

Identifying Comorbid Hearing Loss and Autism Spectrum Disorder in Children

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Introduction

Autism Spectrum Disorders (ASD) are more prevalent in people with hearing loss (HL) than in the hearing population. Estimates vary, but Carr, Xu and Yoshinaga-Itano (2014) report that the prevalence of Autism Spectrum Disorder within the hearing impaired population may be three times as high as in the general population. Diagnosis of comorbid Autism Spectrum Disorder and hearing loss is complicated by the fact that communication and social behaviors may be affected in both conditions.

Clinical Question:

What evidence-based practices are currently available for identifying children with dual diagnoses of Autism Spectrum Disorder and hearing loss?

Methods

Search Strategy: *Databases:* CINAHL, PubMed, ERIC & PsycInfo. *Inclusion Criteria:* Peer-reviewed, English and published 2007-2017. *Search Terms:* (autis* OR ASD OR “Autism Spectrum Disorder” OR Asperger* OR “Pervasive Developmental Disorder” OR PDD*) AND (“hearing loss” OR deaf* OR “hearing impair*” OR “hard of hearing”) AND (diagnos* OR screen* OR identif* OR assess*).

Study Selection: *Final Search:* 249 results post-deduplication. *Inclusion Criteria for Independent Review:* Pediatric population, comorbid HL and ASD, and discussion of methods for identifying and/or diagnosing HL or ASD. *Exclusion Criteria:* Not empirical studies. *Title & Abstract Independent Review:* 206 articles excluded. Mean interrater reliability: 92.3%. *Full Text Independent Review:* 33 excluded. Mean interrater reliability: 93%.

Quality Appraisal: Evidence Evaluation Forms from Cincinnati Children’s Hospital (LEGEND) were used to rate the studies’ methodology as either Good or Lesser Quality during a tertiary independent review. Interrater agreement for the first round was 70%. After reaching a consensus on which form to use for each study, the articles were reassessed and interrater reliability was 90%.

Data Extraction: Study data were extracted using a table designed by the authors. The table included detailed information about study characteristics, methods and results.

Table 1: Included Study Characteristics

First Author, Year	Study Location	Study Type	Quality Assessment Rating	Assessment Tool
Carr, 2014	USA	Psychometric	2b	LENA Language and Autism Screen
Denmark, 2014	UK	Cross-Sectional	4a	Emotion Recognition Task
Mood, 2014	USA	Psychometric	2b	ADOS-2
Rafal, 2013	Poland	Cross-Sectional	4a	Otoacoustic Emission Testing (OAE)
Shield, 2016	USA	Cross-Sectional	4a	Theory of mind task; Visual perspective-taking task
Shield, 2012	USA	Mixed Methods	4b	Observation of palm reversal patterns
Szarkowski, 2014	USA	Cohort-Retrospective	4b	Various - Including ADOS, ADI-R, Vineland-II, Bayley-II, and others
Tas, 2007	Turkey	Cross-Sectional	4b	Otoacoustic Emission Testing (OAE)
VanDam, 2015	USA	Cross-Sectional	4a	Automated Vocal Analysis (LENA)
Worley, 2011	USA	Cross-Sectional	4b	BISCUIT

Evidence appraisal forms published by Cincinnati Children’s Hospital (LEGEND) were used to appraise the quality of evidence in each study. These forms were developed by the James M. Anderson Center for Health Systems Excellence.
LENA: Language Environment Analysis
ADI-R: Autism Diagnostic Interview – Revised
ADOS-2: Autism Diagnostic Observation Schedule, Second Edition
Bayley-II: Bayley Scales of Infant and Toddler Development, Second Edition
BISCUIT: Baby and Infant Screen for Children with Autism Traits

Results

Few standardized assessments have been studied in the pediatric population with comorbid HL and ASD. The search conducted in the present study identified articles of varying quality levels and methodological approaches (Table 1). The included studies tended to address one of the following sub-areas within the broader topic of the dual diagnosis of HL and ASD: assessment of HL in children with ASD, assessment of ASD in children with HL, and differential diagnosis of HL and ASD in non-comorbid populations.

Challenges to data analysis included the range of study designs and assessment tools. The lack of applicable psychometric data prevented quantitative analysis across studies. Thus, the studies were analyzed qualitatively. Overall, research in this subject area has been limited, with small cross-sectional or psychometric studies constituting the majority of the evidence base.

Table 2: Included Study Findings

First Author, Year	Promising Results?	Tools for Identification of ASD in Children with HL	Tools for Identification of HL in Children with ASD	Tools for Differentiation of HL versus ASD
Carr, 2014	Unclear	Score beyond cutoff on both CDI and LENA		
Denmark, 2014	Yes	Comparative performance in emotion recognition task when signer’s face was masked versus visible		
Mood, 2014	Yes	Modified version of ADOS-2		
Rafal, 2013	Yes		OAE (type not reported) at 1-kHz and 2-kHz	
Shield, 2016	Yes	Language comprehension, false-belief understanding, visual perspective-taking		
Shield, 2012	Yes	Hand-reversal errors in signing		
Szarkowski, 2014	No	No evidence provided to recommend a certain assessment.		
Tas, 2007	Yes		Transient-Evoked OAE	
VanDam, 2015	Yes			LENA acoustic analysis of utterances
Worley, 2011	Yes			BISCUIT-Part 1

Discussion

Currently, no standardized assessment exists for the diagnosis of ASD in children with HL. Both standardized (e.g., ADOS-2, BISCUIT) and non-standardized (e.g., LENA) assessments have been examined as potential assessment tools for this population. However, psychometric data for these tools has been reported inconsistently. Relatively few studies have examined the diagnosis of HL in children with ASD, which can likely be attributed to the widespread practice of newborn hearing screening using objective measures. However, given the limits of newborn hearing screening practices on a global level, evidence supporting the use of OAE and ABR objective measures for assessing HL in children with ASD could validate these methods for use in the absence of newborn hearing screening. Finally, comorbid diagnoses often required clinical judgment from a variety of professionals experienced in HL, ASD and sign-language.

Future Directions

Diagnosing Autism Spectrum Disorders in Hearing Loss

- Establish consistent adaptations to existing ASD diagnostic tools for use with children with HL.
- Determine cutoff scores for promising screening tools, including hand-reversal errors, use of facial expression to interpret emotion, visual perspective-taking and false belief understanding.
- Include children with comorbid ASD and HL in future studies of assessments that hold promise for differentiating between children with ASD and those with HL (e.g. BISCUIT-Part 1, LENA acoustic analysis).
- Perform longitudinal studies to determine whether early screening measures (such as combination LENA and CDI) predict future ASD diagnosis in children with HL.

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- Administer periodic, objective audiological assessments to children with ASD diagnoses.

References Upon Request

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