Language Outcomes of Latino Children Who Are Deaf or Hard of Hearing: A Multi-State Sample

Beatriz de Diego-Lázaro[1]; Adelaida Restrepo[1]; Allison Sedey[2]; Christine Yoshinaga-Itano[2];
[1]Arizona State University, [2]University of Colorado Boulder

Introduction

- Latino children are the largest minority group of children who are deaf or hard of hearing (DHH), 22.3%[1], and it is expected to keep increasing [2].
- However, research on speech and language development in Spanish-speaking children who are DHH is still in the early stages [3], especially for children ages birth to three years of age.
- The current study is a first step in the effort of describing this population as it explores basic predictors of vocabulary outcomes traditionally considered by the literature in monolingual (English) children with hearing loss.
- Parent educational level, degree of hearing loss, age of identification of the hearing loss, age of amplification, and age of intervention predict language development in monolingual English children who are DHH [4 5].

Objectives

1) To examine differences by degree of hearing loss in language quotients measured by the Child Developmental Inventory (CDI) and the Inventario del Desarrollo de Habilidades Comunicativas MacArthur (IDHC) in Spanish-speaking children who are DHH.
2) To identify variables that best predict expressive vocabulary quotients measured by the IDHC in Spanish-speaking children who are DHH.

Method

Participants

- 53 children who were DHH from the National Early Childhood Assessment Project (NECAP)
- Between 8 and 36 months of age
- With bilateral hearing loss
- Without additional disabilities (per parents' and interventionists' report)
- Without a diagnosis of auditory neuropathy
- Whose primary home language was Spanish (per parents' report)

Services

- Children received on average 2.46 hours of monthly early intervention at home.
- 40% of the children met the Early Hearing Detection and Intervention (EHDI) guidelines of identification of hearing loss by three months of age and enrollment in intervention by six months of age [6].

Table 1.
Demographic Information (*N* = 53).

Age in months at:	Mean (SD)	Range
Identification of the hearing loss	4.4 (4.8)	<1-27
Amplification	7.7 (5.2)	2-25
Enrollment in early intervention	7.5 (6.1)	1-27

Method

Measures

1) NECAP initial and follow-up demographic forms for demographic information and audiologic records.
2) Child Developmental Inventory (CDI[7]) for expressive and comprehension language quotients.
3) Inventario del Desarrollo de Habilidades Comunicativas MacArthur (IDHC [8]) for expressive vocabulary quotients. Total scoring (Spanish + American Sign Language –ASL-) was applied for children who used ASL.

- Language and vocabulary quotients interpretation:
  Language quotient =100, language score equals age level.
  Language quotient < 100, language score below age level.
  Language quotient > 100, language score above age level.

Procedures

- All the assessments were based on caregiver report and took them between 75 to 120 minutes.
- Assessments were delivered and collected by the early interventionists.
- Assessments were sent to the University of Colorado-Boulder NECAP staff for scoring.

Results

Differences by Degree of Hearing Loss

- Degree of hearing loss was determined for each participant based on their better-ear pure tone average (PTA).
- Three different between- subjects one-way Analysis of Variance (ANOVA) were performed, one for each language measure.
- Children with moderate/severe to profound hearing loss showed lower language quotients than children with mild to moderate hearing loss.

Table 2.
One-Way ANOVA Results, Means and Standard Deviations for Mild to Moderate and Moderate/Severe to Profound Groups (N = 53).

	Mild to moderate (26-55 dB)		Moderate/ severe to profound (56- >91 dB)		*df*	*F*	*Adjusted* R^2	*p*
	n	M (SD)	n	M (SD)				
CDI- Comprehension	10	86.1 (17)	15	63.9 (14.5)	1	12.2	.31	.002
CDI- Expressive	10	91.7 (13.9)	15	66.6 (17.3)	1	14.6	.36	.001
IDHC	29	88.8 (22.7)	24	62.9 (23.1)	1	16.4	.23	<.001

Results

Vocabulary Predictors

- Out of all possible predictors, only variables that were significantly correlated with the vocabulary quotient ($p < .05$) were selected.
- Chronological age ($r = -.62$), degree of hearing loss ($r = -.49$), functional hearing abilities ($r = .45$), and age of enrollment in intervention ($r = -.34$) were included in the hierarchical multiple regression analyses.
- The combination of these predictors and the interaction between chronological age and age of enrollment in the intervention accounted for 61% of the variance in vocabulary quotients.
- The interaction indicated that the younger the children and the earlier the intervention, the higher the vocabulary quotients. However, this effect was not significant for older children (between 30 and 36 months of age, n = 15) who showed lower vocabulary quotients than younger children, regardless of the age at which they received intervention.

Table 3.
Summary of Hierarchical Regression Analysis for Variables Predicting Vocabulary Quotients (N = 51).

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Chronological Age	-2.15	.42	-.60**	-2.15	.34	-.58**	-3.01	.51	-.81**
Degree the HL				-14.27	5.53	-.27*	-11.40	5.48	-.22*
Functional Hearing Abilities				15.43	5.63	.29**	16.79	5.45	.31**
Age of Intervention				-.14	.39	-.03	-3.84	1.79	-.91*
CA x Age of Intervention							.14	.06	.95*
Adjusted R^2		.35			.58			.61	
F for change in R^2		28.89**			9.85**			4.68*	

Note: HL= hearing loss; CA = chronological age.
*p < .05. **p < .01.

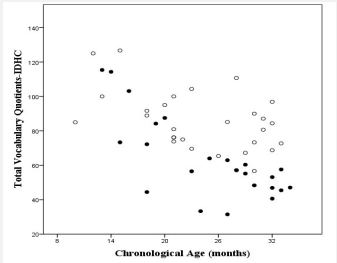

Figure 1. Relationship between chronological age and vocabulary quotients-IDHC by degree of hearing loss. Empty dots represent children with mild to moderate hearing loss (26-55 dB) and filled dots represent children with moderate/severe to profound hearing loss (56- >91 dB).

Conclusions

- Both groups (children with mild to moderate and moderate/severe to profound hearing loss) showed language quotient means below hearing peers and below English-speaking children with hearing loss [9].
- Children who received intervention by four months of age exhibited higher vocabulary outcomes than children who received intervention after four months of age.
- Although receiving intervention early and having high functional hearing abilities indicated a protective effect, children in this study showed difficulties in keeping the acceleration in vocabulary development after 18 months of age.
- Such vocabulary delays have the potential to interfere with the development of language and literacy skills and subsequent academic achievement.
- Future research may focus on assessing intervention quality variables that positively affect the language outcomes of these children, providing evidence-based practices to intervene with this population.

Contact

Beatriz de Diego-Lázaro
Arizona State University
beatriz.dediegolazaro@asu.edu
http://www.billlab.net/

Acknowledgments

This work has been supported by La Caixa Foundation Fellowship (Spain) and by the Disability Research and Dissemination Center (DRDC) through its Grant Number 5U01DD001007, FAIN No. U01DD001007 from the Centers for Disease Control and Prevention (CDC).

References

1. Gallaudet Research Institute (2013). *Regional and National Summary Report of Data from the 2011-12 Annual Survey of Deaf and Hard of Hearing Children and Youth.* Washington, DC: GRI, Gallaudet University.
2. Caesar, L. G., & Williams, D. R. (2002). Socioculture and the delivery of health care: who gets what and why. *The ASHA Leader, 7*(6), 6-8.
3. Bunta, F. & Douglas, M. (2013). The effect of dual-language support on the language skills of bilingual children with hearing loss who use listening devices relative to their monolingual peers. *Language, Speech and Hearing Services in Schools, 44*, 281-290.
4. Yoshinaga-Itano, C. (2000). From screening to early identification and intervention: discovering predictors to successful outcomes for children with significant hearing loss. *Journal of Deaf Studies and Deaf Education, 8*(1), 12-30.
5. Calderon, R. (2000). Parental involvement in deaf children's education programs as a predictor of child's language, early reading, and social-emotional development. *Journal of Deaf Studies and Deaf Education, 5*, 140-155.
6. American Academy of Pediatrics. (2007). Year 2007 position statement: principles and guidelines for early hearing detection and intervention programs. *Pediatrics, 120*(4), 898.
7. Ireton, H. (1992). *Child development inventory*. Minneapolis, MN: Behavior Science Systems.
8. Jackson-Maldonado, D., Thal, D. J., Fenson, L., Marchman, V. A., Newton, T., Conboy, B., & Bates, E. (2003). *MacArthur Inventarios del Desarrollo de Habilidades Comunicativas: User's guide and technical manual*. PH Brookes.
9. Sedey, A. L., & Yoshinaga-Itano, C. (2015). *Language Outcomes of Children with Unilateral Hearing Loss: A Multi-State Perspective* [Powerpoint slides]. Retrieved from http://ehdimeeting.org/archive/2015/System/Uploads/pdfs/Tuesday_Coe_300_AllisonSedey_1623.pdf