



NOVEMBER 9-12, 2023
Disney's Coronado Springs Resort
Lake Buena Vista, FL

Auditory Processing Disorders and Vision Processing Disorders in Twice-Exceptionality (2e): Are These Foundational Factors Being Overlooked?

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AGENDA

- Research Overview
- Auditory Processing Disorders
 - Why it happens, how to diagnose, how to support
 - When to refer
 - Clinical Data
- Vision Processing Disorders
 - Why it happens, how to diagnose, how to support
 - When to refer
 - Case Studies
- Takeaways

Paper accepted to upcoming JEG Special Issue on 2e

De Bonte, A., et al. (In Press). Auditory processing disorders and vision processing disorders in twice-exceptionality (2e): Are these foundational factors being overlooked?. Journal for the Education of the Gifted.



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OVERVIEW

- What is Auditory Processing Disorder (APD)?
- What is Vision Processing Disorder (VPD)?
- There is a LOT of symptom overlap with common 2e diagnoses
 - Especially ADHD & dyslexia
- Most pediatricians and neuropsychs do NOT screen for APD or VPD
 - Need APD & VPD specialists to diagnose
- Are we overlooking these disorders in 2e kids?

Our Goal

**Increase awareness, screening, and referral
for APD & VPD**

WHY DIAGNOSIS MATTERS

“Why do you need a label?”

Because there is comfort in knowing you are a normal zebra, not a strange horse.

Because you can't find community with other zebras if you don't know you belong.

And because it is impossible for a zebra to be happy or healthy spending its life feeling like a failed horse.”



The important part is that the label is
ACCURATE

Find the correct root cause

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WHY DIAGNOSIS MATTERS

- **Accurate diagnosis helps build positive self-concept**
 - Lazy, unmotivated, “just try harder” is harmful
- **Missed opportunities to support**
- **Applying the wrong supports causes frustration when they don’t work**
- **Wasting time that could be spent developing strengths**
- **Early intervention works better – neuroplasticity!**
 - **Dyslexia intervention in 1st or 2nd grade is twice as effective as in 3rd**
(Lovett et al., 2017)
 - **Solid intervention strategies for both VPD and APD**
- **2e students are masters of masking & compensating**
 - **Accurate diagnosis is tricky! It’s probably not just one thing...**

“A diagnosis of ADHD should not be made without first ruling out the possibility that APD might be mimicking ADHD.

I have had the opportunity to evaluate children who I believe were erroneously provided stimulant treatment, who did not benefit from the medication, and who had auditory perceptual disorders without ADHD. When stimulant treatment was stopped there was no change in their behavior functioning or school performance.”

(Keller, 1992, p. 113)

APD CO-OCCURRING CONDITIONS

- Common behaviors of APD also reported in **ADHD, autism, anxiety, dyslexia**, and other **learning challenges**
(Dawes & Bishop, 2009; Lawson et al., 2015)
- Review of **13 studies** found significant symptom overlaps between APD, **dyslexia**, and **ADHD** (de Wit et al., 2018)
- **110 children** with suspected APD also had challenges with **working memory, executive attention, and processing speed**
(Ahmmed et al, 2014)
- **104 children/teens** with **ADHD**, those who also had **ODD** or **separation anxiety disorder** endorsed many more auditory processing challenges on a checklist (Ghanizadeh, 2009)

Is it APD or ADHD or BOTH?

With APD, behaviors present when background noise is present

With ADHD, behaviors are observed regardless of acoustic environment
(Chermak & Bellis, 2014)

100+ children with listening difficulties: 34 had both **ADHD** and APD;
the rest did not. APD and **ADHD** were separate and distinguishable
diagnoses (Gyldenkarne et al., 2014)

“APD and **ADHD** are frequently co-morbid while being
distinct entities.” (Dawes & Bishop, 2009, p. 453)

APD and DYSLEXIA

- 50% of the **dyslexic** students studied also had APD (Welsh et al., 1980)
- Individuals diagnosed with APD and **dyslexia** often report the same characteristics (Banai and Kraus, 2014)
- Perception of phonemes was more impaired in students with APD and **dyslexia** combined than with either disorder alone (Kritsi et al., 2008)
- “Children with **dyslexia** show impairment of central auditory processing” (Hugdahl & Hellend, 2014, p. 181)
- 19 **dyslexic** children were compared with 25 children with APD; both groups had similar language, reading, and attention problems. 1/3 of the APD group scored clinically significant for **autism**. (Dawes & Bishop, 2010)

VPD CO-OCCURRING CONDITIONS

- 225 children/teens with **IEPs** were twice as likely to have diagnosable VPD – “Out of the 179 **IEP** patients who required some form of [vision] treatment, **124 (69.3%) would have passed a distance visual acuity screening program.**” (Walline & Carder, 2012, p. 91-92)
- Convergence insufficiency was 3x more likely in a child with **ADHD** (Granet et al., 2005)
- Children with convergence insufficiency scored higher on **psychosomatic, learning problems, and hyperactive** categories of the Connors (Borsting et al., 2005)

Is it VPD or Dyslexia or BOTH?

- Meta-analysis of 11 studies: **Dyslexic** children fixate 2.33 times longer, 1.58 times more fixations, 1.83 times more regressions when reading (Hatch, 2020)
- VPD more common in **dyslexic** students compared to controls
 - Accommodative 55% vs. 9%; Vergence 34% vs. 15%; Ocular motor 62% vs 15% (Raghuram et al., 2018)
- Of 24 **dyslexic** students, 88% had **visual** attention deficits, 83% had **auditory** processing deficits, and 50% had both (Gokula et al., 2019)
- 11 of 21 **dyslexic** students studied had vision processing deficits (Georgiou et al., 2012)

IN SHORT...

- There is lots of opportunity for misdiagnosis or under-diagnosis
 - Huge amount of symptom overlap
- APD is not the same as ADHD, but they can co-occur
- VPD is not the same as dyslexia, but they can co-occur
- So let's get smarter about APD and VPD

Why it happens

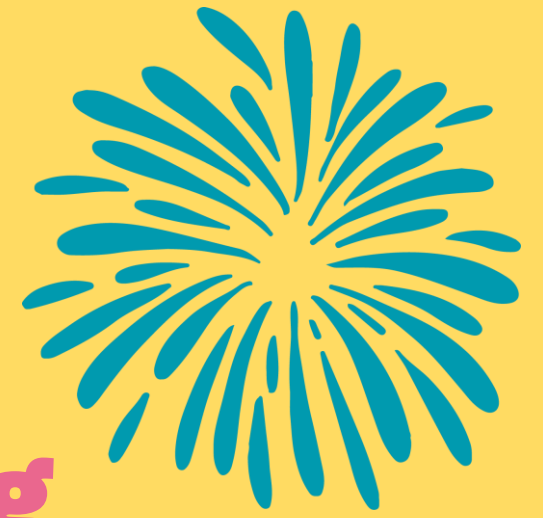
How to diagnose

How to support

When to refer



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Auditory Processing Disorders (APD)

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APD IMPACTS

APD can impact academic and work performance, self-esteem, social relationships, and overall well-being. It can also impact how one feels in noisy environments and quality of life.

Many of the Foundation's gifted clients have been classified inappropriately. Lazy, unmotivated, noncompliant, rude, underachiever, emotionally sensitive, etc., are some of the labels assigned to them.

We would never tell a blind student to go home every day and try harder to read a book, just as we should not tell an individual with APD to try harder to listen and focus during their day.

APD DEFINITIONS

- Deficits in the neural processing of auditory information in the CANS not due to higher order language or cognition. - ASHA, 2005
- A disorder that is marked by a deficit in the way the brain receives, differentiates, analyzes, and interprets auditory information (as speech) and that is not attributable to impairments in peripheral hearing or intellect. – Miriam Webster
- A neurological disorder in which a person has difficulty properly interpreting sounds received by the ears, particularly the phonemes of speech. Abbreviated CAPD. CAPD can result in difficulties with attention, speech production, and reading. – Medical Definition of central auditory processing disorder (medicinenet.com)



THE AUDITORY SYSTEM IS RESPONSIBLE FOR:

- Detecting Sounds (Hearing)
- Understanding and Assigning Meaning
- Filtering and Prioritizing Sounds



chicken or beef saté with peanut dipping sauce

[MAKES 6 SERVINGS]

This saté with peanut dipping sauce is a favorite of Kelli's family for parties. In fact, Kelli made it for the first time for her college graduation party, which she self-catered. It has remained popular ever since, and we still make it for festive, celebratory occasions. The saté is seasoned, but it's the dipping sauce that really makes the dish-it's a little spicy, a little creamy, and a whole lot o' tasty.

Saté

¾ cup tamari wheat-free soy sauce
¼ cup sake
1 lime, juiced
2 tablespoons honey
4 garlic cloves, minced
1 teaspoon ground coriander
1 teaspoon ground turmeric
2 pounds chicken breast or beef sirloin, cut into thin strips

Peanut Dipping Sauce

1 vine-ripened tomato, quartered
½ cup peanut butter
½ cup GF chicken broth
½ lime, juiced
⅓ cup cilantro leaves
3 tablespoons tamari wheat-free soy sauce
2 tablespoons brown sugar
2 garlic cloves, peeled
1 jalapeño chile pepper

1. To make the saté: Combine the soy sauce, sake, lime juice, honey, garlic, coriander, and turmeric in a bowl.
2. Place the chicken or beef in the soy sauce mixture and toss to coat. Cover and marinate for at least 1 hour. The meat can be marinated in the refrigerator for up to 24 hours.
3. Meanwhile, to make the peanut dipping sauce: Combine all the ingredients in a food processor and blend until smooth.
4. Heat a grill to high. Remove the chicken or beef strips from the marinade and thread onto metal skewers or bamboo skewers that have been soaked in water for several hours. Place on the grill and grill until the meat is cooked through.
5. Serve the saté with the peanut dipping sauce on the side.



chicken saté with dipping sauce

[MAKES 6 SERVINGS]

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Saté

$\frac{3}{4}$ cup tamari sauce
1 cup sake
1 juiced
4 honey
1 teaspoon minced
1 turmeric
2 chicken or beef sirloin, thin strips

Dipping Sauce

1 cup tomato, quartered
butter
 $\frac{1}{2}$ lime, juiced
 $\frac{1}{3}$ cup leaves
3 tablespoons
tablespoons brown sugar
2 peeled
jalapeño

1. To the saté: the soy sauce, sake, honey, garlic, coriander, and a bowl.
2. Place the the soy sauce and toss to coat. Cover and for at least The meat can be in the refrigerator for hours.
3. Meanwhile, to peanut dipping sauce: a food processor and smooth.
4. Heat to high. the chicken or beef strips from the onto metal or bamboo that have been in water for Place on the grill and the meat is cooked through.
5. Serve the saté sauce on the side.



APD FACTS

- APD is not related to intellectual abilities
- Boys vs. girls
- APD can also occur in conjunction with giftedness, ADD/ADHD, anxiety, autism, dyslexia, sensory processing difficulties, speech and language challenges, visual processing disorder (VPD), etc.
- APD, sensory processing disorder, and autism are NOT the same



APD CAUSES

- Genetics
- Delayed maturation
- Condition or virus affecting the central nervous system
- Head trauma
- Asynchrony in the CANS between the ears



APD Traits

Anxiety
Difficulty Completing Work
Difficulty Following Directions
Difficulty Socializing with Peers
Distracted
Excessive Talking
Impulsive
Inattentive/hyperactive
Noncompliant
Poor Self-Esteem
Temper Tantrums
Underachiever

ADHD Traits

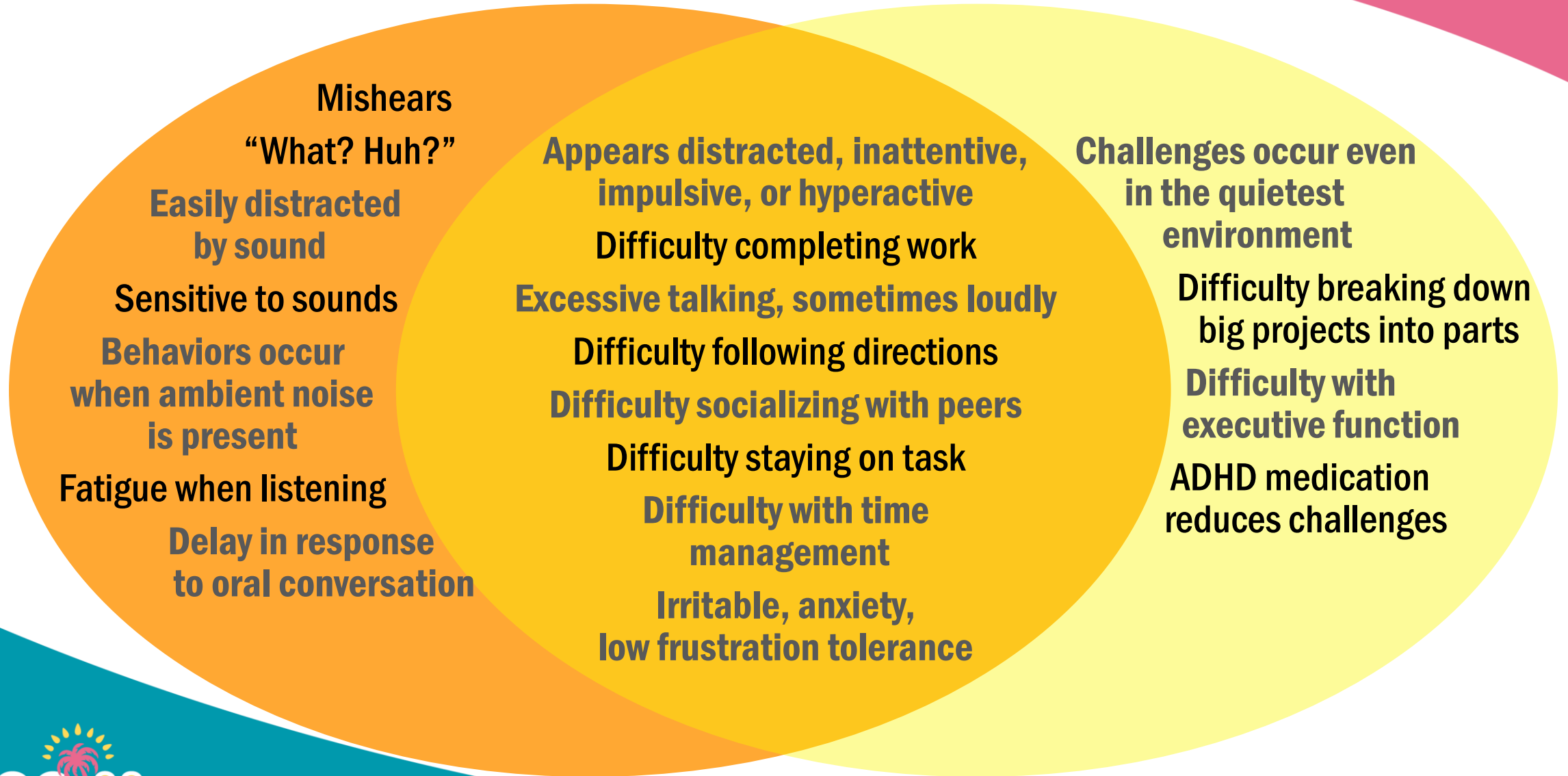
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They're the SAME!

Sources: Katz and Journal of American Academy of Child & Adolescent Psychology

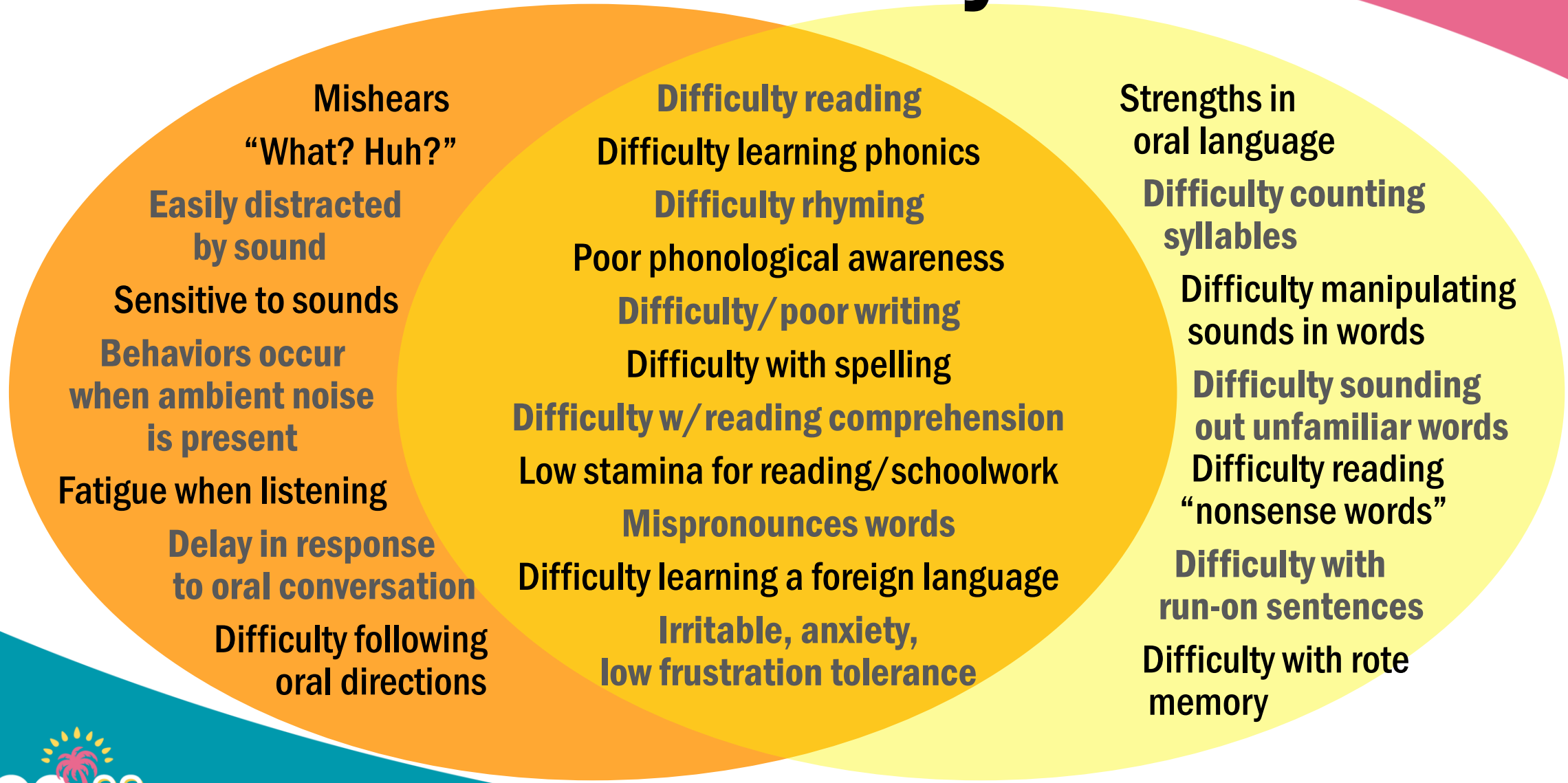
APD

ADHD



APD

Dyslexia



Reported Behaviors of 55 Gifted Individuals Later Diagnosed with APD at Able Kids Foundation

- Easily distracted (75%)
- Sensitive to loud sounds (73%)
- Difficulty following directions (73%)
- Experiences anxiety (71%)
- Easily frustrated (67%)
- Forgetful (62%)
- Writing difficulties (60%)
- Difficulty completing assignments (60%)
- Slow at starting new tasks (56%)
- Appears confused in noisy places (56%)



APPROACHES TO MANAGING CAPD

- **Compensatory Strategies** – Preferential seating, quiet test environments, sound attenuating devices for concentration, and auditory breaks
- **Auditory Therapy** – May take months or years to complete. Lack of evidence it changes the central auditory nervous system
- **Hearing Aids** – Low gain hearing aids programmed with different noise algorithms
- **FM Systems** – Student headphones, teacher mic. Provides improved auditory input for one-on-one instruction but lacks efficiency in other environments
- **Passive Ear Filter** – Speech Discrimination can improve by balancing timing asynchronies in the central auditory nervous system



EAR FILTER vs. FM SYSTEM

- 1,000 client files, randomly sampled
- 25-word list of single syllable words
- Speech understanding with no filter or FM system = 58.96%
- FM System = 87.82%
- Passive Ear Filter = 85.51%



APD TESTING CONSIDERATIONS – ESPECIALLY FOR THE GIFTED POPULATION

- Testing requirements
 - Receptive language of age 3, headphones, compliance to complete tasks
- Experience and specialization of audiologist
- Sensitivity and specificity of tests used
- Brainstem vs. cortical CANS profiles of gifted individuals
 - 100% with APD had brainstem level inefficiencies
 - Only 16% with APD also had cortical level challenges



APD TESTING CONSIDERATIONS – ESPECIALLY FOR THE GIFTED POPULATION

- Speech-In-Noise (SIN) Test with appropriate SNR
- The larger the SNR, the easier the task
 - Case study



Caution: Screeners & Questionnaires often result in false negatives

P D C
L P E D
P E C F D
E D F C Z P
F E L O P Z D
D E F P O T E C
L E F O D P C T

BEST REFERRAL PRACTICES

- **Consult with an audiologist that specializes in APD**
 - With strong specificity & sensitivity, mindful of brainstem tasks and SNRs
 - Beware of a “low normal” score for a gifted student
- **Refer for APD testing whenever you see common APD behaviors**
 - Easily distracted
 - Sensitive to sounds
 - Difficulty following oral directions
 - Anxiety
 - Easily frustrated, irritable
 - Behavioral dysregulation in noisy environments
 - Trouble understanding words in background noise
- **Probably a lot more common than we expect!**





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Vision Processing Disorders (VPD)

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THE VISION SYSTEM:

- **Eyesight (visual acuity)** - measurement of the smallest level of detail one can see from a set distance away *** Typical eye exam**
- **Eye movement control (ocular motility)** – pursuits & saccades
- **Vergence eye movements** - eyes moving to the same place in 3D space, convergence & divergence for 3D perception
 - “Convergence insufficiency”
- **Accommodation** – flexibility and stamina of lens control for focus
- **Visual perception** - deriving meaning & understanding from vision, visual figure-ground, visual form constancy, visual sequential memory
- **Visualization** – hold visual images in the mind’s eye
- **Integrating vision with vestibular & auditory input**, to plan a motor or cognitive response

VPD

ADHD

Visual Fatigue

Blurriness

Letter Reversals

Words “Float”

Difficulty copying accurately

Clumsiness

Difficulty with eye-hand coordination

Difficulty with sports

Anxiety

Appears distracted, inattentive, impulsive, or hyperactive

Low stamina for reading/schoolwork

Difficulty completing work

Difficulty producing writing

Difficulty staying on task

Difficulty visualizing what “done” looks like

Challenges

occur even when not a visual or visualization task

Difficulty with time management

Difficulty breaking down big projects into parts

Difficulty with executive function

ADHD medication reduces challenges

VPD

Dyslexia

Visual Fatigue
Blurriness
Letter Reversals
Words “Float”
Difficulty copying accurately
Clumsiness
Difficulty with eye-hand coordination
Difficulty with sports

Difficulty reading
Skips words or lines
Mispronounces words
Difficulty/poor writing
Difficulty w/ reading comprehension
Low stamina for reading/schoolwork
Difficulty completing work
Difficulty with grammar/punctuation
Difficulty with spelling/sequencing
Inconsistent scores on standardized tests
Difficulty with math facts (slow or mistakes)

Difficulty counting syllables
Difficulty manipulating sounds in words
Difficulty sounding out unfamiliar words
Difficulty reading “nonsense words”
Difficulty with run-on sentences
Difficulty with rote memory

VISION THERAPY

- Customized, individualized exercises to build visual processing skills
- Under the supervision of a developmental/functional optometrist
- Does not strengthen eye muscles; rather, strengthens neurological pathways (Ciuffreda, 2002)
- Randomized double-blind study of 221 children found that office-based vision therapy surpassed home/computer exercises (CITT, 2008)
- Parents reported fewer academic concerns after vision therapy (Borsting et al., 2012)
- However, there is conflicting research showing vision therapy is not consistently effective (Rawstron et al., 2005; Rucker & Phillips, 2018; Wang & Kuwera, 2022)

Customizing vision therapy for individual needs is essential



CASE STUDY: Mike

- 6 year old boy, autism and ADHD
- Mentioned double vision: the second copy was “not real”
- Gifted visual-spatial scores on neuropsych testing
- Diagnosed: reduced eye tracking, depth perception, vergence stamina
- Treated with reading glasses and vision therapy
 - Improved convergence from 4 to 18 prism diopters (near vision)
 - Now reads without double vision

**Takeaway: Kids can have visual strengths in some areas,
and still have significant challenges in others**

CASE STUDY: Samuel

- 6 year old boy, in accelerated/gifted school program
- Diagnosed with freckle on his eye, which was causing red eye
- Also diagnosed with inaccurate eye tracking, low depth perception, low vergence stamina
- Parents not aware of any visual difficulties, but:
 - Tended to get “bored” when reading after a couple of pages
 - Mirrored/reversed letters when writing
 - Disliked sports and tossing/catching a ball

Takeaway: Gifted kids can compensate for VPD and may not display obvious signs or symptoms

CASE STUDY: Cassie

- 10 year old girl, ADHD
- Difficulty with reading and writing
- Evaluation showed only slight issues with tracking and vergence, but
 - Well below average on visual discrimination, visual spatial relationships, visual form constancy, visual sequential memory, visual figure ground
 - Scored low on visual-motor integration on Beery-Buktenica Visual Motor Test
- Vision therapy focused largely on perceptual skills
 - Minimal on eye tracking, vergence, or depth perception
- After 12 months, reading & writing improved

**Takeaway: Vision therapy must be customized to individual needs;
there are many flavors of VPD**

VPD TESTING CONSIDERATIONS

- Developmental or functional optometrist
- International listings on www.covd.org
- Look for FCOVD fellowship credential for highest quality
- Should count like an annual eye exam for insurance
 - Will test for glasses prescription
 - But a lot more thorough: 3D, scanning, tracking, etc.
- Regular eye doctors (optometrist, ophthalmologist, even pediatric specialists) rarely screen for VPD
 - If the prescribed glasses aren't helping, that may be a clue...
 - School screenings do not look for VPD

BEST REFERRAL PRACTICES

- **Refer for VPD testing when:**
 - Suspicion for dyslexia, ADHD, or APD
 - Attention issues during visual tasks
 - Intermittent blurriness, fatigue, or low visual stamina
 - Letter reversals or words moving after age 5-6
 - Reading or writing challenges
 - Clumsiness, trouble with athletics, ball sports
 - Trouble with eye-hand coordination
 - Head turn/tilt
- **Probably a lot more common than we expect!**



TAKEAWAYS

- APD & VPD have a LOT of symptom overlap with common 2e diagnoses
 - Especially ADHD & dyslexia
- Most pediatricians and neuropsychs do NOT screen for APD or VPD
 - Need APD & VPD specialists to diagnose
- Refer families/clients/friends who have these characteristics
- Proper identification and support could improve 2e student outcomes at the foundational, root-cause level

Our Goal

**Increase awareness, screening, and referral
for APD & VPD**





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THANK YOU

Key resources:

covid.org for VPD

ablekidsfoundation.org for APD

www.thepasttest.com for dyslexia

tinyurl.com/APDVPDpreprint

for our paper

tinyurl.com/APDVPDslides for slides