Is there evidence to support

Personal Hearing Devices for CAPD Management (?)

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EAR-Central, PLLC

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CAPD Diagnosis and Treatment
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What *is* CAPD Really?

"It should be noted that a diagnosis of CAPD does not necessarily describe a single, unitary disorder, but actually represents a group of clinical entities which – individually or occurring together – often comorbid with other supramodal influences, can result in communicative difficulties for a patient. …"

-- Michael Webb

EAR-Central, PLLC

What *is* CAPD Really?

"…Symptoms like poor speech-in-noise performance, temporal processing problems, "amblyaudia" (abnormal integration of the signals from the two ears in the brain), spatial processing disorder (SPD), phonemic decoding; etc., represent some of the clinical manifestations that are included in CAPD. Professional differential diagnosis by a qualified neuro-audiological specialist and other relevant professionals is critical."

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-- Michael Webb

Is CAPD Management a Reality?

>While all manifestations of CAPD are not exclusively auditory-specific; neither are the associated, comorbid supra-modal deficits "auditory-independent."

>"Auditory Fingerprint" ("Footprint"-F. Musiek)

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Is CAPD Management a Reality?

>Ideally, "Management as Reality" can be achieved by professional competence, cooperation, mutual respect, and the reciprocal sharing of ideas and relevant outcomes.

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What is "Management?"

Merriam-Webster:

"Management is *judicious* use of *means* to accomplish an *end*."

Is our "Management" characterized by having and exercising sound [clinical] judgment (i.e., "*judicious*")?

What is "Management?"

Merriam-Webster:

"Management is *judicious* use of *means* to accomplish an *end*."

Are our "Management" processes and procedures (i.e.,"*means*") guided and informed by this sound clinical judgment?

What is "Management?"

Merriam-Webster:

"Management is *judicious* use of *means* to accomplish an *end*."

Do our "Management" processes and procedures guided by sound clinical judgment produce a beneficial *outcome* (i.e., "*end*")?

Personal Hearing Devices for CAPD Management

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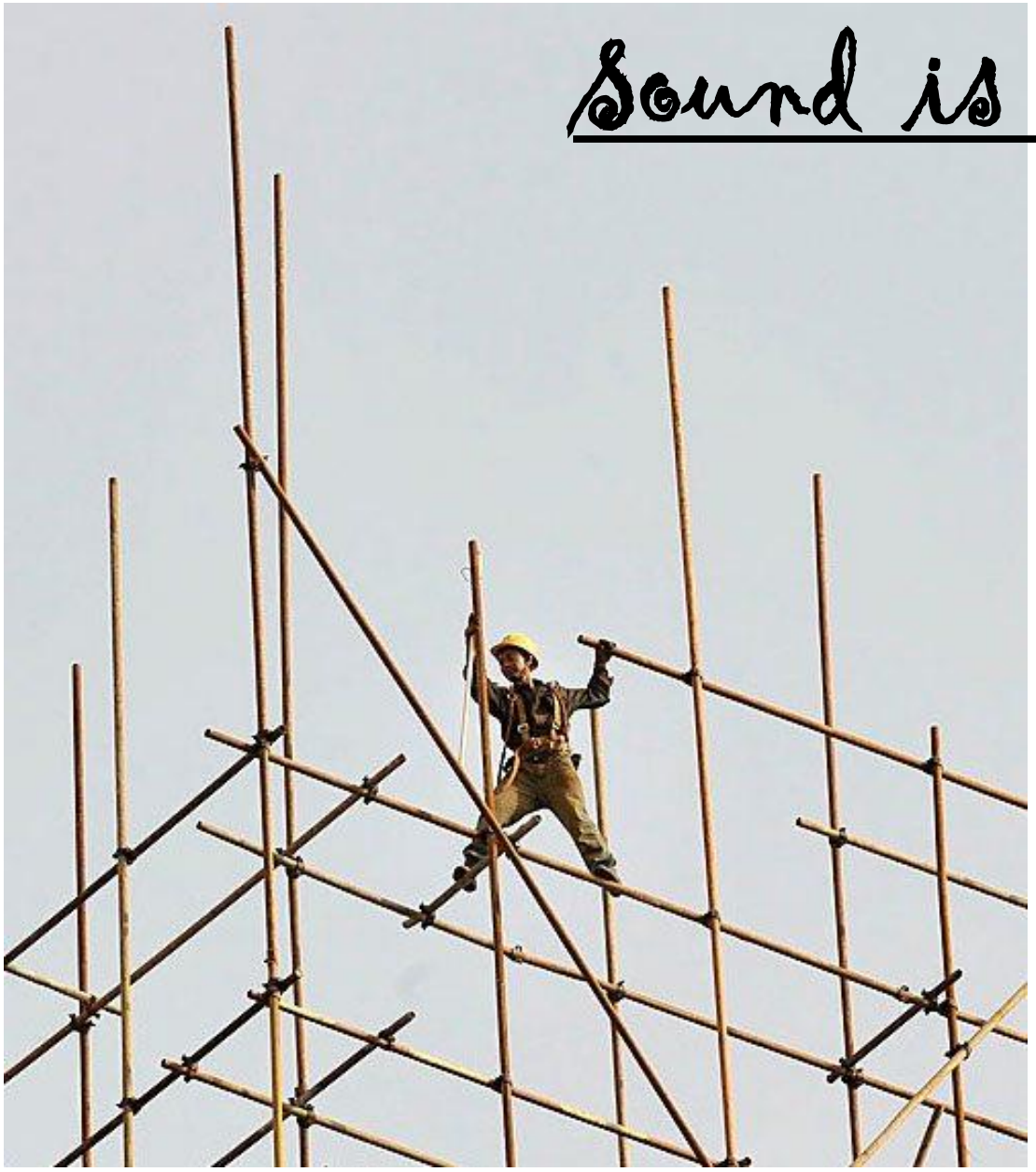


Sound is Scaffolding

...Cognition is the Edifice

"Active participation with sound is the scaffolding of cognition."

--Nina Kraus*

Deficit-Specific Interventions

Both ASHA & AAA guidelines address the principles that should guide management of CAPD.

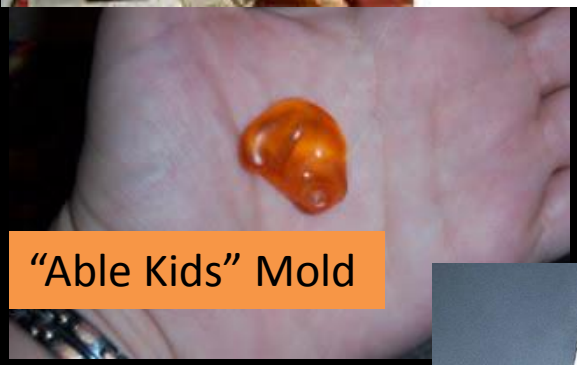
They specify:

- Interventions should be related to particular deficits
- To capture the power of neuroplasticity, therapy interventions should be regular-- frequent and robust. Multi-modal stimuli are likely advantageous.
- "*Neurons that fire together, wire together.*" (Hebb)

Personal Hearing Device (PHD) Options

- With rare exceptions, CAPD ***is***, at least in part, a "Hearing [**Listening**] Deficit" (though *not* a "hearing loss."): ***like a "conductive pad" in the CANS.***
- Partial helps for signal improvement in CAPD are
  - Increased audibility (especially for consonants)
  - Reduced background noise (Better SNR)
  - Mitigation of effects of acoustics and distance
  - Direct, clear access to target voices (Teachers; etc.)

Non-Electronic Alternatives



"Able Kids" Mold

Free Demo Today Only!

Personal Hearing Device (PHD) Options

- Kuk, et.al. JAAA (2008), "Personal Amplification for School-Aged Children with [APD]." Improved scores on APD tests and classroom performance after use.
- Now with the proliferation of wireless accessories (esp. companion mikes, Streamer/FM & DM boots) the options for classroom use have exploded.
- Plus, a PHD system is BINAURAL & Portable.

Personal Hearing Device Options

- We have fitted scores of Adult and Pediatric CAPD patients with these systems with very positive responses in most cases. Good TBI outcomes.
- Personal Devices/Streamer should be considered as a stand-alone (or combined with FM, if available) option for auditory enhancement if possible. Always with a trial period! Real-Ear verification is critical!

Hearing Aid Considerations

"Sometimes 'more' isn't better, Linus: sometimes it's just 'more.'"

--Sabrina

- **Digital features are largely strategies to compensate for poor cochlear function**
- **Aggressive feedback systems aren't as critical (minimal gain)**
- **Multi-band processing and noise reduction systems aren't critical with such narrow fitting parameters**
- **Complex directionality schemes (polar-plot "nulls"/ binaural "spatial sound" processing likely won't benefit significantly**
- **Sometimes complex features: multi-bands, compression factors (WDRC), noise features/switching, feedback systems; etc., introduce signal delays, circuit noise, and faint distortions (artifacts), usually not audible to cochlear hearing losses but possibly intrusive to CAPD patients. More linear is often better (think output limiting--again, think "conductive.")**

Hearing Aid Considerations (Cont'd)

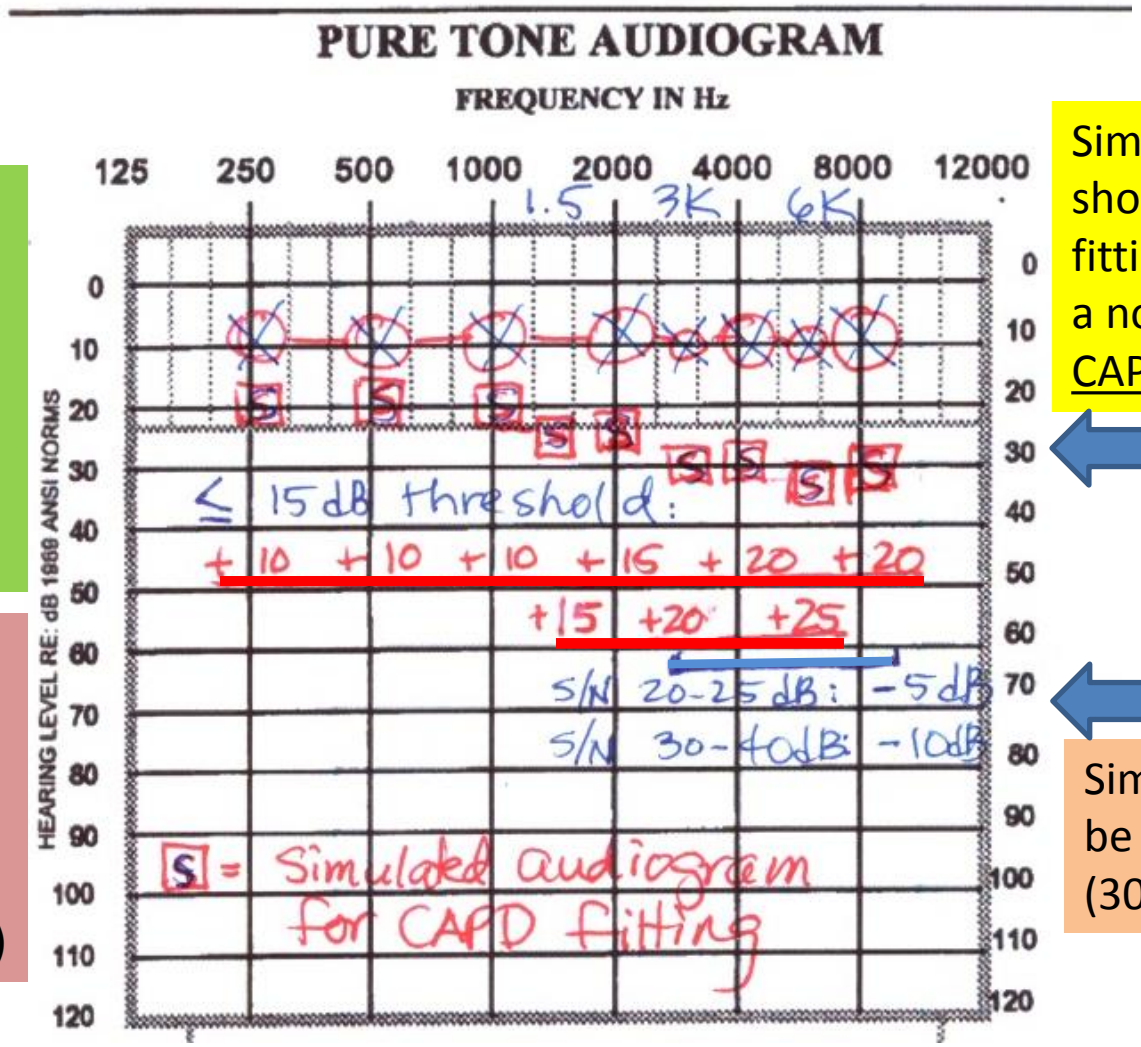
But don't scrimp on the important stuff!

- **Do get bluetooth streamer/companion mike capability. (FM/DM Jack). Avoid dedicated iPhone/Android systems!***
- **Streamer with capability to mute onboard environmental microphones while in streaming modes.**
- **Do get a T-Coil (or at least a streamer with onboard T-coil)**
- **I prefer to offer unlinked (independent) bi-directional VCs for the two ears (avoid HA's with "sprinkler" VC or no VC at all.)**
- **For pediatrics, get a good pediatric support package and warranty. (L&D ins!)**
- **Function over form. BUT! For tweens/teens, compromise may be needed.***

Suggested Gain Correction Factors

Flat, Reverse audiograms (>20 dB in LFs), or frequencies with A/B gaps may need extra gain (+ 5-10 dB)

+/- occluding earmolds will usually require less gain (not recommended for < 25 dB loss)



Simulated Audiogram should be inputted in fitting software (with a note: "Simulated for CAPD Fitting."

Simulated Gain should be reduced in HFSNHL (3000-8000 Hz only)

General Fitting Guidlines

- **I prefer a full-directional program for the default memory.**
- **For kids under 7, I usually only set up one memory at the beginning, with no active controls. With experience, add VC.**
- **For older kids/ adults, I will typically add an omni program as secondary, and possibly a T-program for loops or landlines (but usually not necessary)**
- **Experimenting with adaptive directionality may be useful in some cases.**
- **I usually start with a mid-level adaptation setting and, if tolerated well, increase to full target after 1-2 weeks.**

General Fitting Guidelines (Cont'd)

- **Acclimatization period should build ASAP to include class-time at a minimum. I encourage them to expand use to other life situations (esp. competitive), but don't demand it. Most use the HA's full time [=f(age)]**
- **After one month of use, provide parents/teacher(s) questionnaire(s): BMQ-R, CHAPPS, Q-SAO/ CAPD-C [COSI, APHAB]**
- **After 3-6 months, do probe CAPD behavioral retests to gauge benefit and assist in choosing further therapeutic interventions (as needed).**
- **Follow-up ABR/CAEPs after 9-12 months (if applicable).**

Questionnaire for Assessing Subjective Amplification Outcomes in Child CAPD Patients
(Q-SAO/ CAPD-C)

Q-SAO /CAPD-C (Children)

How long has your child worn personal hearing devices (PHD) to treat communication difficulties associated with central auditory processing disorder (CAPD)?

Describe **auditory symptoms** which s/he experienced prior to/ after beginning CAPD treatment with PHDs:

(Circle best option: ***Use different colored pens or pencils for "before" and "after" responses.***)

Rating: 1-*Not at all*, 2-*Rarely*, 3-*Occasional*, 4-*Frequently*, 5-*Constant/ Crisis*

a) Poor word recognition in quiet environments ("Huh?" a lot) **[1 - 2 - 3 - 4 - 5]**
b) Poor word recognition in classes / noisy environments **[1 - 2 - 3 - 4 - 5]**
c) Poor ability to maintain auditory attention **[1 - 2 - 3 - 4 - 5]**
d) Poor word recognition with soft-spoken people **[1 - 2 - 3 - 4 - 5]**
e) Poor word recognition from speakers/signals at a distance (> 6 feet) **[1 - 2 - 3 - 4 - 5]**
f) Poor word recognition with rapid speech presentations **[1 - 2 - 3 - 4 - 5]**
g) Poor word recognition with television/ Likes volume louder **[1 - 2 - 3 - 4 - 5]**
h) Poor word recognition in movie theaters **[1 - 2 - 3 - 4 - 5]**
i) Poor word recognition in live theater **[1 - 2 - 3 - 4 - 5]**
j) If in lectures, poor understanding even with strategic/ preferential seating **[1 - 2 - 3 - 4 - 5]**
k) Increased stress or anxiety in communication situations or afterwards (especially after school) **[1 - 2 - 3 - 4 - 5]**
l) Increased fatigue in listening situations or afterwards (e.g., after school) **[1 - 2 - 3 - 4 - 5]**
m) Poor "auditory presence" (volume/ brightness / comfortable & easy access to signals)—often signaled by complaints of "It's not clear." **[1 - 2 - 3 - 4 - 5]**
n) Difficulty maintaining focus / attention in an extended conversation **[1 - 2 - 3 - 4 - 5]**
o) Frustration felt because communication partners express impatience or frustration (teacher(s), peers, family; etc.) **[1 - 2 - 3 - 4 - 5]**
p) Impaired relationship(s) attributable to partner frustration in communication **[1 - 2 - 3 - 4 - 5]**
q) Difficulty when visual cues (like facial/lips) were absent or limited **[1 - 2 - 3 - 4 - 5]**
r) Difficulty on the telephone (direct to ear) or when listening with one ear (e.g., monaural headset/ earbud, whisper to one side; etc.) **[1 - 2 - 3 - 4 - 5]**
s) Diminished appreciation of music or reduced subjective quality **[1 - 2 - 3 - 4 - 5]**
t) Difficulty understanding song lyrics **[1 - 2 - 3 - 4 - 5]**
u) Negative academic progress due to auditory challenges **[1 - 2 - 3 - 4 - 5]**
v) Poor linguistic processing (phonics, reading, spelling, word problems in math **[1 - 2 - 3 - 4 - 5]**
w) Withdrawal from desired activities due to poor auditory performance **[1 - 2 - 3 - 4 - 5]**
x) Poor confidence (anxiety) in communication situations **[1 - 2 - 3 - 4 - 5]**
y) Depression related to communication struggles **[1 - 2 - 3 - 4 - 5]**
z) Observable diminished self-esteem or quality of life due to auditory issues **[1 - 2 - 3 - 4 - 5]**

On the back of this page, please describe other significant improvements or elaborate on any impacts of PHD use which have affected your child (pos./neg.).

Questionnaire for Assessing Subjective Amplification Outcomes in Adult CAPD Patients
(Q-SAO/ CAPD-A)

Q-SAO /CAPD-A (Adults)

How long have you worn personal hearing devices (PHD) to treat communication difficulties associated with central auditory processing disorder (CAPD)?

Describe **auditory symptoms** which you experienced prior to/ after beginning CAPD treatment with PHDs:

(Circle best option: ***Use different colored pens or pencils for "before" and "after" responses.***)

Rating: 1-*Not at all*, 2-*Rarely*, 3-*Occasional*, 4-*Frequently*, 5-*Constant/ Crisis*

a) Poor word recognition in quiet environments ("Huh?" a lot) **[1 - 2 - 3 - 4 - 5]**
b) Poor word recognition in noisy / competitive environments **[1 - 2 - 3 - 4 - 5]**
c) Poor word recognition in poor acoustic environments **[1 - 2 - 3 - 4 - 5]**
d) Poor word recognition with soft-spoken people **[1 - 2 - 3 - 4 - 5]**
e) Poor word recognition from speakers/signals at a distance (> 6 feet) **[1 - 2 - 3 - 4 - 5]**
f) Poor word recognition with rapid speech presentations **[1 - 2 - 3 - 4 - 5]**
g) Poor word recognition with television/ Likes volume louder **[1 - 2 - 3 - 4 - 5]**
h) Poor word recognition in movie theaters **[1 - 2 - 3 - 4 - 5]**
i) Poor word recognition in live theater **[1 - 2 - 3 - 4 - 5]**
j) If in lectures, poor understanding even with strategic/ preferential seating **[1 - 2 - 3 - 4 - 5]**
k) Increased stress or anxiety in communication situations or afterwards (especially after workl) **[1 - 2 - 3 - 4 - 5]**
l) Increased fatigue in listening situations or afterwards (e.g., after work) **[1 - 2 - 3 - 4 - 5]**
m) Poor "auditory presence" (volume/ brightness / comfortable & easy access to signals)—often signaled by complaints of "It's not clear." **[1 - 2 - 3 - 4 - 5]**
n) Difficulty maintaining focus / attention in an extended conversation **[1 - 2 - 3 - 4 - 5]**
o) Frustration felt because communication partners express impatience or frustration (worker(s), peers, family; etc.) **[1 - 2 - 3 - 4 - 5]**
p) Impaired relationship(s) attributable to partner frustration in communication **[1 - 2 - 3 - 4 - 5]**
q) Difficulty when visual cues (like facial/lips) were absent or limited **[1 - 2 - 3 - 4 - 5]**
r) Difficulty on the telephone (direct to ear) or when listening with one ear (e.g., monaural headset/ earbud, whisper to one side; etc.) **[1 - 2 - 3 - 4 - 5]**
s) Diminished appreciation of music or reduced subjective quality **[1 - 2 - 3 - 4 - 5]**
t) Difficulty understanding song lyrics **[1 - 2 - 3 - 4 - 5]**
u) Negative work/career outcomes due to auditory challenges **[1 - 2 - 3 - 4 - 5]**
v) Poor reading comprehension/ recall **[1 - 2 - 3 - 4 - 5]**
w) Withdrawal from desired activities due to poor auditory performance **[1 - 2 - 3 - 4 - 5]**
x) Poor confidence (anxiety) in communication situations **[1 - 2 - 3 - 4 - 5]**
y) Depression related to communication struggles **[1 - 2 - 3 - 4 - 5]**
z) Observable diminished self-esteem or quality of life due to auditory issues **[1 - 2 - 3 - 4 - 5]**

On the back of this page, please describe other significant improvements or elaborate on any impacts of PHD use which have affected your child (pos./neg.).

Q-SAO/ CAPD-C:

Score Sheet (Computer)

PRE-HA

POST-HA

5- Constant →																									
4- Frequent →																									
3- Occasional →																									
2- Rarely →																									
1- Never →	N	O		P	E	R	C	E	I	V	E	D		D	I	F	F	I	C	U	L	T	I	E	S	
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Word Recognition	Poor WRS in Quiet ("Huh?")	Poor WRS in Class/ Noise	Poor Auditory Attention	Poor WRS for Soft Speakers	Poor WRS for Speakers >6 ft.	Poor WRS for Rapid Speech	Poor WRS for TV/ Volume Up	Poor WRS for Movie Theater	Poor WRS for Live Theater	Poor WRS in class w/ Pref. Seats	Diff. when no visual cues	Diff. on phone/ monaural													
Sound Quality													*Poor "Auditory Presence"*												
Relational Impact														Impaired Relationships	Hurt by Partner Frustration										
Success																Difficulty w/ focus & Attn.	Neg. Academic Outcomes	Poor Linguistic Processing	< Music Appreciation/Quality	Difficulty w/ Song Lyrics	> Communication fatigue	> Comm. Stress / Anxiety	< Activities due to APD	Poor confidence in Comm.	Depression related to APD	< Self-Esteem due to APD
Music Enjoyment																									
Personal Impacts																									

Q-SAO/ CAPD-C:
Score Sheet (Hand Graphing)

PRE-HA

POST-HA

5- Constant →	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
4- Frequent →	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
3- Occasional →	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
2- Rarely →	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
1- Never →	N	O		P	E	R	C	E	I	V	E	D		D	I	F	F	I	C	U	L	T	I	E	S	

	Poor WRS in Quiet ("Huh?")	Poor WRS in Class/ Noise	Poor Auditory Attention	Poor WRS for Soft Speakers	Poor WRS for Speakers >6 ft.	Poor WRS for Rapid Speech	Poor WRS for TV/ Volume Up	Poor WRS for Movie Theater	Poor WRS for Live Theater	Poor WRS in class w/ Pref. Seats	> Comm. Stress / Anxiety	> Communication fatigue	Poor "Auditory Presence"	Difficulty w/ focus & Attn.	Hurt by Partner Frustration	Impaired Relationships	Diff. when no visual cues	Diff. on phone/ monaural	< Music Appreciation/Quality	Difficulty w/ Song Lyrics	Neg. Academic Outcomes	Poor Linguistic Processing	< Activities due to APD	Poor confidence in Comm.	Depression related to APD	< Self-Esteem due to APD
Word Recognition																									
Personal Impacts																									
Success																									
Relational Impact																									
Music Enjoyment																									
Other																									

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

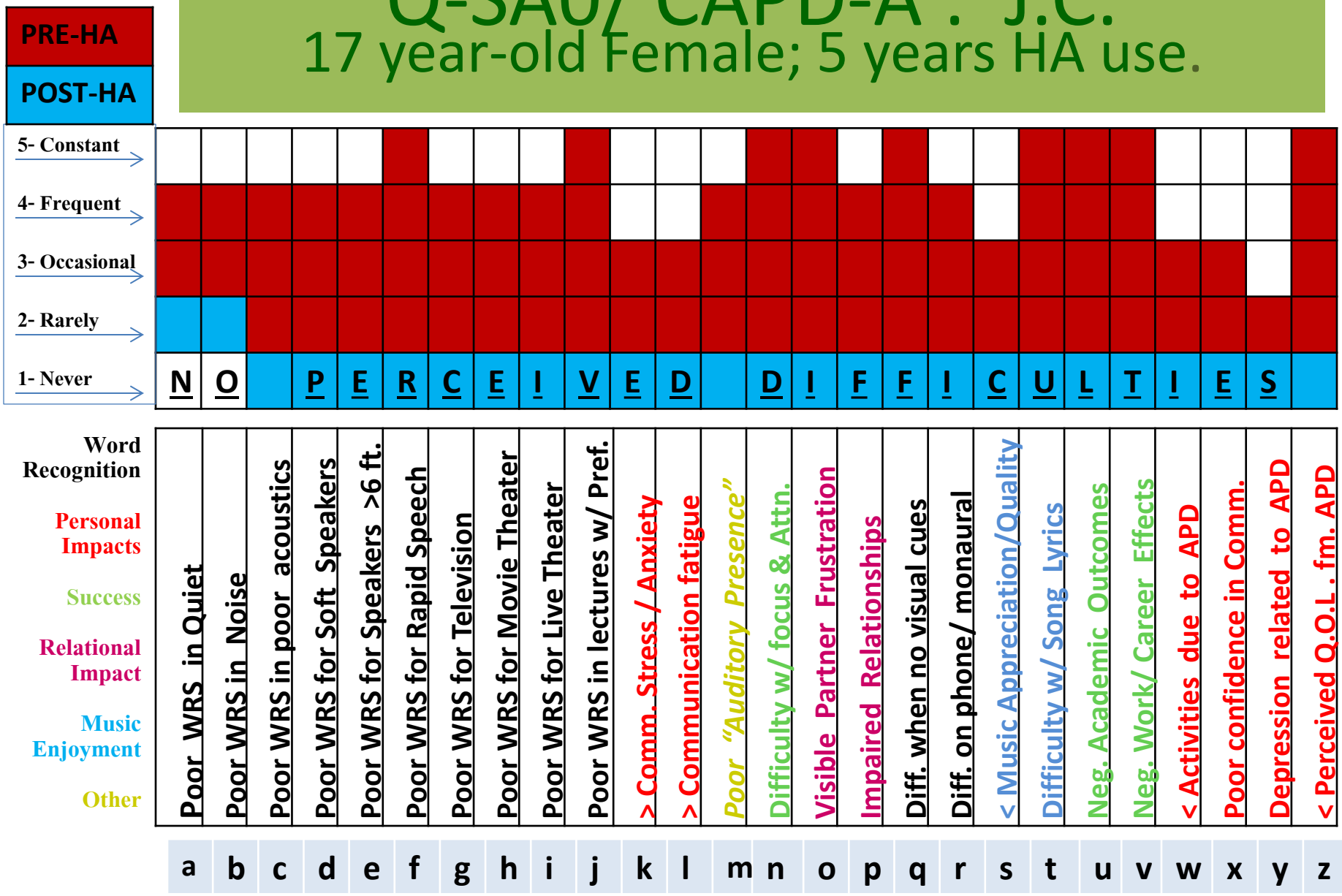
Personal Hearing Devices (PHDs)

CAPD Case Studies

EAR-Central, PLLC

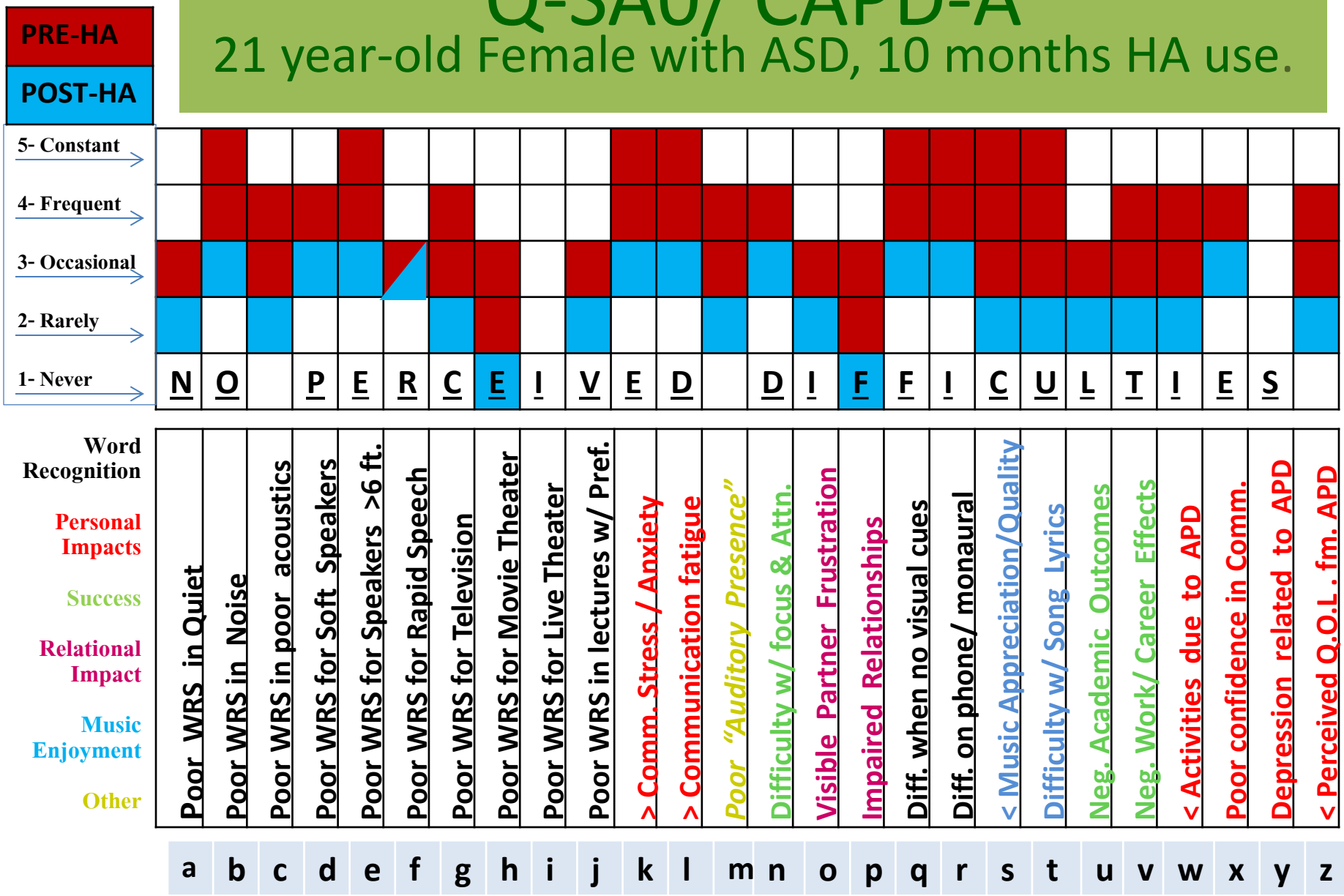
Q-SA0/ CAPD-A : J.C.

17 year-old Female; 5 years HA use.

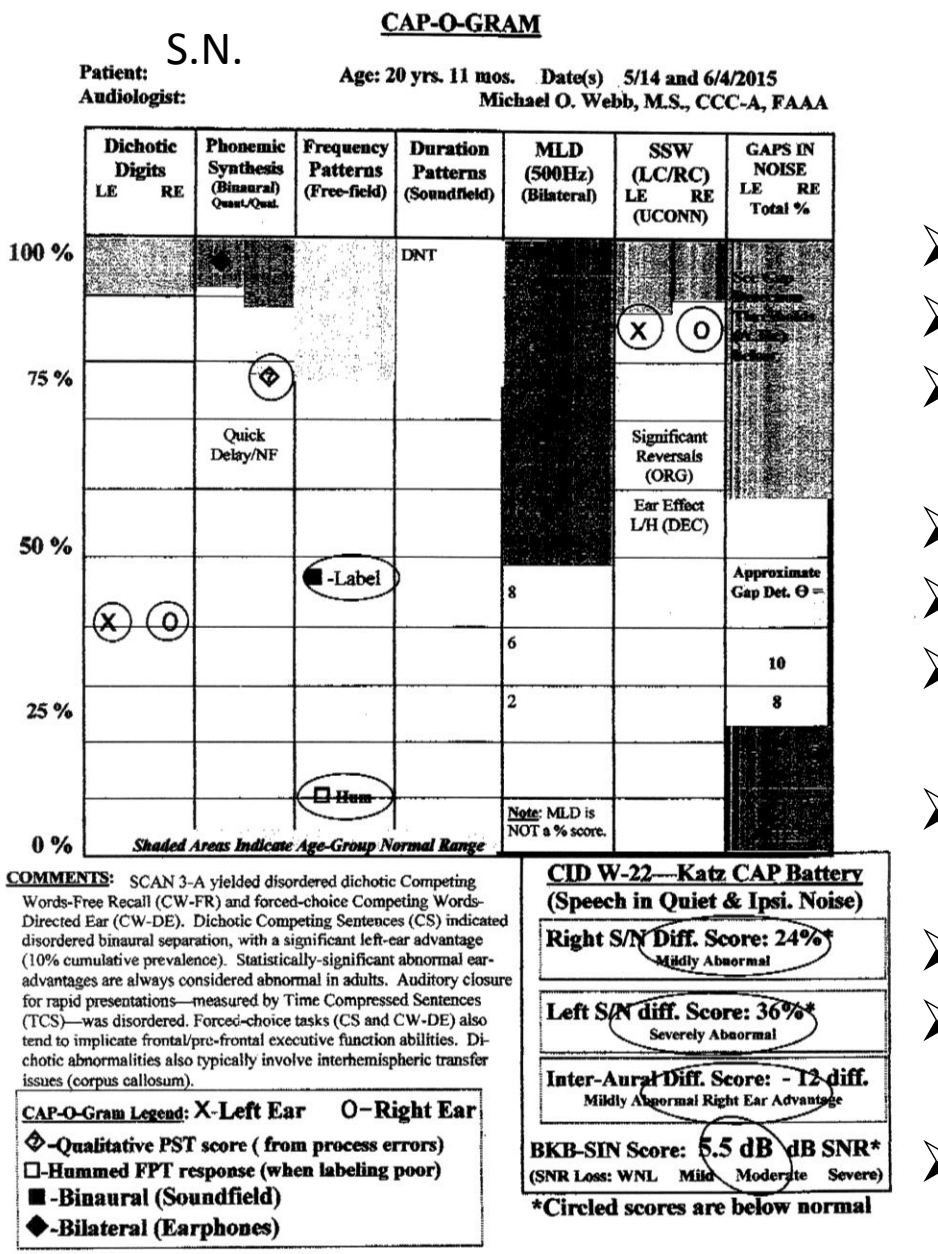


Q-SA0/ CAPD-A

21 year-old Female with ASD, 10 months HA use.



S.N., 21 y.o. Female (ASD)



S.N.

CAP-O-GRAM

Patient:
Audiologist:

Age: 20 yrs. 11 mos. Date(s) 5/14 and 6/4/2015
Michael O. Webb, M.S., CCC-A, FAAA

	Dichotic Digits LE RE	Phonemic Synthesis (Binaural) Quant./Qual.	Frequency Patterns (Free-field)	Duration Patterns (Soundfield)	MLD (500Hz) (Bilateral)	SSW (LC/RC) LE RE (UCONN)	GAPS IN NOISE LE RE Total %
100 %				DNT		X O	
75 %		Quick Delay/NF				Significant Reversals (ORG)	
						Ear Effect L/H (DEC)	
50 %	X O		-Label		8		Approximate Gap Det. Θ =
					6		10
25 %					2		8
0 %			Hum		Note: MLD is NOT a % score.		

Shaded Areas Indicate Age-Group Normal Range

COMMENTS: SCAN 3-A yielded disordered dichotic Competing Words-Free Recall (CW-FR) and forced-choice Competing Words-Directed Ear (CW-DE). Dichotic Competing Sentences (CS) indicated disordered binaural separation, with a significant left-ear advantage (10% cumulative prevalence). Statistically-significant abnormal ear-advantages are always considered abnormal in adults. Auditory closure for rapid presentations—measured by Time Compressed Sentences (TCS)—was disordered. Forced-choice tasks (CS and CW-DE) also tend to implicate frontal/pre-frontal executive function abilities. Dichotic abnormalities also typically involve interhemispheric transfer issues (corpus callosum).

CAP-O-Gram Legend: X-Left Ear O-Right Ear
◈-Qualitative PST score (from process errors)
□-Hummed FPT response (when labeling poor)
■-Binaural (Soundfield)
◆-Bilateral (Earphones)

CID W-22—Katz CAP Battery
(Speech in Quiet & Ipsi. Noise)

Right S/N Diff. Score: 24%* Mildly Abnormal

Left S/N diff. Score: 36%* Severely Abnormal

Inter-Aural Diff. Score: - 12 diff. Mildly Abnormal Right Ear Advantage

BKB-SIN Score: 5.5 dB dB SNR*
(SNR Loss: WNL Mild Moderate Severe)

*Circled scores are below normal

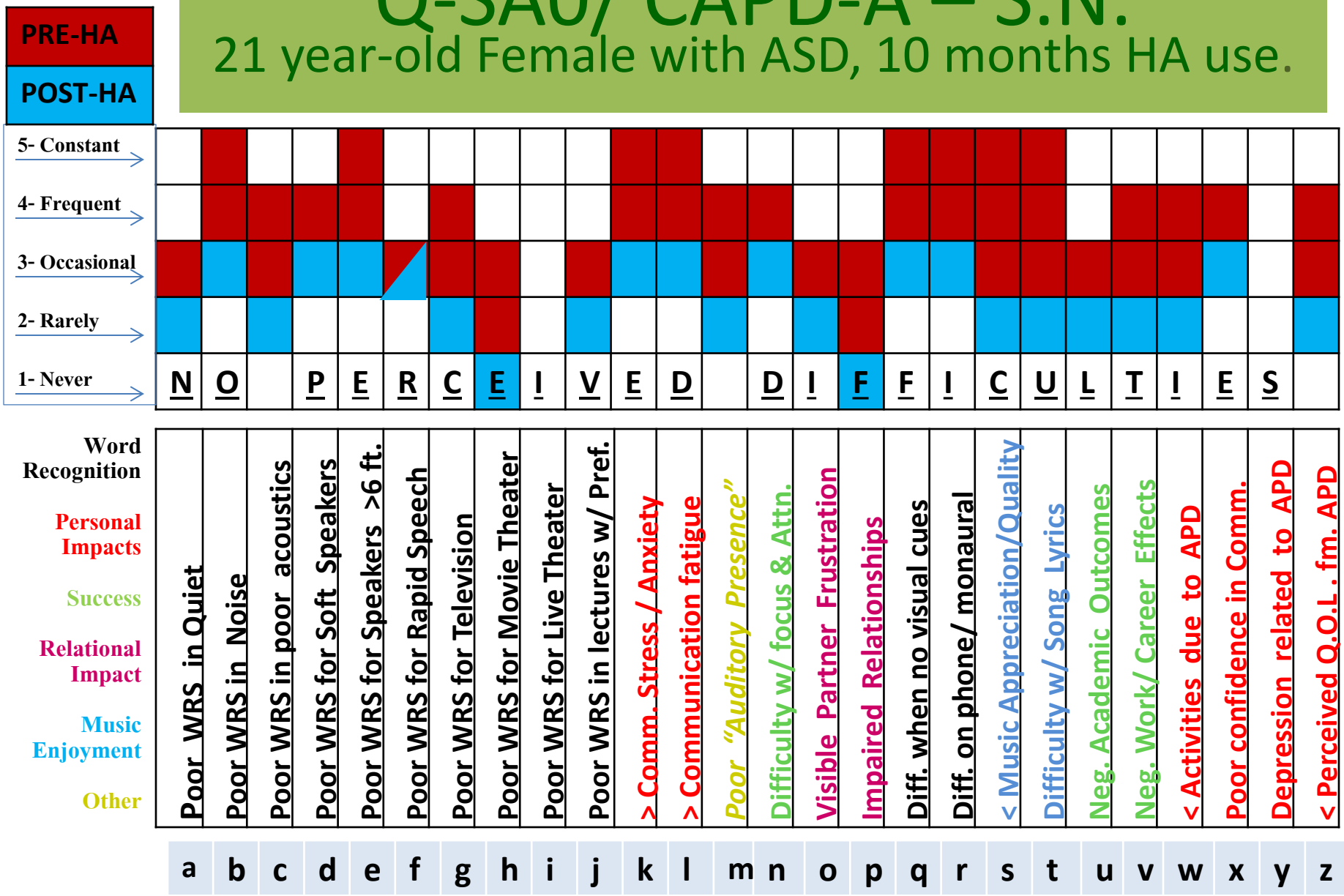
#5650 P.004 /029

02/12/2016 10:31 5204589623

- High-fn. Autism, dyslexia
- Left-hand dominant
- Reading (sight words), Spelling/word problems
- Poor comprehension
- Distractibility
- Poor musical aptitude and rhythm. Disliked music
- Learned ASL to support her communication
- Poor laterality/localization
- Poor auditory awareness/ alerting
- Failed course due to teacher's accent.
- Family Hx reading problems

Q-SA0/ CAPD-A – S.N.

21 year-old Female with ASD, 10 months HA use.

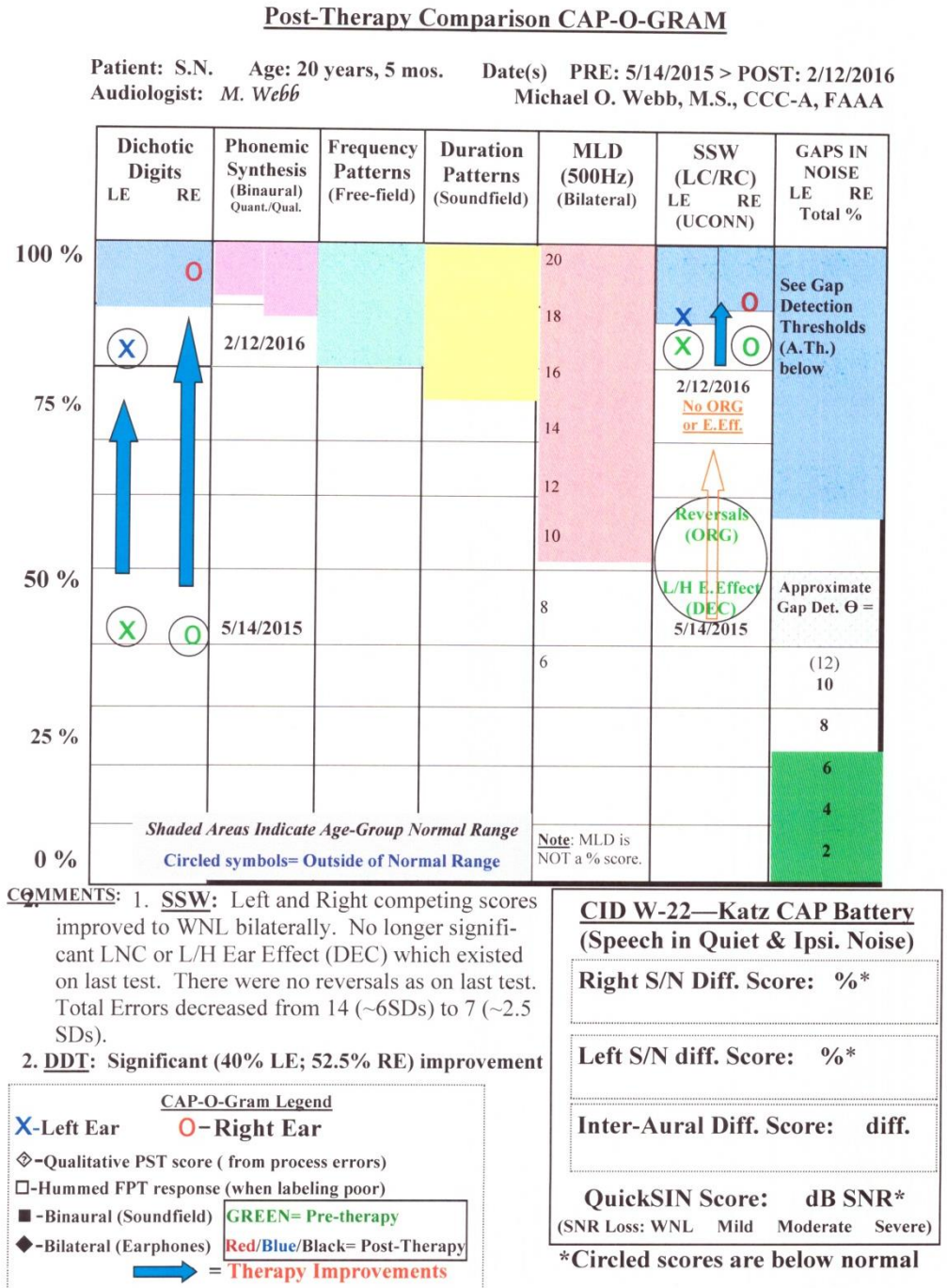


S.N.

Subjective Comments

- Running water has most facnating Sound
- Walking on gravel + Leaves is a splinded passtime Beacuse I can hear it!!
- Birds have Sound Not just ~~noise~~ noise
- I dont startlig as easy from sudden noise
- I now understand "why" people Listen to music + Like it.
- Beacuse I can ~~here~~ hear + understand music I have expanded my music Likes drastically
- Goats make distictive Sounds
- Can have conversation in noisy welding Lab
- Dont have to be directly infront of Someone to hear them they can be a little distance away
- Can have conversation in Grocery store + enjoy it.
- Can be included in coveration at restrount
- Roomate Notices diffence ~~with~~ with + without hearing aids in
- muitaple people talking easier to track
- Some noises demand my attion
- drawn more to looking at peoples faces

S.N., Post-10 mo. PHD Use SSW/DDT



COMMENTS: 1. SSW: Left and Right competing scores improved to WNL bilaterally. No longer significant LNC or L/H Ear Effect (DEC) which existed on last test. There were no reversals as on last test. Total Errors decreased from 14 (~6SDs) to 7 (~2.5 SDs).

2. DDT: Significant (40% LE; 52.5% RE) improvement

CAP-O-Gram Legend

X-Left Ear O-Right Ear

◇-Qualitative PST score (from process errors)

□-Hummed FPT response (when labeling poor)

■-Binaural (Soundfield) GREEN= Pre-therapy

◆-Bilateral (Earphones) Red/Blue/Black= Post-Therapy

= Therapy Improvements

CID W-22—Katz CAP Battery
(Speech in Quiet & Ipsi. Noise)

Right S/N Diff. Score: %*

Left S/N diff. Score: %*

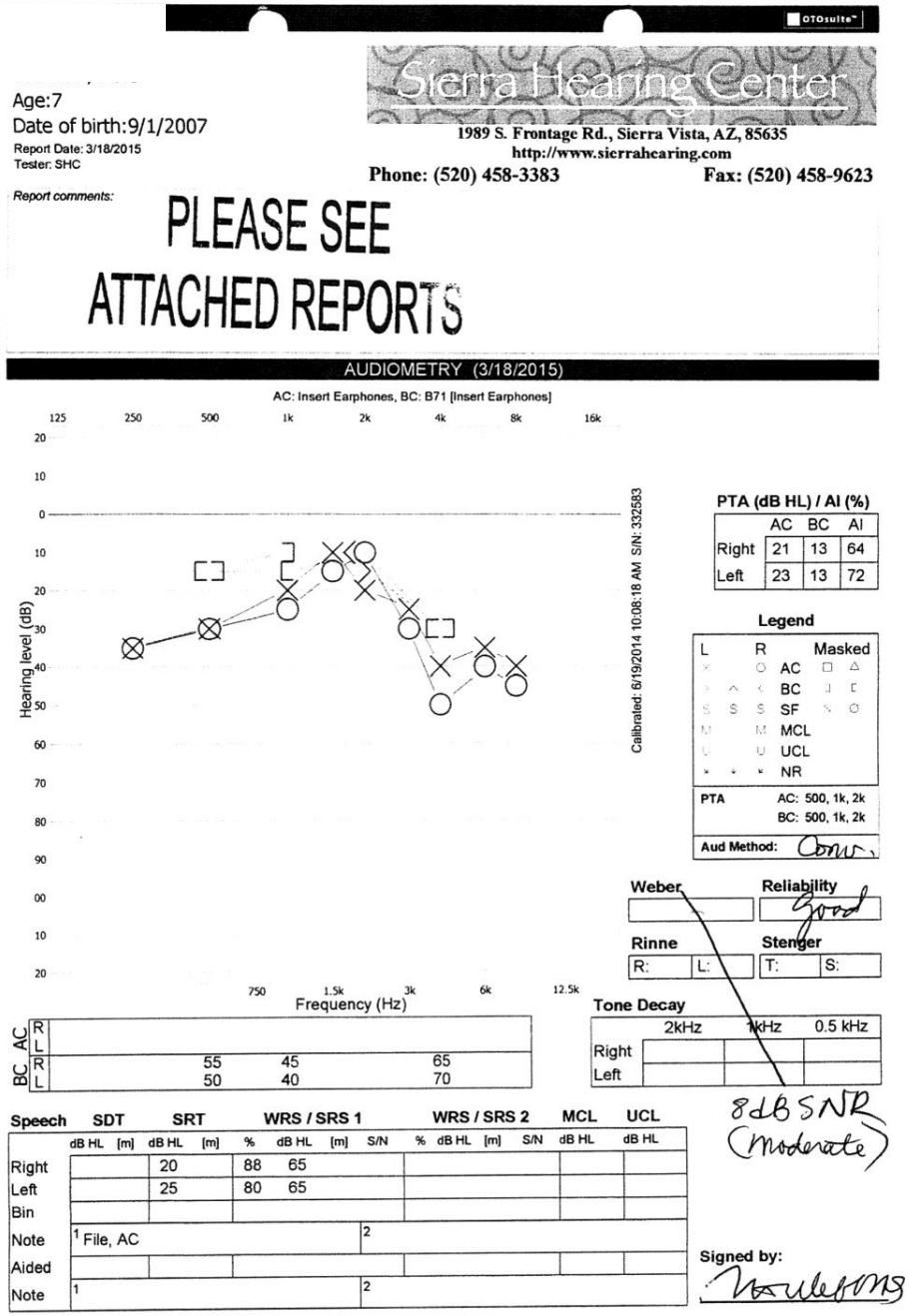
Inter-Aural Diff. Score: diff.

QuickSIN Score: dB SNR*

(SNR Loss: WNL Mild Moderate Severe)

*Circled scores are below normal

- No other therapies used at the time of this retest.
- Patient has started dichotic training (A.P. "Zoo Caper Skyscraper").
- No further retests done as yet.
- Patient recently added a Bluetooth Streamer and companion mic.



Sierra Hearing Center
1989 S. Frontage Rd., Sierra Vista, AZ, 85635
http://www.sierrahearing.com
Phone: (520) 458-3383 Fax: (520) 458-9623

Age:7
Date of birth:9/1/2007
Report Date: 3/18/2015
Tester: SHC

Report comments:
PLEASE SEE ATTACHED REPORTS

AUDIOMETRY (3/18/2015)
AC: Insert Earphones, BC: B71 [Insert Earphones]
Hearing level (dB)
Frequency (Hz)
Calibrated: 6/19/2014 10:08:18 AM S/N: 332583

PTA (dB HL) / AI (%)

	AC	BC	AI
Right	21	13	64
Left	23	13	72

Legend: L, R, Masked; AC, BC, SF, MCL, UCL, NR
PTA: AC: 500, 1k, 2k; BC: 500, 1k, 2k
Aud Method: Conv.

Weber
Reliability: Good
Rinne
Stenger: T: S:

		750	1.5k	3k	6k	12.5k
AC	R					
	L					
BC	R		55	45		65
	L		50	40		70

Tone Decay

	2kHz	1kHz	0.5 kHz
Right			
Left			

8dB SNR (Moderate)

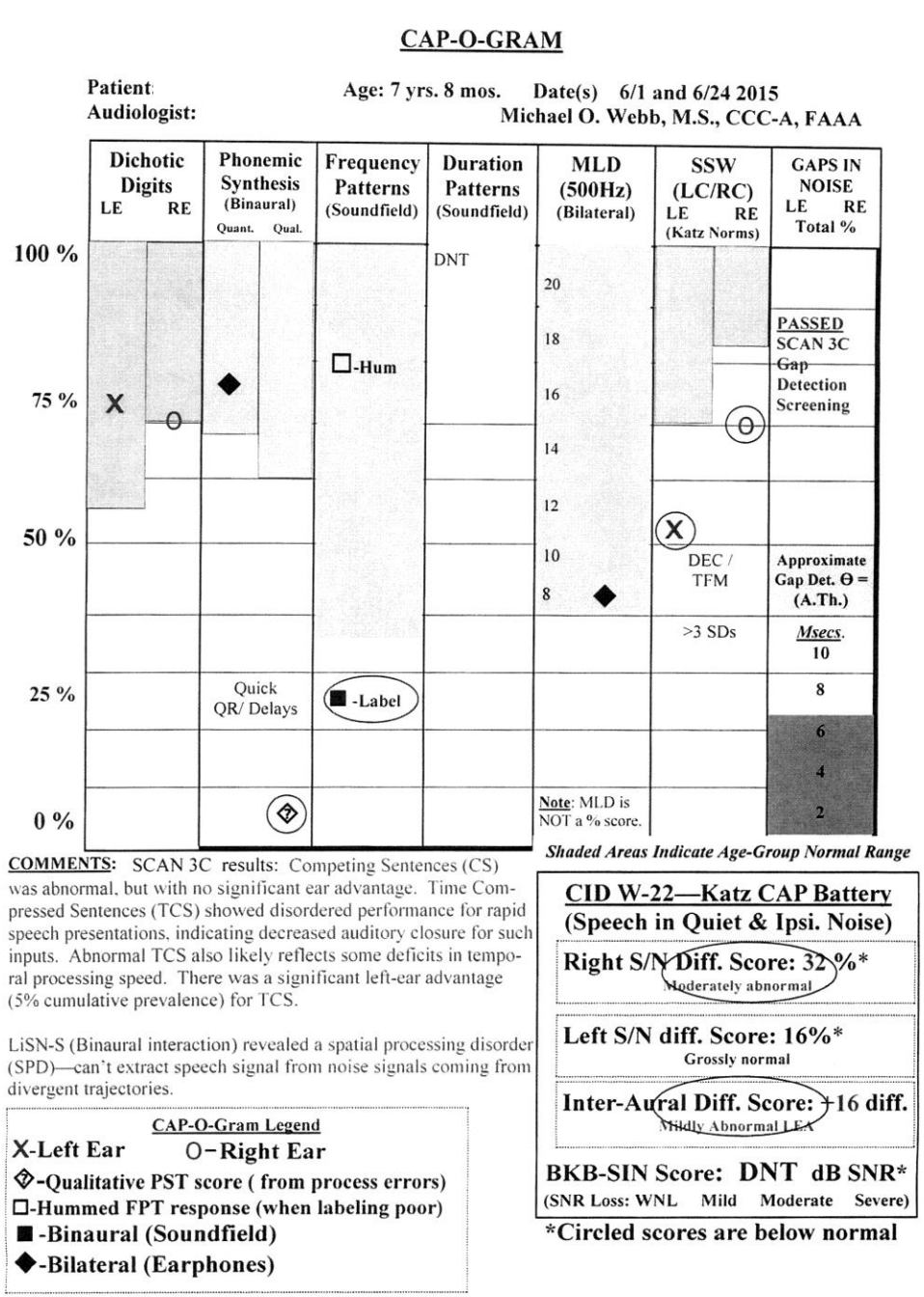
Speech	SDT		SRT		WRS / SRS 1				WRS / SRS 2				MCL	UCL
	dB HL	[m]	dB HL	[m]	%	dB HL	[m]	S/N	%	dB HL	[m]	S/N	dB HL	dB HL
Right			20		88	65								
Left			25		80	65								
Bin														
Note	1 File, AC							2						
Aided														
Note	1							2						

Signed by:

T.H., 8 y.o. Male (HFHL)

- Audiological follow-up since age 22 mos and 28 mos.
- Recurrent otitis media. Saw ENT for tx. (P.E. tubes). Had residual perforation.
- Lost from care for ~5 yrs.
- School AUD requested consult & poss. HA/FM
- Evaluated for CAPD
- Referred for HA's through S&C CRS clinic (Medicaid)
- Fitted for one H/A (R), despite bil. HL and CAPD.
- HOH teacher observed in math/art: "No APD impact."

T.H., 8 y.o. Male (HFHL)



CAP-O-GRAM

Patient:
Audiologist:

Age: 7 yrs. 8 mos. Date(s) 6/1 and 6/24 2015
Michael O. Webb, M.S., CCC-A, FAAA

	Dichotic Digits LE RE	Phonemic Synthesis (Binaural) Quant. Qual.	Frequency Patterns (Soundfield)	Duration Patterns (Soundfield)	MLD (500Hz) (Bilateral)	SSW (LC/RC) LE RE (Katz Norms)	GAPS IN NOISE LE RE Total %
100 %				DNT	20		
					18		PASSED SCAN 3C Gap Detection Screening
75 %	X O	◆	□-Hum		16	O	
					14		
					12	X	
50 %					10	DEC / TFM	Approximate Gap Det. Θ = (A.Th.)
					8 ◆		
						>3 SDs	*Msecs.* 10
							8
25 %		Quick QR/ Delays	■-Label				6
							4
0 %		◈			Note: MLD is NOT a % score.		2

Shaded Areas Indicate Age-Group Normal Range

COMMENTS: SCAN 3C results: Competing Sentences (CS) was abnormal, but with no significant ear advantage. Time Compressed Sentences (TCS) showed disordered performance for rapid speech presentations, indicating decreased auditory closure for such inputs. Abnormal TCS also likely reflects some deficits in temporal processing speed. There was a significant left-ear advantage (5% cumulative prevalence) for TCS.

LiSN-S (Binaural interaction) revealed a spatial processing disorder (SPD)—can't extract speech signal from noise signals coming from divergent trajectories.

CAP-O-Gram Legend

X-Left Ear O-Right Ear
◈-Qualitative PST score (from process errors)
□-Hummed FPT response (when labeling poor)
■-Binaural (Soundfield)
◆-Bilateral (Earphones)

CID W-22—Katz CAP Battery
(Speech in Quiet & Ipsi. Noise)

Right S/N Diff. Score: 32 %*
Moderately abnormal

Left S/N diff. Score: 16%*
Grossly normal

Inter-Aural Diff. Score: +16 diff.
Mildly Abnormal LEA

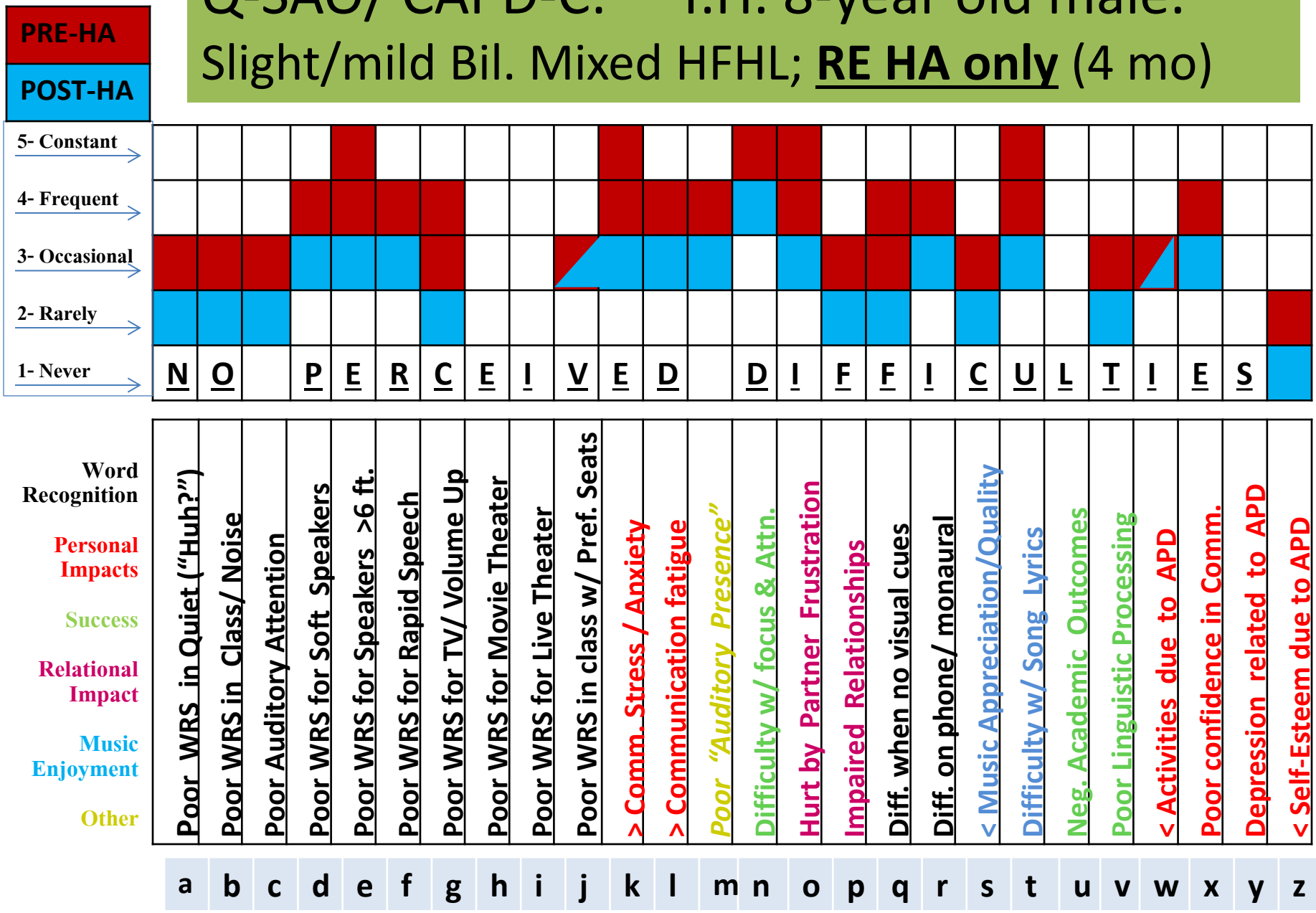
BKB-SIN Score: DNT dB SNR*
(SNR Loss: WNL Mild Moderate Severe)

*Circled scores are below normal

- Integration (REA) on SSW
- Abnormal FPT for labeling (WNL for humming) problems
- Severely abnormal PST (Qualitative: Quick, QR, and delays)
- Moderately abnormal W22-SIN on the right (LEA)
- Disordered auditory closure for rapid speech (TCS)
- Abnormal bin. Separation (CS)-no significant EA
- SPD on the LiSN-S

Q-SAO/ CAPD-C: T.H. 8-year old male.

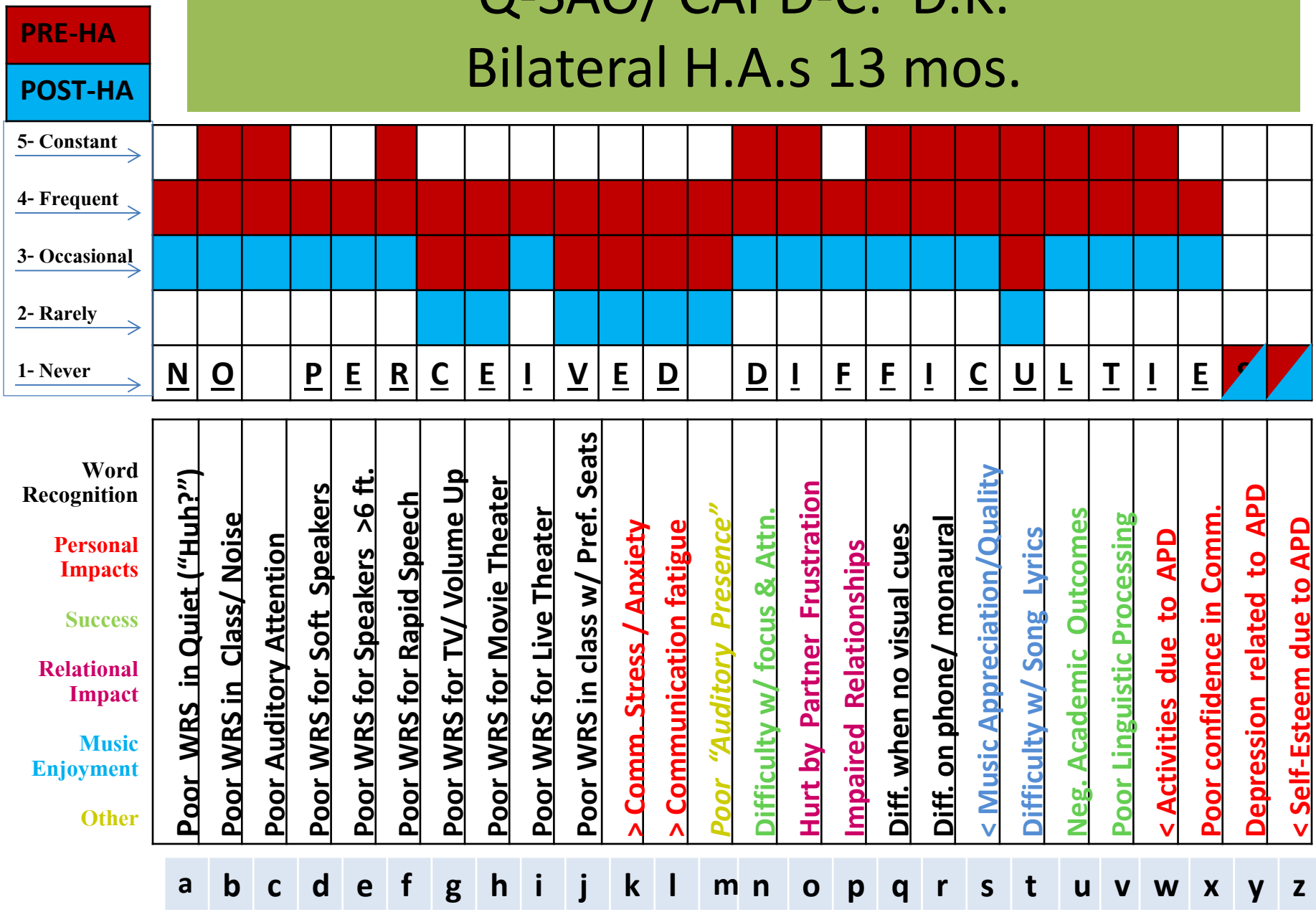
Slight/mild Bil. Mixed HFHL; **RE HA only** (4 mo)



T.H. Subjective Comments

"Because T. also has sensorineural hearing loss it is hard to determine what the root of the problem was. One thing that stands out to me the most is that [he] rarely asks me "what a ____" is. (Insert any combination of letters to make a word that he *thinks* he heard.) And he has a high non-verbal IQ (131). In my opinion this is why he never asks "what?" [in class] and instead looks around and stands up to figure out what he is hearing. This comes across as ADHD…"

Q-SAO/ CAPD-C: D.K.
Bilateral H.A.s 13 mos.



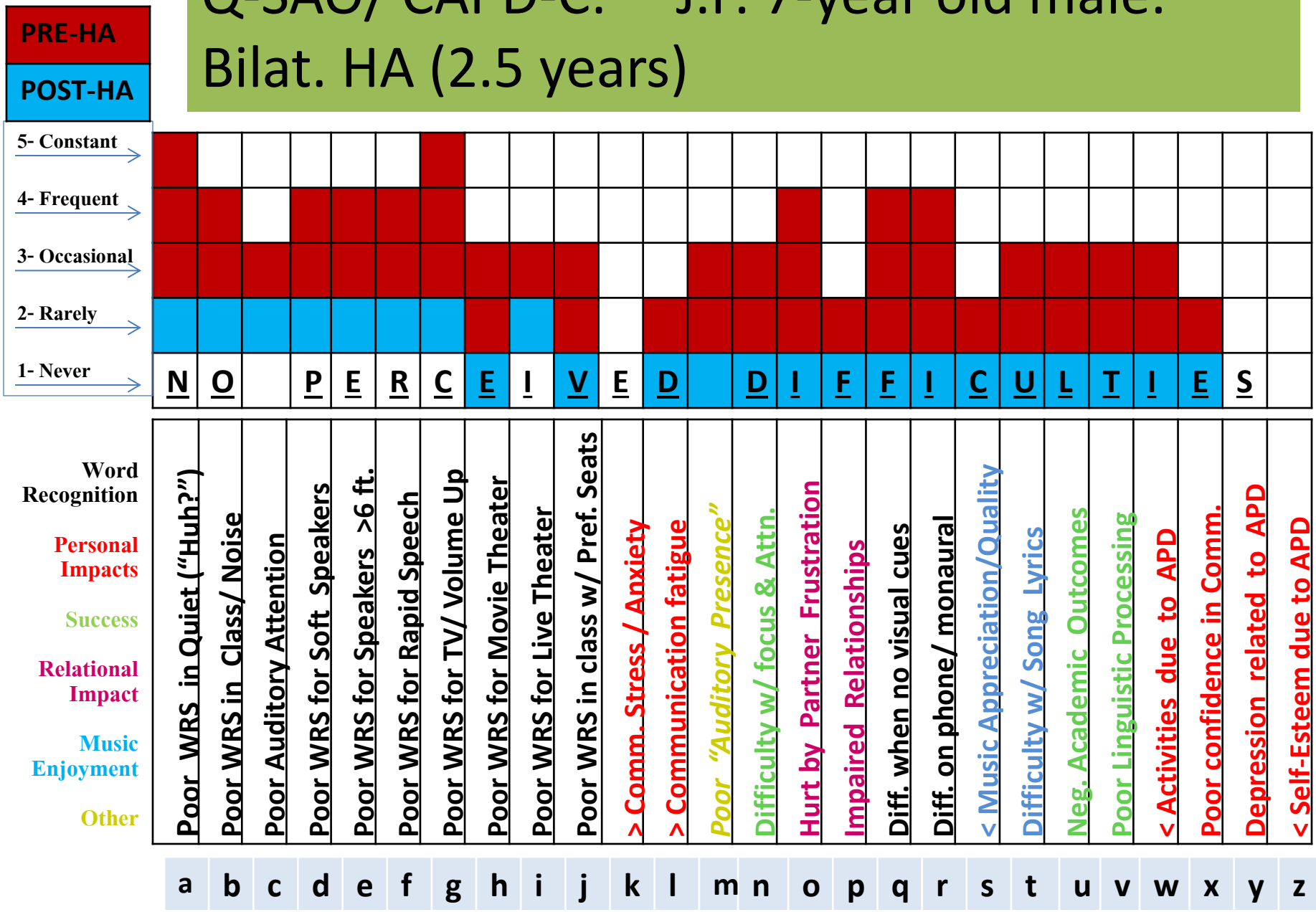
D.K. Subjective Comments

D has improved alot now that he wears his hearing aide daily. His grades on assignments are more consistant. He has been able to pull all "A's" & "B's" with a "C" every now and then. He has really grown in math. He still struggles with reading. We are working on reading skills and trying to find ways to help Dylan. D, continues to go to speech Therapy and Occupational therapy on a weekly basis. He has progressed nicely.

We are open to new therapy type sessions, so if there is any you recommend that would be awesome.

* We have used Capdots & ILS a few times. I hope we can make use of it more on a regular basis.

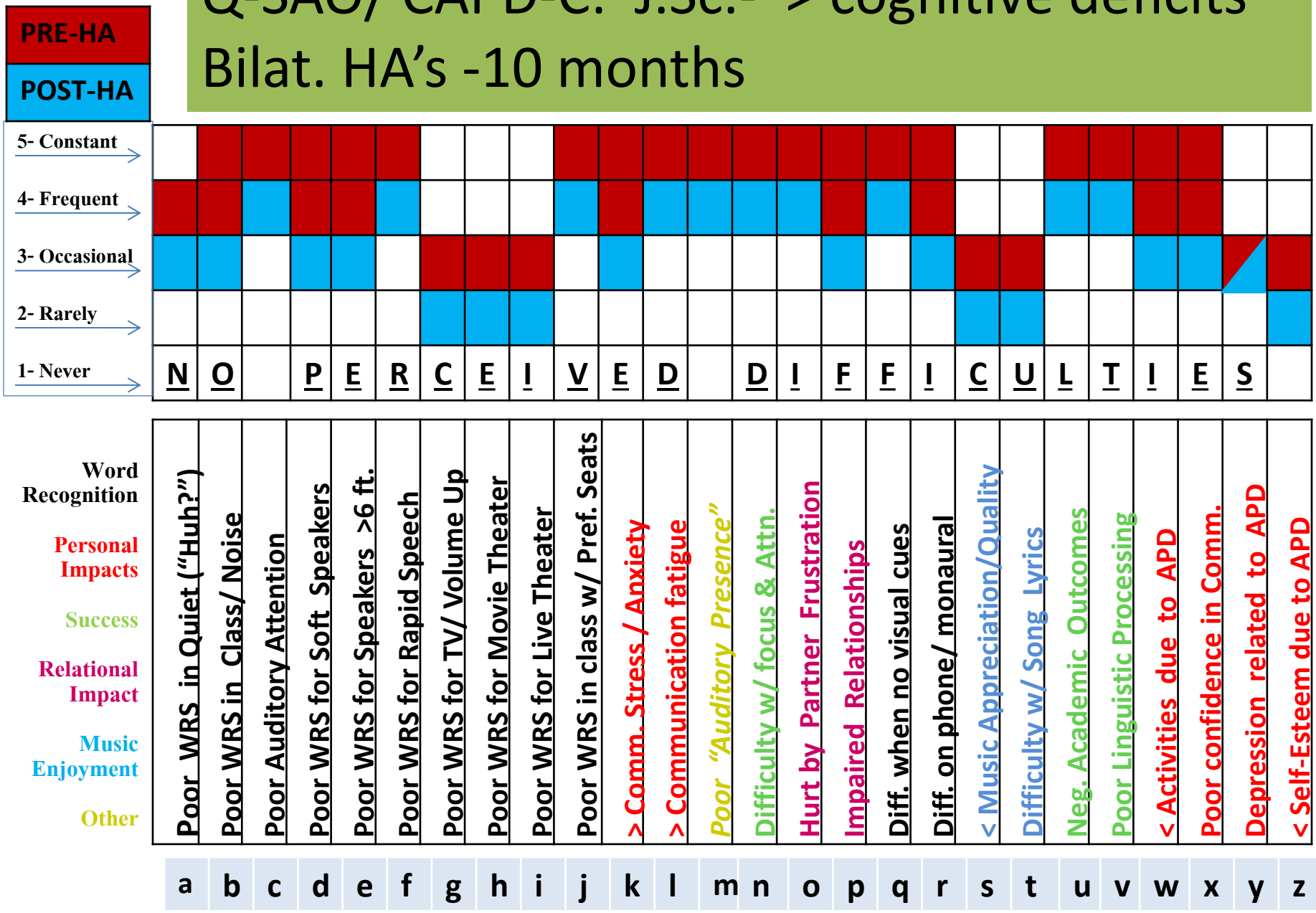
Q-SAO/ CAPD-C: J.P. 7-year old male. Bilat. HA (2.5 years)



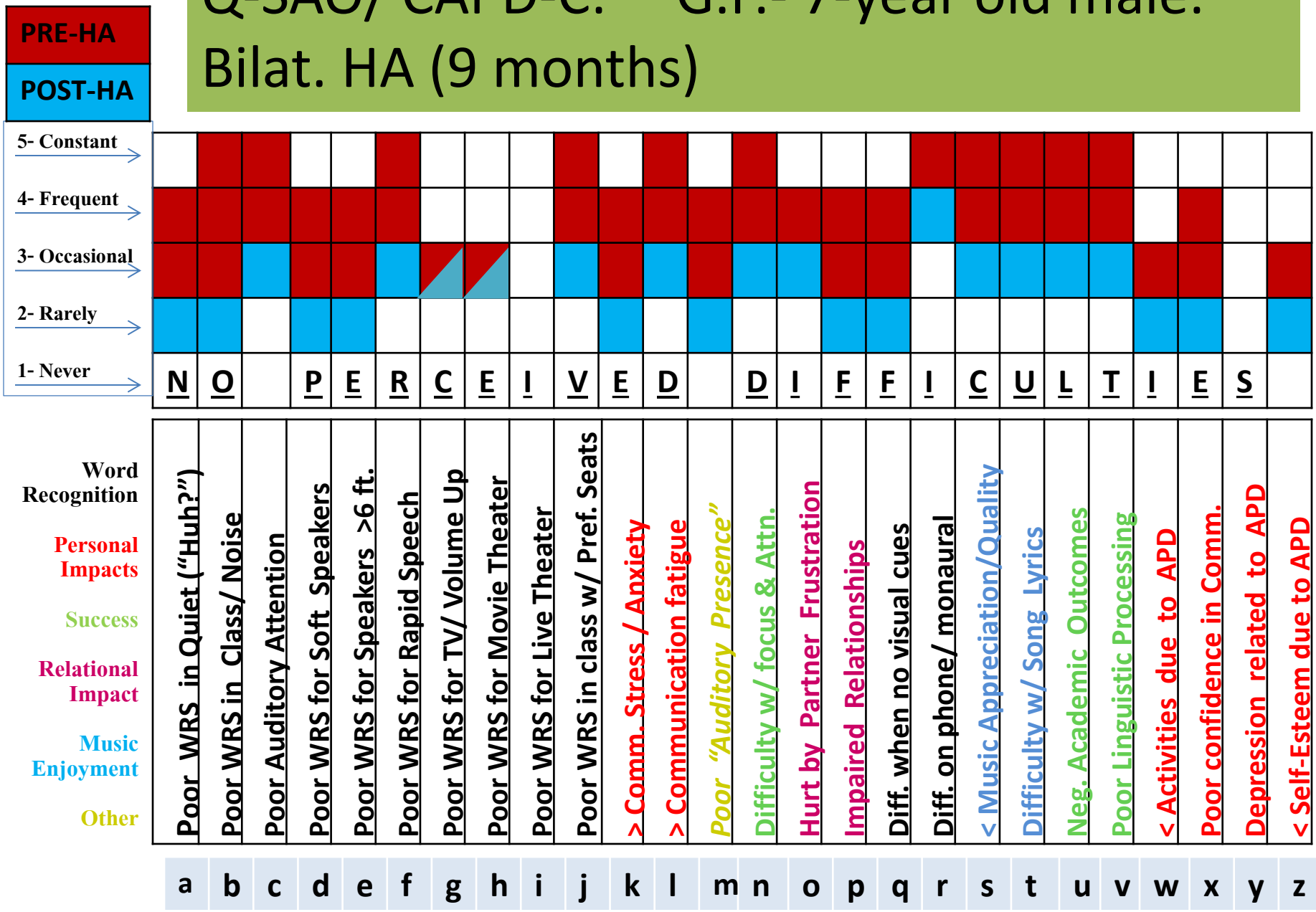
- "J. P. has excelled in school since he started waring [sic] his hearing aids. He is in the top of his class. He reads at a 6th grade level. He loves math and reading. He also recently became a member of the National Elementary Honor Society. Getting him PHDs was one of the best things we ever did for him. Thank you..."

J.P. Subjective Comments

Q-SAO/ CAPD-C: J.Sc.- > cognitive deficits Bilat. HA's -10 months



Q-SAO/ CAPD-C: G.P.- 7-year old male. Bilat. HA (9 months)



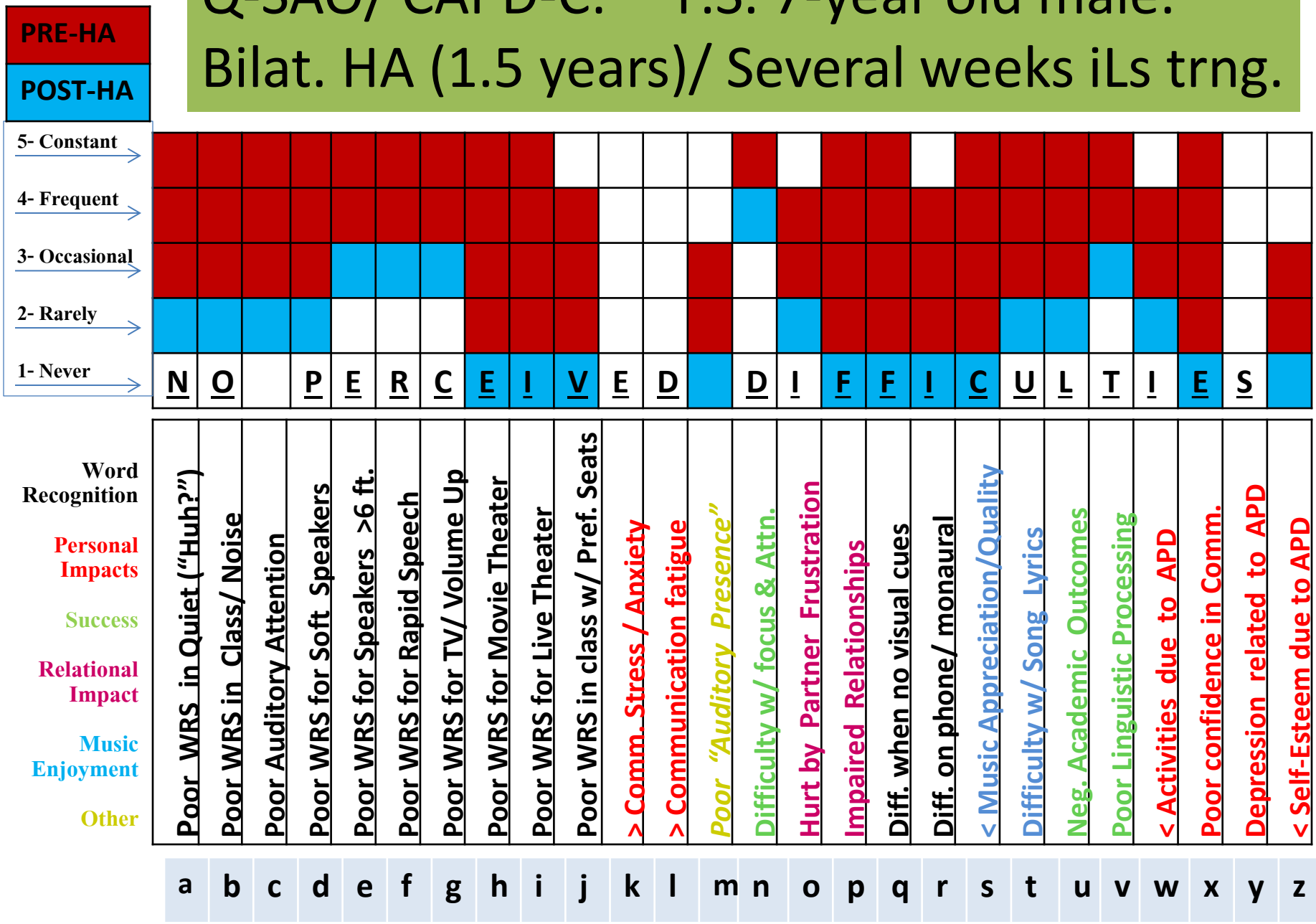
G.P. Subjective Comments

- *"Since getting his hearing aids: G. P.'s behavior in school has improved as a direct result of being able to focus and engage better in class. He gets out of his chair less, talks less with friends, and participates more. His reading and grades have improved more to a level I knew he was capable of.*

  He doesn't ask for clarification as often as he used to…The constant blank stares and "huh?"s are a thing of the past. It does still benefit him to give instructions slowly and while he is looking at you, but his comprehension has improved.

  We have also found that G.P.'s speech is improved and he is easier to understand since getting his hearing aids."

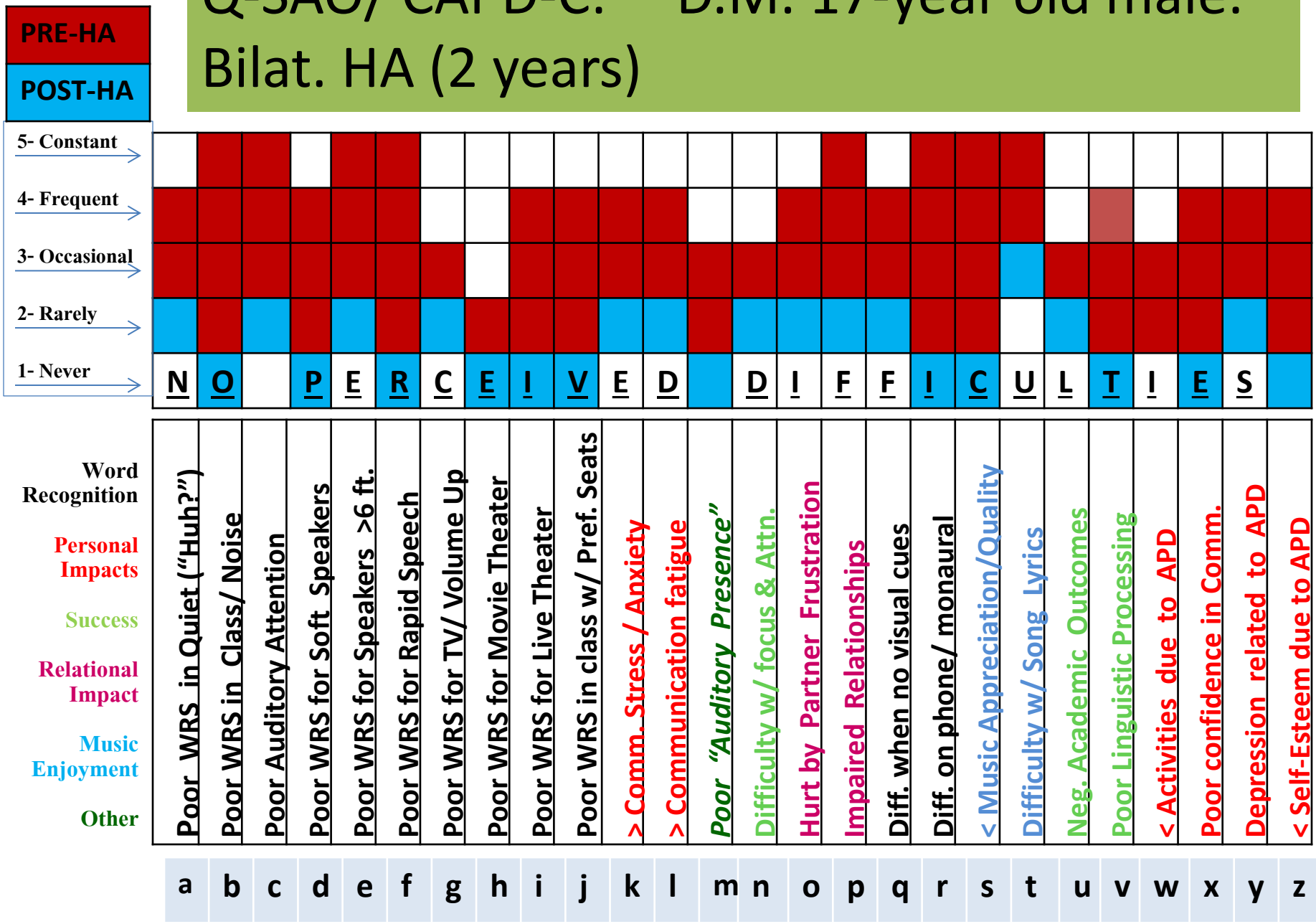
Q-SAO/ CAPD-C: P.S. 7-year old male. Bilat. HA (1.5 years)/ Several weeks iLs trng.



- "Hearing aids have changed his quality of life. He is doing much better in school and has almost caught up to his peers in reading levels. For my child, this is HUGE, as he was very far behind when he started wearing hearing aids. He started wearing them at the beginning of 2nd grade, yet he was reading on a Kg level, about four months in. He is now towards the end of his 3rd grade year, and is reading almost at 4th grade level. While he may not be in the top reading level, that is a huge improvement for him. He understands more of what the teacher is saying in class, and also has the ability to block out some of the loud background noise.

P.S. Subjective Comments

Q-SAO/ CAPD-C: D.M. 17-year old male. Bilat. HA (2 years)



Other Clinician Comments:

Katie Teague, AuD (U.S. Army-Texas)

[CAPD] soldiers are often seeking services actively vs. some guys that have noise induced hearing loss who feel "maybe I could hear better" or "I was surprised I had a loss". I think the big thing is that these guys leave for a deployment and are healthy, feel great, etc, get involved in blast trauma and never feel like they hear the same. They can nearly almost always tell you when the hearing changed***. They tend to perk up immediately when they put the hearing aids on the first time. They tend to be my best users in not only they wear them everyday, but they wear them the most hours.***

Those who likely have acquired APD because of long term noise exposure seem to present a little differently and don't seem to get as much perceived benefit. "

Alice Cerkoney, AuD (VA-Tampa, FL)

"Things have slowed down frankly since there are less blast injury patients (which is a good thing) but ***I do still fit "gentle amplification" for these folks referred to me (who have problems and typically tinnitus too) and they seemed relieved to have someone validate their issues."***

- She reports that the TBI/CAPD users are very faithful in their wearing time and report significant subjective benefits.

Donna Geffner, PhD (St. Johns U., NY)

Fits teenage CAPD patients with Starkey "Halo" (iPhone-interfaced) RIC devices and has seen positive outcomes. They are particularly excited about the tech-y "phone connection" aspect of the devices. [The iPhone can be used as a companion mike, remote control, and can "geo-tag" custom environment settings.]

Conclusions

- **Questionnaire responses, patient acceptance, and subjective observations by parents/ educators/ therapists support the use of personal hearing devices (PHDs) as an effective management tool in many forms of CAPD, including cases associated with TBI.**
- **Engaged, proactive family, therapeutic and school support is a major factor in success.**
- **Use of concomitant FM/ wireless mic options likely enhances outcomes, but doesn't appear prerequisite to many of the observed benefits.**

Conclusions (Cont'd)

- **While some PSAPs and other OTC/ internet or otherwise non-audiologically-supervised PHDs MAY provide certain benefits, the fitting of such devices to normal peripheral hearing, *especially in children* could be harmful and should be supervised by a APD-qualified audiologist, including real-ear verification of safe levels and assessment of outcomes for evidence of benefits.**
- **Annual monitoring of hearing and key CAPD test outcomes is advised.**
- **Cost of quality PHDs/ lack of insurance coverage is a major deterrent to adoption of this form of CAPD management. Unbundled pricing may be a partial solution.**

Conclusions (Cont'd)

- **Earlier intervention affords the potential of more robust outcomes (> neuroplasticity?) AND greater acceptance/utilization of the devices, often extending beyond mere classroom use to "life." >Use time >benefits. Cognitive deficits may limit perceived benefits.**
- **PHD stimulation often exhibits therapeutic effects (like with FM usage) beyond the mere target of signal access and clarity: binaural integration, temporal resolution, music appreciation, attention/focus, self-regulation, speech production/voice regulation.**
- **Use of PHDs *may* be useful as a "broad-spectrum" neuroplastic preparation to mitigate the magnitude of some CAPD deficits and reduce the number/ duration of other therapies required.**

For Future Consideration

- **Formal efficacy research into this method of management should be undertaken.**
- **Assessment of dependency: trial "weaning strategies" could be attempted to assess the durability of benefits and the feasibility of withdrawal of amplification at some point.**
- **Advocating with the HA manufacturing industry to provide lower-cost, lower-featured, gain/SPL-limited PHDs with connectivity options as a "niche" product for use with CAPD/ minimal HL. ("Enhancer")**

For Future Consideration (Cont'd)

- **Formal investigation into this method of management should include evaluating appropriate feature usage: directionality types, noise-reduction, band width and processing channels, attack/release times, expansion, compression ratios, linear vs. output limiting vs. WDRC, slim-tube vs. RIC.; etc.**
- **As a PRT therapy tool, providing alternate program for temporary frequency-enhancement to aid difficult discriminations (e.g. /f/ vs /Θ/).**
- **Possibly using Live Speech Mapping (LSM) as a short-term accompanying visual stimulus/ feedback mechanism to assist in PRT training.**

Is there evidence to support

Personal Hearing Devices for CAPD Management (?)

Yes, I believe there is!

Thank You!

IGAPS 2016 SPRING MEETING

April 28-29, 2016 / KC, MO

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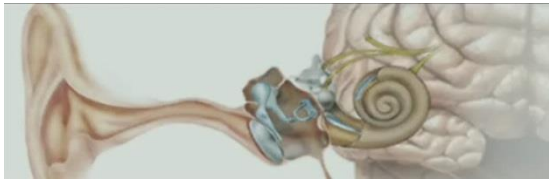

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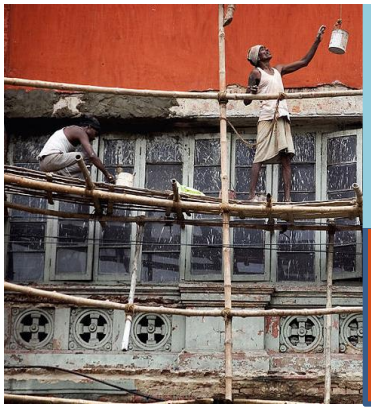
SUPPLEMENTAL SLIDES

(APPENDICES ONLY. NOT PART OF THIS PRESENTATION.)

Buffalo Model CAPD Profiles (1)

Bellis-Ferre CAPD Profiles (1)

Deficit-Specific Therapy Supplement (3)



CAP Assessment

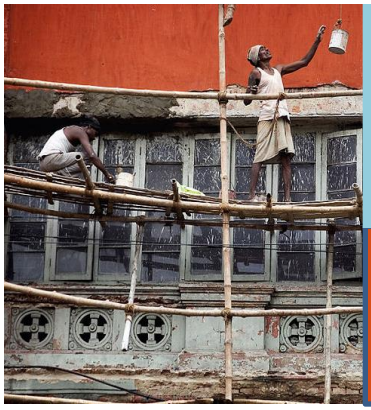
Classification of APD Findings: Profiles

Buffalo Model (Katz): Communication Clusters

- Integration [INT]- Corpus Callosum (IHT)
- (Phonemic) Decoding [DEC]- Left Hemisphere
- Tolerance/ Fading Memory [TFM]- Anterior EF
- Organization [ORG]- Executive Function

Dedicated Deficit-Specific Therapy Manual Available

CAPD: Mostly Management (Ed. Katz and Masters)



CAP Assessment

Classification of APD Findings: Profiles

Bellis/ Ferre: 3 Primary

Neurophysiological Substrates / Cognitive and Behavioral Sequelae

1. Auditory Integration Deficit- Corpus Callosum (IHT)
2. Prosodic Deficit- Right Hemisphere
3. Auditory Decoding Deficit- Left Hemisphere

- **2 Secondary** (related to higher-order abilities)
  - Associative ~Receptive Language (syntax/semantics)
  - Output-Organization ~Executive Function

Flexible-Source Therapy Options

- School-based or Outpatient SLP, Cognitive, Reading/Learning Support, Occupational Therapy.
- Home/Clinic-based Online/Software: CAPDOTs®, Hearbuilders, iOS apps (iPad): Acoustic Pioneer ®
- CD materials: earobics, FastForward, DIID, CIAT
- Neuroplastic stimulation: Interactive Metronome, Tomatis (TLP, AIT, ILS)

Deficit-Specific Interventions

Beyond Therapies:

Checklist:

- Environmental changes: Acoustics, noise level, visual distractions, distance. Freefield Amplification.
- Teaching Strategies: Pre-teach, Handouts, Getting Attention, Less Information, Shorter "packages", Check Understanding, Encourage, Listening Breaks.

Deficit-Specific Interventions

Checklist (Cont'd):

- Self-Regulating Strategies: Whole-body Listening, Self-rehearsal, Self-Advocacy, Situational Problem-Solving.
- FM Systems: Individual systems or Classroom. Open-ear, Ear-Worn receivers. **Usually monaural**. **Limited to classroom use** (in most cases).