 68.8 (3.7)$	$M = 21.6 (2.4)$
Gender	13 F, 12 M	18 F, 12 M
Years in Edu	$M = 15 (3.4)$	$M = 15.4 (2.4)$
LCT	$M = 16.4 (5.3)$	$M = 26.6 (5.3)$
RST	$M = 22 (6.9)$	$M = 23 (5.9)$

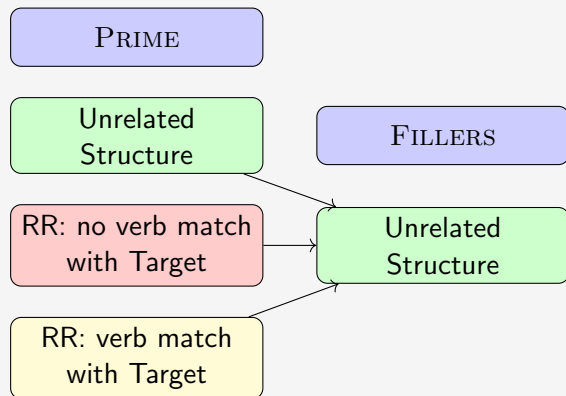
Van Boxtel & Lawyer (2022), *Language, Cognition, Neuroscience*;
<https://doi.org/10.1080/23273798.2022.2091151>

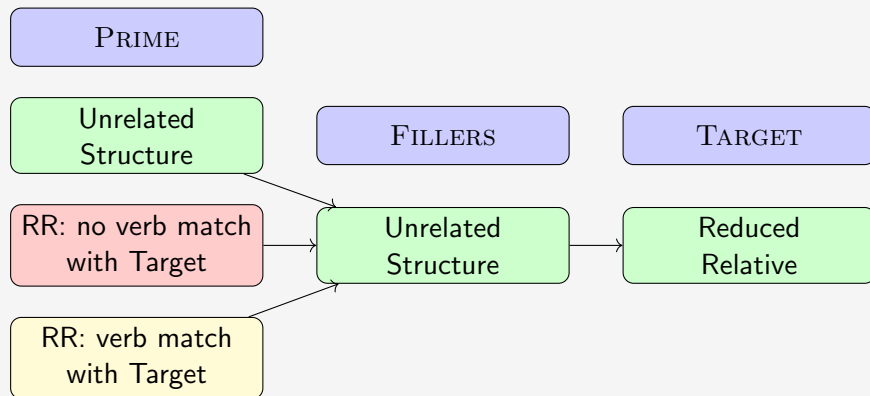
PRIME

Unrelated
Structure

RR: no verb match
with Target

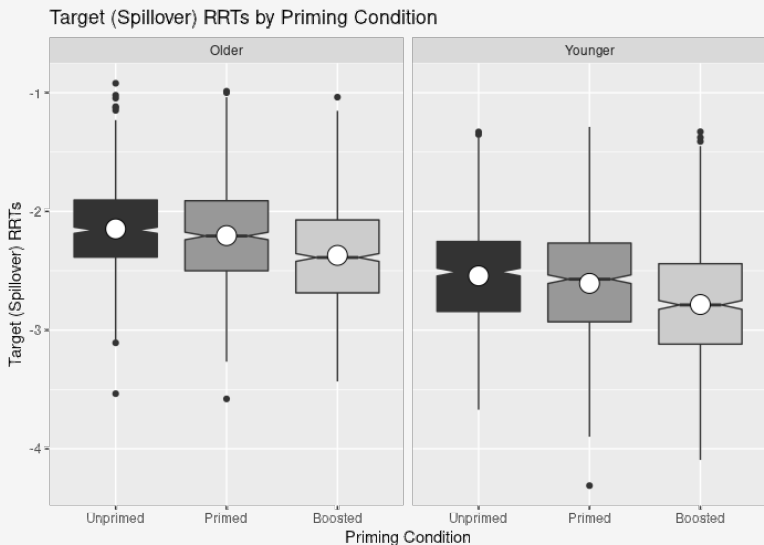
RR: verb match
with Target





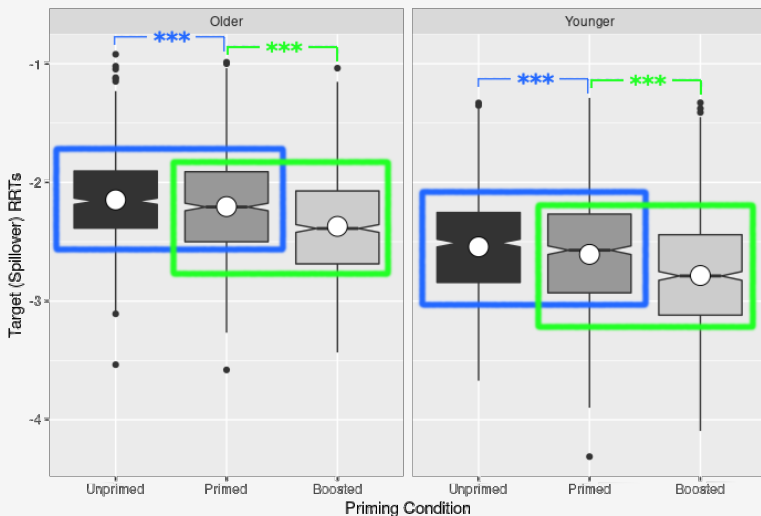
Study 2: Results (1)

Study 2: Results (1)



Study 2: Results (1)

Target (Spillover) RRTs by Priming Condition



Study 2: Results (2)

- No age differences on RC disambiguation;

Study 2: Results (2)

- No age differences on RC disambiguation;
- No age differences on memory interference;

Study 2: Results (2)

- No age differences on RC disambiguation;
- No age differences on memory interference;
- No age differences on syntactic priming;

Study 2: Results (2)

- No age differences on RC disambiguation;
- No age differences on memory interference;
- No age differences on syntactic priming;


Study 2: Results (2)

- No age differences on RC disambiguation;
 - No age differences on memory interference;
 - No age differences on syntactic priming;
- Application of new techniques to old problems worthwhile.

Study 2: Results (2)

- No age differences on RC disambiguation;
- No age differences on memory interference;
- No age differences on syntactic priming;

→ Application of new techniques to old problems worthwhile.



Neuropsychologia
Volume 48, Issue 4, March 2010, Pages 909-920

Reduced short-term memory span in aphasia and susceptibility to interference: Contribution of material-specific maintenance deficits

Laura H.F. Barde ^{a, b, *}, Myrna F. Schwartz ^b, Evangelia G. Chrysikou ^a, Sharon L. Thompson-Schill ^{a, b}

[Show more](#)

+ Add to Mendeley Share Cite

<https://doi.org/10.1016/j.neuropsychologia.2009.11.010> [Get rights and content](#)

Language recovery in aphasia following implicit structural priming training: a case study

Jiyeon Lee & Grace Man

Pages 1441-1458 | Received 16 Aug 2016, Accepted 10 Mar 2017, Published online: 30 Mar 2017

Download citation

<https://doi.org/10.1080/02687038.2017.1306638>

Check for updates

Full Article

Figures & data

References

Citations

Metrics

Reprints & Permissions

View PDF

Study 3: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

THIRD: By widespread use of neuroimaging methods in cognitive / linguistic studies.

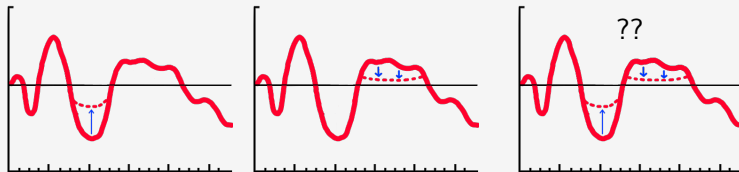
Study 3: Methods (1)

FIRST: By looking at WM from a wider perspective

SECOND: By using an implicit task.

THIRD: By widespread use of neuroimaging methods in cognitive / linguistic studies.

The lawyer | insulted | by | the | judge | quit her profession.



Study 3: Methods (1)

FIRST: By looking at WM from a wider perspective

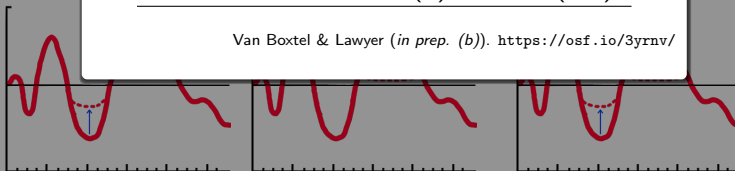
SECOND: By using an implicit task.

THIRD: By widespread use of neuroimaging methods in cognitive / linguistic studies

Demographics

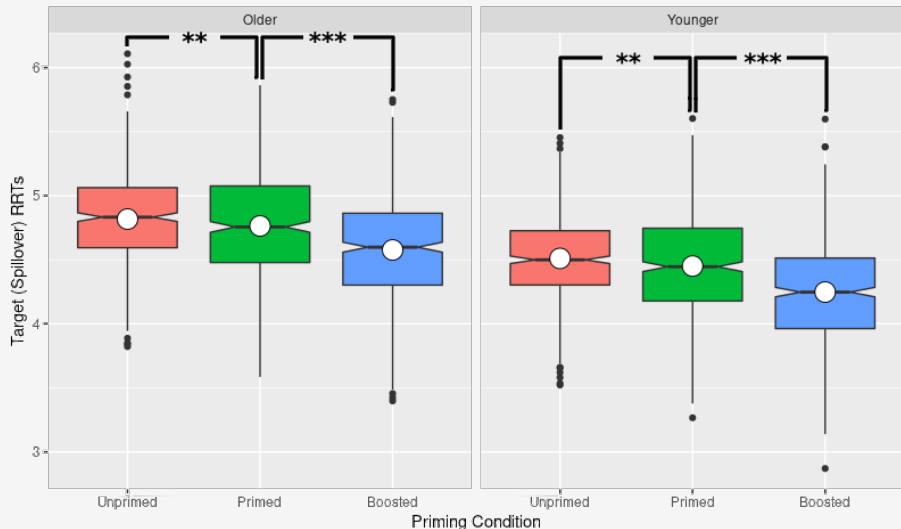
	Older	Younger
Age	69.6 (4)	21.4 (2.3)
Gender	13 F, 5 M	18 F, 2 M
Years in Edu	15.7 (4.1)	15.5 (2.5)
LCT	8.4 (4.3)	8.4 (4.3)
RST	13.5 (6)	17.6 (6.1)

Van Boxtel & Lawyer (*in prep. (b)*). <https://osf.io/3yrnv/>



Reading Times

Target (Spillover) RRTs by Priming Condition



Study 3: Results (ERPs)

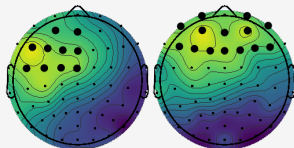
Target Verbs

500-650ms

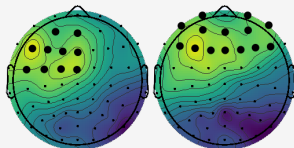
Younger

Older

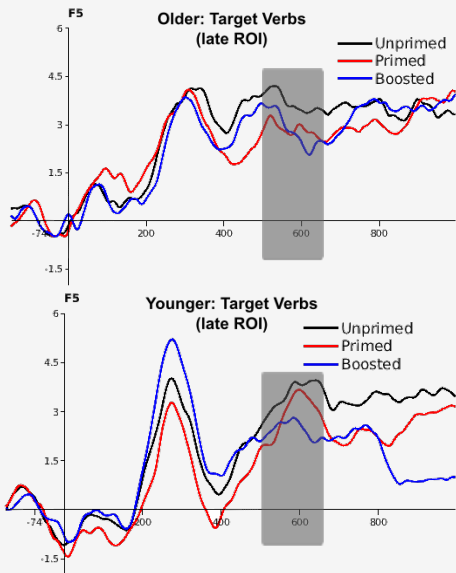
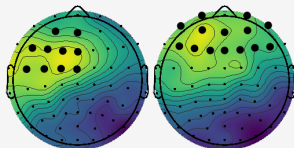
Unprimed



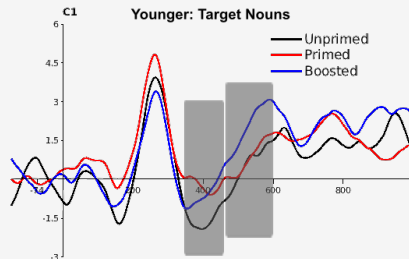
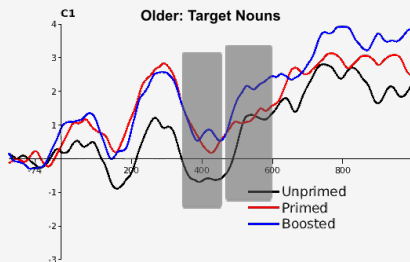
Primed



Boosted



Study 3: Results (ERPs)



Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

(2) Implicit Tasks:
Priming
Value of syntactic
priming shown;
No age differences.

Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

(2) Implicit Tasks:
Priming
Value of syntactic
priming shown;
No age differences.

(3) Use of ERPs
Important to
delve “beyond”;
Age differences
in topography

Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

(2) Implicit Tasks:
Priming
Value of syntactic
priming shown;
No age differences.

(3) Use of ERPs
Important to
delve “beyond”;
Age differences
in topography

Consider *interaction* of memory
and processing;
consider quality
of WM operations

Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

Consider *interaction* of memory and processing;
consider quality of WM operations

(2) Implicit Tasks:
Priming
Value of syntactic priming shown;
No age differences.

Employ *implicit* tasks like priming;
Consider *explicit* task demands

(3) Use of ERPs
Important to delve “beyond”;
Age differences in topography

Discussion

(1) WM Revisited
Quantity > Quality
Showed surprising patterns:
No age differences.

Consider *interaction* of memory and processing; consider quality of WM operations

(2) Implicit Tasks:
Priming
Value of syntactic priming shown;
No age differences.

Employ *implicit* tasks like priming; Consider *explicit* task demands

(3) Use of ERPs
Important to delve “beyond”;
Age differences in topography

Examine *neural* dimension, even in PWA; Note changing patterns with age

Thank you!

 @PurdueAphasia

 @DrWSvBoxtel



purdue.edu/hhs/slhs/aphasia/

willemvanboxtel.eu/