Speech-in-Noise (SIN) assessments and Radio Aids:

The purpose of SIN assessments with a Radio Aid helps to ascertain the following:

How well the Radio Aid system makes speech accessible in environments typically found in mainstream classrooms – and we use speech discrimination tests to evaluate this.

1. How well the deaf child’s functional use of hearing on their current (assessment) amplification package performs in listening conditions that are typically found in mainstream classrooms.

The SIN assessments need to have an ethos of scientific rigour and repeatability of data to make that data valid and meaningful. Thus, I have developed my own here in Northamptonshire and I now share this, along with the reasoning behind it.

NB: It is always useful to ascertain functional use hearing data results without a Radio Aid first - both with and without lip-reading.

Why? ...because:

i. This will show how well the deaf pupil will hear their peers.
ii. This will show the magnitude of the impact and benefit the Radio Aid gives.

Automated SIN Procedure – GW in Northants:

1. Test stimulus - Where possible, use the BKB speech discrimination sentences.
   Why? ...because:
   the BKB uses whole sentences and it is in whole sentences that teachers teach in the classroom. Thus, it is the closest simulation to ‘real life’ conditions that the deaf child will meet in the classroom.

2. Noise stimulus – The Ewing Foundation ‘calibrated classroom babble’
   Why? ...because:
   this has become the industry standard within the profession. Soundbyte solutions use it in their Parrot test equipment.

3. Levels of stimulus – this is probably the most varied test parameter amongst professionals working in this field. I use 60dBA/60dBA at ear level as the standard in Northamptonshire – with a distance of about 1 metre between the tester and tested.
   Why? ...because
   a. In a well noise-managed deaf aware taught mainstream classroom, the average top-end noise levels are about 60 dBA (others may disagree with me on this).
   b. When the Radio Aid is in-situ, I still aim for a speech stimulus of 60 dBA at ear level. (It is about 80 dBA going into the Radio Aid microphone under these conditions.)

4. Position of the calibrated classroom babble Noise generating speaker. Directly behind the deaf child being tested and again at a distance of 1 metre (For the BKB).
   Why? ...because:
   a. It is important to verify the settings by using a SLM (Sound Level Meter – type 2) for scientific rigour.
b. Why 1m? – because at this distance in ‘live voice mode’ I can present a good consistent level of speech at 60dBA @ ear level without projecting my voice and thus without distorting the natural vowel/consonant balance within my natural speech.

**Functional use of hearing** – How a deaf child functions with their hearing varies (this is a reflection of their amplification package, the quality and development of their auditory pathways to the brain and the level of development of their auditory processing skills). Thus it is important to evaluate all aspects of their functional hearing:

1. With and without lip-reading – gives an indication of how much the deaf child can function with listening to speech purely through listening and with the assistance of lip-reading.
2. In varying degrees of noise levels.
   a. 60 dBA (standard recorded levels in Northants)
   b. 70 dBA (Nice to know how the Radio Aid technology copes with this).
   c. 75 dBA (Rare situation in mainstream classrooms – but not unheard of and the limits of my speaker generating technology).

**Acoustics** – classrooms vary considerably in the quality of their acoustics. In an ideal world an acoustic evaluation of the classroom would be great. Not everyone has access to a Norsonic 118/140. Thus we use simply three terms:

1. Acoustic quality is **GOOD** (classroom has low ceilings with acoustic tiling, carpeting and may have a 0.4 RT).
2. Acoustic quality is **AVERAGE** (classroom is typical of a mainstream primary or secondary school. Viz: between 0.6 and 0.8 RT)
3. Acoustic quality is **POOR** (classroom is typically Victorian with high ceiling and no carpets).

Ideally it would be best to do the assessment in the actual classroom – in practice this may not be possible during school hours. Thus recording the acoustics of the test room and noting how it compares with the actual classroom is as scientific as one can be in this situation.

**Evaluating young deaf children – the automated Parrot-plus2.**

The automated Parrot plus 2 has all the equipment needed to complete this assessment for deaf children who are developmentally ready for the Toy Test or NMPT.

Note: the child may not be developmentally ready to do SIN assessments at this age – professional judgement on the validity of any results obtained must be commented upon. For some children being able to engage and focus when in ‘noise test’ situations is just too much. However the technology is capable of doing these assessments if the deaf child is ready.

Note: this equipment uses test distances of 75cm for the position of the speakers in front and behind the tested – although their Phoenix technology uses a test distance of 1m.

**Automated vs Live voice:**

**Automated** - The harsh reality is that placing a Radio Aid microphone in front of a speaker stimulus will introduce a degradation of the acoustic quality of the speech stimulus – this in turn gives poorer results than is actually the case in the real world of the classroom. However, the results are scientifically robust and repeatable if the test conditions are repeatable.

Also, because the quality of the speech stimulus is degraded in comparison to live voice this requires a higher level of cognitive demand upon the listener to engage with the assessment.
Live voice – The results obtained from Live voice assessments are the most reflective of the deaf child’s likely performance in the real-world classroom.

Why?

...because a ‘live voice’ has all the natural acoustic properties inherent in speech without any degradation caused by electronically generated speech and it is the quality of speech that the deaf child will listen to in the real world classroom.

But scientific rigour? This is a challenge. However, a practiced and skilled presenter will be able to maintain a good degree of consistency of stimulus presentation such that 60 dBA is received at ear level (and thus 80 dBA into a properly positioned Radio Aid microphone). I have done this over many years with the BKB and achieve repeatability of results +/- 4% ie 2/50 key word variance.

The future:

There is no doubt that the age of the Radio Aids with the early years deaf child population is now upon us. All local authorities are being challenged by the NDCS about their provision of Radio Aids for early years. The research evidence is compelling that application of Radio Aid technology will improve outcomes for congenital deaf children and early onset deaf children in terms of:

- speech and language development.
- behavioural management of early years deaf children.
- health and safety of early years deaf children.

The challenge to this profession is to develop test techniques for measuring:

**testing SIN performance in deaf children from a first fitting of hearing aids following newborn hearing screening.**

**testing SIN performance in deaf children under 1 year with Radio Aids.**

**testing SIN performance in deaf children in early years with a Radio Aid from 1 to 2 ½ years.**

**testing SIN performance in deaf children from 2 ½ year to school age entry.** – this is sorted. See comments above about Parrot-plus2. This technique also can be easily modified for use of live voice assessment – which the deaf child is more likely to engage with than listening to a mysterious black box 😊.

The future is bright for Radio Aids and deaf children

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