Speech, Language, and Vocabulary Outcomes in Children with Dual Diagnoses: Hearing Loss and Autism

Katie Marsh, Ivette Cejas, PhD, Christopher Fonnesbeck, Tamala Bradham, PhD
Disclosures

✦ OPTION Inc is an international, non-profit organization comprised of listening and spoken language programs and schools for children who are deaf or hard of hearing in Canada, South America, and the U.S.

✦ OPTION Inc. has contracted with Vanderbilt University Medical Center to provide oversight of the Listening and Spoken Language Data Repository (LSL-DR)

✦ Funding for LSL-DR
  • Omaha Hearing Health Foundation
  • Oberkotter Foundation
  • Cochlear Foundation
  • Vanderbilt Institute for Clinical and Translational Research grant support
    o UL1TR000011 from NCATS/NIH)

✦ Disclosures for Dr. Bradham at VUMC:
  • Principal Investigator for LSL-DR
  • Prior Board Member of OPTION, Inc

✦ Disclosures for Dr. Cejas at UM:
  • AG Bell Board of Directors
  • Research funded by:
    o NIDCD R01 DC04797
    o NIDCD R03 DC014760
    o NIDCD R21 DC016265
Learning Objectives

✧ Compare language outcomes of children with dual diagnosis of hearing loss and autism

✧ Identify demographic variables associated with group differences

✧ Discuss implications for hearing technologies & early intervention
Autism Spectrum Disorder (ASD)

✧ Complex developmental brain disorder
  • Emerges (often diagnosed) during early childhood
  • Impacts on social skills, communication & behavior across lifetime

✧ Considered to be a spectrum, with symptoms ranging from mild to severe

✧ 1 in 59 children meet criteria for ASD
  • 4:1; Males:Females
Dual Diagnosis: Hearing Loss (HL) + ASD

✧ Estimates of comorbidity vary (Gallaudet Research Institute, 2009)
  • 1 in 53 children with HL receive services for ASD
  • Higher rates amongst the profoundly deaf
✧ Szymnski et al. (2012) 32,334 DHH children
  • 39.9% of all children had additional disability
  • 35.4% of children with profound hearing loss had co-existing ASD diagnosis
Dual Diagnosis: HL + ASD

- Meinzen-Derr et al. (2014) Exploratory study with 24 children with dual diagnoses
  
  - Average age of diagnosis of autism in children with normal hearing = 48 months (CDC, 2008)
  - Average age of diagnosis of autism in children with hearing loss = 66.5 months
  - Children with more severe hearing loss & cochlear implants were diagnosed sooner
OPTION Schools / Programs

✧ Listening and Spoken Language – Data Repository (LSL-DR)
  • 2010 – 49 sites in 4 countries
  • 2019 – 32 active sites in 2 countries

✧ Current LSL-DR Cohort (n=8,304)
  • 4-year olds
  • Confirmed diagnosis of hearing loss
  • English as primary language

✧ LSL-DR email: lsldr@optionschools.org
<table>
<thead>
<tr>
<th>Child Demographics</th>
<th>HL + ASD (n=33)</th>
<th>HL (n=4,132)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>24 (72.7%)</td>
<td>2,104 (50.9%)</td>
</tr>
<tr>
<td>Female</td>
<td>9 (27.2%)</td>
<td>2,028 (49.1%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>21 (64%)</td>
<td>2,518 (61%)</td>
</tr>
<tr>
<td>Black</td>
<td>3 (9%)</td>
<td>515 (12.5%)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>1 (3%)</td>
<td>360 (9%)</td>
</tr>
<tr>
<td>Asian</td>
<td>2 (6%)</td>
<td>226 (5%)</td>
</tr>
<tr>
<td>Other</td>
<td>6 (18%)</td>
<td>419 (10%)</td>
</tr>
<tr>
<td>Missing</td>
<td>--</td>
<td>94 (2%)</td>
</tr>
<tr>
<td>Child Demographics</td>
<td>HL + ASD (n=143)</td>
<td>HL (n=4,132)</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Age of HL Diagnosis</td>
<td>Mean= 17 months (SD=17.7 months)</td>
<td>Mean= 11.9 months (SD=18.2 months)</td>
</tr>
<tr>
<td>Age of Amplification</td>
<td>Mean= 20.8 months (SD=17.9 months)</td>
<td>Mean= 17 months (SD= 19.2 months)</td>
</tr>
<tr>
<td>Age When Intervention Started</td>
<td>Mean = 21.2 months (SD=17.5 months)</td>
<td>Mean= 17.6 months (SD= 19.7 months)</td>
</tr>
<tr>
<td>Age When First Enrolled in OPTION</td>
<td>Mean = 34.1 months (SD=19.8 months)</td>
<td>Mean= 29.2 months (SD=26.7 months)</td>
</tr>
</tbody>
</table>
Measures

✧ Articulation
  • Arizona Articulation Proficiency Scale
  • Goldman-Fristoe Test of Articulation

✧ Vocabulary (Expressive/Receptive)
  • Peabody Picture Vocabulary Test
  • Expressive Vocabulary Test
  • Receptive One-Word Picture Vocabulary Test
  • Expressive One-Word Picture Vocabulary Test

✧ Language Skills (Expressive/Receptive/Total)
  • Clinical Evaluation of Language Fundamentals-Preschool
  • Clinical Evaluation of Language Fundamentals
  • Oral and Written Language Scales (Oral Composite)
  • Preschool Language Scales (Total Language Score)
Results: Receptive Language
Results: Vocabulary & Articulation

- Comparing HL + ASD and HL Only:
  - Similar performance on Articulation
  - Expressive Vocabulary significantly lagging behind HL only group
  - Wider range of scores on Expressive Vocabulary
Results: Language Measures

![Histograms for ASD and non-ASD groups showing frequency distribution.](image-url)
Results: Language Measures (ASD + HL)
Results: ASD

✦ Comparing HL + ASD and ASD Only:
  • HL + ASD were ~16 points worse on average in Expressive Vocabulary
  • No difference for receptive vocabulary
✦ Estimates for Language & Articulation were inconclusive due to limited data
Clinical Implications

- Evidence based practices (EBP) for children with hearing loss & ASD are lacking

Placements/Interventions

- Early Intervention Services (Birth-3 years)
- Child Find Programs (3-21 years)
  - IEP Goals: Functional auditory & communication goals
- OPTION Schools
- Behavioral therapy (ABA, ESDM)
- Speech & Language Therapy
- Technology (AAC, Amplification devices)
- Visual Supports
Conclusions

- Children tend to make progress but slower & more variable
- Early Identification is **KEY**
- Multidisciplinary approach with flexible collaboration
- Assessment & Intervention should be individualized to address specific needs & functional goals
Acknowledgments

Thank you to all of the contributors:

✦ The parents and children who participated in this study
✦ The investigators and data collectors of the LSL-DR study
✦ The educators and practitioners working in OPTION schools
✦ The faculty and staff at the University of Miami Ear Institute
✦ The funding sources that make the LSL-DR study possible