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REPORTS

DAVID GILLESPIE ASKS ...
WE ANSWER

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DAVID GILLESPIE ASKS, WE SCRATCH OUR HEADS AND TRY TO ANSWER

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David Johnson, and Nancy Stecker

A letter from David Gillespie (West Kentucky Easter Seal Center, Paducah), reminds us of the richness of clinical practice and how important clinical experience is for those of us who teach and do research. It also provides incentive, when working clinically, to ask questions, gather data, and try to make sense of what we see.

David asks five challenging questions that make us draw upon our own clinical experience, the literature and to rely heavily on logic and common sense. Because the first author did not have enough of these ingredients, he asked some colleagues to help out. Each of the audiologists who responded has considerable experience in the area of central auditory processing. Collectively, we are able to offer some ideas for your consideration.

David indicates that, so far, he has not seen references to these questions or they have not been answered to his satisfaction. (We shall see if we do any better.) He welcomes an airing in SSW REPORTS.

QUESTION 1.

My first question deals with "reverse cerebral dominance" i.e. RCD. By this term I mean:
a) a child of 6 to 9 years of age,
b) Competing Sentence Test (CST): poor performance RE, fine in LE, and,
c) SSW: RC abnormal (but okay if you use the LC norm), LC normal, and
d) all other CAP tests (speech-in-noise, Dichotic Digits, SCAN and Phonemic Synthesis): normal.

A. What are the possible implications of RCD for language in children?

B. I work with 2 or 3 kids who are struggling in reading who show this reversed dominance, however they do very well on the rest of the CAP battery. What do you suggest?

C. One study reportedly demonstrated that phonemic dyslexics (as opposed to visual dyslexics) have strong LE scores [on dichotic tests]. Based on this finding, what are the implications for the reading teacher/speech-language pathologist working with such a child?

D. If the results of all CAP tests are okay, is RCD for language considered an "abnormality", especially if the child is doing well in school?

The answers to David's questions were written independently, therefore there may be some redundancy in the responses. This may, in fact, be helpful to the reader.

The first response is by Kathryn Barrett (University of North Carolina - Greensboro):

Overview: My first concern regarding RCD is documentation. How does Mr. Gillespie determine if a child is truly right hemisphere dominant for speech and language? According to the literature, the percentage of true

cases of RCD is very small. If a child is documented to be right hemisphere dominant for speech and language, then I would suggest reversing the right and left norms on the SSW test.

The fundamental issue of documenting RCD still concerns me. Unless RCD is unequivocal, I would first consider evaluating the results of the SSW test with respect to: a) the strengths and weaknesses of the ipsilateral and contralateral pathways and b) the pattern of errors observed on the SSW. For example, if the child is truly normal (just reversed) we would not expect to see significant response biases, as these should be normal after adjusting Ear Effect criteria.

Basically, I have more questions than answers to David's inquiry, specifically with respect to the documentation of RCD. For example:

1. Are the children left- or right-handed?
2. What were the results and pattern of errors on Competing Environmental Sounds (CES) test?
3. What was the pattern of errors on the SSW test?
4. Do neurological test results (e.g., EEG or PET), if performed, suggest RCD?

Q 1-A. No. To coin a phrase: "If it ain't broke, don't fix it!" If a child is doing well in school with no apparent subtle difficulties, then leave well enough alone.

Q 1-B. Personally, I feel that cerebral dominance is not the issue here. The fact that the child is struggling with reading is a reflection of a functional problem that could be the result of any number of etiologies. To suggest RCD as causative is speculative, at best. What percentage of individuals who are right hemisphere dominant for speech and language have difficulty in reading? Does the literature show that those who are right hemisphere dominant have more reading difficulty than those who are left hemisphere dominant? Typically, regardless of cerebral dominance, if there are no symptoms of functional difficulty then those individuals are not seen for evaluation. Remediation for a child with reading problems should focus on the functional aspects of the child's difficulty.

Jack Katz (University at Buffalo) adds 2c worth to David's question:

Only rarely have I been forced to calculate SSW data "both ways". RCD may be of concern in Type A cases with R-ear peaks (poor performance in column B). Type A is the only SSW sign I feel is strongly associated with handedness, and even then it is not seen in most L-handers. It is sometimes seen in a R-handed person from a L-handed family. Therefore, what are the chances that these R-handers have RCD?? Slim!

QUESTION 2

If you evaluate a child (6 - 9 yr old) for CAPD and dominance for language has not been established (i.e., no strong ear on the SSW or CST), what are the implications for the SLP or generally for remediation strategies?

The first response to this question is by Nancy Stecker (University at Buffalo). She indicates:

I found David Gillespie's second question somewhat confusing, but I will answer as best I can.

If a child revealed a severe score on the SSW test with a similar percentage of error for each ear, I would not necessarily assume that the child has not developed cerebral dominance for language. The results do tell you that the child has a significant auditory processing disorder. More specifically he probably has a severe decoding problem because the norms allow for more errors in the LC Condition than the RC (making the RC relatively poorer). As far as I am concerned the implications for remediation would be no different than for

any other child exhibiting severe RC and LC scores.

Jack's 2 1/2 pennies worth:

It is true that 1) the mean CSSW scores for normal 5-yr olds (CNS-1985) are similar in each ear (RC=36, LC=40), 2) RC improves quickly with age, and 3) LC never quite equals RC until the teen years. This suggests that cerebral dominance has an influence on dichotic test performance. Nevertheless, because cerebral dominance is such a vague concept-function, I get little help from inferred dominance in knowing what to do for a child.

On the other hand, a severe bilateral peak in a child is an indication of generalized CAPD and probably language disorder. Based on the category system, it is likely composed of both poor decoding (generally receptive language disorder) and TFM (more associated with expressive language), and/or Integration difficulty.

QUESTION 3

As we know, kids with ADHD, as well as those who have CAPD, can perform poorly on speech-in-noise tests. If a kid who was previously diagnosed as having ADHD (and taking Ritalin) comes in for a CAP evaluation and does real well on the entire battery except for speech-in-noise, are you going to call him CAPD and put him in your Tolerance-Fading Memory category?

I come across this finding with lots of kids who have ADHD (diagnosed either before or after my CAP testing). Personally, since speech-in-noise was the only test in which they had a problem and given the fact that they have been diagnosed as (or is obvious to me that they are) ADHD, I really don't feel that they have CAPD. However, if they have difficulty with other parts of the battery as well, then I feel that the kid has both ADHD and CAPD.

The first answer to this question comes from David Johnson (Hennepin County Medical Center - Audiology, Minneapolis, MN). He writes:

To respond appropriately to this question one should have a model of auditory processing in mind to help sort out what is happening when we receive auditory information:

1) ear receives auditory information,
2) inner hair cells encode it,
3) afferent system transmits it to the brainstem,
4) via a feedback loop [olivocochlear bundle] it triggers efferent neurons in the cochlear duct,
5) this permits outer hair cell manipulation to enhance and magnify portions of the signal,
6) enabling the desired information to be pulled out from the background noise, first at the cochlear level (and later in step #9),
7) subsequently, the information is relayed to the brainstem both ipsilaterally and contralaterally,
8) then up to the competing auditory reception centers of the brain, and
9) finally, the message is integrated through the left auditory reception area in about 94% of the population (the other 6% are integrated through the right auditory reception area for a) left-handed children of left-handed mothers and b) in prelingually right hemisphere damaged individuals).

Auditory figure-ground problems may be related to either of two levels in the above model (or to both).

Level 4. Recent literature suggests that a permanent developmental disability of the brainstem feedback loop could contribute to a speech-in-noise disorder. It is associated with deprivation secondary to chronic middle ear effusion which interferes with the child's normal development (Pillsbury, Grose and Hall, 1991). these children can hear everything in noise, but just can't pick out the figure from the ground. This explains why some apparent auditory processing disorders are not differentiated by the SSW test, but are differentiated by Bob Keith's SCAN test. The filtered word subtest

of the SCAN is correlated with ADD 60% of the time (Keith, Rudy, Donahue and Schwallie, 1988). These children do not fit the TFM category.

Level 9 Figure-ground problems at the hemispheric level (#9) are quite different. The dominant hemisphere must process the information auditorily while holding the competing information in short-term memory. The breakdown occurs when the competing information from the opposite hemisphere either can't be recalled (from short-term memory) or information from the dominant and nondominant hemispheres get "smushed" or blended together. When more errors occur at the ends of morphemic test strings than at the beginnings (Kaplan, Gladstone and Katz, 1984; Katz, McCarthy, Jacobs and Wilson, 1982), the children demonstrate comprehension of the message gestalt but lose the small details (having most difficulty with short, nonredundant messages) (Lucker, 1981). When the breakdown is at level #9, then Ritalin will sometimes make a difference because it affects dichotic fusion skills (Ivey and Jerome, 1988). The TFM category adequately describes this higher level breakdown.

J.K. adds:

Having ADHD increases, not decreases, the chances of having CAPD. With one CNS problem it is more likely that regions close by will also be affected. A CAP case may have a speech-in-noise problem and no memory problem (not TFM, just S-in-N). If there is no confirmation of a S-in-N problem on other tests, I feel somewhat uneasy, but with clear case history support, the symptoms cannot be overlooked (especially because most speech-in-noise tests evaluate monaural [auto correlation] and not dichotic [cross correlation] abilities. [We can get at these skills with MLD and evoked potentials if the SSW and CST fail to provide a proper challenge)]. Whether we call it CAPD or ADHD, the child is likely to need our type of help. In my experience Ritalin is not enough in most of these cases.

QUESTION 4

1. Isn't it true that in speech-in-noise testing you are looking at three possibilities for poor performance? The child is missing the words mainly because of:
a) and inability to discriminate the words clearly in competition (auditory closure?),
b) the distraction present, or
c) both a and b.

2. I wonder whether a pure ADHD case (no CAPD involvement) misses the words mainly due to b and a pure CAPD case (with no ADHD involvement) misses the words due to c, but mostly a.

3. Have you noticed a lot of kids with strong histories of being easily distracted by background noise have no difficulty with speech-in-noise tests. I have.

The first response to question #4 is from Nancy Stecker. She states:

David did not state of what his speech-in-noise test consists. Procedures differ widely from clinic to clinic. Therefore, it is often difficult to make comparisons. However, he raises some interesting points.

1. I agree that when evaluating this skill, we often measure a combination of both distraction and discrimination ability. A child with borderline-normal or poorer discrimination scores, will almost always have difficulty (supporting Gillespie's point a). These children most likely have decoding problems. Other children have excellent discrimination in quiet, good SSW results (therefore appear to handle a competing speech task), yet do poorly on the speech-in-noise test. These children most likely cannot tolerate the distractability of the multitalker or the noise present here and not on the SSW test, supporting David's point b. These are most likely the children who have TFM problems. It is my experience that a good majority of the children I see have both a and b.

2. I have evaluated a few children diagnosed by a psychologist as having ADHD yet perform within normal limits on CAPD tests and normal or near normal on speech-in-noise tests. Given the advantage of one-on-one interaction, excellent acoustics and minimal visual distractions, they can often score well our tests.

3. Once in a while, I will evaluate a child who is reportedly distracted by environmental noises yet performs normally on the speech-in-noise test. While this is very rare, we do test under ideal conditions (as stated above) and test using earphones, with the noise coming from only one direction (as opposed to classroom noise which is more varied and comes from all directions), and therefore may not obtain abnormal scores. If I get normal scores for such a child who is highly distractable in class, I recommend treating the problem if there is an obvious need for assistance.

I see more children who perform poorly on our speech-in-noise tests, yet do not report being distracted in school. These children often have decoding signs, but not always.

Kathryn Barrett states:

Mr. Gillespie's three factors are quite reasonable (although, I would label a as figure-ground). In my personal experience with children who exhibit both CAPD and ADHD, it is very difficult to distinguish which is the primary cause of the child's difficulties. Clearly, if one is not attending to the signal then the child will perform poorly regardless of CAP ability.

Because of the difficulty in distinguishing CAPD from ADHD, I hesitate to rely on the results of a particular test to determine this for me. Typically, I will not only evaluate the number of errors, but the pattern of errors on several tests. For example I use the GFW Auditory Selective Attention subtest to a) determine selective auditory attention skills - a problem for many children who exhibit CAPD (based on the total errors) and b) determine attentional difficulties. I have found children who have the ADHD syndrome tend to miss items sporadically (some easy as well as some hard ones). I have seen this on the Phonemic Synthesis test as well. An attentional pattern is clearly evident if the child cannot correctly blend "shoe" but has no difficulty with a more challenging word such as "ghost". Looking for this pattern has been helpful in teasing out these problems.

Children who have CAPD exclusively, or primarily, will generally have trouble with all of the items or consistently on the harder ones. Typically, they will not show sporadic errors as does a child with ADHD with or without CAPD. When both ADHD and CAPD are present, they are extremely interactive. Therefore, a test battery approach is most advantageous in allowing you to look at several conditions in which the auditory system can be taxed.

I am not sure if I have addressed your questions or not, but I hope that my remarks are helpful. I would welcome any return comments.

QUESTION 5

Jack, you say that children with Decoding problems may have trouble with /r/ and /l/ sounds. Since these sounds are usually late in developing anyway, I don't see where this is a helpful diagnostic clue.

Initial response is from J. Katz.

Good point, David. The /r/ and /l/ sounds tend to develop after the other sounds (e.g. the /s/ which is probably defective in more children). It seems to me that these two liquid sounds develop late because many children do not have sufficiently clear mental concepts and/or rapid phonemic processing ability. Although, they are difficult sounds to perceive, my 2 1/2 year old granddaughter (not to boast) produced good /r/ and /l/ sounds.

My guess is that many of our CAP kids contributed to raising the age level standards for these sounds. /s/ appears to challenge fine motor skills whereas /r/ and /l/ are the ones that require fine Decoding ability. Therefore, when I see a child for CAP evaluation and note poor articulation of /r/, I strongly suspect Decoding.

Just as in the case of receptive language problems, I feel that the observation of /r/ and /l/ articulation problems are helpful conceptually. Although, I believe that /l/ is the more difficult sound to perceive, the /r/ problem that is more tenacious. Because /l/ can be taught by tactile compensation, it often disappears quickly at the hands of a speech pathologist. However, /r/ cannot be taught by the tactile method and requires improved auditory skills. Although, a child may produce a good /l/ this does not insure that the youngster is perceiving it properly.

David Johnson has some insights on this question as well. He writes:

/r/ and /l/ sounds are vocalic, but in our language they function as consonants. Children with CAPD often have difficulty recognizing them and even confuse them, so obviously there is a Decoding problem or a confusion problem.

The R-hemisphere is thought to process vocalics and the L-hemisphere is more associated with plosives and other consonant sounds. Perhaps we could argue that the two hemispheres are in a state of tension. One hemisphere tries to resolve the identification by using a vocalic filter, while at the same time the other hemisphere is trying to process it through a consonant/transient filter. If we accept this hypothesis, then the reason for the difficulty in perceiving these sounds may be a processing conflict. I personally do not believe this is strong diagnostic sign, but it takes on greater significance when other information suggests Decoding problems as well.

SUMMARY AND BRIEF DISCUSSION

David Gillespie has provided us with thought provoking questions about CAPD. In general, the respondents did not feel that RCD and incomplete dominance were especially useful concepts, given our present level of understanding. We did not know how this information would help in the remedial process.

First, the problems produced by RCD and incomplete dominance for language are not known to us at the present time. Second, the panel did not feel that these central test results represented a good measure of cerebral dominance for a particular child. Third, because of the lack of documentation and rare occurrence of these conditions, very little is known to us about how to translate this information into usable strategies (as opposed to those we currently use for typical children with CAPD).

David G. brought up a S-in-N question. He laid out an attractive 3-factor model for understanding failure on this test. It includes failure due to a) discrimination errors (perhaps we can add Kathryn's thought that this could also be difficulty extracting figure from background information), b) distractability, or c) a combination of a and b.

Dave J. provided an anatomical-physiological model to show that there are two types of figure-ground difficulties. One is at brainstem and the other at the cerebral level.

Nancy pointed out that S-N tests vary greatly, but, the ones she uses appear to be very sensitive to CAPD despite the ideal conditions under which we test (compared to the classroom).

Jack felt that observations of /l, r/ articulation and discrimination errors were helpful both clinically and theoretically. Davids G. and J. were less enthusiastic. Now we welcome your comments and observations.