

Auditory Processing Assessment

Name	Nicholas Belling		
Date of Birth	09/11/2015		
School	St Joseph's – Port Lincoln	Year Level	1
Assessment Date	14/11/2022	Age at Ax	7 years 0 months
Report Date	16/11/2022		

Auditory Processing (AP) refers to one's ability to detect, discriminate and process sounds within our environment. It is often thought of as the "brainwork of hearing", or in other words "what we do with what we hear".

The processing of sound is complex. It begins at a peripheral level (outer ear, middle ear, and inner ear) and then travels to the brain via several processing sites (nuclei) using both ipsilateral pathways (same side) and contralateral pathways (sound crosses to the opposite side). These pathways have both afferent processing (towards the brain) and efferent processing (feedback from the brain) which are highly interconnected. Efferent pathways assist in regulating auditory attention based on one's attention to task, relevance of the sound, emotional state, and prior learning experience. The entire auditory pathway is organised to preserve important information from sounds such as frequency (pitch), timing, and loudness. A strong auditory system plays a critical role in Nicholas' ability to process and understand speech in different settings.

An auditory processing assessment examines the functioning of the auditory system, identifying any areas of weakness that may benefit from auditory training and auditory rehabilitation. Auditory processing develops with age, with optimal abilities expected at around age 12. Damage to the auditory pathway such as traumatic birth, developmental delay, persistent ear infections, concussion, brain injury, illness and other neurological conditions can all cause auditory processing difficulties.

Results Summary

To diagnose Nicholas with an auditory processing disorder, he must have performed significantly below his aged peers on at least two tests in our test battery (i.e., two standard deviations from the mean) or on one test (three standard deviations from the mean).

Nicholas was found to meet this criterion and is therefore diagnosed with an Auditory Processing Disorder (APD).

Specifically, Nicholas was found to have difficulties with;

- **Decoding:** Nicholas' ability to quickly and accurately process speech sounds (phonemes).
- **Tolerance-Fading Memory:** Nicholas' ability to understand speech in the presence of competing noise. This also requires auditory short-term working memory.

When interpreting results, it is important to note that Nicholas has been diagnosed with a mild receptive and expressive language delay (please refer to Novita Speech Pathology Assessment report dated 26/09/2022). His results must be interpreted with caution and recommendations made must be considered alongside his existing difficulties and should involve a multidisciplinary approach.

Reason for Referral

Nicholas was referred for assessment of his AP abilities by his parents, Greca and Luke. He attended All Ears & Speech / Little Allied Health on the 14th November 2022 for assessment of his peripheral hearing and auditory processing abilities.

Relevant History

Nicholas attended accompanied by his parents, Greca and Luke who reported Nicholas to have had a significant history of middle ear dysfunction as a younger child, requiring grommets at 2 years of age (under the care of an ENT Specialist in Brisbane). Nicholas is reported to snore, and mouth breathe. He was reported to have passed his newborn hearing screening at birth. A family history of dyslexia and Autism Spectrum Disorder was reported. No family history of hearing loss was reported. Luke and Greca reported Nicholas to have slightly delayed overall development and a stutter (not currently under the care of a speech pathologist). Concerns were also raised for Nicholas' behaviour, specifically that he demonstrates some possible sensory seeking behaviours (hits himself when he is excited, seeks loud sounds).

Nicholas' teacher, Belinda Keryn, kindly provided information about Nicholas' listening and learning in the classroom via telephone interview. Concerns were raised for Nicholas' academic progress and learning across all areas of the curriculum, especially literacy. I understand Nicholas receives support with his literacy at school (MiniLit Program). Nicholas' teacher noted him to have a short attention span while sitting on the mat, listening to verbal instructions. Belinda has noted Nicholas to say "I'm so confused" when there is a significant amount of verbal information presented. Nicholas will often forget what he is required to do when he returns to his desk. He asks his teacher for support, seeking help independently. Belinda noted Nicholas to require significant encouragement to have a go. He gives up easily and can display a fixed mindset. Concerns were raised for his level of confidence.

Nicholas underwent an assessment with Speech Pathologist, Rachel Ayliffe in September 2022 (Novita). At this time, Nicholas was found to have a mild receptive and expressive language delay. Speech pathology intervention was recommended to assist in supporting and extending Nicholas' expressive language, receptive language and language content skills. Please refer to his speech pathology report (dated 26/09/2022) for further detailed information.

I understand Nicholas is currently on the wait-list for psychology regarding support for anxiety.

Questionnaires

The following questionnaires were administered to gain an in-depth understanding of Nicholas' auditory processing abilities. They further provide a baseline from which to measure change should auditory training and rehabilitation be indicated.

The **Buffalo Model Questionnaire (Revised) BMQR** was administered to provide information regarding Nicholas' relevant medical history and communication abilities across several domains. The domains include decoding, noise, memory, attention and social emotional well-being, integration, and organisation. This questionnaire further provides a means to validate test results and assess therapeutic benefits should auditory training and rehabilitation be indicated.

Nicholas' scores on the BMQR highlight difficulties across all domains. Greca and Luke reported Nicholas to have difficulty understanding language and spoken instructions. He is often noted to mis-interpret what was said. He has difficulties reading aloud and saying speech sounds. Nicholas was reported to respond slowly to spoken language and speaks slowly (Greca reported that she feels this is to curve his stutter and brain processing). Nicholas is reported to enjoy being around loud noises yet can be distracted by noise. He has difficulty understanding speech in noise and is noisy compared to his aged peers. He is often noted to interrupt others talking and forgets things that he was told. Greca reported Nicholas to have difficulty paying attention and using language (feels his use of language is limited). The possibility of a level of anxiety was raised. Nicholas was further reported to have poor handwriting (right-handed) and required support with his organisational skills. Luke and Greca note Nicholas to have limited eye contact with unfamiliar people or when he is meeting people for the first time.

The **Hearing Inventory for Children** allows for a greater understanding of Nicholas' hearing difficulties; i.e., how his hearing affects him socially and emotionally and how this contributes to his overall well-being. This questionnaire provides individual scores for social and emotional wellbeing, along with providing a total score to determine Nicholas' overall hearing difficulties. This questionnaire was completed by Nicholas' mother, Greca.

Nicholas' score using this questionnaire was 12, indicating that Greca does not feel that Nicholas' hearing difficulties have a negative impact on his social and emotional well-being.

Behavioural Presentation

Nicholas presented as a friendly and cooperative child who was comfortable in the test environment. He appeared physically restless during his appointment and seemed to benefit from use of a fidget toy. Despite this, it is reasonable to assume that results obtained provide an accurate indication of his true auditory processing abilities.

Peripheral Hearing Assessment

Nicholas responded reliably and consistently to pure-tone audiometry. Results revealed hearing within normal limits (typical) bilaterally, besides a mild high frequency hearing loss in his left ear at 8kHz (please see audiogram in Appendix A). Speech discrimination testing using the Children's Word list revealed excellent speech discrimination at soft conversation levels bilaterally (i.e. > 93% @ 30dBHL).

Tympanometry, a measure of middle ear function, revealed a Type A tympanogram in his right ear, consistent with normal middle ear pressure and compliance. A Type A deep tympanogram was found in his left ear, consistent with ear drum hyper-mobility. An ipsilateral acoustic reflex was present at an appropriate level at 1kHz on the right ear. An absent/elevated reflex was recorded at 1kHz in the left ear.

Distortion Product Otoacoustic Emissions (DPOAE) screening revealed strong emissions 1kHz to 8kHz in the right ear and at 1kHz, 1.5kHz and 2kHz in the left ear. Better results were expected in his left ear given his audiogram, with review recommended.

Considering the above results and reported snoring and mouth breathing, **review with an Ear Nose Throat Specialist is recommended** for medical opinion and management.

Central Test Battery

Nicholas' auditory processing abilities were formally assessed using the Buffalo Model (Central Test Battery) and memory subtests from the Test of Auditory Processing Skills (4th Edition) TAPS-4. The Central Test Battery is comprised of 3 tests; **Speech in Noise Test**, **Staggered Spondaic Word Test** and **Phonemic Synthesis Test**.

Speech In Noise

Difficulty understanding speech in noise is a common concern for children/adults with auditory processing difficulties. The Speech in Noise test analyses Nicholas' ability to understand speech in the presence of competing background noise. In this assessment single-syllable words are presented to each ear individually in quiet and in the presence of noise. A Speech to Noise Ratio (SNR) of +5dB is used (i.e., this means that speech is slightly louder than the background noise). The percentage correct in quiet, and the percentage correct in noise are compared to determine Nicholas' performance in noise (Speech in Noise Difference score).

We would expect Nicholas to correctly identify 75% of words in noise in his right ear and 72% of words in noise in his left ear. Nicholas identified 56% of words in his right ear and 68% of words in his left ear. This is significantly below what is expected for his age in his right ear.

Nicholas' scores can also be interpreted by examining the difference in performance within each ear in quiet and in noise and also by examining scores between his ears in noise.

When looking at ears individually, Nicholas was found to have a highly significant difference between listening in quiet and in noise in his right ear, indicating tolerance fading memory difficulties.

The difference in performance between Nicholas' ears in noise was not significant compared to his aged peers.

Nicholas' result: Significant difficulties identified with the nature of his errors indicative of decoding and tolerance fading memory difficulties.

Staggered Spondaic Word (SSW) Test

The ability to integrate information presented to both ears simultaneously was measured using the **Staggered Spondaic Word test (SSW)**. The SSW is a binaural test with different words presented to each ear. Some of the words are non-competing (i.e., they arrive at each ear individually) and others are competing (i.e., different words arrive at each ear at the same time). Some items are presented to the right ear first, and some items are presented to the left ear first. Nicholas was required to repeat all the words he heard.

This assessment is scored counting correct answers and by carefully examining Nicholas' response behaviour (e.g., are there delays in his response, does he reverse answers or omit the first sound of words etc.). Results from this assessment helps to define Nicholas' auditory processing profile and identify any compensation strategies he may be using.

Quantitatively, on average at 7 years of age, we would expect Nicholas to make less than 28 errors in this assessment. Nicholas' total Number of Errors (NOE) was 64. This indicates a significant binaural integration difficulty and is consistent with his presenting concerns.

Qualitatively, it is important to note that Nicholas required extended time and effort to process information compared to his peers. Nicholas was noted to respond with words he previously used earlier in this assessment, consistent with decoding difficulties.

Nicholas' result: Significant difficulties identified with the nature of his errors indicative of decoding and tolerance fading memory difficulties.

Phonemic Synthesis (PS) Test

Nicholas' phonemic awareness was assessed using the Phonemic Synthesis test. This test looks at Nicholas' ability to blend speech sounds to identify the word. Nicholas hears words presented sound-by-sound via a speaker (i.e., to both ears). This assessment provides information on Nicholas' ability to process speech efficiently and effectively at a speech sound level.

Quantitatively, at 7 years of age, we would expect Nicholas to score 17 or more on the 25 test items in this assessment. Nicholas scored 17 and therefore this is as expected for his age.

Qualitatively, it is important to note that Nicholas often responded quickly, likely as a compensatory strategy for auditory memory.

Nicholas' result: Mild difficulties identified with the nature of his errors indicative of decoding difficulties.

Auditory Memory (TAPS-4)

Auditory memory and auditory working memory both play an important role in Nicholas' processing of auditory information. Auditory memory refers to Nicholas' ability to listen, retain and recall information presented verbally. Typically, auditory memory improves with age.

Nicholas' auditory memory skills were assessed using the memory subtests on the Tests of Auditory Processing Skills (4th Edition).

Number Forward (TAPS-4) & Word Memory

Nicholas was required to repeat numbers/words read to him of increasing length. These subtests assessed his ability to retain simple sequences of auditory information.

Number Memory Reverse (TAPS-4)

Nicholas was required to repeat number sequences in the reversed order. This assessed his ability to retain and manipulate simple sequences of auditory memory (working memory).

Sentence Recall (SR)

Nicholas was required to repeat sentences read out loud of increasing length. This subtest assessed his ability to retain details in sentences of increasing length and grammatical complexity.

Nicholas' result: Significant Difficulties with Sentence Recall (16th percentile)

Nicholas was found to have difficulties with his Auditory Memory skills, specifically with recalling meaningful information of increasing lengths (i.e. sentences). This finding is consistent with his already diagnosed language delay.

Weak sentence recall is likely to be affecting his ability to follow directions and instructions in the classroom. Weak sentence recall further affects Nicholas' ability to take notes, learn new vocabulary and subject content.

Nicholas' Auditory Processing Profile

Nicholas was found to meet the criteria for the diagnosis for an Auditory Processing Disorder (APD). He was found to present with Decoding and Tolerance-Fading Memory difficulties.

Decoding (DEC): Nicholas was found to have significant difficulties with his ability to process speech sounds quickly and accurately. This is the most common difficulty seen in children with an auditory processing disorder. Individuals with decoding difficulties often find phonics, articulation, and reading accuracy challenging. They often have problems understanding directions. They require extensive time to process verbal information, get confused easily and require repetition. Their response to verbal information can be slow.

Tolerance-Fading Memory (TFM): Nicholas was found to have significant difficulties with his ability to understand speech in background noise and to retain information heard (auditory short-term memory). This is a common difficulty found in individuals with an APD. Individuals with TFM difficulties often have challenges with reading comprehension and remembering directions. Language difficulties, whether this be spoken, written or both are common. Further, individuals presenting with TFM often have difficulties focussing, attending to task, can be impulsive and are hypersensitive to sounds that are well tolerated by others. Their executive function skills often require support and development.

Recommendations

Auditory Training

Nicholas would benefit from an auditory training program specifically designed to meet his auditory processing profile. The Buffalo Model (Jack Katz) recommends a 2-part auditory training program, however depending on your child's progress this may be modified. Our team of audiologists have extensive experience in working with children with auditory processing disorders and are skilled at maintaining your child's engagement using a variety of therapy tools to not only make training enjoyable but to achieve best outcomes. The initial auditory training program consists of 14, 45-minute sessions which are typically scheduled weekly (however with family commitments fortnightly may be more easily managed). A 2-month break is recommended prior to review to determine whether further auditory training is required and whether improved skills have been generalised to everyday life.

Auditory Training for Decoding

Phonemic Training Program (PTP) – This evidence-based program focuses on ensuring an individual has the correct foundation for discriminating and identifying speech sounds. The training typically starts “easy” to ensure success, and then the level of difficulty is increased gradually. Training is intentionally repetitious to ensure the brain processes speech quickly and accurately.

Phonemic Synthesis – This auditory training program focuses on connecting sounds to words. It is an extension of the PTP. Individual sounds (phonemes) are presented to

produce a word or a nonsense word. The lessons gradually increase in level of difficulty of both phonemes and number of phonemes.

Auditory Training for Tolerance Fading Memory

Speech-in-Noise Desensitisation Training – The primary difficulty for individuals with TFM is to understand speech in background noise. Therefore, to strengthen this weakness desensitisation is used whereby noise is gradually increased with a constant level of speech. This follows a similar principle to how allergies are managed using a desensitisation program. The primary goal of this therapy is to improve Nicholas' ability to understand speech in the presence of noise. This therapy also improves Nicholas' tolerance of background noise. Following an initial training program, speech in noise understanding is reassessed to monitor progress.

Short Term Auditory Memory Training – Memory plays an important role in auditory processing and refers to Nicholas' ability to listen, retain and recall information presented verbally. Therapy is tailored to meet Nicholas' auditory processing profile and use fun and engaging activities. Our experience team of audiologists provide lessons on listening and memory that are engaging, creative and meet Nicholas' needs in a functional and meaningful way.

Personal Listening Device / Sound-field System

A personal listening device improves Nicholas' access to the target signal (i.e. his teacher's voice). This reduces his effort required to understand instructions in the classroom in the presence of background noise or when seated at a distance from his teacher. Use of a personal listening device has also been shown to improve a child's confidence and participation in the classroom. They are more likely to become engaged in classroom discussions, no longer uncertain of what has been said.

At Little Ears we recommend Roger technology by Phonak which maximises speech understanding in noise and over distance using digital and dynamic technology. Dynamic technology refers to the devices ability to monitor the background noise level in the classroom and adjust the gain applied to the teacher's voice accordingly. This is important to ensure Nicholas always hears his teacher clearly and comfortably and in addition cues his auditory attention to his teacher thereby reducing his awareness of ambient background noise. The set-up involves Nicholas' teacher wearing a small transmitter (a little bigger than a pen) with Nicholas wearing a wireless receiver (available as an ear-level device or small device with headphones).

Nicholas may like to trial a personal listening device prior to purchasing one. At Little Ears a 4-week classroom trial is available to determine whether a personal listening device will be successful. The trial costs \$275 for 4 weeks (inclusive of 2 appointments with your child's audiologist to collect and return then device) plus \$50 insurance. An additional fee of \$200 will be charged only if the device is not returned at the end of the trial on time and in good working condition). Should you wish to purchase a device following the trial, \$100 will be deducted from the purchase price.

Low Gain Hearing Aid

There is a growing body of evidence supporting the use of low gain hearing aids for people identified with auditory processing difficulties. Evidence from these studies shows reduced listening effort and fatigue and improvements understanding speech in quiet and in noise. Current hearing aid technology is sophisticated, using beam forming directionality to enhance the primary speaker's message in the presence of noise. Further, mild gain hearing aids enhance the soft consonants in speech, thereby working in unison with auditory training to improve decoding.

In low gain hearing aid fittings, gain is applied for soft and conversational speech, with no gain applied to loud sounds.

Environmental Strategies

Nicholas would benefit from meeting his friends or family in environments with good acoustics i.e. soft furnishings on the floor and walls, adequate lighting to improve his visual access to the speaker and where he has some control over where he is positioned to avoid high level noise i.e., kitchen in a restaurant, road traffic etc.

Classroom Strategies

The role educators play in supporting a child with an auditory processing disorder cannot be underestimated. Encouragement and understanding from Nicholas' teachers regarding his listening strengths and areas requiring further development is imperative for his success. Attention to Nicholas' learning environment is just as important. The following recommendations are suggested for consideration by Nicholas' educational team.

Classroom Acoustics

Research by the National Acoustic Laboratories (NAL) indicate that children spend 45-75% of their time listening to their teacher and classmates in their classroom (Mealings, NAL 2016). Classrooms are prone to high noise levels. This has further increased with contemporary, and often open-plan classrooms, with a stronger emphasis on collaborative group work. There are standards for classroom acoustics (AS/NZS2107:2000) which detail recommendations for unoccupied classroom ambient noise levels and reverberation times, however these standards are not enforced. Research also suggests that children placed in classroom with poor acoustic often have lower literacy and numeracy skills. This is further heightened for a child with auditory processing difficulties.

Optimal classroom acoustics ensures that Nicholas can discriminate spoken language for his teacher or peers amongst other dynamic classroom noise. There are several applications available to measure the ambient noise in Nicholas' unoccupied classroom. It should be < 35-45dBA. You might like to consider the application Decibel X. This highly rated and easy to use application turns a smartphone into a pre-calibrated sound level meter to accurately measure noise levels from 30dB to 130dB. There are currently no standards for occupied classrooms.

Effectively reducing background noise and reverberation in the classroom can be simple and inexpensive. Soft furnishing, e.g., carpets, curtains, and acoustic boards, can all

significantly reduce reverberation, thereby improving classroom acoustics. For example, an acoustic board can be made by filling the back of a large canvas with foam / wadding and can then be covered with material. Sheer curtains can be purchased from Spotlight / Ikea and many carpeting stores offer end of roll sales. Children may also like to bring in a cushion for their chair and chair and table legs can have silicone protectors to absorb sound. Classroom doors can have acoustic seals installed which can be purchased from Bunnings to reduce noise coming in from outside the classroom.

To help manage noise levels in the classroom there are many interactive programs that Nicholas' teacher may like to access that visually represent classroom noise levels in real-time. For example, Bouncy Balls (bouncyballs.org).

Effective Communication Strategies

The following communication strategies will be beneficial for Nicholas' friends, family and education team when speaking with him:

- Use Nicholas' name when gaining his attention
- Use non-verbal cues (facial expressions, body language and gesture) to aid Nicholas' understanding.
- Nicholas would benefit from a slightly slower rate of speech.
- Use brief instructions to reduce the demand on Nicholas' short term auditory memory.
- Should Nicholas require information to be repeated, please do so using the exact same phrase so Nicholas can fill in any information missed, rather than having to process new information. If Nicholas requires further clarification, then try phrasing in a simpler way.

Additional Classroom Strategies

- Preferential seating is important to ensure good visual access to the primary speaker and interactive technology. Nicholas would be best seated close to where his teacher is primarily positioned, and next to quieter children in the class. Set seating is preferred as moving children with listening difficulties often causes further listening challenges and anxiety. Nicholas should not have to twist in his seat for visual access of his teacher or the interactive whiteboard. This would help address Nicholas' difficulty with decoding skills and listening in background noise. Writing new words, key words or difficult words on the board can support Nicholas in his understanding and allow him to obtain a better grasp of the words that may be incorrectly perceived.
- Nicholas' auditory processing difficulties likely cause him anxiety participating in classroom/group activities. Provide Nicholas with information on upcoming discussions to ensure he does not feel singled out or unprepared.

- Encourage Nicholas to use a visual aid to subtly flag times he has not heard or understood and requires support. His self-confidence should improve as he experiences more success in the classroom. Younger children may like to make a cue card which can be placed on either side to represent they have or have not understood the task. Alternatively, an easily identified pencil/pen (i.e., coloured, ooshie topper etc.) could be placed on the desk when assistance is needed.
- Nicholas' auditory processing difficulties mean that he will often be working harder than his peers to listen, attend and retain verbal information. He may at times feel overloaded with auditory information and benefit from an opportunity to have short break. For example, younger children may enjoy a quick physical movement break, older children may get the break they need by running a message to the front office.
- Give Nicholas the benefit of the doubt if he has not followed an instruction correctly.
- If possible, provide Nicholas with an alternative learning space that is free from noise and distractions.

Additional Recommendations

- As indicated above, review with an **ENT Specialist** is recommended given Nicholas' hyper-compliant left ear drum, left mild hearing loss at 8kHz, reported snoring and mouth-breathing.
- **Paediatrician review** – Given the significant concerns reported for Nicholas' development, learning difficulties and behaviour, it is recommended that he be reviewed by a Paediatrician. This was discussed in detail with Greca at Nicholas' support planning appointment.

- **Psychologist**

- Counselling and support

- Concerns were raised by Nicholas' parents and teacher regarding the possibility of him having an underlying level of anxiety in the classroom and low self-confidence and self-compassion. This was also noted in his appointment. He required a significant amount of encouragement to complete tasks. I understand Nicholas is currently on the wait-list for psychology support.

- Educational Assessment

- Considering the significant concerns for Nicholas' academic progress across the curriculum, especially with literacy, referral to an Educational Psychologist is recommended. This assessment would be beneficial to highlight Nicholas' learning strengths and areas for improvement, ensuring intervention and support is appropriate and that his parents and education staff have realistic expectations regarding his ongoing learning.

- **Occupational Therapy** – It is recommended that Nicholas be assessed by an experienced paediatric occupational therapist, to determine whether underlying sensory issues are impacting on his development and ability to attend and focus in the classroom. Nicholas was reported to demonstrate some possible sensory seeking

behaviours (hits himself when he is excited, seeks loud sounds) and have significant difficulties with his handwriting skills (right-handed). Research suggests that there is a strong link between handwriting skills and literacy. Handwriting is an essential skill for sound academic progress at school. Handwriting problems can interfere significantly with Nicholas' ability to express himself, keep up in class, demonstrate learned material and complete assignments and homework on time. These difficulties can extend to home-life and impact on self-esteem.

- Re-engagement and support with a **Speech Pathologist** – Nicholas may benefit from review with a speech pathologist given ongoing concerns for his stutter and language skills. Greca reported additional concerns for Nicholas' ability to correctly interpret the meaning in language – you may wish to discuss this further with Nicholas' speech pathologist.
- **Orthoptist / Vision Assessment** - I recommend eliminating the possibility of any visual problems affecting Nicholas' learning in the classroom. I suggest contacting Mrs. Tania Straga, Orthoptist specialising in the assessment and management of children on (08) 8267 3304 at Adelaide Eye Therapy. An orthoptist is a university-trained allied health professional specialising in the diagnosis and management of eye-disorders and vision loss.) Alternatively, you may like to contact an Optometrist.

Review of Auditory Processing Abilities

Review of Nicholas' auditory processing skills is recommended in 12 months' time, or two months following completion of an auditory training program should you proceed with this recommendation. This will allow us to monitor Nicholas' progress, determine if further auditory training is required and whether improved skills have been generalised to everyday life. Intervention is dynamic and requires ongoing review to ensure supports reflect your child's current listening profile.

Please let me know if you have any questions regarding this report or if you need further assistance.

Kind Regards



Lauren Iasenzaniro
Senior Audiologist
All Ears Audiology / Little Ears

References

Dr. Teri Bellis, Ph.D. (2002) When the Brain Can't Hear

Dr. Jack Katz, 2014 Audiology Online: APD Evaluation to Therapy: The Buffalo Model

Executive Function & Self-Regulation (2022); Centre on the Developing Child, Harvard University: <https://developingchild.harvard.edu/science/key-concepts/executive-function/>

Appendix

A – Peripheral Hearing Assessment

Name:		DOB:		Attended with:	
Date:		Site:		Referred By:	

Otoscopy – visual examination of the ear canal and ear drum (tympanic membrane)

Right Ear	
Left Ear	

Tympanometry – measure of middle ear health

	Pressure (daPa)	Compl (ml)	ECV (ml)	Type
Right				
Left				

Acoustic Reflex - examines the integrity of the auditory neural pathway

Probe	Tone	500HZ	1kHz	2kHz	4kHz
RE	RE (RI)				
LE	LE (LI)				
RE	LE (LC)				
LE	RE (RC)				

Speech Audiometry – assesses your child's ability to discriminate between different speech sounds at varying loudness levels

Speech Test		
Presentation (dBHL)	Right Ear (%)	Left Ears (%)

Summary	
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Assessment	
Reliability	

SYMBOLS	LEFT	RIGHT
Air	X	O
Masked Air	⌵	●
Bone	>	<
Masked Bone	☐	☐
Sound Field Binaural dB SPL		☐

Distortion Product Otoacoustic Emission
examines cochlear function (inner ear)

Ax	
RE	
LE	
Notes	

Audiologist/s:

Signature

