

CAPD is classified in ICD-10 as H93.25 and hearing evaluation and not screening should be implemented in children with verified communication and/or listening deficits

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The article "It Is Time to Rethink Central Auditory Processing Disorder Protocols for School-Aged Children" appeared in *American Journal of Audiology* Vol. 24 • 124–136 • June 2015 as a tutorial paper. The author used the argument referring to CAPD made by Cowan et al, 2009 that "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". However, Central Auditory

Processing Disorder (CAPD) is included in the USA version of the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) under the code H93.25, although this was not mentioned in the paper by DeBonis. The authors of this letter would like to point out some additional omissions of this paper that may bias the paper's conclusions.

According to the author of the article in question "The purpose of this article is to review the literature that pertains to ongoing concerns regarding the central auditory processing construct among school-aged children and to assess whether the degree of uncertainty surrounding CAPD warrants a change in current protocols." (page 124, 2nd paragraph) However:

- CAPD definition (page 125) is limited to the ASHA technical report even though American Academy of Audiology 2010 Clinical Practice Guidelines, British Society of Audiology Position Statement 2011 and Canadian Guidelines on Auditory Processing Disorder in Children and Adults: Assessment & Intervention 2012 are more recent.
- The author uses the term "traditional testing" without defining what this is and then makes the following statement (page 125): "The traditional testing process supports the view that CAPD is primarily due to reduced function of the bottom-up aspects of the auditory system" without substantiating this claim by any reference.
- No reference is provided for the statement (page 125) "The researchers also suggested that performance differences between the two ears on dichotic tasks may be minimized when memory is controlled."
- The paper links dichotic digits and Digit Span Test stating (page 125) "Consistent with this, Maerlender, Wallis, and Isquith (2004), on the basis of correlations noted between performance on dichotic digits and the Digit Span Test of the Wechsler Intelligence Scale for Children—Fourth Edition (Wechsler, 2004), suggested that tests of auditory working memory would be more sensitive to auditory processing disorders" but fails to acknowledge the possibility that a child having CAPD would not be able to perform well on Digit Span as a consequence of CAPD, similar to what is seen for children with peripheral type sensorineural hearing loss (Fischer, & Lieu, 2014).

- Since short term memory plays a role in behavioral testing of processing abilities (Shinn-Cunningham, & Best, 2008; Siegel & Ryan, 1989), attention should be optimized during any subjective audiological evaluation. For example, before a dichotic digit test the examiner should confirm that the child can repeat back at least 4-5 numbers in a row or the examiner should prompt the child to repeat the word heard during a speech in noise test when he or she seems to be distracted. It should also be kept in mind, however, that audition and related cognitive functions are subserved by overlapping networks within a “non-modular” central auditory nervous system (Musiek, Bellis, & Chermak, 2005). For example, new evidence suggests that proper functioning of posterior temporal gyrus is critical for short-term memory (Leff, Schofield, Crinion, Seghier, Grogan, & Price, 2009; Acheson, Hamidi, Binder, & Postle, 2011) while Digit Span performance is influenced by the integrity of the inferior frontal and posterior temporal regions (Koenigs, Acheson, Barbey, Solomon, Postle, & Grafman, 2011).
- In some instances, the author reports findings of studies on children with suspected APD as if these concern children with diagnosed APD. This is not appropriate, if one is to argue about the nature of APD; suspicion and diagnosis is not the same. Conclusions drawn in studies of children suspected of having APD should not be regarded as describing APD diagnosed children. These studies clearly discard APD guidelines (American Academy of Audiology, British Society of Audiology, Canadian Interorganization Steering Group for Speech-Language Pathology & Audiology). Example in page 126: "Ferguson, Hall, Moore, and Riley (2011) found high correlations between scores for the Attention and Noise sections of the Children's Auditory Processing Performance Scale (Smoski, Brunt, & Tannahill, 1992) for listeners with CAPD ($r = .75$) and hypothesized that attention is the underlying deficit in these listeners and that this becomes apparent in adverse listening conditions." This may be true for children suspected of CAPD but not necessarily for children diagnosed with CAPD. Under CAPD & Listening ability (page 128-129) the author argues that the presumed relationship between listening abilities and auditory processing skills is "greatly reduced once the contribution of cognitive abilities (i.e., attention and working memory) was removed from

task performance". However, there is no mention of the fact that (i) assessment of auditory processing skills in these studies is not based on everyday clinical auditory processing tests and (ii) that these results concern mainstream school children rather than children diagnosed with CAPD.

- These quoted studies thus provide correlation of data for children attending mainstream schools that may combine together typically developing children with normal auditory processing and those with disordered auditory processing and/or other developmental disorders (i.e. ADHD, Dyslexia, SLI, low or borderline IQ). Association of auditory processing skills may differ between typically and non-typically developing children (eg Grube, Cooper, Kumar, Kelly, Griffiths, 2014) or between groups of children with different developmental disorders (eg Kuppen & Goswami, 2016). Inferences extrapolated from one population to another may thus be problematic.
- Under "intervention" (page 129) the author states that "Loo, Bamiou, Campbell, and Luxon (2010), in a systematic review of studies that used computer-based auditory interventions (CBAT) in children, concluded that positive effects on language and reading are not noted." This is over-simplistically omitting all the positive outcomes (Kujala, Karma, Ceponiene, Belitz, Turkkila, Tervaniemi, Näätänen, 2001; Schaffler, Sonntag, Hartnegg, Fischer, 2004; Veuillet, Magnan, Ecalle, Thai-Van, Collet, 2007) described in this review which concludes: "There is some initial evidence to indicate that CBAT may remediate auditory processing and phonological awareness deficits, with no clear effects on reading and spoken language in populations with language, reading and related learning difficulties."
- Under "summary" (page 129) the author states that: "performance on commonly used tests of auditory processing have been shown to reflect general intelligence, attention, memory, language comprehension, and executive functions, thus raising serious questions about the value of such tests" failing to include other studies that show that general intelligence can not predict auditory processing skills (Iliadou, Bamiou, Kaprinis, Kandylis & Kaprinis, 2009; Weihing, Guenette, Chermak, Brown, Ceruti, Fitzgerald, Geissler, Gonzalez, Brenneman, Musiek, 2015).

The most debatable part of the paper (figure 1) is when the "recommended assessment and intervention process for children with listening and communication difficulties in the classroom" is presented. Although the author was very strict on diagnosis and intervention of CAPD, at this part he is easily endorsing recommendations without providing evidence that all these will work. Are there any published papers showing that this is the most optimal way to diagnose and provide intervention? Were these studies conducted using normal controls to assess whether they improve as well? No such evidence is presented. In their proposed approach the author suggests that when a child has a verified listening or communication deficit we should screen for hearing, implying that there is no need for hearing evaluation in school aged children for whom there are listening or communication concerns. We strongly feel that this is not correct practice; in fact when there are any concerns regarding a child's listening or communication, a hearing evaluation should be scheduled, as this may uncover hidden auditory pathologies (Iliadou, Chermak, Bamiou, 2015). It should also be noted that hearing screening and hearing evaluation are not identical terms. Hearing screening is implemented in a population to identify those possibly having a hearing loss; this is verified and diagnosed based on subsequent hearing evaluation. An additional important point is that hearing screening is very specific to the hearing sense even though in the proposed approach by DeBonis it is included in the global measures. In conclusion, we are of the opinion that the omission of mention by DeBonis of the inclusion of CAPD into the most recent and currently in use International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) in addition to the other points discussed above show unacceptable bias in a tutorial paper. Furthermore, several elements of the proposed generic approach are not well substantiated while the proposed practice approach concerning hearing and audiological evaluation is incorrect.

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