TOPICS IN

Central Auditory Processing

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FREE OF CHARGE

Can we, or should, we provide CAP services before age 7 or 8?

Right now some people are scratching their heads if it is possible to test for CAP and/or do therapy before 7 or 8 and is it wise to do so. Can little client 'R' shed light on those questions? He was 5 years old when he was first assessed for an auditory processing evaluation.

Case History and Initial Evaluation:

R had received speech and language intervention beginning at age 2, he also had sensory integration intervention since age 3. He received therapy due to delayed speech and language skills with overt difficulties noted with multisensory input (tactile, motor, and auditory input hypersensitivity). R also has had a history of multiple ear infections. He was assessed for auditory processing skills in June of 2015 at age 5 years due to continued difficulty in language and social skills.

He was administered the Buffalo Model Battery to assess his auditory processing skills.

R was able to endure testing in 1 session with redirection and breaks provided, as necessary, to help him perform to the best of his abilities. Findings indicated weakness in both Decoding skills and Tolerance Fading Memory. He had significant scores in all the tests including SSW; Phonemic Synthesis Picture Test; Words in quiet and Speech in Noise Tests. See Table 1 for initial test results. In addition, the following tests were completed:

Phonemic Recognition Initial Test: June 2015

Individual sounds of the English were presented via the loudspeaker at a comfortable loudness level. Difficulty in decoding single phonemes can result in a global auditory comprehension weakness. When sounds are misheard, it is likely that the words are misheard and thus speech in running conversation loses its meaning.

R was unable to complete the entire list on the first day of therapy. So the test was presented over 4 sessions in blocks of 17-20 phonemes each session. Overall accuracy for phoneme recognition was 69%. He had at least 10 delays in phoneme recognition. This suggests that his efficiency was also compromised.

R was able to associate sounds to words with 73% accuracy with 25 response delays.

Short Term Memory, June 2015

3 digit forward recall 90%; 3 digit reversed recall 30% with reversals on 30% of the times

Phonemic Recognition Retest January 2016

On retest R was able to complete the whole list of phonemes in 1 session. He was able to recognize phonemes with 95% accuracy with 3 response delays. R was able to associate sounds to words with 92% accuracy with 4 response delays.

Short Term Memory Retest January 2016

3 digit forward recall 80-100%; 3 digit reversed recall 80-100%;

4 digit forward recall 40%; 4 digit reversed recall 100%

Therapy for R (June 2015- January 2016)

R's 21 therapy sessions included phonemic synthesis training, phonemic awareness and

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recognition training, auditory attention, whole body active participation and listening training, endurance for auditory listening, short-term and working memory training, dichotic and mono-aural listening training, selective listening training, speech in noise, and listening separation, ear lateralization, and integration training. Therapy included use of headphones and speakers in volume controlled setting via audiometer.

Therapy January 2016-June 2016

In this round R's14 therapy sessions included the Dichotic Offset Measure that was administered followed by Dichotic Offset Therapy along with Speech in Noise and phoneme decoding tasks.

Reevaluation: Buffalo Model battery was completed in June of 2016. See Table 1 below: R continues to show weaknesses in Decoding, and Tolerance Fading Memory. Organization difficulties have surfaced now as things get more challenging for him. Of the 15 test scores that were significant initially 12 improved and 7 were within normal limits. The 'Yes' SSW response was not significant initially but there were 24 on retest. Therapy will continue to improve all these areas using other computer based programs that target the specific weaknesses. See Table 2 on the next page.

Final Thoughts

Parents reported that R's ability to engage in conversations improved significantly since he

Table 1: Summary Chart of Test Results

Tests	June 2015 5 years	January 2016 Update- 6 years	June 2016 6 years
Phonemic Synthesis Picture Test # accuracy / (Norm)	7/(8)- 5 year	N/A	N/A
Phonemic Synthesis Test # accuracy / (Norm)	N/A	24 (17) with 23 qualitative errors	24/(17) with 7 Qualitative errors
SSW # errors/ (Norm)	48/ (23)	N/A	44/ (23)
Words in Quiet % accuracy (Norm)- Right-R Left-L	R 62/(95) L 62/ (95)	N/A	R 96/(91) L 92/ (91)
Speech in Noise % accuracy (Norm) Right-R Left-L	R 36/ (72) L 48/ (68)	N/A	R 52/ (72) L 56/ (68)

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Table 2: Comparison of Significant Central Test Findings

Test	Measure	June 2015	January 2016	June 2016	APD Category
Staggered Spondaic Word	Total NOE Score*	48	--	44 [s]	Various
(SSW)	Right Non-Competing*	7	--	5 [s]	Various
*Number of errors	Right Competing*	13	--	13 [s]	DEC
	Left Competing*	16	--	18 [s]	TFM
	Left Non-Competing*	12	--	8 [s]	DEC
	Ear Effect High/Low*	4	--	2	DEC
# Total number	# Smush	1	--	0	TFM
	# Perseveration	2	--	0	DEC
	# Yes	0	--	24 [s]	TFM
Phonemic Synthesis - Picture	Total Score	7	--	--	DEC
(PS-P)	Second Order Error	3	--	--	DEC
Phonemic Synthesis (PS)[1]	Qualitative Errors Only	CNT	23 [s]	7	Various
Word Recognition in Quiet %	Right Ear	62	--	96	DEC
	Left Ear	62	--	92	DEC
Speech-in-Noise (SN) W-22s %	Inter-Aural Difference	12	--	4	TFM
	Right Ear	36	--	52 [s]	TFM
	Left Ears	48	--	56 [s]	TFM

[1] PS could not be given June '15 so PS-P was given
[2] In January '16 and June '16 R had a normal score on the PS Test but many qualitative errors
[s] This shows significant scores after the initial test

began therapy to remediate his weaknesses in auditory skills. They reported that in everyday conversational situations he is able to understand, respond, and initiate conversations with greater ease and accuracy since June of 2015. He is also able to narrate anecdotal events with enough details for an unfamiliar listener to comprehend the big picture with minimal clarifications.

What makes little R's story even more impressive is that he was diagnosed with Autism in January of 2016 by the school system. He was also diagnosed with ADHD and was prescribed medication by his primary care physician during the time he was receiving therapy.

R showed improvement in his auditory skills between age 5 and 6 years. He has benefitted with better ability to socialize and engage in conversations due to better listening skills. He is able to ask questions and respond appropriately. He is able to provide anecdotal information. R is initiating conversations with greater ease.

He continues to be fidgety; however his response accuracy has improved. R has also shown improvement of self-awareness of his voice loudness and does ask if he was too loud at times. Impulsivity has decreased. He does not repeat himself as much as he used to and

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is able to refrain from asking the same questions over and over again. He is now able to narrate anecdotal events with moderate assistance in sentence formation, however he is able to provide important details for the unfamiliar listening partner to comprehend the sequence of events. He passed the Phonological Awareness Literacy Skills Test used by Virginia Public Schools.

Was R better or worse off because he started therapy when he was 5 rather than at age 7 or 8 years of age? If he had to wait 2 or 3 years how much academic and other information would he have missed/misunderstood? Would R's feelings of self-worth be higher, or lower, if he started therapy at age 7 or 8?

Anecdotal data suggests that he was able to exhibit these positive changes in social behaviors only after he received APD therapy. Although medication did decrease his impulsive behaviors, I can't think of any reason to withhold working with children who need the help.

The Appendix on page 11 in Free of Charge shows information about the tests and therapies used with this child.

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10 Myths about CAPD

No one still alive knows the identity of Dear Ackie. We thought that she surely retired (or whatever), but now she sent this in for TiCAP. Thank you Dear Ackie wherever you may be. Ed.

#	Myth	Funny They Should Say That Because…
1	**In the 1970's we started hearing things like:** ***"Everyone knows there's no such thing as AP or CAPD."***	Sure, what we hear just jumps from the ear to the brain (no processing is needed). Just for fun ask an anatomist or physiologist if auditory information in the brain has to be processed. When they stop laughing ask them, at least, for a *yes* or *no* answer.
2	**Later we heard:** **"Okay, maybe there is such a thing as APD, but, even so, it's not important."**	That's interesting that the enormous and complex auditory pathways both afferent and efferent, don't serve any important function for us.
3	**Still later it changed to:** **"Well no, there is, of course APD, it's just that there's not any research out there."**	What search-words did you use to miss all the APD literature? Just start with the 200+, high quality research studies, from Nina Kraus' lab at Northwest University (www.brainvolts.northwestern.edu/hearingjournal/index/php).
4	**"I had to laugh; about what you guys call APD. It is, of course, really just a language disorder. Yep, you bet it's language."**	What does /b/ mean?? Nothing. Dichotic listening, GAP detection, speech-in-quite vs. -noise, what part of language are they? Also, if APD is language; why is such a high percentage of those we see had years of Speech-Language therapy? Then when we work with them it reduces APD, improves speech, reading, spelling etc. Can you help to explain that?
5	**Recently we've been hearing:** **"AP actually develops from language."**	Do we speak before we are able to babble, or is it the other way around??
6	**You're so quiet, what's your answer?** **"That doesn't deserve an answer. But tell me this, what's the point of testing for APD? There's no therapy for it!"**	While you are on Nina Kraus' website see how many studies they have done with APD therapy with powerful behavioral and electrophysiological results.
7	**"Oh no, if anyone said that there's no APD therapy, what they really meant is there's no research to support it, right?"**	See above
8	**So far you're batting at zero. Id there anything else you'd like to make up?** **"Everyone knows you can't evaluate for APD below 7 years of age – the children are just not mature enough. Just wait till they're 7. That must be correct; two national guidelines say that too. "**	Let's wait till they are 21 so they will be even more mature. For developmental problems professionals want to identify them ASAP. Then start speech or other therapies, offer hearing aids etc. That is to take advantage of child's neural plasticity. No guidelines say not test under 7 and the most recent one says the opposite.

10 Myths about CAPD (cont'd)

9	**Aren't you the guys who boast about evidence based, what's your evidence? "We never said you can't test under 7 for APD, it's just that there aren't any tests to use. Even if there are such tests; they just don't have any norms for such young kiddos."**	While some test developers did not choose to gather norms below 7 years, it does not mean that it can't be done. Look at all the tests that are highly respected and go below 7 years: SSW, SCAN, PS & ASA (with norms to 3-6 years), also a new test by Moncrief goes down to 6 years. Early intervention is logical, ethical & most importantly critical.
10	***"Okay, okay maybe I was a little off on those 9 points, but you'll never convince me that Phonemes are Audiology."***	"Are words audiology" [he nodded *yes*], "Sentences?" Yeah. "Tones, noise, tone pips" Sure. "Then why not phonemes??? He responded: "……."

Dear Ackie
Degree unknown
Address withheld at author's request

OPINION: On CAPD, controversy & do we need to name trump?

***Hearing Review* recently featured** the latest rehash of academic CAPD-bashing in their May, 2016 issue. One wishes such writers might escape their labs and spend some time focusing on real-life CAPD practice. To their credit, they did challenge the "Over-7" rule.

I won't list names comprising the "Never-CAP" voices, but one can't help wondering what myopic definition of "evidence-based" guides their motivation. After each such publication, their views prompt thoughtful responses from well-qualified colleagues providing research-rich answers to their objections. After effectively ignoring these, eventually the same tired laments are regurgitated.

Two things occur to me: first, most CAPD-opponents are not CAPD clinicians or not audiologists. Dare we then infer a possible territorial dispute—even academic hubris—about who gets to "name trump" in diagnosis and management? Healthy professional rapport and respect should render such considerations unnecessary. Unhelpful competition undercuts multi-disciplinary successes and misses the mark of "best practices" in serving our patients, who often become collateral casualties in the academic conflict.

The second characteristic among detractors is a tendency to consider CAPD as exclusively "bottom-up" when determining diagnostic and treatment propriety. The highly integrative nature of processing becomes grossly oversimplified. In their view, all things auditory apparently terminate at Heschl's gyrus.

Granted, we need delineation of professional roles based on scope of practice. But clinical conditions aren't always neatly demarcated along those distinct practice boundaries. If CAPD assessment exposes comorbid deficits, then proper specialists should address all deficit areas, not just cognitive and linguistic performance, ignoring the bottom-up "scaffolding."

Most SLP colleagues would agree that treating problems rooted in poor phonemic processing (and phonemes are primarily auditory signals) with typical therapies may result in less-than-optimal outcomes. To include auditory training emphasizing phonemic reinforcement procedures[1] typically strengthens phonemic infrastructure which can then yield improved therapy outcomes across deficits and disciplines, including supra-modal benefits. The auditory "scaffold" supports our cognitive processes. It is very difficult to consider cognition and audition separately.

To conclude, the vision of IGAPS is to elevate—and disseminate—the professional expertise of CAPD practitioners through education and academic fellowship. In demonstrating strong patient outcomes while contributing to the success of multidisciplinary teams with substance and respect, we will hopefully find fewer challenges to justify our existence and greater opportunities in this underserved area of audiology.

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[1] *E.g., Katz, et. al. Buffalo Model: Phonemic Training Program (PTP) and Phonemic Synthesis Training (PST).*

Getting more from speech-in-noise testing

The SSW and Phonemic Synthesis tests have benefitted from multidimensional scoring for many years. Why not the Speech-in-Noise (SN) test? For the past 12 years I have been trying to figure out if some aspects can be expanded and if qualifiers can be used.

New Features for SN Testing

1. Two of the things we have been keeping track of are delays (X) and extreme delays (XX) on the Speech-in-**Quiet** and Speech-in-**Noise** portions of the Buffalo Battery. Although we do not have norms for SN test Qualifiers (we should include them in the future) they have been very helpful to see if the person actually did well or just pretty/not so well because they took extra time (effort) to respond. Am working on a report right now in which the person had a Noise ear score that was within NLs but had 6 delays and one extreme delay. If the test was timed it would surely have been a failure. So if we ignored Xs and XXs likely we would not get the correct information about the person's processing issues.

Another use of Xs is in a report when you would like the reader to know that this patient is consistently compensating with higher cognitive skills to make up for their CAPD. Delays often lead to some correct answers in communication too, but not timely and importantly expending too much of the person's brain capacity. Over time this leads to fatigue and inattention when the person runs out of steam. [Reminder: we only show an X if there is a delay and the response was correct.]

2. The patient has a Noise score that is outside of NLs. When we subtract Quiet – Noise to reduce the Decoding (DEC) influence, that score is within NLs. What do we do now? We know very well the person has a SN problem (case history, BMQ-R etc. and a significant Noise score) so what is the proper thing to do? We cannot say that the person's poor performance in Noise was not significant, but we can say that it is not a pure TFM sign. The important thing is that the person has trouble in noise. But, based on that score it looks like the problem was a combination of extracting speech from noise and DEC.

For more on Speech-in-Noise Testing and Test Norms go to Free of Charge page 15

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Free of Charge

Can We, or Should, We Provide CAP Services Before Age 7 or 8? (Appendix 1)

Test Explanations:

Staggered Spondaic Word (SSW)

This is a binaural test with different words going to each ear. Some of the words are non-competing (arriving at the two ears at different times) and others are competing (arriving at the two ears at the same time). The patient is to repeat all the words heard. This test provides indicators of APD related to the specific four categories of dysfunction. (List EC, presentation level 50dB SL). Some items are presented from the Right Ear First and some items are presented from the Left Ear First. List of Indicators and their APD category are listed below:

1. RNC- Right Non-Competing: Errors on the right ear items presented without competing words-Global Auditory Processing Deficit
2. RC- Right Competing: Errors on the right ear items when there is a competing message from left ear-Decoding
3. LC- Left Competing: Errors on the left ear items when there is a competing message from right ear-Tolerance Fading Memory
4. LNC- Left Non-Competing: Errors on the left ear items presented without competing words-Decoding
5. Total Errors of all 4 conditions (RNC+RC+LC+LNC)- Global Auditory Processing Deficit
6. Ear High/ Low: Significantly more errors on the Right Ear First items than Left Ear First items-Decoding
7. Ear Low/High: Significantly more errors on the Left Ear First items than Right Ear First Items-Tolerance-Fading Memory
8. Order High/ Low: Significantly more errors on the first 2 words of the items presented than on the last 2 words-Tolerance Fading Memory
9. Order Low/High: Significantly more errors on the last 2 words of the items presented than on the first 2 words- Decoding
10. Type A: Significantly more errors on either Right or left Competing items when compared with each other- Integration
11. Standard Integration Ratio compares left and right ear response errors in the presence of competing messages. SIR score (yellow) of +1.0 SIR or greater is significant & an indication of the Integration category.
12. 2B3: * If 2 or more of the 9 measures are positive then 2B3 is significant for an Integration Problem
13. Reversals: Items repeated accurately however out of order-Organization
14. Delays: Responses not efficient, extra time taken, although responses are accurate-Decoding
15. Tongue Twisters: Knows answer but does not say it right- Tolerance Fading Memory
16. Quick: Starts responding too soon before item is completely presented despite instruction provided to refrain from doing so- Tolerance Fading Memory
17. Perseverations: Repeats word from recent item or repeats error that was given before-Decoding
18. Quiet Rehearsals: Saying the items under breath- lips moving; whispering- Decoding
19. "Yes": Response to carrier phrase "Are you ready?" prior to starting each item despite

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instruction to refrain from doing so. Tolerance-Fading Memory

20. Are You Ready- Repeating the carrier phrase despite instruction given to refrain from doing so. Tolerance-Fading Memory

21. Extreme Delays: Extra time taken to respond accurately although evidently effortless-Integration

22. Available Word: Repeats a word from the item however not in consecutively (white house white dog)- Decoding

23. Back to Back: Repeats a word of the item twice in a row (up up down town)- Decoding

24. Smush-1:Combines parts of two competing words- middle words- typically 2 errors-

Tolerance-Fading Memory

25. Smush-2: Combines first 2 or last 2 (spondee) items (up stairs as upst)- Decoding

26. Intrusive Words: Addition 5th word added in the list while responding despite instruction to refrain from doing so. Decoding or Attention Deficit

27. Available Word: Substitution of the missed word by using a another word heard in the 4 word sequence from the same test item (back door play ground repeated as back ground play ground)-Decoding.

28. Replay: Item replayed because of extraneous or intraneous reasons

29. Instruction: To follow the directions of the test accurately

Cue: To provide complete responses because of unintelligible or partial responses

Dichotic Offset Measure and Therapy:

Dichotic means that each ear gets different signals at the same time. In this specific dichotic task letters of the alphabet were presented for both assessment and therapy at different offset times of 0 milliseconds to 400 milliseconds. The offset time indicates the time gap between the competing signals going into each ear. A 0 millisecond gap means the competing signals to the right and left ear arrive at roughly the same time during the presentation of the item. In this task 2 letters of the alphabet are presented to each ear. Each ear hears 1 letter of the alphabet without competition i.e. non-competing signals and 2 letters with competing signals at different offset measures. Therapy included 10 items of each offset measure for right ear first presentation followed by left ear first presentation. Each therapy session included a total of 20 items for 1 offset measure. Beginning at 500 millisecond offset difference to 0 millisecond offset difference.

Phonemic Synthesis Picture Test:

The task is to blend sounds to identify the word (a type of sound-blending task) by pointing to the picture that corresponds to the word presented. It is primarily an indicator of Phonemic (speech-sound) Decoding. It provides with a total number of correct responses along with qualitative errors.

Qualifiers:

1. First order errors indicate errors on the first sound- Tolerance-Fading Memory

2. Second order responses have errors on

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the second sound- Decoding

3. Third order responses have errors on the final sound-Decoding

Phonemic Synthesis Test:

Words were presented sound-by-sound to both ears via headphones. The task is to blend sounds to identify the word (a type of sound-blending task). It is primarily an indicator of Phonemic (speech-sound) Decoding.

Qualifiers:

1. Delay: Time taken in responding to an item- Decoding

2. Extreme Delay: Response time is very long- Decoding

3. Quick: Not able to wait for the beep prior to responding despite instructions and reminders to wait for the beep- Tolerance-Fading Memory

4. Non-Fused: The individual sounds are repeated without blending completely into a meaningful word- Decoding

5. Quiet Rehearsal: The sounds and responses are practiced silently under the breath- Decoding

6. Reversal: Sounds are reversed with an error in the response (goats for ghost)- Organization

7. O for L (O/L): The items with the /l/ sound is perceived as /ol/ or /o/ (molk for milk)- Decoding

8. Perseveration: A repetition of a response from a previous item either the whole word or a sound from a previous item (bog for dog after hearing the words bake and boat)- Perseveration

9. First sound Omission: Error response due to omission of the first sound in the word (oat for boat)- Tolerance Fading Memory

Word Discrimination Score in Quiet

Right ear and Left ear scores obtained on the W-22 words. It is the ability to hear and understand mono-syllabic words when external and internal redundancies are reduced or eliminated- Decoding

Speech-in-Noise (SN) Test:

Single-syllable recorded word recognition lists presented to each ear individually to evaluate understanding of speech in noise. The correct responses scored in quiet and in noise are compared to determine the influence of the noise. Speech to noise ratio of +5 db was presented. The difference of the influence in noise between the two ears are compared to calculate the inter-aural difference in noise conditions- Tolerance-Fading Memory and Decoding

Each of the Auditory Processing Deficits categories is described below:

- Decoding (DEC) refers to the ability to quickly and accurately digest speech. In addition to these listening problems we often see difficulty with phonics, articulation, reading accuracy, problems in understanding directions and other limitations when the child was younger, at present or when faced with these challenges in the future.
- Tolerance-Fading Memory (TFM) refers to a combination of poor understanding of speech

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in a background of noise as well as difficulty with short-term auditory memory. In addition to short-term memory and speech-in-noise limitations the child is likely to have reading comprehension difficulty and remembering directions. Expressive language issues are common in this group (spoken, written or both).

- Organization (ORG) refers not only to the ability to organize ones thoughts etc. but also to sequencing. In isolation, sequencing limitations have no major academic or communicative difficulties (although problems organizing term papers, expressing ideas in an organized way and spelling reversals are often seen). But ORG is a labor-intensive problem, requiring a great deal of monitoring of both information that is heard or even seen (likely because we say the words/numbers to ourselves) and what the person says and writes. This takes away brain capacity from other important tasks. ORG when combined with other APD problems reduces the person's capacity and increases frustration and confusion.
- Integration (INT) refers to a wide variety of symptoms and problems that differ from child to child. The basic characteristic appears to be difficulty in bringing information together. In some children it is associated with severe reading and spelling problems while in some it is simply associated with very poor spelling.

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Getting more from speech-in-noise testing (cont'd)

The speech we hear must be decoded if we are to use it for any purpose. Thus, most likely:

1. A significant Speech-in-Quiet score can serve as a Decoding sign, and
2. A significant Speech-in-Noise sign represents a noise failure or TFM.
3. As stated above the difference score does not erase the difficulty in noise but ideally checks to see if DEC difficulty may have put it over the top. If a person has a significant Noise score but the difference score is not; it is reasonable to conclude that DEC played a part.
4. A significant Speech-in-Quiet score is a DEC problem column that I have been using effectively, of late. If the Quiet-Noise difference score is within normal limits; I think the Noise score should be considered a combined TFM-DEC category.
5. These examples show just one Noise, one Quiet and one Diff score. There are actually 6 of these scores because each can be right or left. For now let's see some simple illustrations.

Here are some examples:

If Quiet, Noise and Difference scores are all positive; this is what the data are telling us:

Measure	Sig/ NS	Category
Speech-in-Noise	+	TFM
Speech-in-Quiet	+	DEC
Quiet-Noise Diff	+	TFM

If the Noise scores are significant, but not the Quiet scores that would not influence the other 2 findings.

Now what if the Quiet and Noise scores were significant but not the Diff score:

Measure	Sig/ NS	Category
Speech-in-Noise	+	TFM-DEC
Speech-in-Quiet	+	DEC
Quiet-Noise Diff	-	--

Again in this case it is not necessary for Quiet to be significant. However, I'd change Noise to TFM-DEC.

In a small number of cases we see that the Noise score did not reach significance by itself, but the Quiet-Noise Diff was significant:

Measure	Sig/ NS	Category
Speech-in-Noise	-	--
Speech-in-Quiet	-	--
Quiet-Noise Diff	+	TFM

This shows that when we subtracted for DEC the Diff score was significant. The Diff enabled us to see TFM.

This system has served me well for a number of years. As you know getting it right is the important thing. Situations can arise in which

Getting more from speech-in-noise testing (cont'd)

the professionals have to use their best judgments or check with S&E/IGAPS friends to increase the chances of being correct.

Here are the 6 SN measures and their possible positive outcomes and #7 to be discussed.

#	Indicator	Significant Findings
1	Right Quiet	DEC
2	Left Quiet	DEC
3	Right Noise	TFM/ TFM-DEC
4	Left Noise	TFM/ TFM-DEC
5	Right Q-N Diff	TFM
6	Left Q-N Diff	TFM
7	RE (Q-N Diff) - LE (Q-N Diff)	TFM

What about Ear Diff Scores (#7 above)? We surely want to see if the Diff score between ears is significant. Would that show a problem for the person? Surely it would (and now that I have that problem myself), I am positive of this.

I often tell parents that there are 3 major contributors to speech-in-noise ability: Right ear performance, Left ear performance and the "binaural advantage". The binaural advantage is because the 2 signals can be combined, adding 3-dimentionality and 6dB. But when the 2 signals don't match then combining them is much less effective. When my WRS was quite poor on one side I could hear different things on the 2 sides (like high and low frequency tinnitus in opposite ears) or only hear it in one ear.

For example, we know if a person has good hearing, but in one ear has a plug they will have difficulty localizing sound because the brain can't efficiently combine dissimilar signals in the 2 ears. We know they will also have more trouble in noise, so if the performances in the 2 ears are different it suggests, for whatever reason, that the 2 ears are not reliable predictors of one another. So we now check to see if there is a big difference between them, as that would suggest a weaker binaural advantage. I suspect that it primarily should be a noise finding and could produce a major problem.

This table shows the Noise norms:

Norms for (R Q-N Diff)-(L Q-N Diff)

Age	Left Ear Poorer	Right Ear Poorer	RE-LE Diff
5	-5.6	5.6	-11 +5
6	-3.9	8.7	-9 +8
7	-3.9	8.7	-9 +8
8	-11.4	8.0	-11 +9
9	-11.4	8.0	-11 +9
10	-11.4	8.0	-11 +9
11	-10.3	7.5	-10 +8
Adult	-7.9	7.3	-8 +7

Getting more from speech-in-noise testing (cont'd)

Some of you may not have the Quiet/ WRS norms. My apologies. Here they are:

Age	Left Ear	Right Ear
5	88	84
6	88	85
7	90	88
8	90	88
9	90	88
10	90	91
11	93	91
Adult	93	94

Finally

I think the 3 Buffalo Model tests are broad and powerful. What makes them so useful is that they provide more than 1 or 2, yes-no descriptions of the person's performance. They provide useful categories and they help you to see nuances of the individual you are evaluating. This was especially true for the SSW and PS tests. I hope this will provide similar insights for the SN test.

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