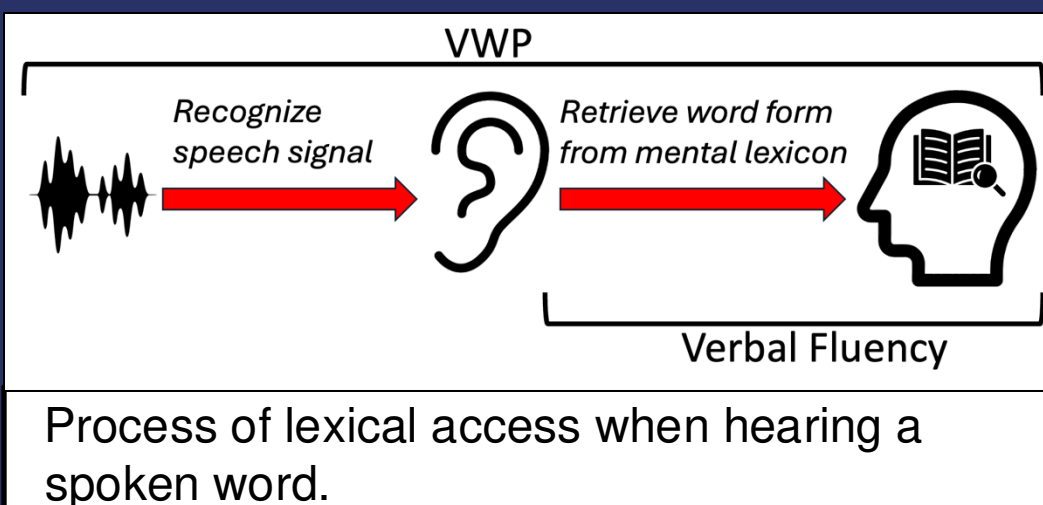


INTRODUCTION

- Lexical access is the ability to retrieve word forms from the mental lexicon. Fast lexical access is crucial for effective communication.
- Two methods of assessing lexical access are:
 - Eye-tracking in the Visual World Paradigm (VWP)
 - Verbal fluency tasks
- The VWP requires listeners to 1) recognize speech presented in the moment, and 2) map that speech onto a known word form in the mental lexicon (Magnuson et al., 2007).
- Verbal fluency tasks require listeners to retrieve word forms from the mental lexicon WITHOUT needing to quickly recognize speech in the moment (Troyer et al., 1997).
- Comparing performance on VWP and verbal fluency tasks helps us understand the extent to which VWP performance is due to in-the-moment speech access vs. word form retrieval.
- Children with hearing aids (HAs) and cochlear implants (CIs) show slower lexical access in the VWP than children with typical hearing (TH) (Klein et al., 2023). To what extent is this delay due to degraded auditory access vs. difficulty with word form retrieval?



STUDY OBJECTIVE

Characterize the relationship between lexical access speed in a VWP eye-tracking task and performance on verbal fluency tasks among children with and without hearing loss.

PARTICIPANTS

Group	n	Age Mean (SD)	Receptive Vocabulary: PPVT-4 Standard Score Mean (SD)	Better-Ear PTA Mean (SD)
TH	25	11.0 yr (.89)	112.5 (13.7)	≤ 20 dB HL
HA	23	11.0 yr (.93)	106.5 (12.7)	48.7 dB HL (10.1)
CI	19	10.8 yr (.79)	93.3 (14.2)	--

All children aged 9-12 years. TH = typical hearing, HA = hearing aid users, CI = cochlear implant users.

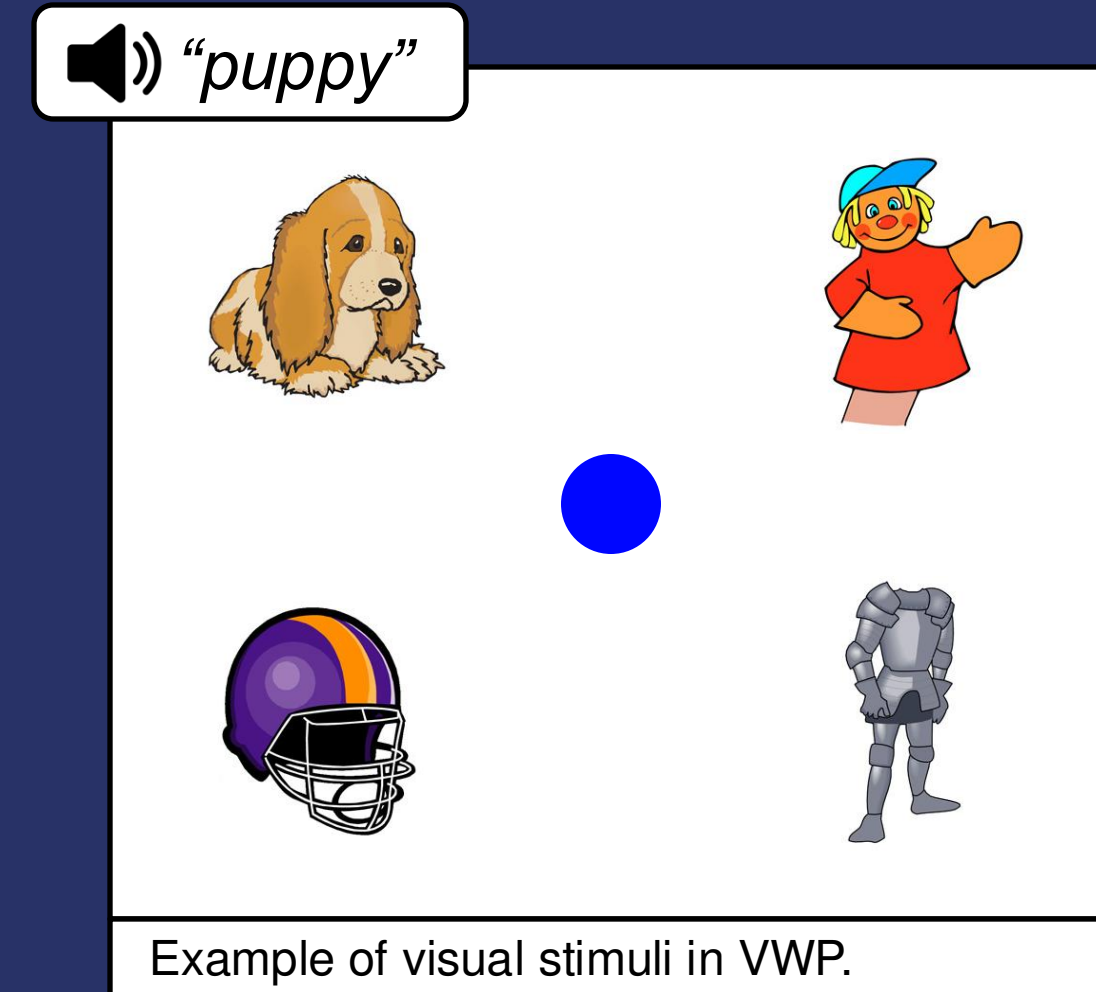
METHOD

Visual World Paradigm (VWP) Eye-Tracking Task

- Isolated target words presented via loudspeaker
- Screen contains four pictures: one target, a phonologically or semantically similar competitor, and two unrelated items
- Child clicks on picture corresponding to target word
- Each child completes 360 trials
- Eye movements recorded and analyzed every 4 ms
- Eye fixations index the extent to which child is considering each item
- Analyses include only correct trials
- Current analysis focuses only on fixations to the target item
- Outcome measure: *Target timing* (speed of fixations to the target item; higher target timing = faster)

Verbal Fluency Tasks

- Two types of tasks: semantic tasks (animals & food) and phonemic tasks (F, A, & S)
- Name as many words as possible within 60 seconds while following the specified semantic category or starting with the specified letter
 - Semantic task example: pig, cow, seal, fish, crab, dog, hamster, ant, lion...*
 - Phonemic task example: fill, fit, fan, fast, fantastic, flop, flip...*
- Most participants organize words using clusters of semantically or phonemically similar words
- Outcome measures: *Total words named, average cluster size, number of switches between clusters, time to the first word*



Example of visual stimuli in VWP.

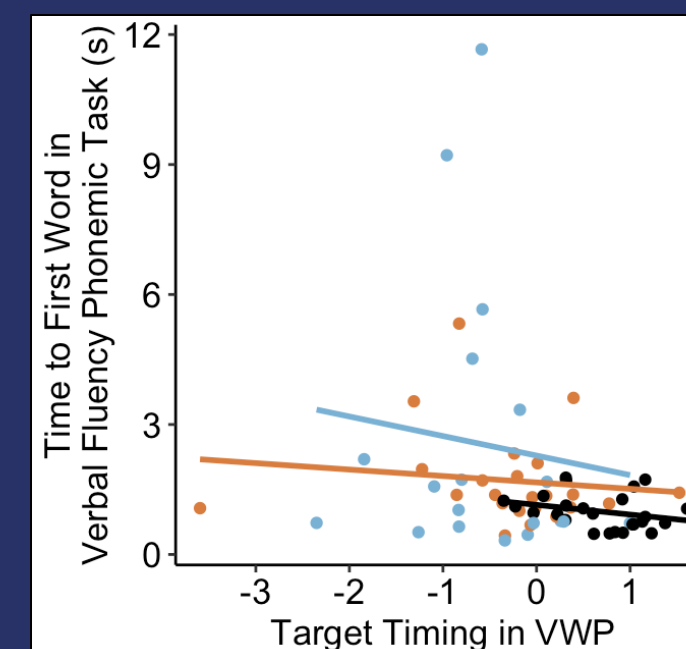
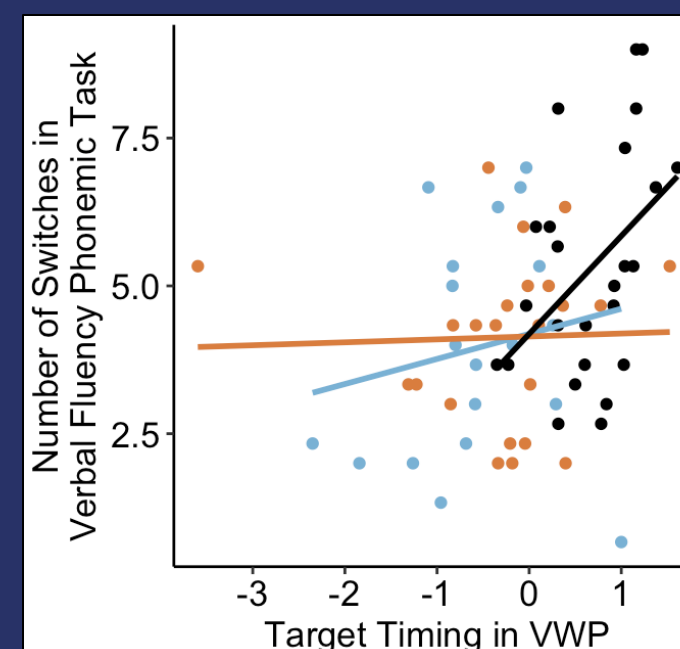
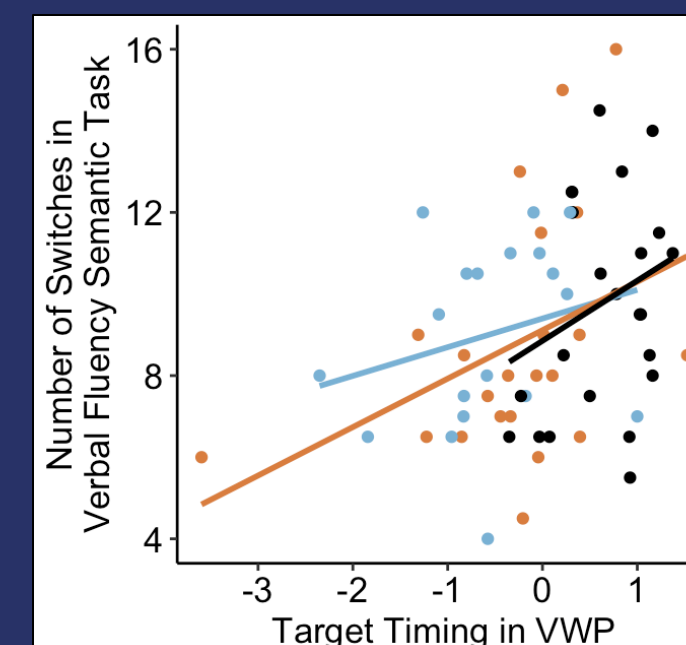
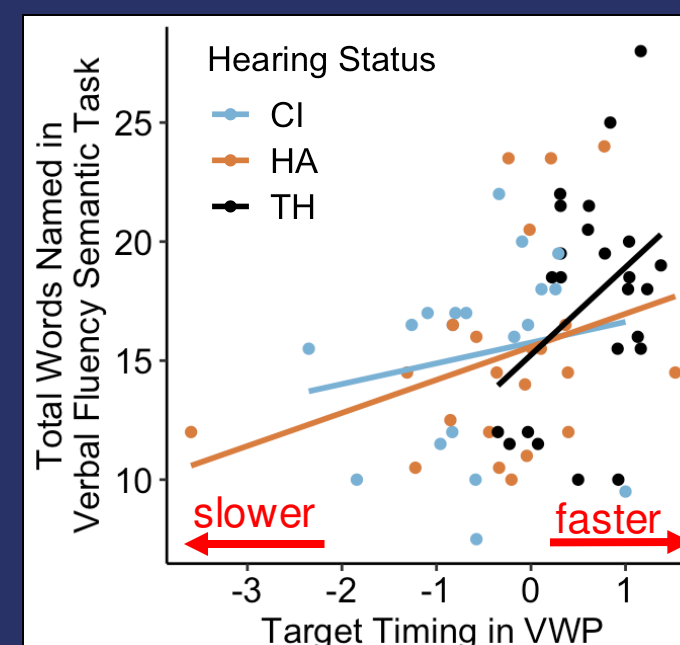
RESULTS

To what extent is target timing in the VWP correlated with verbal fluency measures?

Verbal Fluency Measure	Phonemic Task	Semantic Task
Total words named	.24	.36**
Average cluster size	-.23	.10
Number of switches	.34**	.34**
Time to first word	-.26*	.08

Coefficients for correlations with **target timing** in the VWP.

* $p < .05$, ** $p < .01$



REFERENCES

Images created by Anuvab Sikder, Icon Master, kiddo, shashank singh, & Uswa KDT from Noun Project.
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Magnuson, J. S., Dixon, J. A., Tanenhaus, M. K., & Aslin, R. N. (2007). The dynamics of lexical competition during spoken word recognition. *Cognitive Science*, 31, 133-156.
Troyer, A. K., Moscovitch, M., & Winocur, G. (1997). Clustering and switching as two components of verbal fluency: Evidence from younger and older healthy adults. *Neuropsychology*, 11, 138-146.

RESULTS, CONT.

To what extent do verbal fluency measures predict VWP target timing, after accounting for other relevant variables?

- Linear regressions to predict target timing using verbal fluency measures after accounting for **receptive vocabulary, spectral resolution, and hearing status**
- Total words named in the semantic task remained a significant predictor of target timing in the VWP
- Number of switches and time to the first word in the phonemic task were not significant predictors of target timing
- Number of switches in the semantic task was highly correlated with total words named ($r = .89$) and therefore not included in a regression analysis

Predictor	Estimate	p-value
Total words named, semantic task	.05	.02
PPVT standard score	.02	.005
Spectral ripple score	-.01	.04
Hearing status	-.25	.02

Regression predicting **target timing** in the VWP.
 $R^2 = .50$, $p < .001$

CONCLUSIONS

- Speed of fixations to the target item in the VWP is correlated with several aspects of performance in verbal fluency tasks.
- After accounting for vocabulary, spectral resolution, and hearing status, total words named in the semantic verbal fluency task predicts lexical access speed in the VWP.
- The VWP is sensitive to differences in children's ability to recognize a speech signal AND retrieve words from the mental lexicon.
- Delayed lexical access shown by children with hearing loss in the VWP may be in part due to poorer ability to retrieve words from the mental lexicon, rather than simply being due to poor in-the-moment auditory access.

CONTACT

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