

Introduction

Reading comprehension is a skill crucial for information acquisition, particularly for individuals with hearing loss (HL). HL in ageing adults presents a unique challenge, as it not only heightens reliance on reading comprehension but also exacerbates cognitive decline related to ageing¹. Presently, our understanding of how HL affects reading comprehension in ageing adults remains limited.

Research indicates that individuals with hearing loss exhibit poorer semantic Long-Term Memory (sLTM) access efficiency compared to those with normal hearing, potentially affecting reading comprehension². Moreover, individuals with hearing loss tend to rely more on working memory when performing auditory and non-auditory tasks³. The integrative processes between efficient access to sLTM and WM may also be impacted⁴.

The current study aimed to explore how HL impacts reading comprehension, while controlling for fluid intelligence and years of education. We predicted that HL leads to

- worse performance on reading comprehension
- decreased sLTM access efficiency
- increased reliance on WM in reading comprehension.

Method

• Participants

Hearing Loss (HL) n = 218, mean age = 60.76 (SD = 8.83)
Normal Hearing (NH) n = 215, mean age = 61.53 (SD = 8.32)

• Tasks

Data from the n200 project⁵.

Reading Comprehension: Sentence Completion Task (SCT), Text Reception Threshold (TRT), and Logical Inference-making Test (LIT)
Working Memory Capacity (WMC): Reading Span Test (RST), Semantic Word Pair Span (SWP), Nonword Serial Recall (NSR), and Visual-spatial Working Memory*

Semantic Long-term Memory Access (sLTM): Rhyme Judgement (RJ), Lexical Decision (LD), and Physical Matching (PM)

Other observed variables: Raven Progressive Matrices (RPM), Age*, and Years of Education (YOE).

* Removed from the final model to improve the model fit.

• Data analysis: Multi-group Structural Equation Modelling

Conducted in the following steps⁶:

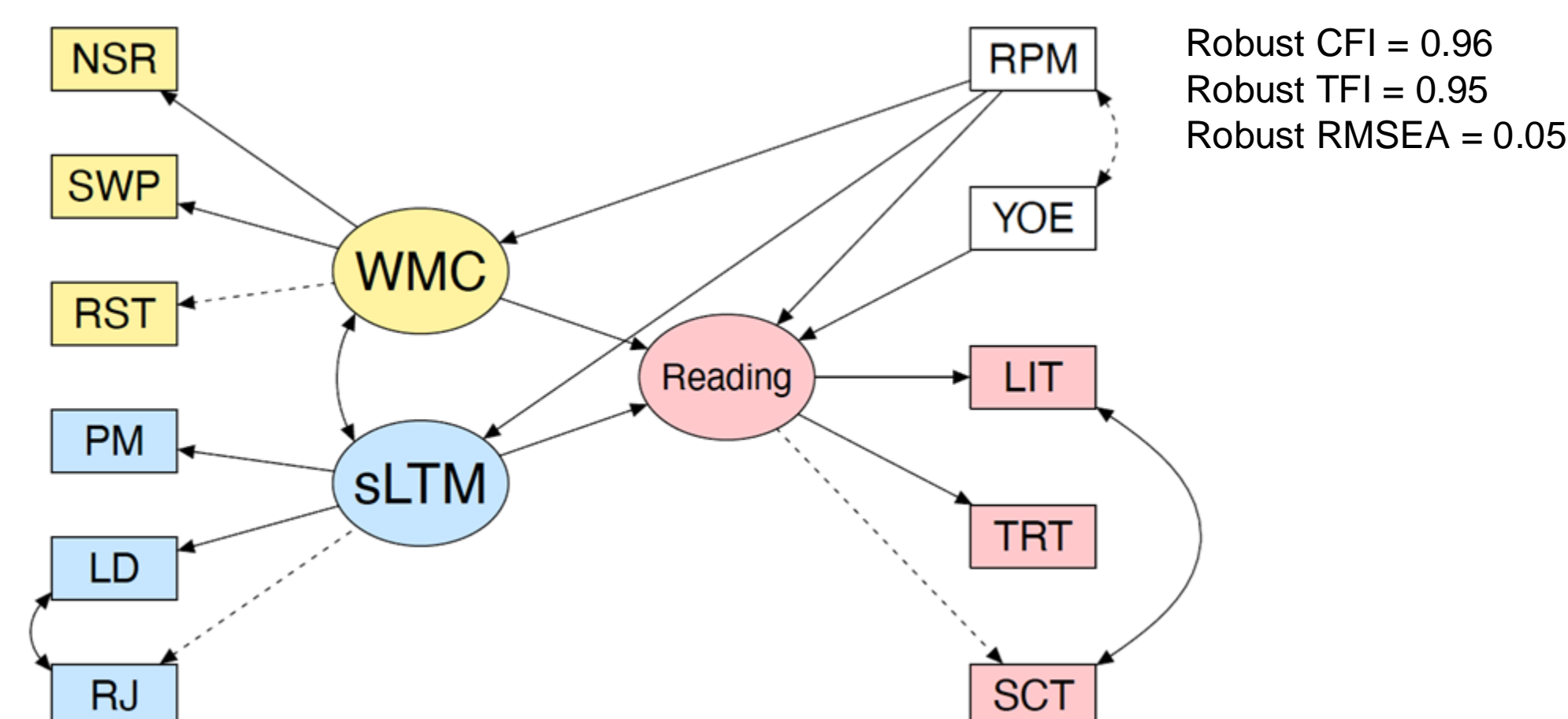
Configural Model Specification & Identification: Fit models without constraints on parameters, refine until satisfactory fit.

Measurement Invariance: Parameters in the final configural model parameters were constrained to enable comparison between groups. Loading and intercept Invariance were examined. Partial Invariance was identified if full invariance was not achievable.

Parameter Comparison: Coefficients and latent means were compared taking partial non-invariance into account.

Results

Final configural model



Regression coefficient comparisons

Predictor	HL				NH				HL - NH		
	β	CI	z	p	β	CI	z	p	β	z	p
WMC	0.58	0.39, 0.77	5.91	<0.01	0.24	0.04, 0.44	2.39	0.02	0.33	2.42	0.02
sLTM	0.25	0.04, 0.46	2.31	0.02	0.44	0.2, 0.68	3.64	<0.01	-0.19	-1.31	0.19

Note. The final configural model passed the test of loading invariance.

WMC significantly predicted reading comprehension in both the HL and the NH group. The regression coefficient was significantly larger in the HL than in the NH group.

The efficiency of sLTM access significantly predicted reading comprehension in both groups. No significant difference in the regression coefficients between the two groups.

Latent mean comparisons

Predictor	HL				NH				HL - NH		
	std.m	CI	z	p	std.m	CI	z	p	std.m	z	p
Allowing for partial non-invariance											
Read	0.16	-0.34, 0.66	0.62	0.54	0.64	-0.11, 1.38	1.68	0.09	-0.48	-2.78	0.01
sLTM	0.22	0.08, 0.37	3.04	<0.01	-0.18	-0.32, -0.04	-2.56	0.01	0.4	3.97	<0.01
WMC	-0.05	-0.19, 0.1	-0.61	0.54	0.1	-0.05, 0.24	1.34	0.18	-0.14	-1.3	0.19
Imposing intercept invariance on all items											
Read	-0.12	-0.22, -0.02	-2.45	0.01	0.23	0.08, 0.39	2.9	<0.01	-0.36	-3.31	<0.01
sLTM	0.21	0.07, 0.34	2.93	<0.01	-0.2	-0.33, -0.06	-2.91	<0.01	0.4	3.98	<0.01
WMC	-0.08	-0.21, 0.06	-1.13	0.26	0.07	-0.06, 0.21	1.04	0.3	-0.15	-1.33	0.18

Note. The final configural model did not pass the test of intercept invariance. Partial non-invariance for Reading -- LIT was identified.

The NH group had higher mean reading comprehension compared to the HL group.

The NH group had higher mean efficiency of sLTM access compared to the HL group.

WMC did not appear to differ between the two groups.

Conclusions

- ❖ Consistent with our predictions, HL was associated with worse reading comprehension in adults.
- ❖ HL was associated with decreased efficiency of sLTM access, which potentially contributed to the difficulty in reading comprehension.
- ❖ Reading comprehension in adults with HL showed increased reliance on WMC, which may be a compensation strategy for deteriorated automatic processing such as sLTM access⁷.

References

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