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REPORT

CAP CATEGORIES IN OTHER TESTS CASE STUDY WITH MANAGEMENT

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THE CAP CATEGORY SYSTEM USING THE SSW AND OTHER TESTS

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For many years we did not realize that there might be rhyme or reason behind the error patterns seen on the SSW test as they might relate to the underlying CAPD. We knew that in patients with brain lesions, the SSW signs were indicative of abnormalities in specific regions of the brain. For example, the research had shown a relationship between the abnormal RC C-SSW score and left auditory reception disorder. Later on localizing information was obtained from response biases to provide intra-hemispheric (e.g., Order H/L and anterior lesions). The same types of C-SSW scores and response bias have been found in CAPD cases. This article will review how the same signs have been found to help us understand CAPD in a manner consistent with the site-of-lesion work. We also believe that it may be possible to apply the concepts that we have noted to other CAP tests.

Since 1985 we have identified what we believe are four major CAP categories and five sub-categories. There is still much work to be done to check these classifications, but we have been very pleased in the application of this taxonomy when we work with clinical cases. These auditory categories help make CAPD quite understandable to teachers and families who are otherwise confused and vague about CAP. We feel that we can predict the problems that the individual faces even when it has not been revealed

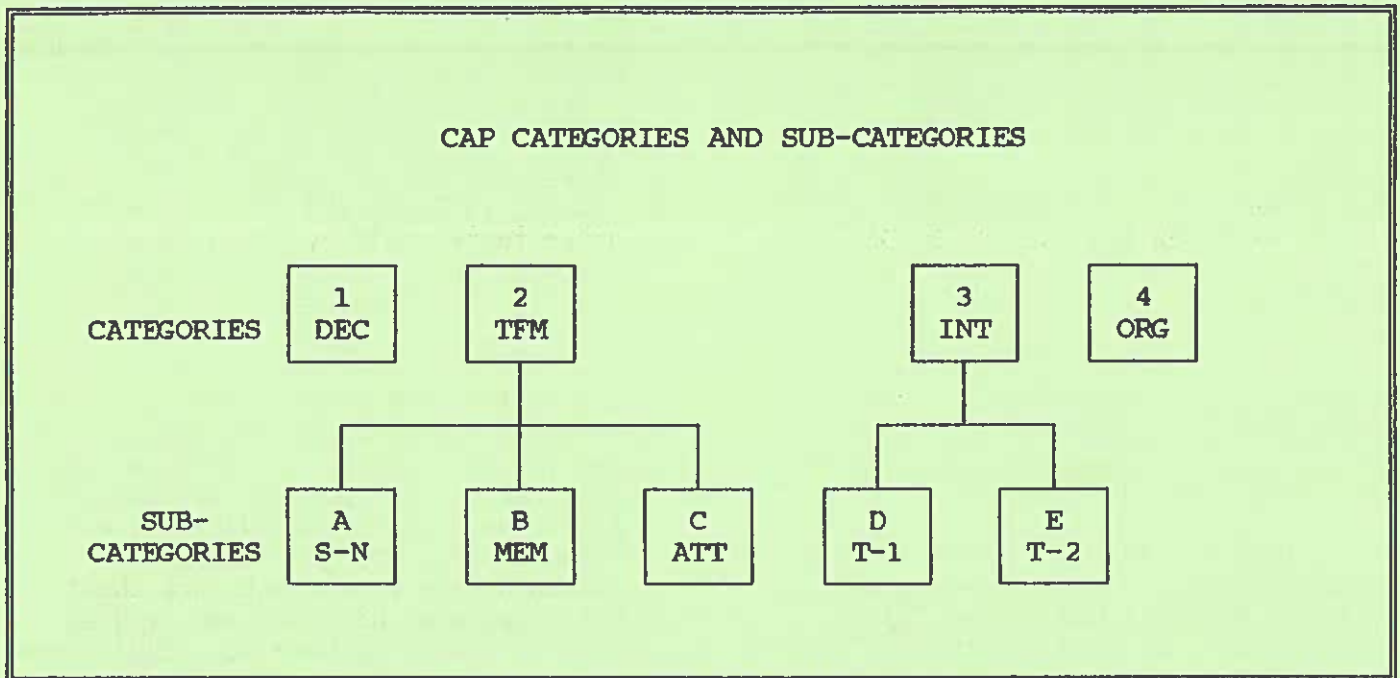
previously by the family. Also, importantly we have been able to make effective recommendations to manage the CAP problems based, in part, on the affected categories.

Table 1 shows the four CAP categories and the sub-categories. Briefly, they are as follows:

1. **DECODING (DEC).** This relates specifically to difficulty in decoding speech at the phonemic level. That is, the person may not discriminate speech sounds quickly and accurately (not unlike individuals who are hearing impaired or aphasic), may not remember them and may not be able to manipulate or combine them. Such a person would be slow in responding to challenging tasks such as the SSW and Phonemic Synthesis (PS) tests.

DEC is associated (not surprisingly) with poor phonic skills, reading word-accuracy (sounding out words) and spelling. It is also associated, among others, with receptive language difficulties.

2. **TOLERANCE-FADING MEMORY (TFM).** This category is made up of at least two sub-categories and maybe three. Both speech-in-noise (S-N) difficulty and short term auditory memory (MEM) problems are the major components of TFM and are most often found together. We are beginning to cautiously include attention (ATT) as a factor in TFM. At present we have not put this to a formal test. However, clinical experience supports the inclusion and our theoretical understanding would lead us to the same conclusion. The TFM



- CAP CATEGORIES**
1. DECODING (DEC)
 2. TOLERANCE-FADING MEMORY (TFM)
 - A. SPEECH-IN-NOISE (S-N)
 - B. MEMORY (MEM)
 - C. ATTENTION (ATT)
 3. INTEGRATION (INT)
 - D. TYPE 1 (T-1)
 - E. TYPE 2 (T-2)
 4. ORGANIZATION (ORG)

Table 1. This show the present conception of the four CAPD categories and the five sub-categories.

category is generally associated with reading comprehension problems and expressive difficulties. In our experience those with Attention Deficit Disorder who have CAPD tend to fall into the TFM group.

3. INTEGRATION (INT). This category seems to be associated with getting information from one side of the brain to the other or perhaps involves other disconnections in the CNS. The tell-tale sign is the Type A SSW pattern. The INT group is made up of two sub-categories. While both groups often have long delays in responding, Type-1 cases have the most severe academic and language difficulties and often considered dyslexic. Their school problems include severely depressed reading and spelling skills and extremely poor handwriting. In many ways the Type 1 cases resemble the DEC group, but worse possibly because of the additional difficulties.

Type-2 cases were found to have great difficulty with learning skills, but not quite as bad as the Type-1 cases (Katz, Kurpita, Smith and Brandner, 1992). In many respects they resembled the TFM group, but they also shared characteristics of Type-1 cases and perhaps because of the combination of factors were quite depressed academically. Not all Type A cases are so greatly involved (so there may be a Type-3 out there and maybe a Type-4). Our major problem with searching out these subgroups is that not more than 15-20% of the CAPD cases have been labeled as INT and the vast majority of them are considered Type-1. So we lack enough data to look further. If we cannot gather enough cases we may ask you for some help (however, some school and other data would be needed).

The fourth category is Organization (ORG). The SSW sign associated with this category is significant reversals. They may also show their sequencing problems on the PS test by recombining speech sounds out of order.

CAP CATEGORIES IN OTHER CENTRAL TESTS

The test battery that we use is the SSW, PS¹ and a speech-in-noise test. Although the battery that we use is well suited to the category system (having many indicators of these categories to look at), we believe that other tests that are used by audiologists could also contribute to this type of CAPD analysis. We are basing our predictions on some underlying assumptions about these tasks. We have not collected any data. Any of you who use the three tests in our battery (SSW, PS and S-N) and also use other tests could evaluate in what way these other tests relate to the category system proposed here.

Table 2 shows the three tests in our battery and eight other tests that are commonly used for evaluating CAPD. The SSW test appears to have the most indicators. For purpose of categorization we have used Condition scores, response bias and qualifiers. As stated before we are not sure about ATT because we have not yet studied it. Of course we have not studied the other tests, but were willing to make some educated guesses.

Based on our analysis tests like PS, CS, and DD might contribute to four of these auditory characteristics and perhaps more. Other tests might logically relate to only one, e.g., FS and MLD. However, a test like PPS might be a strong addition to a battery if signs of INT and ORG could be derived.

If the category system is to be maximally useful, it should be applicable to a variety of CAP tests that are in clinical use. We have made an analysis to help encourage those who use these tests to assess their contribution to this taxonomy.

¹ Phonemic Synthesis Test (with 1K cal. tone) is now available from PRECISION ACOUSTICS, 411 NE 87 Ave., Vancouver, WA 98664, (206) 892-9367.

<u>TEST</u>	<u>DEC</u>	<u>TFM</u>		<u>INT</u>		<u>ORG</u>	
		<u>S-N</u>	<u>MEM</u>	<u>ATT</u>	<u>1</u>		<u>2</u>
Staggered Spondaic Word (SSW)	++	++	++	DK	++	++	+
Phonemic Synthesis (PS)	++	-	+	-	++	-	++
Speech-in-Noise (S-N)	+	++	-	-	-	++	-
Competing CV's (CCV)	++	+	-	-	+	DK	-
Competing Sentences (CS)	++	+	++	DK	-	+	-
Dichotic Digits (DD)	+	++	+	DK	+	DK	+
Pitch Pattern Sequence (PPS)	-	DK	-	DK	++	++	++
Filtered Speech (FS)	++	DK	-	-	-	-	-
Masking Level Difference (MLD)	-	++	-	-	-	-	-
Competing Environmental Sound (CES)	-	-	-	-	++	++	-
Selective Auditory Attention Test (SAAT)	-	++	-	++	-	-	-

Table 2. Illustration of categorical information that may be derived from a variety of audiometric tests. Each test is analyzed based on its potential for indicating each of the four categories, Decoding (DEC), Tolerance-Fading Memory (TFM), Integration (INT) and Organization (ORG) and their characteristics or subcategories, speech-in-noise (S-N), memory (MEM), attention (ATT) and Types 1 and 2 of the INT category. The symbols indicate which tests are felt to be strong indicators (++), indicators (+), non-indicators (-) and which ones we do not know if they are indicators (DK).

CASE STUDY: EVALUATION AND REMEDIATION OF CAPD

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Background Information

KD, a 23-yr-old male was seen for a CAP evaluation. He had a history of poor academic performance and poor social/emotional skills. Because he will be attending college he was referred to identify if CAPD was associated with his academic and social underachievement. KD did not complete high school but got his GED while incarcerated.

Throughout school KD's academic skills were below normal in short term memory (auditory and visual), attending, reading, writing, science and math. In addition, he had difficulty completing his work, was impulsive and careless in his work habits. He said he had great difficulty in noise.

KD was described as outgoing and eager to please, but having difficulty relating to peers. Further he was reported to be high strung, fidgety and his feelings were easily hurt.

His medical history (not surprisingly) included middle ear, sinus and bronchial infections. As a youngster he was diagnosed as having colitis, which was attributed to his great anxiety. He would feign illness and do almost anything to get out of school work. Further, he had a significant history of noise exposure and claimed to have tinnitus, bilaterally.

Audiological Test Results

KD had puretone thresholds within normal limits except for a drop in the 4-8k region (associated with his noise exposure). This could also contribute to his stated difficulty with speech-in-noise. WDS and tympanograms were normal, bilaterally.

The CAP tests were the SSW, PS and S-N. His signs of poor decoding were abnormal RC-SSW score and depressed performance on the PS test. There was also evidence of a TFM problem. This was based on moderately depressed S-N score in the RE (mild in the LE) as well as significant numbers of TTWs and smushes.

When KD was told of his performance on the audiometric battery he stated surprise, saying "I thought I did poorer ...it was difficult, I had to pay quite a lot of attention ... If I didn't listen carefully, I thought I would lose it". These comments suggest that KD obtained the test results with great effort.

Diagnosis

Together the case history and CAP test data support the presence of both a TFM and a DEC problem. For TFM the case history showed he was fidgety, impulsive, had poor short term memory and short attention span and difficulty understanding under noisy conditions. The SSW and S-N, as stated before had a variety of abnormal signs associated with TFM. DEC was consistent with his poor reading as well as his performance on the SSW and PS tests. It is interesting that Katz, Simon and Fanning (1988) found an unusually high percentage of incarcerated youth to show signs of poor decoding. KD who had been incarcerated while showing DEC signs, also demonstrated significant frustration with TFM tasks.

Recommendations

Based on the audiometric findings, the presenting symptoms and case history, the following recommendations were made: PS therapy to improve the weak phonemic decoding skills, S-N desensitization therapy to increase KD's ability to tolerate background sounds and to help him improve on his word recognition under competing conditions. In addition, it was recom-

mended that metacognitive strategies be taught to KD because it was unlikely that he would overcome all of these auditory deficits. A further complication in this case was that KD had only one month available for the remedial program because he would have to relocate in order to attend college.

Therapy and Habilitative Program

KD made reasonably good progress in the period of time that he came for help in our clinic. However, some of the problems noted by his teachers in his youth were also found in our therapy sessions despite the fact that he had a number of years to mature, he was coming of his own volition and the therapy was given on a one-to-one basis without the distraction of other students.

During a typical 45 minute therapy session, KD would have significant difficulty attending. He was often fidgety, wringing his hands and distracted by visual influences around the room. When distracted KD would generally make errors. For example, it would require no more than a yawn, looking away or moving his chair, to cause him to err on a Phonemic Synthesis item.

The therapy program was not easy for him. It required great concentration for him to succeed. When he was aware that he had made an error, he was quick to make excuses, often mocking the "guy" and "his words" for their simplicity and redundancy. In order to improve KD's attitude and motivation, he was told that if he did not get a sufficient score for the completion level that the same program would be repeated on the following visit. The thought of having to hear "that guy" yet again was sufficient motivation to improve his attention.

Although KD was often defensive, at times he was also quite candid in his remarks. For example, one time he said that he did not realize to what a

great extent he had to concentrate for even the simplest listening task. However, despite this realization KD at other times would debate the efficacy of the lessons. Despite his poor performance he would often expound on why a particular lesson was so easy for him.

Because KD had limited ability to focus auditorily and attend, and because he had some difficulty identifying his own listening needs, a significant portion of the therapy program was directed toward the development of metacognitive strategies. An excellent source of information on effective strategies was, "Help Yourself: How to Take Advantage of Your Learning Styles (Sonbuchner, 1991). Some of the topics reviewed from this book include, "How can I take good notes during a lecture, What can I do after I have read something in order to remember it, and How can I memorize more successfully?"

What Next?

Good question. We believe that with some success and a subsequent boost in his self-confidence, that KD will become more motivated. If he does, we feel that he has the ability to improve further his academic performance. He was encouraged to keep us informed about his progress. If we hear from KD we will be sure to let you know too.

References

Katz, J., Singer, S. and Fanning, J. 1988. Auditory processing abilities in incarcerated youth. New York Speech-Language-Hearing Association Conference, Buffalo, NY.

Sonbuchner, G. 1991. Help Yourself: How to Take Advantage of Your Learning Styles. New Readers Press: Syracuse, NY 13210.
