A Story-Based Pupillometry Paradigm of Determiner Perception in Children with and without Hearing Loss

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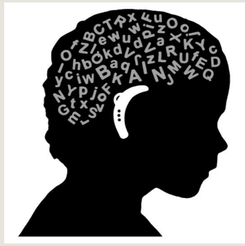


Introduction

Production	Perception
Omission unstressed syllables (Demuth et al., 2009)	Perception of unstressed syllables (Jusczyk et al., 1999)
→ Produced if in footed position	→ Perceived if in footed position (Kedar et al., 2006; 2017) Tested using intermodal looking while listening paradigm
→ Omitted if in unfooted position	→ ??

Aim 1 (method): Determine whether pupillometry is sensitive to children's detection of obligatory determiners.
Aim 2 (theory): Determine whether children's perception of determiners is similarly constrained as their production.

RQ 1: Do 27-month-olds (& preschoolers with hearing loss) detect the omission of obligatory determiners?

RQ 2: Is 27-month-olds' (& preschoolers with hearing loss) detection of determiner omissions modulated by the footedness of the determiner?

Table 1. Expected pupil dilation per condition

	Footed	Unfooted
CP		
O		

Note. CP = Correct Pronunciation, O = Omission

Method part 1

27-month-olds without hearing loss (phase 1) & preschoolers with hearing loss (phase 2)
Monolingual Australian English

Design and stimuli

4 stories
32 monosyllabic high-frequent count nouns
8 target sentences with obligatory determiner (see Table 2)
2 (footed vs. unfooted) x 2 (correct pronunciation vs. omission) within-subjects design (see Table 3)

Table 2. Examples obligatory determiner

I eat breakfast with a blue **spoon**	Pre-target
Daddy washes the **spoon**	Target
I also use a deep **bowl**	Pre-target
Daddy washes the **bowl**	Target

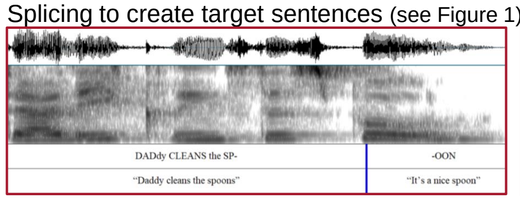
Table 3. Manipulations of an example target sentence

	Footed	Unfooted
CP	Daddy cleans the **spoon**	Daddy washes the **spoon**
O	Daddy cleans __ **spoon**	Daddy washes __ **spoon**

Note. CP = Correct Pronunciation, O = Omission

Stimulus recordings

Female native Australian-English speaker
Splicing to create target sentences (see Figure 1)



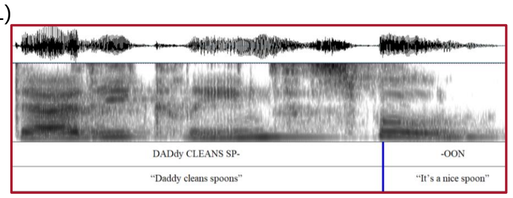


Figure 1. Examples of splicing in the footed condition

Method part 2

Images

300 x 300 pixels drawings (see Figure 2)
All matched on luminance
Presented on grey background (see Figure 3)

Procedure

Looking at drawings while listening to stories
Attention getters in between stories

Dependent variable

Pupil size measured with a Tobii eye-tracker

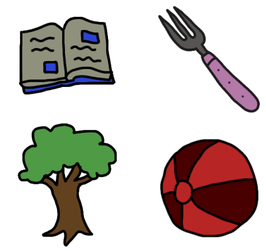


Figure 2. Example drawings

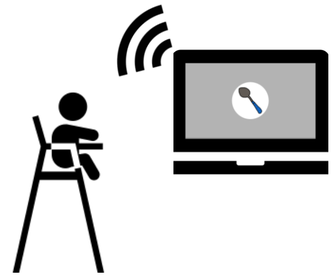


Figure 3. Set-up of the experiment

Results Pilot

5 toddlers without hearing loss
Correct pronunciation only

Conclusions

Children sustain attention throughout procedure
Peak in pupil dilation after target word reveals sensitivity and processing of critical part of the stories (see Figure 4)

→ Results provide proof of concept for full implementation

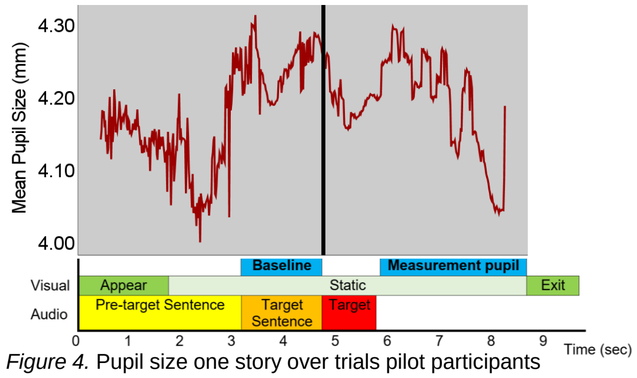


Figure 4. Pupil size one story over trials pilot participants

Discussion

Story-based pupillometry paradigm

High ecological validity
Possibly increased sustained attention compared to previous methods (e.g., Kedar et al., 2006; 2017)

For children without hearing loss

Higher ecological validity than previously used sentences (e.g., "Can you see el book?"; Kedar et al., 2006; 2017)
All determiners are obligatory (no animate nouns; Zangl & Fernald, 2007)

For children with hearing loss

This method might be less cognitively demanding than overt response tasks (e.g., Titterington et al., 2006)
Research on determiner perception specifically is scarce

In short, this story-based pupillometry paradigm is a promising innovative method for determiner perception in both children with and without hearing loss.

References

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