

# The role of signs in spoken word learning in limited auditory access

The role of augmentative signs in spoken word learning by children and adults in limited auditory access

Lian van Berkel-van Hoof  
l.vanberkel@pwo.ru.nl

Promotors: Prof. Dr. Harry Knoors, Prof. Dr. Ludo Verhoeven  
Co-promotor: Dr. Daan Hermans



# Overview

- Introduction
- Method
- Study 1 (children: DHH and H in normal sound)
- Study 2 (children: DHH, H in babble noise)
- Study 3 (adults: DHH, H in babble noise)



# Introduction

## Previous studies hearing adults and children:

- Gestures aid word learning



# Introduction

## Previous studies DHH children:

- Signs aid word learning
- ...Or at least do not hinder it



## Present studies

### Do augmentative signs aid word learning in different conditions?

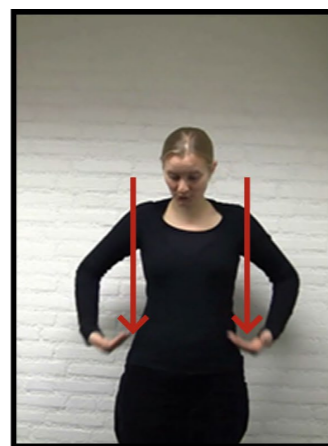
1. Children (9-11): DHH with sign language knowledge, H in normal sound condition
2. Children (9-11): DHH without sign language knowledge in normal sound, H in babble noise
3. Adults (student-age): DHH with (some) sign language knowledge in normal sound, H in babble noise





# Method Study 1 and 2

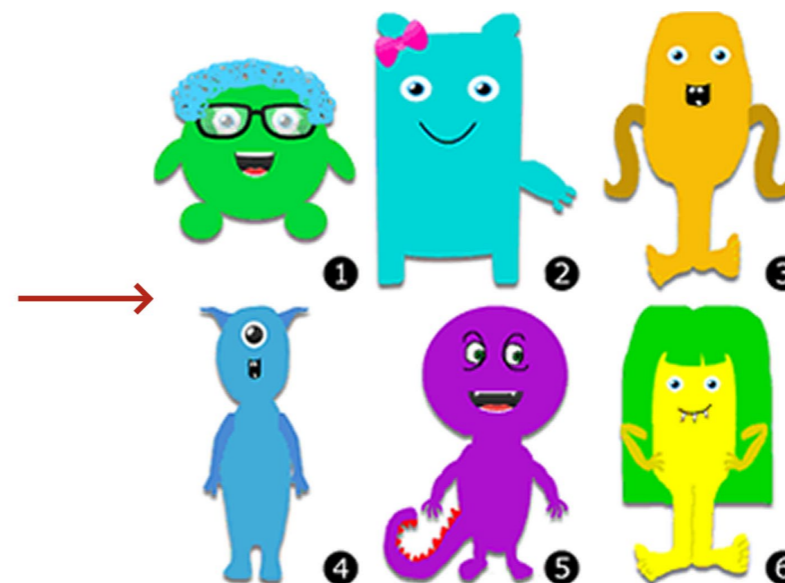
- Children (9-11 y-o)
- 20 pictures of aliens
  - Half with pseudosign (based on Sign Language of the Netherlands)
  - 4 sessions in 1 week
- Test of receptive word knowledge days 2, 3, 4



Look,  
a soeiel!



Where  
is the soeiel?



## Study 1: Children

- 9-11 year-old DHH children in special education (N=16)
- 9-11 year-old H children with normal sound (N=19)

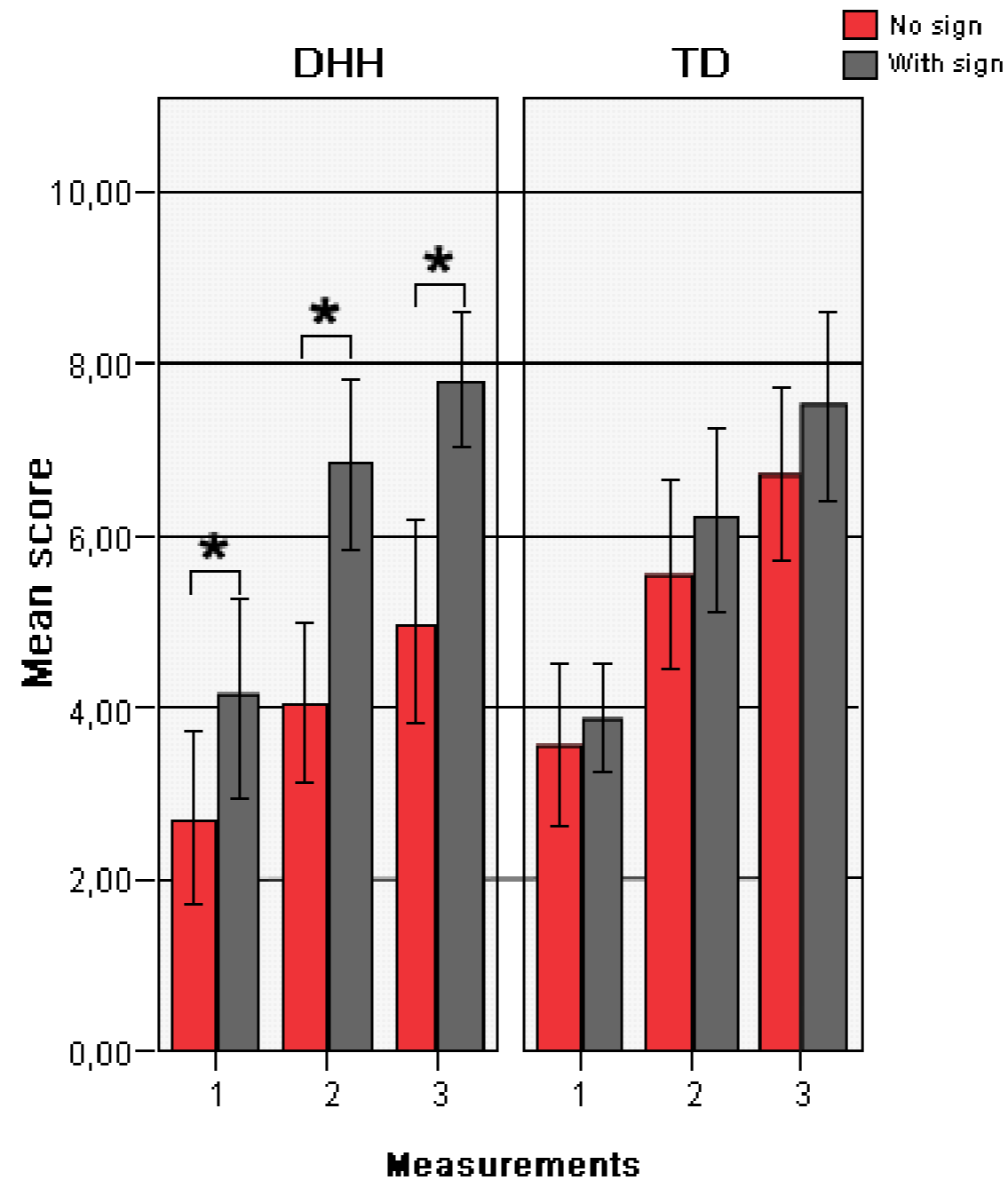
Van Berkel-van Hoof, et al., 2016



# Mean accuracy word learning

DHH no noise  
N=16

H no noise N=19





## Interim discussion H children

Why different results from previous literature?

- Previous research: new label for familiar object
- Present study: new label for unfamiliar object
- Perhaps no need for sign (at this age)?



## Interim discussion DHH children

Why effect for DHH, but not for H?

- DHH children more experience with sign language
- DHH children more 'tuned in' to visual stimuli, because:
  - Not hearing well causes different experience with visual cues (regardless of familiarity with Sign Language)
  - Not hearing well causes adjustment to non-ideal auditory signal (regardless of hearing status)



## Study 2: Children

- 9-11 year-old DHH children in regular education (DHHreg), no knowledge of SL (N=19)
- 9-11 year-old H children with babble noise (N=38)
- Same method as Study 1

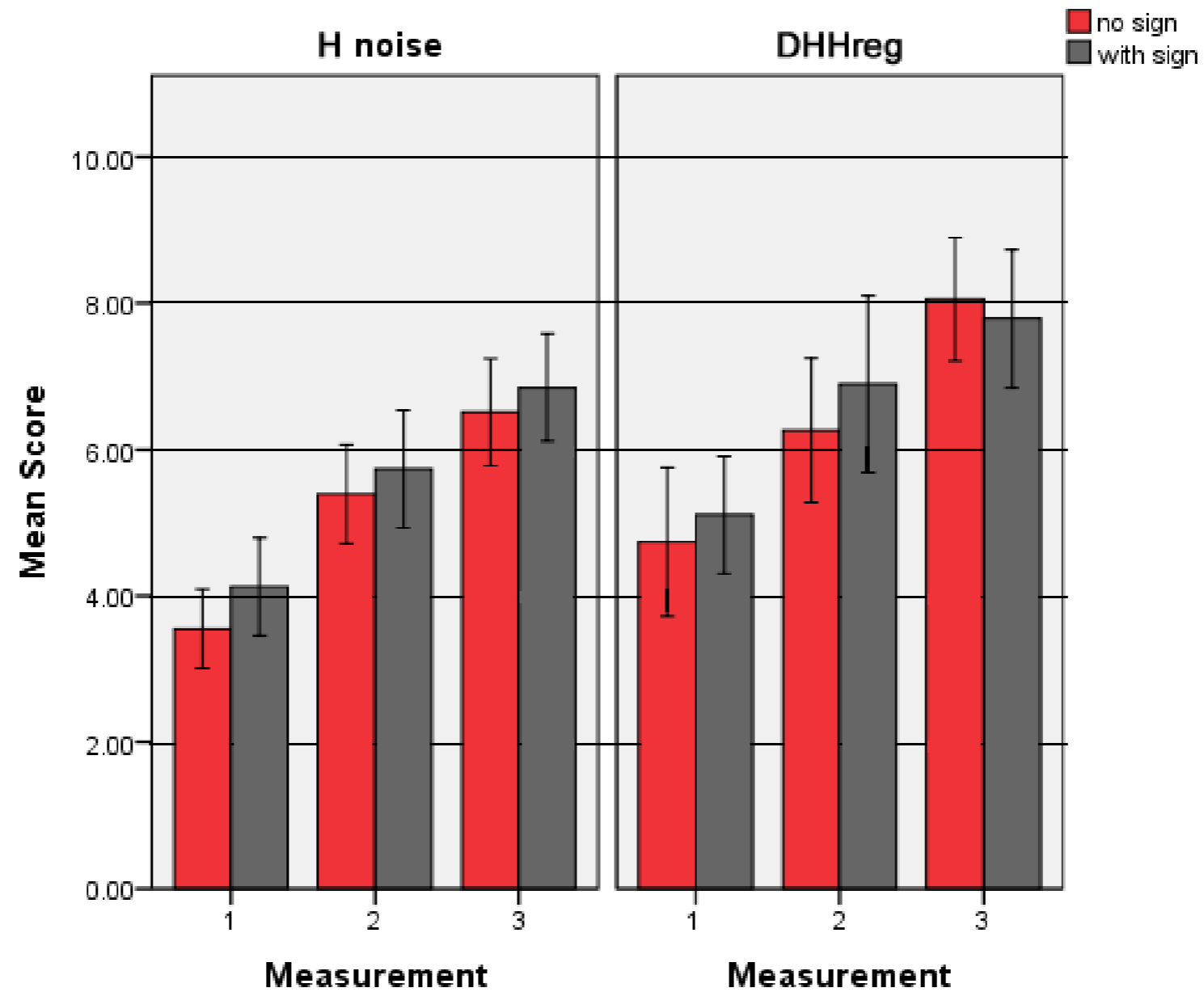
Van Berkel-van Hoof, et al., subm.



# Mean accuracy word learning

H noise N=38

DHHreg N=19



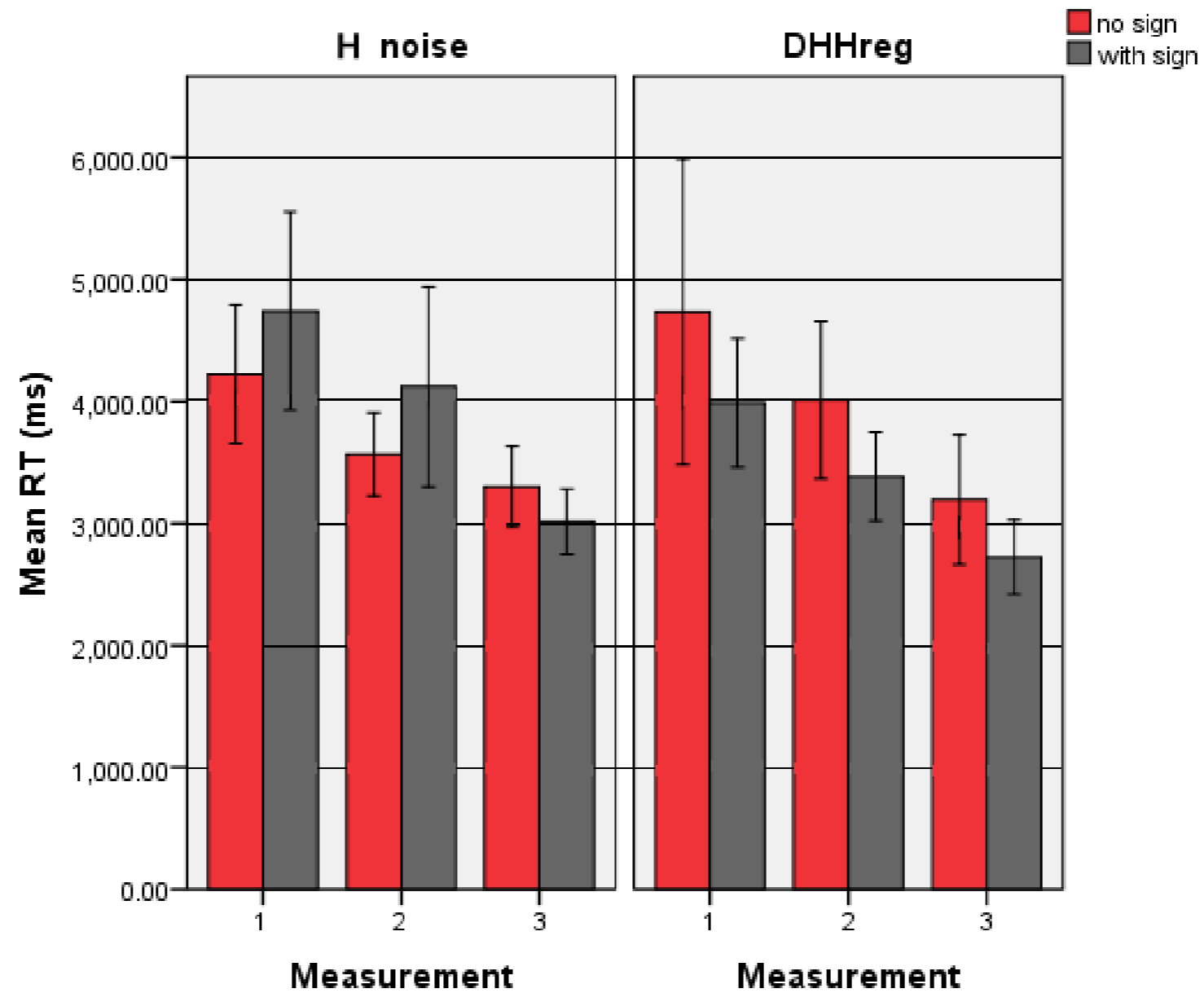
Error Bars: 95% CI



# Mean RT word learning

H noise N=38

DHHreg N=19



Error Bars: 95% CI



## Interim discussion

No effect of signs on word learning accuracy

DHH children: Significantly faster RT in sign condition + less variation

- Very tentative: DHH children may indeed be more 'tuned in' to visual stimuli, because:
  - Not hearing well causes different experience with visual cues (regardless of familiarity with Sign Language)
  - ~~Not hearing well causes adjustment to non-ideal auditory signal (regardless of hearing status)~~





## Implications for practice - children

### When working with DHH children on spoken language:

- Using Sign-supported speech aids word learning
- But effects may not be immediately perceptible if child is unfamiliar with sign language



## Study 3

Our previous studies showed:

- Augmentative signs do not aid spoken word learning for H children, even in adverse listening conditions.
  - Does age play a role?
  - Does cognition play a role?



## Method study 3

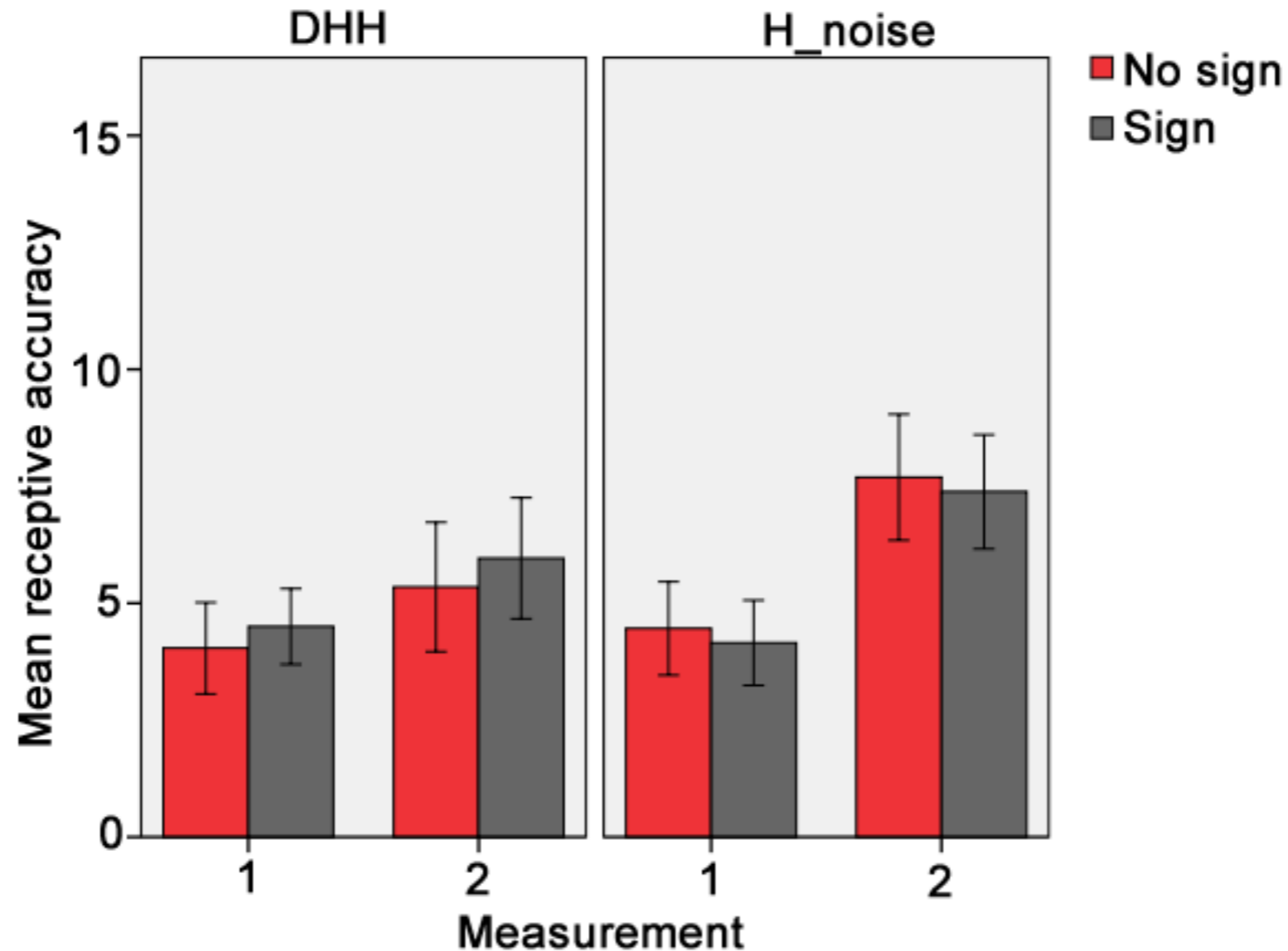
- Adults (university students): DHH (N=25), H with noise (N=26)
- 30 pictures of aliens
  - Half with sign (adapted from previous experiments to meet ASL phonotactics and pseudosign status)
  - 2 sessions, app. 1 week apart
- Test of receptive word knowledge immediately following training (both days)
- Test of productive word knowledge on day 2
- Cognitive and linguistic tasks, language use questionnaire



# Mean accuracy receptive word learning

DHH  
N=25

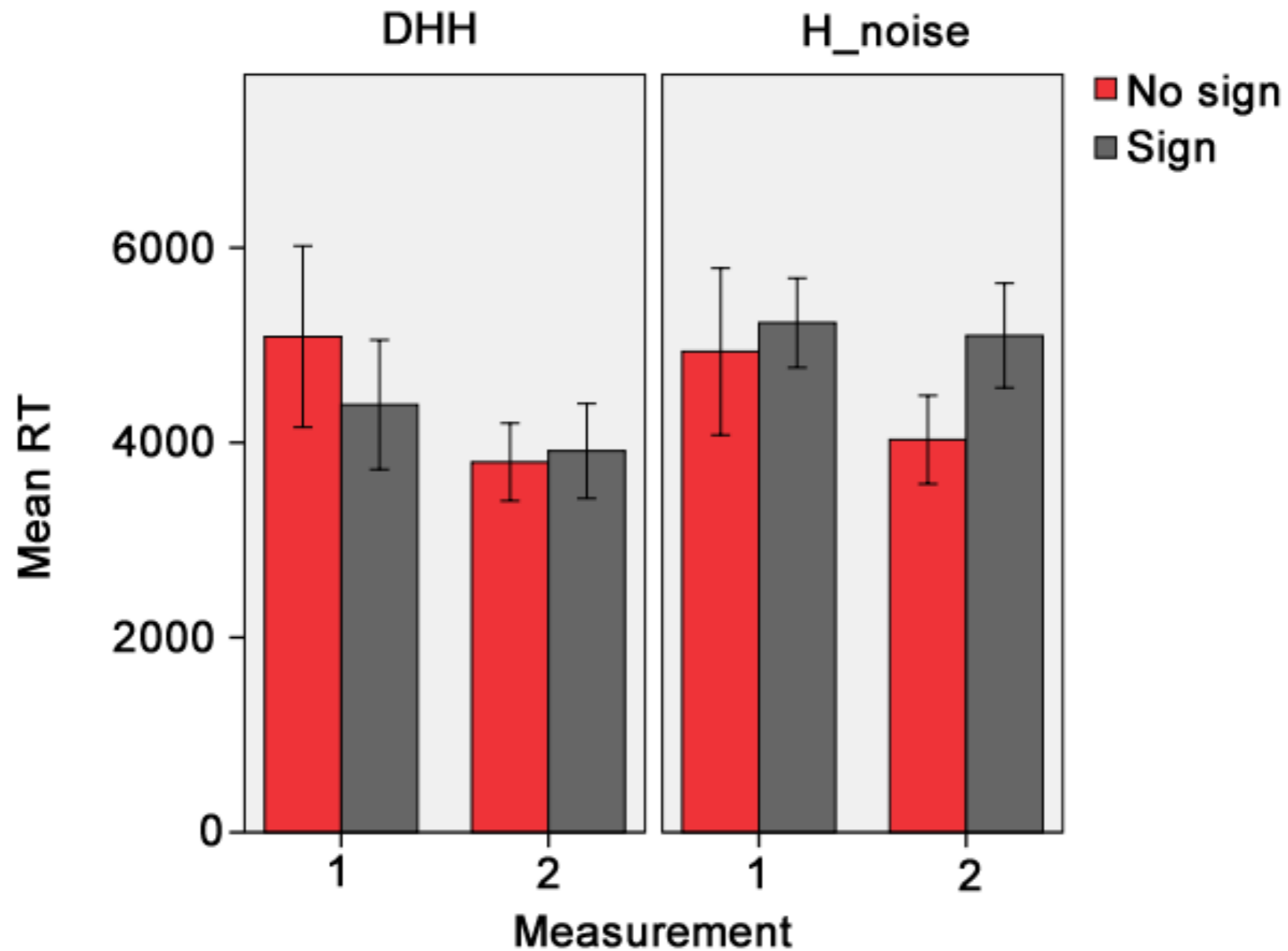
H noise  
N=26



# Mean RT receptive word learning

DHH  
N=24

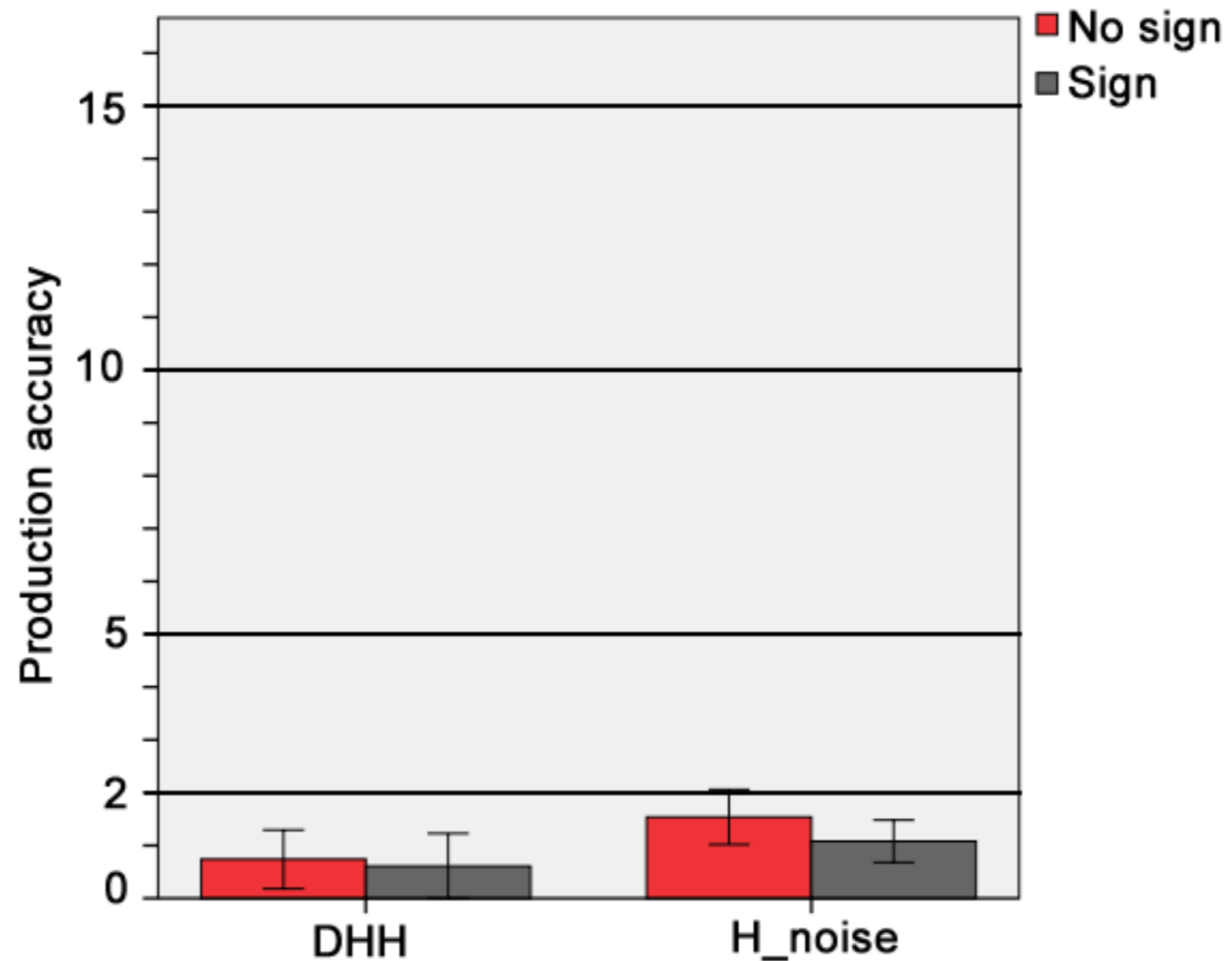
H noise  
N=24



# Mean accuracy productive word learning

DHH no noise  
N=23

H noise  
N=25





## Mean scores other tasks

Task	DHH		Hearing		t-test	
	M	SD	M	SD	<i>t</i> (df)	<i>p</i>
Digit span fw.	5.73	1.40	7.15	1.05	-4.45 (50)	<.001**
Digit span bw.	4.54	1.27	5.20	1.27	-1.86 (50)	.069
Rapid naming	35.39	6.43	31.50	4.80	2.47 (50)	.017*
Corsi fw.	6.39	1.13	7.08	1.20	-2.14 (50)	.037*
Corsi bw.	6.50	0.95	6.69	1.26	-.62 (50)	.536
Dual task	9.69	8.27	4.81	2.03	2.87 (26.78)	.008*
Sentence rep.	15.81	11.87	34.38	5.11	-7.33 (33.96)	<.001**

\*Significant at  $p < .05$

\*\*Significant at  $p < .001$



## Summary Study 3

- DHH show no effect of signs in this experiment
  - Except when Dual task performance is covariate
- Hearing have faster RTs without signs, but no sign effect for receptive accuracy
- Productive accuracy are too low for reliable analyses
- Receptive accuracy is equal overall, but learning gain seems higher for hearing group



## Implications for practice - adults

- Using Sign-supported speech does not hinder spoken word learning
- And it may be helpful for some students



## Discussion Study 3

- Why different results from studies with children?
- Age (adults vs. children + this group was identified at later age)?
- CI / HA technology less advanced?
- Samples too different?
- Task was too different (no semantic consolidation because of immediate testing)?
  
- Why interaction with divided attention?
  
- Watching mouthing+sign+listening to word?



## General summary

- DHH children: Signs aid word learning
- H children: even in babble noise signs do not aid word learning
- DHH adults: may benefit from signs if divided attention is controlled for
- H adults in babble noise: are (mildly) hampered by signs



## General discussion

### Factors possibly influencing sign effect:

- Hearing status
- Age
- Semantic consolidation through nocturnal sleep?
- Divided attention skills (for DHH adults, at least)





## Take-home message

‘ Augmentative signs show promise for aiding spoken word learning for DHH children and adults. But: it’s complicated. ’



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**Thank you for your attention!**



Lian van Berkel-van Hoof  
l.vanberkel@pwo.ru.nl

