Auditory Processing Disorder – does it exist as a condition in its own right?

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Introduction

• Definitions
• History
• Approaches
• Test Battery
• South Tees - Case note Review
• Controversies
• Conclusions

• What will you do?
If you can’t explain it *simply*, you don’t understand it well enough.

— Albert Einstein
Definitions

“APD means different things to different people.” (Jerger 2009)

“What we do with what we hear” (Katz)

“a modality-specific perceptual dysfunction that is not due to peripheral hearing loss”
Definitions

- BSA
- AAA
- ASHA

- American and BSA definitions are quite different and opposing
AAA (2010) and ASHA (2005)

‘APD refers to difficulties in the perceptual processing of auditory information in the central nervous system and the neurobiologic activity that underlies that processing and gives rise to electrophysiologic auditory potentials’
the quality and quantity of scientific evidence is sufficient to support the existence of (central) auditory processing disorder [(C)APD] as a diagnostic entity, to guide diagnosis and assessment of the disorder, and to inform the development of more customized, deficit-focused treatment and management plans. (C)APD is an auditory deficit; therefore, it continues to be the position of ASHA that the audiologist is the professional who diagnoses (C)APD.

(Central) auditory processing disorder [(C)APD] refers to difficulties in the processing of auditory information in the central nervous system (CNS) as demonstrated by poor performance in one or more of the following skills:

- sound localization and lateralization;
- auditory discrimination;
- auditory pattern recognition;
- temporal aspects of audition, including temporal integration, temporal discrimination (e.g., temporal gap detection), temporal ordering, and temporal masking;
- auditory performance in competing acoustic signals (including dichotic listening); and
- auditory performance with degraded acoustic signals.
six statements on what APD is considered to be, supported by research evidence, stating that APD “impacts on everyday life primarily through a reduced ability to listen, and so to respond appropriately to sounds”
BSA (2011)

- APD is characterised by poor perception of both speech and non-speech sounds.
- APD has its origins in impaired neural function.
- APD impacts on everyday life primarily through a reduced ability to listen, and so respond appropriately to sounds.
- APD should be assessed through standardized tests of auditory perception.
- APD does not result from failure to understand simple instructions.
- APD is a collection of symptoms that usually co-occurs with other neurodevelopmental disorders.
Early History

• Early pioneers (late 1800s & early 1900s) Link between brain injury and disturbances of receptive & expressive language (Broca, Wernicke, Jackson, Head, Freud, etc)

• 1950s – recognised normal PTA but struggling in background noise (Mykleburst 1954)

• 1955 - auditory deficits after acquired brain lesions affecting the temporal lobes (Bocca 1954, 1955)

• 60s and 70s – Many site of lesions studies in adults (SSW); Dichotic Digits in patients with lesions

• 1970s – Jerger first test battery – known lesions (cysts, strokes, tumours)

• 1977 – Case Conference Robert Keith – **most tests originate from this work**
Audiological Approach

- Many tests resulting in reduced scores in patients with known lesions in ANS
- Gap detection, Dichotic Digits, SSW
- Tumours, stokes, temporal lobe lesions
- Mainly all in adult subjects (limitation) – few studies in children
AAA and ASHA (2005)

The types of tests recommended in the battery include:

(a) temporal processes and pattern recognition
(b) dichotic listening
(c) monaural low-redundancy speech perception
(d) Localization lateralization, and binaural interaction
(e) auditory discrimination
(f) electroacoustic tests
(g) electrophysiological measures
Tests

- Still no gold standard, for screening or diagnosing

- We need
  - Validity
  - High sensitivity and specificity
  - Good test retest
  - Standardised with normative data
  - Criterion reference
  - What else causes test failures
Limitations

- 35 types of measures are available for testing for APD (ASHA technical report)

- Cognitive deficits can cause low scores (Dillon 2012)

- W. J. Wilson and Arnott (2013) - 150 school-aged children who had completed at least four CAPD tests, rates of diagnosis ranged from 7.3% to 96% depending on the criteria used.

- Dillon and colleagues (2012) - as the number of tests increase, so too, does the opportunity to perform poorly due to accumulated statistical probability (and fatigue).

- Still no explicit criteria
Problems with large Test battery

- Impacts on child's attention
- Relevance of the normative data
- Statistical implications
- Should be screen, often diagnostic
Listening Approach (Dillon)

- LISN
- SPD – Spatial processing disorder
- Approach based on listening – we are not going to ever have a definition
- Speech based
- Developed good test – retest
- Normalisation of test material

- ‘Argues we do not really need to diagnose
- Deficit specific training

- Dillon says forget gold standard and forget defining APD
Auditory Attention (Moore and Ferguson)

- Mainly due to cognition and auditory attention
- Evidence that children with APD could hear speech well in quiet and noise

- IMAP Test battery could not identify APD
- n = 1638, ages 6-11 years – population study
- APD was due to poor auditory attention

- Specific diagnosis may be more to do with the professional that sees the child
  - Audiologist – APD
  - Paediatrician – ADD/ADHD
  - SALT – Specific Language Impairment
Auditory Processing includes...

• “Bottom-Up” processes (US)
  – Occur in the auditory system prior to higher-order cognitive and linguistic operations at the cortical level
  – Treated with auditory training

• “Top-Down” processes
  – Influenced by attention, memory and linguistic competence
Other Approaches

- Psychoeducational Approach
- Modality Specificity
Existing Comorbidities

- 23 children
- Case note review
- Referred with AP symptoms
- 3-17 years of age (average 9.3)
- 70% males
Existing Comorbidities

- Autistic Spectrum Disorder: 30%
- Memory Problems: 20%
- Dyslexia / Dyspraxia: 10%
- Mental Health / Behavioural: 10%
- Non-organic hearing loss: 5%
- Developmental Delay / LD: 5%
- Epilepsy: 5%
Referral on to SALT and Ed Psych

- 31% referred
- 52% not referred
- 17% already under SALT

- 35% referred
- 56% not referred
- 9% already under ed psych
Discussion

• Dawes and Bishop (2010) showed evidence of autistic behaviours in one third of their APD sample

• similarities between the presenting symptoms of APD, ADHD, specific language impairment (SLI), dyslexia and autistic spectrum disorder

• Most of our children had these other communication difficulties

• Kelly et al. (2009) found that 76% of a sample of 68 children with suspected APD also had language impairment. 53% demonstrated reduced sustained auditory attention, 59% demonstrated decreased auditory memory.

• Glue ear group – secondary APD or listening difficulties? - impaired ‘bottom up’ processing of sounds, which may have originally been present, have produced longer term changes of hearing that can persist even when normal hearing is restored.
Management

• Depends on Diagnosis
• Multi-disciplinary approach
• Who to refer to?
• Acoustic changes to environment
• FM systems
• Teachers communication skills
• Auditory Training
• Techniques enhancing working memory and attention
'such impairments have not been shown to uniquely contribute to a clearly defined condition that would warrant its inclusion in any of the major disease classification systems, such as the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; American Psychiatric Association, 2013) or the International Classification of Functioning, Disability and Health (World Health Organization, 2001)
Clinical Entity

• to be a clinical entity, nosography (i.e., the systematic description of diseases) the clinical entity must have an unambiguous definition

• arguably does not represent a homogenous group

• In order to be classified in the Diagnostic and Statistical Manual of Mental Disorders (DSM), it must be defined to be mutually exclusive, exhaustive, and result in clinical impairment
Summary and Conclusions

• Excites and frustrates
• Not simple or easy
• Lack of universally accepted criteria, guidelines and definitions
• 60 years of trying to define APD
• No gold standard test battery to diagnose (BSA 2011)

• Cacace and McFarland (2005) – research ‘stalled’ and still heavily rely on ‘expert opinion’
• Need more controlled experiments
• ‘persistent lack of evidence validating the nature of the disorder and the most appropriate test protocol threatens its viability as a diagnostic entity’
Summary and Conclusions

• Debate and Controversy
• Still no consensus what APD is

• Are we just looking for a label?
• Cognitive problems often harder for parents to accept
• Are true deficits likely memory, attention and language?
• The decision is yours to make

• Which approach to take?
• Is it our problem?
• How are you treating these patients?
• Share experiences?
• How will you manage?
References


• BSA. (2011a). Position statement: Auditory processing disorder (APD)


Psychoeducational Approach

• Mainly from children
• Has a long history
• Not as interested in where in brain problem lies
• Isolate separate measurable skills (short term memory, visual processing, reading and writing ability)
• Psychologists theories and models
• Is auditory processing a separate measurable skill (CHC theory of intelligence and assessment)
Modality Specificity (Cacace and McFarland 2005)

- Argument that should only or predominantly exist in the auditory domain
- Modality specific perceptual dysfunction
- APD should be distinguished from attention, visual, cognitive and language based
- Tests designed to rule other modalities out
- if the auditory system were not modular in a general sense, then the concept of an APD would not be meaningful
Prevalence of APD

• 3 - 7% of children (Musiek et al., 1990)

• 2 - 3% of children, 2:1 ratio for boys & girls (Chermak & Musiek, 1997)