EFFECTS OF NOISE ON FAST MAPPING AND WORD LEARNING IN CHILDREN WITH AND WITHOUT HEARING LOSS

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Background/History

- New population of young children with hearing loss (HL) using listening and spoken language
  - More children identified through NBHS
  - Advanced technology (cochlear implants and high powered hearing aids)
  - Increasing scores on language measures (Hayes, et al., 2009; Nicholas & Geers, 2008; Connor, 2006)

New challenges

- More children with HL are entering mainstream settings at earlier ages
- Some of these children do not qualify for services based on standardized test scores

Fast mapping and word learning

- Fast mapping is the ability to produce a label for a referent given limited/brief experience with the word
- Word learning is ability to produce the word after repeated exposures in a supported learning context (Kiernan & Gray, 1998; Gray, 2003; Gray, 2004)

Word learning in children with HL

- Children with HL do not perform as well as NH peers on word learning tasks (Stelmachowicz et al., 2004; Houston et al., 2005; Gilbertson & Kamhi, 1995;
- However, similar to NH peers, experience and existing vocabulary skills are related to success in word learning (Lederberg et al., 2000; Stelmachowicz, et al., 2004; Gilbertson & Kamhi, 1995)

Addition of Noise

- Noise is a part of educational settings (Nelson & Soli, 2000)
- Children with HL perform more poorly in noise than NH children (Smaldino & Crandell, 1999; Bess, 1999; Finitzo-Heiber & Tillman, 1978; Litovsky, Johstone, & Godar, 2006)

Current study

GOAL:

- Better understand how preschool children with HL perform on fast mapping and word learning tasks compared to NH peers in quiet and in noise conditions.

Questions

1. Are there significant between-group differences (NH vs. HL) in the number of words produced after the first (Time 1) session which novel words are introduced (i.e., fast mapping)?
2. Are there between-group differences (NH vs. HL) in the number of words produced following three exposures to novel words in quiet and in noise at Time 2 (i.e., word learning assessment)?
3. What is the relationship between age, standardized assessments, fast mapping and word learning in quiet and noise for NH children and children with HL?
4. How do traditional hearing loss variables (e.g., age of identification, age fit with hearing aids, age enrolled in early intervention, and device) relate to fast mapping and word learning performance in quiet and in noise conditions?

Methods: Participants

- 36 children
  - 17 NH (age range: 28-72 months, *M*: 44, *sd*: 13.21)
  - 19 HL (age range: 37-68 months; *M*: 50.79, *sd*: 10.58)
    - Attended private preschool program using listening and spoken language
    - 8 children used HAs; 11 used CIs
      - 7 children bilateral CIs, 4 children unilateral
        - Average age of first stimulation: 12.16 months (*sd*: 14.55; range: 7-47)

HL Group

	Average age	SD	Range
Identification	14.16 months	16.72	1-48
Fit with HAs	17 months	16.91	2-50
Enrolled in early intervention	25.11 months	14.55	7-47

Procedures: Assessments

- General Language: Preschool Language Scale-4 (Zimmerman, Steiner & Pond, 2002)
- Expressive Vocabulary: Expressive One-word Picture Vocabulary Test (Gardner, 2000)
- Receptive Vocabulary: Peabody Picture Vocabulary Test (Dunn & Dunn, 1997)

Methods

	LIST A					LIST B				
Group 1	QFMP* QFMI*	E1	E2	E3	QWLP* QWLI*	NFMP* NFMI*	E 1	E2	E3	NWLP* NWLI*
Group 2	NFMP* NFMI*	E1	E2	E3	NWLP* NWLI*	QFMP* QFMI*	E 1	E2	E3	QWLP* QWLI*

- = dependent variables

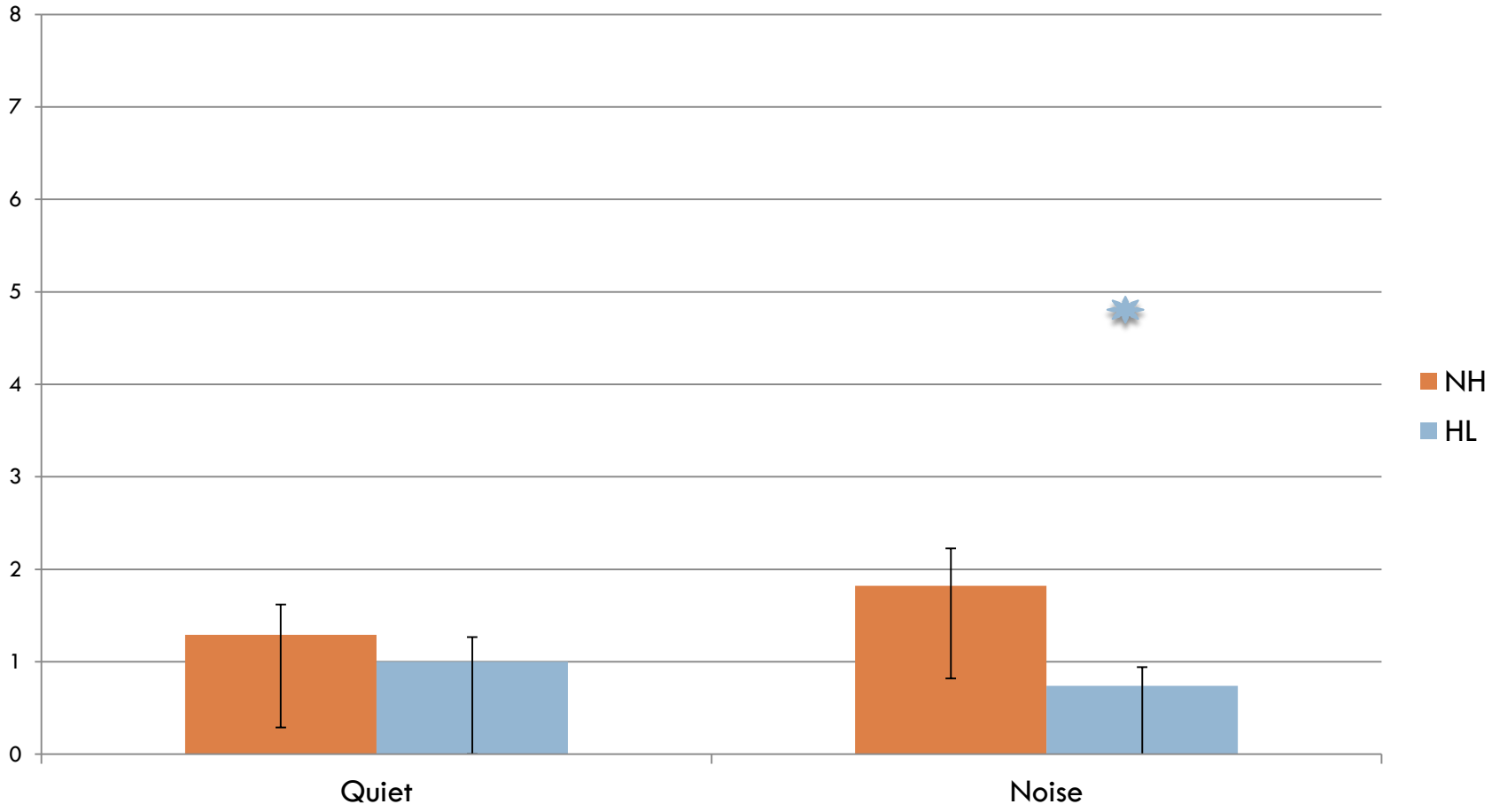
Stimuli


home made
COASTALSURFING.COM
MR. ZOGS
WAX
CARPINTERIA • CA 93013
WARM WATER SURF WAX • NET WT. 75 GRAMS • DO NOT EAT/CHEW

Results

- Question 1: Are there significant between-group differences (NH vs. HL) in the number of words produced after the first (Time 1) session which novel words are introduced (i.e., fast mapping)?
  - Quiet condition: No difference between groups
  - Noise condition: Yes, HL < NH in noise ($p < .05$, $d = .80$)

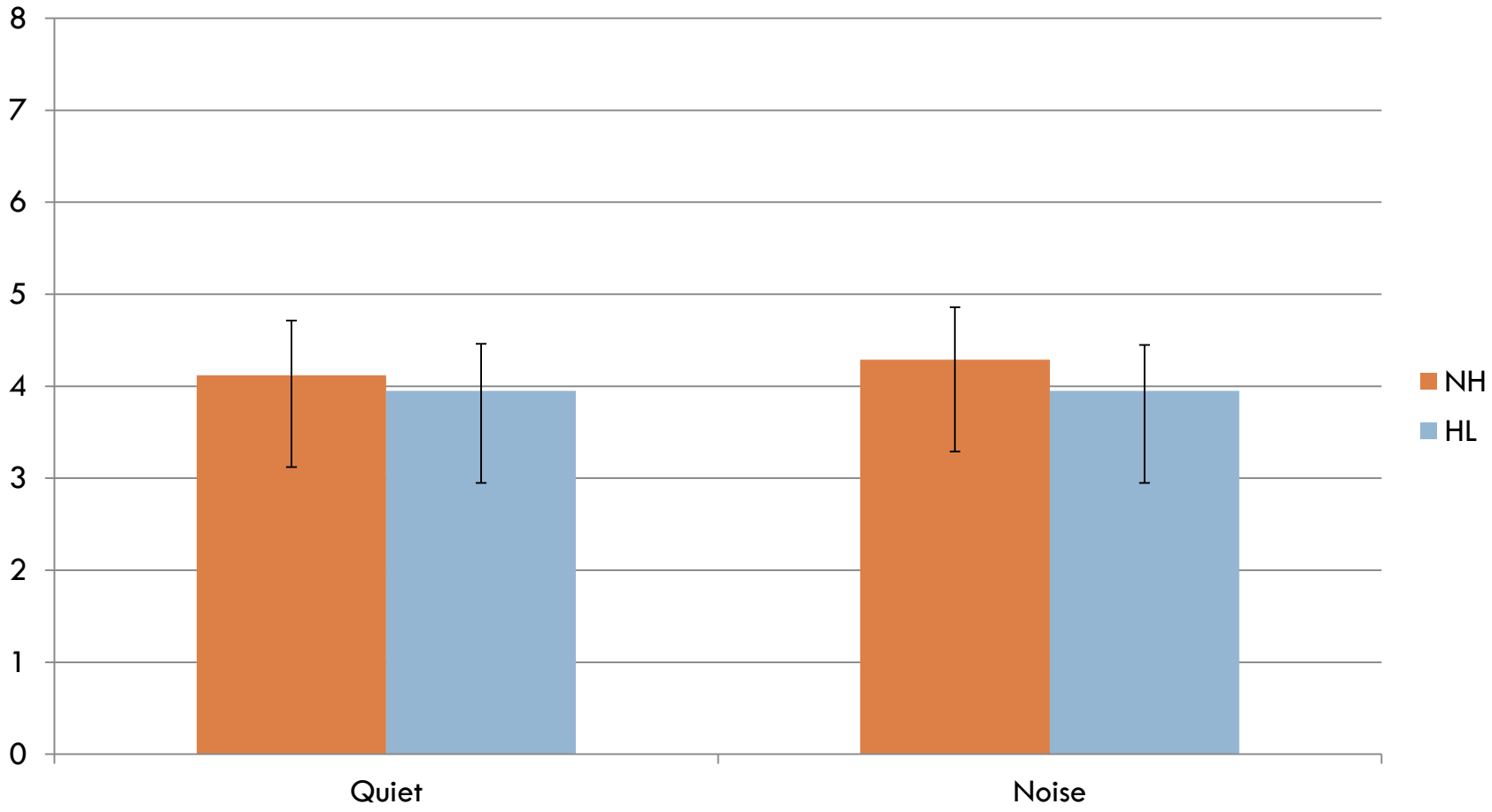
Fast Mapping (Time 1)



Results

- Question 2: Are there between-group differences (NH vs. HL) in the number of words produced following three exposures to novel words in quiet and in noise at Time 2 (i.e., word learning assessment)?
  - Quiet condition: No difference between groups
  - Noise condition: No difference between groups

Word Learning (Time 2)



Results

Question 3: What is the relationship between age, standardized assessments, fast mapping and word learning in quiet and noise for NH children and children with HL?

NH Group

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	--											
2. PPVT	.026	--										
3. EOWPVT	.658**	.360	--									
4. PLS-4	.172	.133	.524*	--								
5. QFMP	.614**	.216	.595*	-.045	--							
6. QFMI	.717**	-.060	.549*	.275	.602*	--						
7. NFMP	.830**	.123	.539*	-.021	.852**	.669**	--					
8. NFMI	.652**	.285	.455	.181	.395	.425	.610**	--				
9. QWLP	.616**	-.033	.350	.158	.346	.588*	.480	.577*	--			
10. QWLI	.369	.395	.398	.265	.116	-.122	.211	.666**	.317	--		
11. NWLP	.772**	-.159	.498*	.121	.443	.732**	.623**	.570*	.856**	.258	--	
12. NWLI	.364	.411	.362	.369	-.016	.374	.107	.290	.572*	.116	.482*	--

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

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HL Group

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	--											
2. PPVT	.294	--										
3. EOWPVT	.235	.549*	--									
4. PLS-4	.031	.649**	.821**	--								
5. QFMP	.623**	-.072	.300	.020	--							
6. QFMI	.432	.524*	.239	.104	.233	--						
7. NFMP	.349	.154	.218	.033	.441	.163	--					
8. NFMI	.551*	.519*	.402	.403	.290	.294	.419	--				
9. QWLP	.103	.151	.339	-.036	.087	.498*	-.036	-.150	--			
10. QWLI	-.050	.163	.118	.002	.095	.584**	.056	-.108	.579**	--		
11. NWLP	.408	.424	.629**	.425	.288	.408	.550*	.684**	.333	.065	--	
12. NWLI	.273	.286	.415	.246	-.023	.141	.306	.287	.420	.026	.590**	--

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Results

Question 4: How do traditional hearing loss variables (e.g., age of identification, age fit with hearing aids, age enrolled in early intervention, and device) relate to fast mapping and word learning performance in quiet and in noise conditions?

Results

- No significant difference between CI and HA users in quiet or in noise conditions
- Age fit with hearing aids was the only factor significantly correlated with any dependent variables (i.e., fast mapping production in noise)

Discussion

- Both groups of children learned novel words over time in quiet and in noise
- Children with HL demonstrated poorer fast mapping skills in noise conditions than NH peers
- At Time 2 (with repeated exposures), there was no between-group difference
- Differences in the variables correlated with fast mapping performance for HL group

Considerations

- NH group: Better performance in noise?
- Would different types of noise yield different results?
- What are the effects of *type, amount* of intervention?

Implications

- Results suggest that children with HL may benefit from continued support with novel information in noise settings
- In contrast to NH group, age, standardized assessments, and performance in quiet are not significantly related to fast mapping performance in noise for the HL group

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THANK YOU!

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