Considerations in Assessment of Autism Spectrum Disorder with Children who are Deaf or Hard of Hearing

Christine Yoshinago-Itano, PhD

I want to acknowledge co-presenters on previous presentations on this topic

- Amy Szarkowski
- Susan Wiley
- Christine Yoshinaga-Itano
- Deborah Mood

Disclosures

Dr. Yoshinago-Itano is on the LENA Scientific Advisory Board but has no financial interest in the LENA Foundation
Learning Objectives

Understand the rates of ASD in Deaf/HH > general population

Describe atypical development in children with the dual diagnosis

Explain a minimum of two "red flags"

Discuss how assessments may need to be adapted when there is a question of possible ASD in D/HH children

Seminars in Speech and Language (2014)

- Screening, Diagnosing and Implementing Interventions for Children who are deaf or hard of hearing with autism spectrum disorder
- Co-Editors: Christine Yoshinaga-Itano, Ph.D. & Amy Thrasher, M.A.

- Szarkowski, A., Mood, D., Shield, A., Wiley, S. & Yoshinaga-Itano, C. A Summary of Current Understanding Regarding Children with Autism Spectrum Disorder who are Deaf or Hard of Hearing
- Wiley, S., Innes, H. Supporting Families of Children who are Deaf/Hard of Hearing with an Autism Spectrum Disorder
- Carr, J., Xu, D. & Yoshinaga-Itano, C. Language ENvironment Analysis (LENA) Language and Autism Screen (LLAS) and the Child Development Inventory Social Subscale as a possible autism screen for children who are deaf or hard of hearing
- Mood, D. & Shield, A. Clinical Use of the Autism Diagnostic Observation Schedule-Second Edition with Deaf Children
Based on Expert Experience & Literature, we will address:

- Epidemiology of the dual diagnosis
- "Red flags" for recognizing/screening ASD in D/hh children
- Assessment considerations
- Implications of dual diagnosis for intervention
- Resources for family support
- Educational advancement of providers

Why it is important

- ~ 4% of D/hh children have ASD → can further complicate communication development
- Diagnostic process & availability of appropriate interventions are severely lacking
- Misdiagnosis can greatly impact outcomes in this group of children
Epidemiology

- Rates of ASD continue to grow, even for children who are deaf

<table>
<thead>
<tr>
<th></th>
<th>CDC believed Prevalence Rates</th>
<th>Annual Survey believed Prevalence Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-2005</td>
<td>1:125</td>
<td>1:111</td>
</tr>
<tr>
<td>2005-2006</td>
<td>1:110</td>
<td>1:94</td>
</tr>
<tr>
<td>2006-2007</td>
<td>-</td>
<td>1:53</td>
</tr>
<tr>
<td>2007-2008</td>
<td>1:88</td>
<td>1:81</td>
</tr>
<tr>
<td>2009-2010</td>
<td>1:68</td>
<td>1:59</td>
</tr>
</tbody>
</table>

Prevalence of Autism based on Severity of Hearing Loss

Data is provided from the Annual Survey of Deaf and Hard of Hearing Children and Youth Conducted by the Gallaudet Research Institute. Published in Szymanski, Brice, Lam and Hotto, 2012

Age of Diagnosis for ASD and Hearing Loss

### Surveillance for Autism

<table>
<thead>
<tr>
<th>Behavior</th>
<th>8 months</th>
<th>12 months</th>
<th>18 months</th>
<th>24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Contact</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turning to Name Call</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imitation</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pointing</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Gestures-Waving</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pretend Play</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Showing Behaviors</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Fail Criteria</strong></td>
<td>Fail 2/2</td>
<td>Fail 3/4</td>
<td>Fail 3/4</td>
<td>Fail 3/5</td>
</tr>
</tbody>
</table>

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### SCREENING FOR AUTISM WITH LENA TECHNOLOGY

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**Methods**

LENA: Language ENvironment Analysis
Methods: Automatic Processing

Audio Stream of Child Voice & Environment Sound

Identification of Different Sounds (Segmentation)

Sequence of Key Child, Adult, Environment Noise Overlapped Sounds

…..

Human Voice (Child or Adult)

Phone Recognition

Consonant-like Sound, Vowel-like Sound, Non-Speech Sound, Pause

Data Set of the Study

<table>
<thead>
<tr>
<th>Child Groups</th>
<th>Number of Children (N)</th>
<th>Number of Recordings</th>
<th>Child Segments (number in million)</th>
<th>Phoneme-like Units (number in million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Development (TD)</td>
<td>106</td>
<td>802</td>
<td>2.15 M</td>
<td>8.42 M</td>
</tr>
<tr>
<td>Language Delay but not ASD (LD)</td>
<td>49</td>
<td>333</td>
<td>0.75 M</td>
<td>2.65 M</td>
</tr>
<tr>
<td>Autism (ASD)</td>
<td>71</td>
<td>225</td>
<td>0.53 M</td>
<td>1.82 M</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>1363</td>
<td>3.43 M</td>
<td>12.89 M</td>
</tr>
</tbody>
</table>

In the following slides of results of findings
- Green: Typical Development (TD)
- Blue: Language Delay not Related to Autism (LD)
- Red: Autism (ASD)

Frequency of Vowel-like Sound

[Graph showing frequency of vowel-like sound across child age in months]
Frequency of Consonant-like Sound

**t-test**
(Welch 2-sample 2-side)

- TD versus ASD: $t(90) = 7.95^{***}$
- TD versus LD: $t(68) = 5.52^{***}$
- LD versus ASD: $t(118) = 2.62^{**}$

*p < 0.05
**p < 0.01
***p < 0.001

Correlation with age:
- TD: $0.67^{***}$
- LD: $0.42^{**}$
- ASD: $0.32^{*}$

Correlation with age:
- TD: 0.63^{***}
- LD: 0.32^{*}
- ASD: 0.32^{*}

*p < 0.05
**p < 0.01
***p < 0.001

Result of C-MLU: Trajectories & Correlation with Chronological Age

Correlation with chronological age:
- HH: 0.51^{***}
- TD: 0.63^{***}
- LD: 0.32^{*}
- ASD: 0.32^{*}

*p < 0.05
**p < 0.01
***p < 0.001

Probability of Sound Collision

**t-test**
(Welch 2-sample 2-side)

- ASD versus TD: $t(132) = 3.66^{***}$
- ASD versus LD: $t(111) = 2.94^{**}$
- TD versus LD: $t(90) = 0.13$

*p < 0.05
**p < 0.01
***p < 0.001
Child Vowel Volume (dB)

**t-test** (Welch 2-sample 2-side)

- ASD versus TD: $t(125) = 5.84^{***}$
- ASD versus LD: $t(117) = 4.78^{***}$
- TD versus LD: $t(97) = 0.45$

*p<0.05*

**p<0.01**

***p<0.001

---

Characteristics of Female Caregiver (Vowels inside “Child-directed” Voice)

Mean, Standard Error and t-Statistics

- ASD-vs-TD: $4.63^{***}$
- ASD-vs-LD: $3.58^{***}$
- TD-vs-LD: $0.91$

- ASD-vs-TD: $8.58^{***}$
- ASD-vs-LD: $6.09^{***}$
- TD-vs-LD: $1.72$

- ASD-vs-TD: $3.37^{***}$
- ASD-vs-LD: $2.25^{**}$
- TD-vs-LD: $0.16$

**t-test:** *p<0.05; **p<0.01; ***p<0.001

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Characteristics of Female Caregiver (“Child-directed” Non-Speech Voice)

Mean, Standard Error and t-Statistics

- ASD-vs-TD: $7.02^{***}$
- ASD-vs-LD: $5.44^{***}$
- TD-vs-LD: $1.01$

**t-test:** *p<0.05; **p<0.01; ***p<0.001

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Conclusion: Unique Characteristics of Children with Autism:

- Less Frequent Consonant-like Sounds
- Higher Chance of Sound Collision
- Louder Vowel-like Sounds
- Lower Spectrum Entropy of Unvoiced Consonant Sounds (how noise-like versus tone-like a sound is)
- Discriminant Analysis: 94% (6% Equal-Error-Rate)

Conclusion: Female caregivers of children with autism

- Unique Characteristics of “Child-directed” Voice of Female Caregivers of Children with Autism:
  - Longer Vowel Duration
  - Louder Vowel Volume (dB)
  - Higher Vowel Pitch
  - Lower Spectrum Entropy of Non-Speech Sounds

CHILD DEVELOPMENT INVENTORY: SOCIAL QUOTIENT
Development Quotient

- \((\text{Development Age} / \text{Chronological Age}) \times 100\)
- Decreases with time
- Both loss of skills and
- Failure to gain new skills – interaction with peers

Personal-Social Quotient: CDI

Referral Rates for Criteria 3
Results

- LLAS is a robust measure resulting in the most accurate need for referral.
- Using a double screen (LENA and CDI) the refer rate for the LLAS and M-CDI is 16.87%:
  - Those that referred on LLAS but not the M-CDI was 24.10%
  - Those that referred on the MINN-CDI Social but not the LLAS were 7.23%
- Therefore, using a double screen relying on LLAS is the most appropriate for determining who warrants referral for further evaluation
- The sensitivity for referral is robust for all types of hearing loss, except for bilateral severe/profound hearing loss

Moving beyond screening to diagnosis

- “Gold standard” assessment tools commonly used with hearing children have not been validated with children who are D/HH
  - ADOS-2, ADI-R
  - Efforts underway in Great Britain to validate for use with D/HH
- Use of ADOS-2 with D/HH (Mood & Shield, 2014)
  - May under-identify ASD if used in a “standardized” manner
  - Failure to administer module that matches the child’s language functioning results in lack of ability to assess atypical language and social communication
  - Administration of “easier” module relies on tasks that are too developmentally easy and a missed opportunity to assess social/communication skills appropriate for the child’s developmental functioning
- Many tools may not reliably identify ASD among children who are D/HH
  - Use of ADOS-2 algorithms with D/HH is not advised
  - When used by a clinician familiar with ASD and deafness, ADOS-2 may reveal important clinical information
- Multiple sources of information and rule in/rule out process are necessary

Other Diagnostic Considerations

<table>
<thead>
<tr>
<th>Learning/Communication:</th>
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<tbody>
<tr>
<td>• Intellectual Disability</td>
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<tr>
<td>• Communication Disorders</td>
</tr>
</tbody>
</table>
| Behavioral Conditions:
  - ADHD
  - Anxiety disorder
  - Obsessive compulsive disorder
  - Sensory integration difficulties |
| Medical Conditions:
  - Medical Conditions
  - Tourette’s Syndrome
  - Epilepsy
  - Landau-Kleffner and other epileptiform language disorders
  - Peripheral visual cuts
  - Benign stertotypies |
Interventions for Dual Diagnosis

- Evidence of effectiveness of interventions is lacking (mostly case studies).
- It is reasonable to take interventions which have been successful for hearing children to modify/adapt for children who are deaf/HH.

Review of Interventions for ASD
(Warren et al, 2011, Pediatrics)

- 4120 studies; 34 met inclusion criteria – 1 rated good – 10 fair – 23 poor.
- Interventions thought to show improved outcomes in cognition, adaptive functioning & early educational attainment.

Categories of Effective Intervention
(Warren et al., 2011, Pediatrics)

- Lovaas-based & Early Intensive Behavioral Intervention (EIBI)
  - Discrete trial teaching (DTT)
  - Widely known in the public as Applied Behavioral Analysis (ABA)
  - Uses praise & reinforcers → transfer to naturalized settings.
- Comprehensive Approaches - Children < 2 yr
  - Early Start Denver Model → ABA techniques in a functional developmental framework, sensitive to developmental sequence, positive, affect-based relationship
  - 2 yrs enrolled – significant cognitive & language gains
  - Must be “implemented with fidelity” and supervision
- Parent Training
  - Best at promoting social communication & language; less impact on child’s IQ.
Implications of Communication on Interventions for Dual Diagnosis

- Communication needed:
  - joint attention, turn-taking, imitation, choice-making, play
- Communication modality can be complex
  - Picture Exchange Communication System (PECS)
  - Technology/Augmentative Communication
  - Signs, gestures, spoken

Implementation of Interventions Children with ASD who are D/Hh

- Lovaas/Early Intensive Behavioral Intervention
  - Direct teaching (breaking down a task and building the skill).
  - Generalization of skills learned
  - Finding appropriate motivators, rewards
- Comprehensive, developmental approaches
  - “What is ASD, what is hearing loss?”
  - Promoting interactions with typical peers – more challenges?
  - Begins early (12-18 mo.) – Delayed diagnosis of ASD in D/hh population may make this challenging?

Interventions for Dual Diagnosis: Social Communication

- Parent Training
  - Fostering social communication skills, teaching parents about importance of communication & language access in general
- Social Skills Groups
- Social Stories
- Who is the peer group?
  - Learning cultural norms for both hearing and Deaf worlds
Family Resources

- Seminars in Speech/Language special edition devoted to ASD among children who are D/HH (November, 2014, vol 4)
- Gallaudet Odyssey special editions re: deafness/autism
- Deafness and Family Communication Center of the Department of Child and Adolescent Psychiatry- Children's Hospital of Philadelphia
  - http://www.raisingdeafkids.org/special/autism/
- Colorado Hands and Voices- Deaf Plus
- Autism Society
  - http://www.autism-society.org/

“Red Flags” for a possible ASD in children who are Deaf/HH

- Atypical preverbal communication
  - poor eye contact, lack of pointing, poor orientation for communication, poor joint attention
  - delays in language acquisition beyond what one could expect based on hearing loss/etiology/intervention history
- Atypical language features
  - echolalia, palm rotation errors, persistent gesture use despite instruction in formal sign and use of formal sign by others in the child’s environment (distinct from home signs)
- Social difficulties
  - failure to initiate/respond to peers when communication taken into consideration, failure to recognize Deaf cultural norms, etc
- Repetitive behaviors/restricted interests

<table>
<thead>
<tr>
<th>Deficits in Social/Communications and Social Interaction</th>
<th>ASD</th>
<th>Typically developing D/HH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficits in social/emotional reciprocity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atypical social approach</td>
<td></td>
<td>Appropriate social smile</td>
</tr>
<tr>
<td>Difficulty with reciprocal conversations</td>
<td></td>
<td>Appropriate eye contact</td>
</tr>
<tr>
<td>Reduced sharing of affect/interests/Enjoyment and limitations in social interaction</td>
<td></td>
<td>Engages others in their environment with integrated eye contact, gives/show behavior, gestures, vocalizations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imitate motor/vocal/signs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate joint attention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33-34</td>
</tr>
</tbody>
</table>
### Deficits in Social/Communicative and Social Interaction

**D/HH + ASD**

<table>
<thead>
<tr>
<th>Deficits in social/emotional reciprocity</th>
<th>Social/emotional reciprocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced/absent social smile</td>
<td>Limited or inconsistent eye contact</td>
</tr>
<tr>
<td>Reduced sharing of affect</td>
<td>Limited give/show behavior</td>
</tr>
<tr>
<td>Difficulties with joint attention</td>
<td>Difficulty engaging in social conversation at one's language ability level</td>
</tr>
<tr>
<td>Does not readily respond to name or culturally appropriate attention-getting measures</td>
<td></td>
</tr>
<tr>
<td>Difficulty understanding others' needs and feelings or processing facial/signed emotion cues</td>
<td></td>
</tr>
</tbody>
</table>

**ASD Typically developing D/HH**

<table>
<thead>
<tr>
<th>Deficits in communicative behaviors for interaction</th>
<th>Social/communicative behaviors for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorly integrated verbal/nonverbal behavior</td>
<td>Appropriate eye contact</td>
</tr>
<tr>
<td>Abnormalities in eye contact and body language</td>
<td>Well integrated gestures/eye contact/vocalizations</td>
</tr>
<tr>
<td>Limited facial expressions/gestures</td>
<td>Wide range of facial expressions; use of ASL facial grammatical markers</td>
</tr>
<tr>
<td>Difficulties in understanding nonverbal cues</td>
<td>Will learn incidentally with visual/auditory access, the sequence of learning language will follow typical developmental norms</td>
</tr>
<tr>
<td></td>
<td>May have difficulties with vocabulary, grammar, word order, idiomatic expressions and other aspects of verbal communication</td>
</tr>
</tbody>
</table>

**D/HH + ASD**

<table>
<thead>
<tr>
<th>Deficits in communicative behaviors for interaction</th>
<th>Social/communicative behaviors for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited gestures</td>
<td>Lack of pointing for shared enjoyment</td>
</tr>
<tr>
<td>Lack of pointing for shared enjoyment (e.g. pointing to make choices)</td>
<td></td>
</tr>
<tr>
<td>Difficulty with choice making (e.g. pointing to make choices)</td>
<td></td>
</tr>
<tr>
<td>Using others as objects for communication (e.g. hand as tool)</td>
<td></td>
</tr>
<tr>
<td>Abnormal prosody of speech/sign</td>
<td>Poor understanding/use of integrated ASL facial grammatical features</td>
</tr>
<tr>
<td>May demonstrated poorly integrated sign and spoken language (if utilizing total communication approach)</td>
<td></td>
</tr>
<tr>
<td>Shifting of signing space below typical visual spatial space</td>
<td></td>
</tr>
<tr>
<td>Poor understanding/use of integrated ASL facial grammatical features</td>
<td></td>
</tr>
<tr>
<td>Gaps in acquisition of language and delays beyond expected for hearing loss/intervention history/availability of language</td>
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</tr>
<tr>
<td>Limited spontaneous language use of words within child's repertoire for social communication (e.g. to comment, share, respond)</td>
<td></td>
</tr>
<tr>
<td>Limited range of facial expression or poorly coordinated</td>
<td></td>
</tr>
<tr>
<td>Difficulty grasping Deaf cultural norms (e.g. use of attention getting strategies, entering/exiting conversations)</td>
<td></td>
</tr>
</tbody>
</table>
Language features of ASD in ASL

Features similar to oral language but may present differently in visual language

- Palm reversals (Shield, 2014)
- Pronoun avoidance vs. pronoun reversal (Shield, 2014)
- Echolalia
- Persistent use of individual’s own gestures rather than formally instructed/used sign vs. neologisms (e.g. “red” vs. “ketchup”)
- Failure to use appropriate sign space
- Mixed results regarding use of facial aspects of sign language and impact of ASD (Denmark, 2011, 2014)

<table>
<thead>
<tr>
<th>Deficits in Social/Communications and social interaction</th>
<th>ASD</th>
<th>Typically developing D/HH</th>
</tr>
</thead>
</table>
| Deficits in developing and maintaining appropriate relationships | - Difficulties building relationships appropriate to developmental level  
- Difficulty adjusting behavior to context  
- Difficulty with imaginative play  
- Difficulty making friends or limited interest in people | - Interested in people and able to develop age-appropriate relationships when communication is accessible  
- Imaginative play follows typical developmental course (commensurate with language and nonverbal IQ)  
- Flexible play  
- May prefer to control conversation or play if having troubles following changes in conversation based on language level or in challenging listening environments (when using an auditory/oral approach) |

<table>
<thead>
<tr>
<th>Deficits in Social/Communications and social interaction</th>
<th>D/HH + ASD</th>
</tr>
</thead>
</table>
| Deficits in developing and maintaining appropriate relationships | - Reduced shared enjoyment  
- Delayed acquisition of symbolic play skills inconsistent with nonverbal IQ  
- Difficulty making and sustaining friendships even when communication is accessible  
- Unusual social overtures toward others (e.g. backing into parents, grunting at peers, hitting peers to initiate contact)  
- Play is rigid and unimaginative |
### Restricted/Repetitive Patterns of Behavior

<table>
<thead>
<tr>
<th><strong>ASD</strong></th>
<th><strong>Typically developing D/HH</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereotyped or repetitive speech, motor movements, or use of objects</td>
<td>Usually not demonstrated, particularly in children with well-established communication system and average nonverbal IQ. Echolalia can occur as a typical developmental pattern, but should be for a brief period of time. You/I pronoun reversals can occur as part of typical development for children with co-occurring visual impairments.</td>
</tr>
</tbody>
</table>

### Restricted/Repetitive Patterns of Behavior

<table>
<thead>
<tr>
<th><strong>D/HH + ASD</strong></th>
</tr>
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<tbody>
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<td>Stereotyped or repetitive speech, motor movements, or use of objects</td>
</tr>
<tr>
<td>Echolalia in sign or spoken language</td>
</tr>
<tr>
<td>Idiosyncratic gestures (e.g. persistent use of made up gesture, distinct from home sign, when formal sign taught/used)</td>
</tr>
<tr>
<td>Palm rotation errors</td>
</tr>
<tr>
<td>Difficulty with pronoun use (not using point gesture to indicate others, fingerspelling name instead of using pronoun/point, “you”/“I” confusion in auditory/verbal children)</td>
</tr>
<tr>
<td>Rocking, twirling, flapping, spinning</td>
</tr>
<tr>
<td>Highly repetitive play with objects (e.g. persistence in lining up toys with significant upset if disrupted)</td>
</tr>
</tbody>
</table>

### Restricted/Repetitive Patterns of Behavior

<table>
<thead>
<tr>
<th><strong>ASD</strong></th>
<th><strong>Typically developing D/HH</strong></th>
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<tbody>
<tr>
<td>Excessive adherence to routines</td>
<td>Given an understanding of communication, child will change routines, activities. The resistance seen is typical for all children or due to comprehension issues. May struggle with transitions if language level doesn’t yet support understanding first-then concept.</td>
</tr>
</tbody>
</table>

### Restricted/Repetitive Patterns of Behavior

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### Restricted/Repetitive Patterns of Behavior

<table>
<thead>
<tr>
<th></th>
<th>DHH + ASD</th>
</tr>
</thead>
</table>
| **Excessive adherence to routines** | May require parents/caretakers to say things in exactly the same way  
Resistant to change, transitions are difficult (these difficulties are beyond that anticipated by language level)  
Significant upset when routines are disrupted |

### ASD

<table>
<thead>
<tr>
<th></th>
<th>Typically developing DHH</th>
</tr>
</thead>
</table>
| **Highly restricted, fixed interests that are abnormal in intensity or focus** | Preoccupation with a particular object or topic  
Highly unusual interest for child’s developmental age (i.e., ceiling fans) |
| **Hyper-or hypo-reactivity to sensory input or unusual interest in sensory aspects of environment** | Unusual sensory interests (visual inspection, smelling objects), fascination with lights/spinning objects  
Indifference or oversensitivity to pain/heat/cold |
| **Hyper-reactivity to sensory input or unusual interest in sensory aspects of environment** | Unusual sensory interests (visual inspection, smelling objects), fascination with lights/spinning objects  
Indifference or oversensitivity to pain/heat/cold |
| **Highly restricted, fixed interests that are abnormal in intensity or focus** | Repeated play with toy or object (often rather than playing with a wide variety of toys)  
Play with toy for other than intended purpose  
Unusual interests of unusual intensity or for child’s developmental age (e.g., perseverance on street signs, ceiling fans, researching all presidents of the US at age 3) |
| **Hyper-reactivity to sensory input or unusual interest in sensory aspects of environment** | With some DHH children, may see limited response to amplification (seem to be more deaf than you would expect based on their audiogram or amplified responses)  
May show sensitivity to wearing amplification  
Hypo and hyper-sensitivities  
Sensory seeking behaviors (pushing head on floor in inverted “V” position, repeatedly watching blinds opening and closing, sniffing non-food objects before use)  
Unusual reactions to environment unlikely related to hearing loss (e.g., avoidance of smells/touches) |
## Other Diagnostic Considerations

<table>
<thead>
<tr>
<th>Learning/Communication:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Disability</td>
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<tr>
<td>Communication Disorders</td>
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<table>
<thead>
<tr>
<th>Behavioral Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
</tr>
<tr>
<td>Anxiety disorder</td>
</tr>
<tr>
<td>Obsessive compulsive disorder</td>
</tr>
<tr>
<td>Sensory integration difficulties</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Conditions</th>
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</thead>
<tbody>
<tr>
<td>Medical Conditions</td>
</tr>
<tr>
<td>Tourette's Syndrome</td>
</tr>
<tr>
<td>Epilepsy</td>
</tr>
<tr>
<td>Landau-Kleffner and other epileptiform language disorders (rare)</td>
</tr>
<tr>
<td>Peripheral vision cuts</td>
</tr>
<tr>
<td>Benign stereotypies</td>
</tr>
</tbody>
</table>