Hyperlexia: An SLP’s Point of View

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A Brief History

• My story: How I became aware of hyperlexia.

• History in the literature
  – There is no clear agreement on definition in the literature.
  – Silberberg and Silberberg (1967) introduced the term hyperlexia
  – Others had described precocious and unexpected reading abilities previously (Parker, 1919; Phillips, 1930; Kanner, 1943)
Differing Views on the Definition

• Authors agreed that the reading decoding level was unexpected when compared to age or intellectual functioning.

• Authors agreed that decoding was more advanced than reading comprehension.
  • Most agreed that reading comprehension was impaired.
  • Most agreed that deficits in reading comprehension were related to deficits in language comprehension.
Authors agreed that hyperlexia is often associated with ASD.

However, hyperlexia may also be associated with other disorders.

Hyperlexia may not be caused by the disorder with which it is associated.
Prevalence

- Few studies of prevalence have been done.
- Since it is not a stand-alone diagnosis, the prevalence may be under-reported.
- Burd and Kerbeshian (1985) using the DSM III definition of PDD at the time, identified four children in a group of 66 with PDD who presented with hyperlexia (6 percent).
- Grigorenko, Klin, Pauls, Senft, Hopper and Volkmar (2002) found in a sample of 80 children referred for evaluation at the Yale Developmental Disabilities Clinic, 12 were identified with hyperlexia (15 percent). All of those identified with hyperlexia also were diagnosed with autism or (PDD-NOS) in their referred sample.
Profile of Strength & Weakness
Characteristics of Children Who Develop Hyperlexia

- Children who develop a hyperlexic reading style have a particular profile of cognitive and linguistic abilities, coupled with considerable reading experience, plausibly resulting from narrow-focused preoccupations with reading
- Relative strengths - phonological and orthographic skills, rote memory
- Relative weaknesses - semantic skills
- Exceptional levels of practice and exposure to print

(Nation, 1999)
Profile of Strength & Weakness
Characteristics of Children
Who Develop Hyperlexia, cont.

- Does this profile of strengths and weaknesses arise from differences in neural organization?
- Are these children’s brains “wired differently” as a result of their underlying disorder and relative to their hyperlexia?
- Recent developments in neuroimaging are beginning to illustrate these differences, but do not yet tell us why the differences occurred.
Neural Organization

• Data from earlier electroencephalogram (EEG) studies is inconsistent and conflicting (Elliott & Needleman, 1976; Goldberg & Rothermel, 1984; Huttenlocher & Huttenlocher, 1973; Mehegan & Dreifuss, 1972).

• Some found variations in EEG’s and some did not. Sample sizes were small.
Neural Organization, cont.

- Landmark study - Turkeltaub, Lynn-Flowers, Miranda, Gareau, and Eden (2004)—The Neural Basis of Hyperlexic Reading: An fMRI Case Study
  - During a covert reading task, the functional magnetic resonance imaging (fMRI) of a 9-year-old boy with hyperlexia was compared to two groups in a previous normative study
    - Chronological age matches
    - Reading age matches
  - Results - The 9-year-old boy with hyperlexia showed:
    - Greater activity in the left inferior and superior temporal cortices than chronological age—and reading age-matched controls
    - Greater activity in the right inferior temporal sulcus than reading age-matched controls
Neural Organization, cont.

Turkeltaub et al. (2004), cont.

• Findings suggest:
  • simultaneously drawing on both left hemisphere (phonological) and right hemisphere (visual systems) brings about precocious reading
  • hyperlexic reading is associated with hyperactivation of the left superior temporal cortex (Note: dyslexia is associated with hypoactivation in this area)
  • follow-up studies have not been done yet
Human Connectome Project
Diffuse Tensor Imagining mapping neural connectivity
Human Connectome Project
Diffuse Tensor Scan
Human Connectome Project
White Matter DT Scan
Neural Organization, cont.

Neuron (http://www.cell.com/neuron/abstract/50896-6273(14)00651-5)  
August, 2014

- Researchers found a surplus of synapses in brains of autistic children and adolescents due to slowdown of pruning process. A drug that restores normal pruning can improve autistic-like behaviors in mice, but has side effects.

“While people usually think of learning as requiring the formation of new synapses, the removal of inappropriate synapses may be just as important.” (Sulzer, 2014)
Questions

- Can we use hyperlexic reading to improve language skills?
- Can the precocious reading skills be used to improve social and behavioral functioning?
- Are there implications for academic success in children with hyperlexia?
- Children with hyperlexia often display similar language, social, and behavioral patterns. Is hyperlexia the central characteristic with associated behaviors, or is hyperlexia a symptom displayed by some individuals who are diagnosed with language, social, or behavioral disorders?
The Blind Men and the Elephant

It’s a Fan!

It’s a Spear!

It’s a Snake!

It’s a Wall!

It’s a Tree!

It’s a Rope!
Clinical Cases at the Center for Speech and Language Disorders

- During the past 30+ years, we have seen hundreds of children with hyperlexia. Our experiences have mirrored those reported in the literature. These include:
  - Monozygotic twins concordant for autism and hyperlexia
  - Micro-preemies with early brain insults with hyperlexia who also met criteria for ASD
  - Nonverbal apraxic children, with and without autism, with precocious reading and spelling skills
  - Children with all degrees of severity of ASD who were hyperlexic
  - Children who were clearly not ASD, but who had language disorders and hyperlexia
  - Children whose deficits improved dramatically with therapy and children whose primary deficits persisted
Some of these children were precocious spellers as well. They could type, write or arrange plastic letters at an early age.

Reading comprehension was deficient, mirroring their deficits in language comprehension. Conversely, they could understand what they could read about as well as they could understand oral language. Higher-level comprehension of inference and abstraction was deficient.
Clinical Presentation

We define hyperlexia in terms of the following clinical presentation:

- Children who read unexpectedly and precociously within the context of another developmental disorder
  - Autism spectrum disorder
  - Language disorder
  - Cognitive impairment
  - Nonverbal learning disability
  - Social (pragmatic) communication disorder
Clinical Presentation, cont.

• We will not define hyperlexia solely as a discrepancy between decoding and comprehension since that definition does not describe precocious and unexpected reading abilities in the context of other deficits.

• Typical readers can decode material that they do not comprehend because they may lack the background knowledge or schema necessary for higher-level comprehension. This discrepancy is not characterized as hyperlexia.

• We will not dismiss hyperlexia as mere “word-calling” since the children we see understand many of the words they read.

• We do not marginalize hyperlexia as a “splinter skill” since it is a key element of the child’s learning style.
Common Characteristics

- May decode phonetically
- May learn many sight words
- Reading decoding occurs before the age of five
- May spell (orally, type, write or “air-write”) 
- Early reading may begin with high interest words, logos, titles, signs
- Early fascination with letters and words may be intense
- May attend to written words better than to pictures
- May teach themselves to read by intense repetition of children’s videos, computer programs and/or books
Common Characteristics, cont.

• Reading comprehension generally lags behind.

• Reading comprehension mirrors difficulties in language comprehension.

• Early reading comprehension for concrete material may be adequate, but difficulties arise in higher-level interpretation of abstract and inferential material.
Effect of Gestalt Processing  
(Prizant, 1982)

- Reduced flexibility in comprehension and use of language to communicate.
- Literal comprehension of language.
- Reduced discerning of nuances of meaning and intention.
- Echoed language patterns, chunks of language are used.
- Precise intended meaning of the speaker not conveyed.
- Need to listen for meaning.
Identifying Hyperlexia

• Since hyperlexia is not a stand-alone diagnosis, nor is it a distinct syndrome described in the DSM-5, it is identified on the basis of its presenting symptoms.

• If the child demonstrates precocious and unexpected reading within the context of another developmental disability in formal and informal assessment, the term hyperlexia can be applied.
Why Identify Hyperlexia?

• In our experience and as reported in some literature, the precocious reading can be used as a powerful tool in language intervention.

• It is a key element in the child’s learning style.

• It is a strength that can be used to scaffold and remediate weaknesses.
Intervention

- Although the literature is contradictory as to whether the presence of hyperlexia affects the outcome in children with ASD (Grigorenko et al. 2002; Burd & Kerbeshian, 1988), the following two articles describe how using written language and reading as an intervention strategy improved language skills.
Intervention, cont.

• Kistner, Robbins and Haskett (1988) reported on a study of a minimally verbal girl with hyperlexia and autism, whose ability to decode words was used to increase her functional speech.

• Written prompts resulted in rapid increase in appropriate verbal responses in naturalistic settings.
Craig and Telfer (2005) describe a case study of scaffolding language growth over time in a boy with hyperlexia and ASD. Although this boy’s comprehension lagged behind his reading decoding and writing abilities, intervention was successful in using these abilities to build oral language comprehension, expression, academics and social interactions.

Visual priming and written schedules aided school performance.

In general, using his strengths provided an excellent in-road into his growth in language comprehension when auditory stimuli were not adequate.
Intervention, cont.

• Whether or not reading is used in therapy, work toward meaningful comprehension must be the primary goal of intervention.

• As Aram (1997) phrased it, “If the printed words provide a motivational ‘in’ or help concretize what is being taught, then print might well be appropriate. If, on the other hand, the printed word becomes a stimulus for overlearned, ritualistic behavior largely devoid of meaningful comprehension, then print is not appropriate for furthering such a child’s comprehension abilities.”

• Although Aram’s point is well taken, in our experience we have been able to develop ritualistic decoding into meaningful intervention by drawing children into new activities based on their obsessions.
Intervention, cont.

• Goals for treatment are created relative to the child’s primary diagnosis and presentation. Language goals will relate to the child’s language disorder or to the communication deficits related to ASD.

• Treatment is based on efficacious methods to meet established therapy goals for each child, taking into account the child’s learning style and adding written language as a support.
Intervention, cont.

• Typical learning style
  – Visual learner
  – Pattern seeker
  – Difficulty with auditory/language processing
  – Gestalt processor of language (Prizant, 1982)
    • Learns language in chunks and through echolalia without necessarily attaching meaning to each word
  – Strong auditory and visual learning memory
  – Strong verbal imitation skills
  – Concrete, rigid and literal thinker
  – Likes routines
Intervention, cont.

• Typical learning style, cont.
  – May have focused interests
  – Difficulty picking up incidental language/information from the background
  – Difficulty with language formulation
  – Difficulty with social reciprocity, perspective-taking (ToM) and conversation
Intervention, cont.

- Match intervention tactics to learning style
  - Use strengths in reading decoding to develop weaknesses in language comprehension
  - *When in Doubt, Write it Out!* (Beedham, n.d.)
  - Write, write, write because children with hyperlexia will read, read, read (Miller, 1993)
Intervention - General Tactics

- Write lists, rules, and schedules
- Offer choices
- Use written and visual models
- Use cloze sentence formats and patterned language
- Use scripts and models and ask the child to repeat
- Provide demonstrations rather than explanations
- Teach one way, and then reverse the process
- Use rote learning and frequent repetition
- Write questions and write answers
Intervention - General Tactics, cont.

- Build background information (schemas)
- Use high interest activities
- Teach reading comprehension directly
- Read, write and tell stories
- Use a positive reward system
- Use social stories and social rules
- Collaborate with parents and school staff

(adapted from *Hyperlexia: Therapy that Works*, CSLD 2002)
Outcomes

• We have followed several hundred children with hyperlexia over the past 30+ years.
• Outcomes have varied with the severity of the language disorder, the presence and severity of co-morbid autism spectrum disorders, and with the type and intensity of intervention offered.
• While the precocious reading can be used for initial language scaffolding, the issues of higher-level language comprehension and social functioning become paramount as the child gets older.
Outcomes, cont.

Here is a sampling of some of our case outcomes:

- AF - Affected by ASD and epilepsy. His reading decoding skills and written expression are far above his reading comprehension and social language abilities. He is a well-behaved and pleasant young man who loves to peruse cookbooks and take adventure trips with his dad.

- CT - Diagnosed with a language disorder and hyperlexia when he was four. He graduated from college with a degree in computer information systems.

- JM - Diagnosed with an ASD and hyperlexia, earned his college degree in music. He works full-time at a national laboratory using computer skills. He lives on his own and drives his own car.
Outcomes, cont.

- CM - Despite a successful high school career in academics and sports, he has had a difficult time motivating himself to pursue higher education. He lives at home, has a steady job, but likes his routines.

- OL - With a few residual mild symptoms of ASD. He graduated from college, is doing well at his job, and just bought his own townhouse.

- KD - With a diagnosis of Asperger's. This accomplished poet is living with her parents and slowly pursued an associate degree at a community college and maintained an “A” average.
Outcomes, cont.

- Younger children with hyperlexia are in a variety of educational settings depending on the degree of their co-morbid disorders.
- Some are in general education with support services.
- Some are fully included in general education with an aide.
- Some receive resource services for up to 50 percent of the school day.
- Some are in instructional special education classes.
- Some parents have opted for home school or private school programs.
- All receive speech and language pathology services.
Lessons to be Learned

• Craig and Telfer (2005) summed it up well, “[Jason’s] case underscores the importance of attending to a client’s strengths as well as weaknesses. As clinicians, we may identify strengths, but then ignore them as we focus on the deficit areas. This case study demonstrates how beneficial it can be to use a child’s strengths in one domain to leverage language growth in others.”
A Final Note

“It has been my pleasure to join the journeys of these interesting and unusual children and their devoted families. While they have taught us much about the nature of hyperlexia, as can be seen from the literature, the enigma remains.”

- Phyllis Kupperman
References


