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Vol. 23 No. 3 **August 2001**

APD or CAPD?

Jack Katz

Over the years I have heard it a thousand times, from both professionals and lay people, "*CAP*, oh that's such a confusing concept to me"; "its such a vague notion" or "Oh, but we've already had his hearing tested". Fortunately in recent years I have heard those kinds of statements less and less. Will the recent recommendation of Jerger & Musiek (2000) to use the term Auditory Processing Disorder (APD) instead of Central Auditory Processing Disorder (CAPD) help or hurt the situation? If there is any benefit is it worth the change?

Let me say from the outset that I am a 'stick in the mud'. I don't change terminology readily unless I see that the benefits surely outweigh the deficits.

None of the terms we use were 'God-given'. They all have limitations and hopefully benefits. Let's see where we have come from in the AP-name saga. When I started working in this area, many years ago, we called it Auditory Perception (AP). I thought that was a clear and useful term. It caused little confusion because everyone knows what the word *perception* refers to in everyday life and it is parallel to the well-known term *Visual Perception.* Ah, but all that is ancient history now.

In the 70s we were told that 'perception' is something we can't measure (we can only infer it from our test data, but don't really test it). Therefore it was suggested we use 'processing' instead. Although I did not consider this an improvement in terms, in time I came to accept the change. However, not long after that we were told that we should preface the term with the qualifier 'central' in order to differentiate it from simple peripheral problems that are measured by pure-tone thresholds. So the term Central Auditory Processing (CAP) was born. Over the years I gradually used CAP more than Auditory Processing as parents and professionals quickly took to it.

Jerger & Musiek's recommendation to use APD, their rationale for this change and their discussion of this significant name change comprise exactly one sentence! They write:

> *In keeping with the goals of maintaining operational definitions, avoiding the imputation of anatomic loci, and emphasizing the interaction of disorders at both peripheral and central sites, however, it seems more appropriate to label such problems as "auditory processing disorder" (APD).* (p. 467-8)

Operational Definition

An operational definition describes the test's procedure, so everyone knows what was done to get the resulting score. For example, Dichotic Digits, Phonemic Synthesis and many other audiologic tests tell what they entail by their names. On the other hand, Bekesy Audiometry is not an operational definition, because its name does not reveal the task that is presented.

It is generally helpful to use operational definitions, but I do not understand how Jerger & Musiek would apply this to *a battery of tests* that use a variety of tasks. For example, Intelligence Quotient (IQ) measures are not operationally defined, because the word 'Intelligence' tells what they are trying to measure and not what they did to find out the IQ. The reason for this lack of an operational definition is not because those test makers neglected an important tenet of test making, but rather because the IQ score is based on a battery of sub-tests. How would you characterize the variety of procedures in the IQ battery? Each of the sub-tests might be defined operationally (e.g., Digit Span, Vocabulary, Information), but not the entire battery.

It is hard to imagine how Jerger & Musiek would operationally define a central test battery. As it turns out neither *CAPD* nor *APD* are operational definitions. How could we operationally define the Buffalo Model that is made up of the SSW, PS and SN tests; or even the tests in the Jerger-Musiek battery (e.g., Duration Pattern Sequence, Dichotic Digits, OAEs, Middle Latency Response)? If you can come up with a good operational definition you're a better person than I.

Jerger & Musiek suggest that the word 'central' makes the term less operational. I would counter that it makes the term less vague, and a better description of what we are trying to do than APD. We have used *APD* in the past, but certainly not because it is any better an operational definition than *CAPD*. Let's see if there are other suggested reasons for a name change that may be more compelling.

Avoid Imputing Anatomic Loci

Jerger & Musiek tell us that 'APD' is better than 'CAPD' because it avoids imputation of anatomic loci. I have not known my good colleagues Jerger and Musiek to shy away from imputing anatomic loci in the past. In fact, they specifically impute anatomic loci in *their* suggested APD test battery. They state (the underlining is my emphasis):

> *Immittance Audiometry- essential to rule out middle ear disorder...*
> *Otoacoustic emissions- useful in ruling out inner ear disorders.*
> *Auditory brainstem response and middle latency response- key measures of the status of auditory structures at the brainstem and cortical levels.* (p. 471-2)

Emphasizing the Interaction of Peripheral and Central Sites

This third rationale of Jerger & Musiek baffles me further and makes the picture they present that much more confusing. We have just read above that their reason for changing the term to APD is to "*...avoid imputing anatomical loci*". Their very next reason *imputes* exactly what they said we should avoid. Now they want to "emphasize the interaction of peripheral and central sites".

Based on Jerger-Musiek's test battery and article, their aim is simply to find out if the child has CAPD or not, with little, if any, regard for what's next (e.g., rehabilitation). This agrees with what Dr. Jerger wrote in response to my concern for the limited interest among his participants in diagnosis for rehabilitative purposes. He responded that the purpose of the 'consensus conference' was for diagnosis and not rehabilitation (personal communication). If diagnostic, why integrate central and peripheral?

If we need to integrate at all, it is for the small percentage of children we test that have CAP and a permanent hearing loss (see following article). In the Jerger-Musiek diagnostic battery and in the more traditional CAP batteries we first study each test's results, then, if desired, one could discuss the combined effects, just as we have done over the years, without the need to change from *CAPD* to *APD*.

Potential Harm

For the most part I feel the article by Jerger & Musiek is misdirected (to be discussed elsewhere). But my purpose here is to discuss the narrow issue of the proposed change from *CAPD* to *APD* and to point out that, at best it is both unnecessary and confusing.

I fear that Jerger & Musiek intend to change what we mean by CAP to a new and not widely known or accepted concept. They write, "An APD may be broadly defined as a deficit in the processing of information that is specific to the auditory modality... it is conceptualized as a deficit in the processing of auditory input" (p. 468). Are they really meaning what they say?

Would Jerger & Musiek like to amalgamate central and peripheral effects when they suggest that we *emphasize the integration of central and peripheral sites*? This would mean that a child with just a hearing loss would have APD, a child with just CAPD would have APD and a child with both hearing loss and CAPD would have APD. This change would set is back decades and we would again have to find another term to indicate CAPD!

Combining these two problems could be harmful:

1) It has taken years to teach everyone that CAP is not what we are testing with puretone threshold measures. Therefore, normal hearing does not insure normal CAP. The term 'CAP' actually helps to clarify this.
2) Hearing aids are the primary approach to deal with hearing loss.
3) Simply increasing the signal level will generally do little for the child with CAPD. At our clinic we work on their processing skills.

Changing the *definition* will surely confuse the lay public, once again, about what central processing is all about. It may also confuse professionals and will surely require yet another term for Central Auditory Processing.

Final Word

The strength of Jerger & Musiek's arguments to change 'CAPD' to 'APD', melts away when critically examined. It seems to boil down to a personal preference rather than a professional or moral imperative, That is surely is not a good enough reason for all of us to change to APD. But if they also succeed in changing the meaning of CAPD to a more general one, I believe it would be a mistake. At a minimum it would make communications about CAP more difficult because it would not be clear who had a significant hearing loss, who had a CAPD, or who had both problems (each of which often require different solutions).

Many audiologists have asked why Jerger & Musiek would write an article that is so out-of-step with the best practices in CAP today. I have not had a clue until now. The only advantage, from their article for APD, that I can see is to accommodate the admixture of tests they have in their Minimal Test Battery (MTB). The MTB is the routine tests they recommend be given to children seen for CAP testing. They have organized their tests separately as behavioral or physiological and then have co-mingled the two groups into a single battery. *Perhaps* this explains why a name change to *APD* seems desirable.

Jerger & Musiek's proposals: 1) changing CAPD to APD; 2) a definition that combines peripheral and central components (without stating their justification), and 3) the extensive battery including some tests not commonly used for CAP testing (see Martin et al., 1998), each deserve critical review before they are accepted.

References

- Jerger, J and Musiek, F (2000). Report of the Consensus Conference on the Diagnosis of Auditory Processing Disorders in School-Aged Children. J Am Acad Audiol, 11, 467-474.
- Martin, FN, Champlin, CA & Chambers, JA (1998), Seventh Survey of Audiometric Practices in the United States J Amer Acad Adiol, 9, 95-104

PURETONE THRESHOLDS IN CHILDREN SEEN FOR CAP TESTING

Jack Katz and Patricia Amorim

It is well known that many children who have Central Auditory Processing problems (CAPD) have a history of conductive hearing loss. It is not clear if many children who are seen for CAPD testing have sensory-neural hearing losses.

Jerger & Musiek (2000) proposed a Minimum Test Battery for CAP evaluations. Not only do their guidelines call for puretone threshold testing to determine the "presence and degree of peripheral hearing loss" (p. 471) and immittance measurements to rule out middle ear disorder and "to identify acoustic reflex abnormalities", but they also feel that it is necessary to use Otoacoustic Emissions (OAE) on a routine basis to rule out "inner ear disorders". That is to say, OAEs are to be administered to each child who is tested for CAPD and not just for children with sensory-neural hearing losses.

If we administer OAEs to all children seen for CAPD, what is the benefit-risk comparison? What is the benefit-cost of doing it and the danger of not doing it on a routine basis? Mind you, we have no concern about the sensitivity of OAEs to identify inner ear disorders. What we don't know is whether there is a reasonable justification for running OAEs routinely because of a high incidence of sensory-neural (S-N) loss in children seen for CAP evaluations.

As you may know OAEs decrease with increasing S-N hearing loss and are generally unobtainable with conductive losses because of mechanical blockage of sound and not because of inner ear abnormality. Research has shown that thresholds with *sensory* hearing losses of 40 to 50dB can be expected to demonstrate no OAEs. However, Kemp has noted the absence of OAEs with S-N losses as low as 30dB HL (Norton & Stoner, HOCA, 1994). Therefore, sensory losses of less than 30dB cannot be identified by OAE testing.

The present retrospective study was carried out to determine how often children who are seen for CAP testing have sensory-neural hearing losses of 30dB or more. That is, how often in our caseload do we see children for CAP testing who have S-N losses that justify OAE testing?

Procedures

This study was carried out to determine the incidence of sensory-neural losses in a random sample of 150 children seen for CAPD evaluation. While we were gathering the data we also checked to see how often conductive losses were noted, as these cases would not be appropriate for OAE testing.

Files were selected randomly from the University at Buffalo Speech-Language and Hearing Clinic files to determine 1) whether CAP testing was carried out, 2) if so whether the child was in the range 5 to 18 years of age, 3) if so, these files were then scrutinized to ensure that both puretone threshold results and case histories were available.

Results

The mean age for the 150 children was 9.3 years (SD = 2.7). Table 1 shows the number of children for whom a history of middle ear pathology was reported and those who were found to have air-bone gaps (≥15dB).

ME Hx	ABG	Both	Tot ME Hx	Tot ABG
44	3	9	53	12

Table 1. Number of children (N= 150) with histories of significant middle ear disorder only (ME Hx); air-bone gap only (ABG); ABG plus ME Hx (Both); total # with ME Hx (Tot ME Hx); and total # with ABGs (Tot ABG).

As expected, a large percentage (35%) of the children were reported to have had middle ear disorders. Fortunately, there were far fewer with ABGs (8%). However, of the 12 children who had ABGs, 9 of them had a reported history of middle ear involvement.

Means (and SDs) for puretone thresholds were calculated for the 138 children (whom we are particularly interested in to determine the need for OAEs) who had no ABGs. Means were also caculated for the 12 children who had significant ABGs. Table 2 shows these puretone thresholds.

	250	500	1000	2000	4000	8000
NoG RE	**8.6 (6.7)**	**7.6 (6.1)**	**4.8 (5.5)**	**1.3 (5.7)**	**1.3 (6.8)**	**6.4 (8.3)**
NoG LE	**8.5 (7.7)**	**6.7 (6.9)**	**4.2 (7.0)**	**2.2 (7.2)**	**0.5 (7.7)**	**6.0 (9.5)**
ABG RE	16.8	18.2	12.7	5.9	8.2	14.5
ABG LE	20.0	16.8	16.4	12.7	13.6	20.5

Table 2. Right and left ear means (SDs) for 138 children with no significant Air-Bone Gaps and means for 12 children with ABGs.

The thresholds for the children with ABGs at the time of testing were on the average almost 12dB poorer than those with no measured ABGs. However, the threshold pattern was the same for both groups in both ears. That is, 2 and 4K Hz had the best thresholds and 250 and 500 Hz as well as 8k Hz had the poorest. These *do not* resemble the expected *inner ear* pattern of loss.

The next step was to determine the presence of hearing loss among those with no ABGs to see how many had thresholds of 30dB or more. We decided to look at the most obvious frequency for inner ear (sensory) losses, 4K Hz. There were ***no S-N cases*** with levels of ≥30dB! Not one. So we then looked at the less likely frequencies, there was not a single child out of 138 non-conductives who had a 30dB loss or more! Therefore, out of 150 children we could not find even one child who met the criterion (at any frequency in either ear) for giving the OAE test! Twelve had conductive problems that precluded evaluation of inner ear function and none of the 138 other children had enough hearing impairment for the OAE to be affected.

Discussion

If we had followed the recommendations of Jerger & Musiek we would have tested 150 children using OAEs without the likelihood of getting even a single meaningful result! Based on these results, can we justify giving OAEs on a routine basis as part of a Minimal Test Battery? Could we justify charging parents for these tests? Would insurance companies be willing to pay OAE claims with such a small probability for meaningful or useful information? Although the expenditure of clinical time for OAEs is relatively small, we could use any time saved to provide extra counseling for the parents or teachers of these children.

Of course, one little study like this, while sobering does not prove that OAEs have no place in a Minimal Test Battery. However, Jerger & Musiek (2000) have shown no evidence whatever that it would be useful! If in the future we test more children with hearing losses for CAPD, we will see more who meet the 30dB criterion. Would that justify having OAEs as part of the Minimal Test Battery? I believe not. Why not test *only* those with losses of ≥30dB HL with OAEs or any other appropriate procedures?

Frankly, I expected in our sample of 150 children to have a few cases with thresholds of ≥30dB. *Hopefully, the study that we conducted would be replicated by many of you.* I would not be surprised if you will find a child or two with S-N loss in your sample, but I would be shocked if there are 5% in any typical population.

We found not one child out of 150, seen for CAPD testing, for whom OAEs would have been appropriate to R/O inner ear disorder. With so few having S-N losses, how can we justify giving OAE tests on a routine basis to children seen for CAP evaluation?

THE THREE NEW QUALIFIERS
Jack Katz

An audiologist pointed out that the new qualifiers do not appear in the SSW Workshop Manual. True, they were added after 1995 when the last manual came out. Here is a page you can add to your manual.

The three 'new' qualifiers are actually pretty old, dating back to the 1960s, when I and Sharon Hadaway were testing adults at a residential facility for the mentally retarded (MR, often referred to as developmentally disabled, however, not as specifically). We found these three peculiar responses quite often, but over the years, working with other populations, I forgot about them (except for Intrusive Words that came up on rare occasions). When working again with the MR population these qualifiers jumped out at me once more. So here is a summary of them. Unlike most of the other qualifiers that have been checked out empirically, these qualifiers have not.

Intrusive Word

Intrusive word is generally seen in the MR population but also with some aphasic patients and a rare child with CAPD. A good example is, ***up stairs <u>pretty</u> down town***, or

(pretty)
up stairs down town
^

A caret is placed below to show the place of the infraction and the intrusive word is shown above and circled (not just in parenthesis). An 'IW' is circled and placed in the numbered box. As you can see there is no error on that item (the 4 words are correct).

We do not know if IWs represent a particular CAP category, but they appear to be a sign of severe Decoding (DEC, as are each of the other 'new' qualifiers). It is not clear if the IW is just an association that the person has and can't inhibit, or what. It is interesting to speculate.

Back-to-Back

Back-to-Back or BTB is also a new qualifier that is found in the MR population. When it was revived a few years ago, I mentioned this to Melody Bricault, an audiologist in the Rochester, NY area. Within a short period of time she noted BTB qualifiers in the general CAPD population. I believe that I have found it once myself (but don't recall if it was an aphasic adult or a child with CAPD - ah the beauty of getting older).

A BTB qualifier is when a person says the same word twice in a row. For example, *up **stairs, stairs** town*. BTB-circled is placed in the numbered box. Again this appears to be a DEC sign. It seems like the very poor Decoders are overwhelmed with the SSW items. When they think back over all the sounds they heard, they seem to pick up the incorrect BTB word instead of the one that they apparently did not have a good handle on.

Smush-2

Smush-2 or (Sm-2) is the combination of two words from the same spondee! The regular smush is usually a combination of the 2 competing words in opposite ears (words 2 and 3), e.g., ***sea shout side*** instead of *sea shore out side*. Sm is a TFM sign.

But Sm-2 is, ***wub black board*** for *wash tub black board* (the symbol, 'Sm-2' is circled and placed in the numbered box). A regular smush is thought to be a high-level error (frontal) where the two words from opposite ears get pushed or smushed together. But how can you explain Sm-2? Our thinking is that this is a severe DEC sign. The person gets a smush of sounds from words even in the same ear. You can just imagine how words get smushed together in everyday speech for this person with such severe DEC difficulties.

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