Types of CAPDs and Reliable Testing – The Oldies but Goodies and the Up Incoming

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Positions Statements

- American Speech-Language Hearing Association (ASHA) 1995;2005
- American Academy of Audiology (AAA) 2010
- Canadian Guidelines, 2012
- British Society of Audiology, 2011

Statements

- All agree it is the audiologist to determine the integrity of the auditory system.
- CAPD involves a neural processing deficit of auditory stimuli that may coexist with, but is not the result of dysfunction in other modalities (ASHA, 2005)

- Multimodality assessment is not in the scope of one professional discipline.

What is (C)APD?

- Central Auditory Processing Disorders is not how we hear, but what we do with what we hear (Katz, 1992).
- Debate resolved about calling it Auditory Processing Disorders (APD).
- (C)APD: where did this come from?

ASHA (1995/2005) Definition

(C)APD involves deficiency in

- Localization
- Auditory Discrimination
- Auditory Pattern Recognition
- Temporal aspects of audition
- Auditory performance decrements with competing signals and degraded acoustic signals

AAA

- The purpose of the evaluation is to differentiate normal versus abnormal performance and identify strengths and weaknesses in the auditory system.
- Test performance can decrease toward the end of the test if there is fatigue, motivation, and inattention issues.

Types of (C)APD

- Buffalo Model (1991)
- Bellis – Ferre Model (1992)
- Spoken Language Processing (SL-P) Model (Medwetsky, 2002)

(C)APD Types for Adults and Children

- Decoding
- Integration
- Tolerance Fading Memory or Fading Memory

- Organization
- Prosodic

CAPD Models

- There are more similarities than differences.
- The Buffalo Model has 33 quantitative and qualitative scores

Decoding

- Small increments of language are misperceived; a bottom up issue
- Delays
- Non-fusions
- Misunderstanding the spoken message
- Word-finding deficit
- At risk for receptive language issues

Decoding

- Weakness in identifying, manipulating and remembering phonemes
- Weak oral reading or word accuracy
- Weak spelling skills
- Rapid speech adds to confusion
- Discrimination errors

Site - of - dysfunction

- Decoding –
  - Primary auditory cortex within the left hemisphere is the probable site of dysfunction
  - Phonemic zone (left posterior temporal)

(Tolerance) Fading Memory

- High / low error patterns
- Reading comprehension difficulty
- Seen in ADHD and Nonverbal Learning Disorders (NVLD)
- Difficulty inhibiting impulsive responses
- Expressive language disorder
- Intolerance to noise?

Site - of - dysfunction

- TFM –
  - frontal lobe (executive function, motor programming)
  - anterior temporal region

    houses amygdala and hippocampus

Integration

- Weak interhemispheric skills
  - Drawing, multimodal tasks
  - Auditory – Visual difficulties
- Long delays to spoken message seen generally 'in life' and on tests
- More global issues
  - Sensory - Language - Reading

Integration

- Decoding, TFM or both
- Most severe type of CAPD and more resistant to therapy than the other two types
- Appears to be malingering on pure-tone testing

Site - of - dysfunction

- Integration
  - Posterior corpus callosum
  - Angular gyrus of parietal-occipital region

Organization

- Reversals seen in testing
  - Staggered Spondaic Word (SSW) is the only CAP test that has norms for # of reversals

  Weak sequencing and organization planning that puts great effort on academic learning
- Prefrontal cortex
- What other disorders have reversals?

? ersalsrev

- ADHD
- NVLD
- LD
- What if all the test results are normal except for reversals?

Keller and Tillery, 2002; 2005; Tillery, 1998

Prosodic

- Perception and recognition of tonal information deficit
- Right hemisphere theory
- Poor pragmatic and social skills

Bellis / Ferre Model

- Auditory Decoding Deficit
- Prosodic Deficit
- Integration Deficit
- Secondary Deficit
  - Organizational
  - Associative

Spoken-Language Processing Model

Similar to the Buffalo Model with additional components:

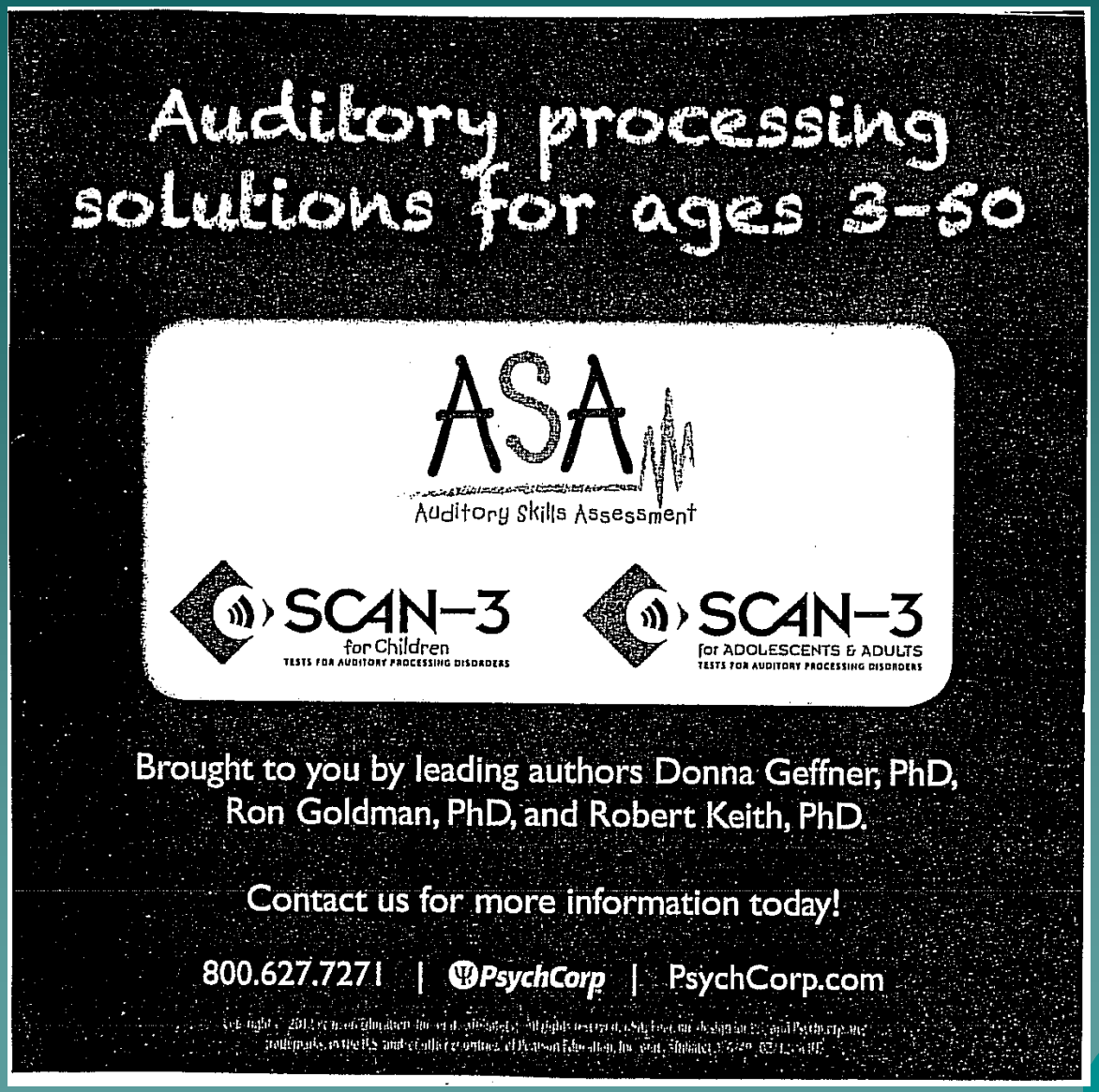
- Attention
- Prosodic
- Working Memory

Why is it important to understand these types of CAPD?

To establish an appropriate intervention and management program!

Continued at the next session!

Screening for CAPD


Auditory processing solutions for ages 3-90
ASA
Auditory Skills Assessment
SCAN-3
for Children
TESTS FOR AUDITORY PROCESSING DISORDERS
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Auditory Skills Assessment (ASA)

- Geffner and Goldman (2010)
- Pearson
- 3.6 years to 6.11 years

- Evaluates linguistic and nonlinguistic auditory skills

Screeners for (C)APD

- SCAN-A ages 13-50 years
  - (Keith, 2009), Pearson Publishing
- SCAN-C Revised ages 5-11 years
  - (Keith, 2009), Pearson Publishing
- Differential Screening Test for Processing
  - (Richards and Ferre, 2006), Lingui Systems

SCAN

- Competing Words
- Auditory Fig Ground (0 dB) (+8 dB) and (+12 dB)
- Competing Sentences
- Gap Detection
- Filtered Words

The Differential Screening Test for Processing (DSTP)

- Three neurological levels of processing:
- - primary acoustic characteristics
- - ID of acoustic related to phonemic portion of language
- - ability to attribute meaning within language

DSTP

- Ages 6 years to 12.11 years
- Poor performance in any area deems it necessary to refer for diagnostic evaluation(s)

Screening for Auditory

Inattention or Impulsivity

Auditory Continuous Performance Test (ACPT) (Keith, 1994)

- Psychologists and SLPs
  - 20 minute test: 6 sets of 90 words with 20 target words in each set
  - Compare 1st set and 6th set of responses
    - (Tillery , Katz & Keller, 2000)

ACPT

- Used by psychologists to compare test 1 vs test 2
  - Tillery, Katz and Keller (2000) *JSHR*
- In the United States: school based SLPs to screen for inattention vs impulsivity

HOW do we DX (C)APD?

- Standardized Tests
  - Monotic and Diotic Tests
  - Temporal Processing or Nonverbal Tests
  - Dichotic Tests

Monotic Tests

- Speech-in-Noise
  - +5 dB Signal to noise ratio
  - Speech and noise stimuli in one ear
  - Do you test the left ear last?
  - Do you give this test last in a series of tests?

Diotic Tests

- Phonemic Synthesis
  - Not a true processing test (ASHA, 2005)
  - Some disagree with this ….
  - All about sounds and the Phonemic Zone: b/a/t = bat
  - Provides Qualitative information

Temporal Processing Tests

- Pitch Pattern Sequence
  - Ordering / labeling (interhemispheric)
- Random Gap Detection
  - Resolution (left temporal)
- Gaps in Noise Test
  - Resolution (interhemispheric)

Dichotic Tests

- Staggered Spondaic Word Test
- Competing Sentence Test
  - SCAN 3A and 3C
- Dichotic Digits Test – screening test?

Staggered Spondaic Word (SSW) Test

Developed in 1968

And in several languages

Norms from age 5 to 60 years

(Emanuel et al., 2011)

SSW Test

- RNC **RC** **LC** LNC
- Hot dog base ball

- LNC - left temporal
- RNC - right temporal
- RC - left temporal
- LC - right temporal/left temporal/corpus

SSW Error Patterns

RNC	RC	LC	LNC	
2	4	18	3	TFM / INT
20	20	20	20	Organic Issue or fatigue/attn
6	20	20	5	

SSW Qualifiers

- Delays
- Smushes
- Tongue Twisters
- Quick Responses
- Perseverations
- Very Long Delays
- Reversals
- High/Low Error Pattern

- CAPD Diagnosis:

  CAPD Types
  - Quantitative
    - Fail one CAP test 3 SDs
    - Fail two or more at 2 SDs
  - Qualitative
    - Look for those qualitative struggles

    - These will improve during therapy…..

Considerations

- Differential Diagnosis
- Working together
- Know the client you are evaluating
- Can we evaluate a 5 or 6 year old?

Evidence Based Practice

- Working Together

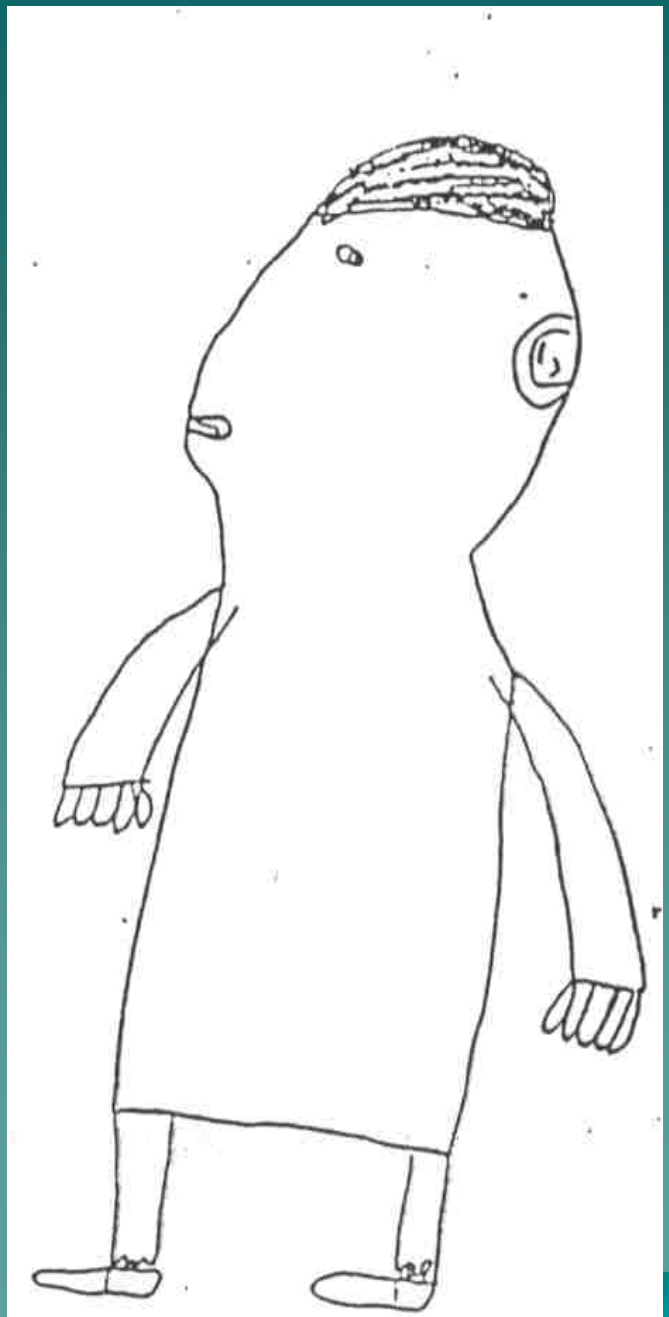
Nonverbal Learning Disorder

- Precocious language development with slight motor acquisition delays
- Tactile defensiveness as infant
- Immature
- Usually identified much later as LD
- Clumsy and uncoordinated
- Bright, appears lazy and unmotivated

Continued

- Highly verbal and articulate
- Equal incidence in males and females
- Poor social skills
- Depressed performance scores relative to verbal scores on the WISC-R
- Poor math, slow at reading but then catches up
- Anxiety profile


37M-K99
GOLF



Wechsler Profile

Verbal IQ 108 Subscale Scores	
Information	12
Comprehension	12
Arithmetic	8
Similarities	12
Digit Span	15
Vocabulary	10

Performance IQ 71 Subscale Scores	
Digit Symbol	8
Picture Completion	8
Block Design	3
Picture Arrangement	6
Object Assembly	2

MY HANDYCAPPING IS A TWO EDGED SWORD IT HAS HELD ME BACK THROUGH OUT MY ENTIRE LIFE.

What type of (C)APD is common among individuals with NVLD?

- Can you take a guess?
  - Weak reading comprehension
  - Weak spelling
  - Good at phonemic awareness
  - Poor writing skills

Keller, Tillery, McFadden (2006)

American Journal of Audiology, 15; 108-113.

- Investigated the relationship of NVLD and (C)APD

Hypotheses:

Children with NVLD

- Are at risk for (C)APD
- Are likely to manifest a TFM profile of (C)APD
- With higher verbal intelligence would be less likely to manifest (C)APD
- What specific intellectual, neuropsychological, memory or academic measures may be indicators of (C)APD

Continued

- Participants
  - 37 children (26 males, 11 females)
  - Ages 6 to 18 years
  - Dx with NVLD per neuropsychological exam
  - Mean Verbal IQ – 111.32 (+/- 16.2)
  - Mean Performance IQ of 83.14 (+/- 13.1)
  - Mean performance split 27.12 for males
  - Mean performance split 30.73 for females

RESULTS

Are children with NVLD more likely to exhibit (C)APD?

YES. 21 (56.8%) were diagnosed with (C)APD.

Estimates of general population range from 3%-to- 20%. The occurrence of (C)APD in this sample of children with NVLD was significantly higher than expected by chance ($p<.001$).

RESULTS

- Are children with NVLD who exhibit higher verbal intelligence less likely to manifest (C)APD?

  YES. All IQ measures were significantly correlated with (C)APD.

  Verbal Score (r = -.50, p=0.002)

  Performance Score (r = -.43, p=0.008)

  Full Score (r = -.50, p=0.002)

RESULTS

- Are children with NVLD more likely to manifest TFM type of (C)APD?

  YES. Among the 37 children with NVLD, 20 (54.0%) were diagnosed with TFM.

  There was also a relationship between TFM and Decoding ($r = .61$, $p=0.001$), but not between TFM and other (C)APD subtypes.

RESULTS

- What neuropsychological measures are most predictive of (C)APD?
  - 17 (out of 52) neuropsychological measures were found significantly correlated with (C)APD.
    - Digit Span
    - Picture Memory
    - Design Memory
    - Sentence Memory
    - Number Let Memory
    - W Vocab
    - W Info
    - Sp Sound Perception

What does this mean for differential diagnosis?

- We must work together:
  - The audiologist and psychologist should work as a team!
  - When the psychologist finds a depressed digit span score, then refer for (C)APD testing
  - When the audiologist finds TFM subtype of (C)APD, then refer for LD or ADHD evaluations

Individuals with ADHD

- Evidence Based Practice indicates:

- Should we control attention and fatigue when administering a screening test?
- Should we test the client while medicated for attention or anxiety issues?
- Should we pause the test tape for a client's delayed response manner?

Thank you and Questions!