

# Benefits of speech & language therapy for hearing impaired children

Liz Fairgray and Suzanne C. Purdy

Speech Science (Department of Psychology, Faculty of Science),  
The University of Auckland, Auckland, New Zealand, Email: l.fairgray@auckland.ac.nz



Reflecting Connections 2008. A joint conference between New Zealand Speech Language Therapists Association & Speech Pathology Australia, Auckland, 25-29 May 2008

## Abstract

Although the need for speech and language therapy is widely recognized for children who are hearing impaired, there is little research evidence for improved outcomes after specific speech and language therapy interventions. With improvements in hearing aid and cochlear implant technology, and consequently improved access to the speech signal, there has been greater emphasis on listening-based therapies. The most widely used therapy is referred to as "auditory-verbal therapy" (AVT). This approach is endorsed by the Alexander Graham Bell Association, but there is paucity of research evidence for AVT effectiveness (Rhoades, 1982; Goldberg & Flexer, 1993; Wray et al., 1997; Rhoades & Chisholm, 2000). Previous studies have focused on psychosocial and educational outcomes of AVT, rather than measuring specific speech and language outcomes. The current study investigates speech and language, speech perception in noise and reading abilities before and after a 6-month period of weekly AVT with an experienced Certified Auditory-Verbal and Speech-language Therapist. Participants are eight children aged 5 to 17 years with moderate-profound sensorineural hearing loss using cochlear implants (CI) and/or hearing aids.

## Method

- N=8 children aged 5 to 17 at start of study (mean 10;5, SD 4;0 years)
- Referred by audiologists, otolaryngologists, advisers for deaf children
- Moderate-severe (N=1), severe-profound (N=1), profound (N=6)
- Following assessments completed pre and post therapy:

Language	Phonology	Articulation	Reading
CELF-4 (Clinical Evaluation of Language Fundamentals-4 <sup>th</sup> Edition)	HAPP-3 (Hodson Assessment of Phonological Patterns Edition-3 <sup>rd</sup> Edition)	NZAT (NZ Articulation Test)	WIAT-II Wechsler Individual Achievement Test-2 <sup>nd</sup> Edition

- Parent & child attend weekly 1-hour sessions for 5-6 months
- Approx. 20 min/day homework
- Perception of Lexical Neighbor Test words in noise measured at +5 dB signal to noise ratio

## Case Example

I am Rebecca's mother and attend all the sessions with Liz & Rebecca.

Hi, my name is Rebecca and I am 17 years old. Although I have pretty good results in my exams I find that going to school is hard because it is very noisy. It is hard for some of my friends to understand what I am saying and I sometimes don't know what they are talking about. The really embarrassing moments happen when I think I have understood somebody and then I realise by the look on their faces that I missed the point.



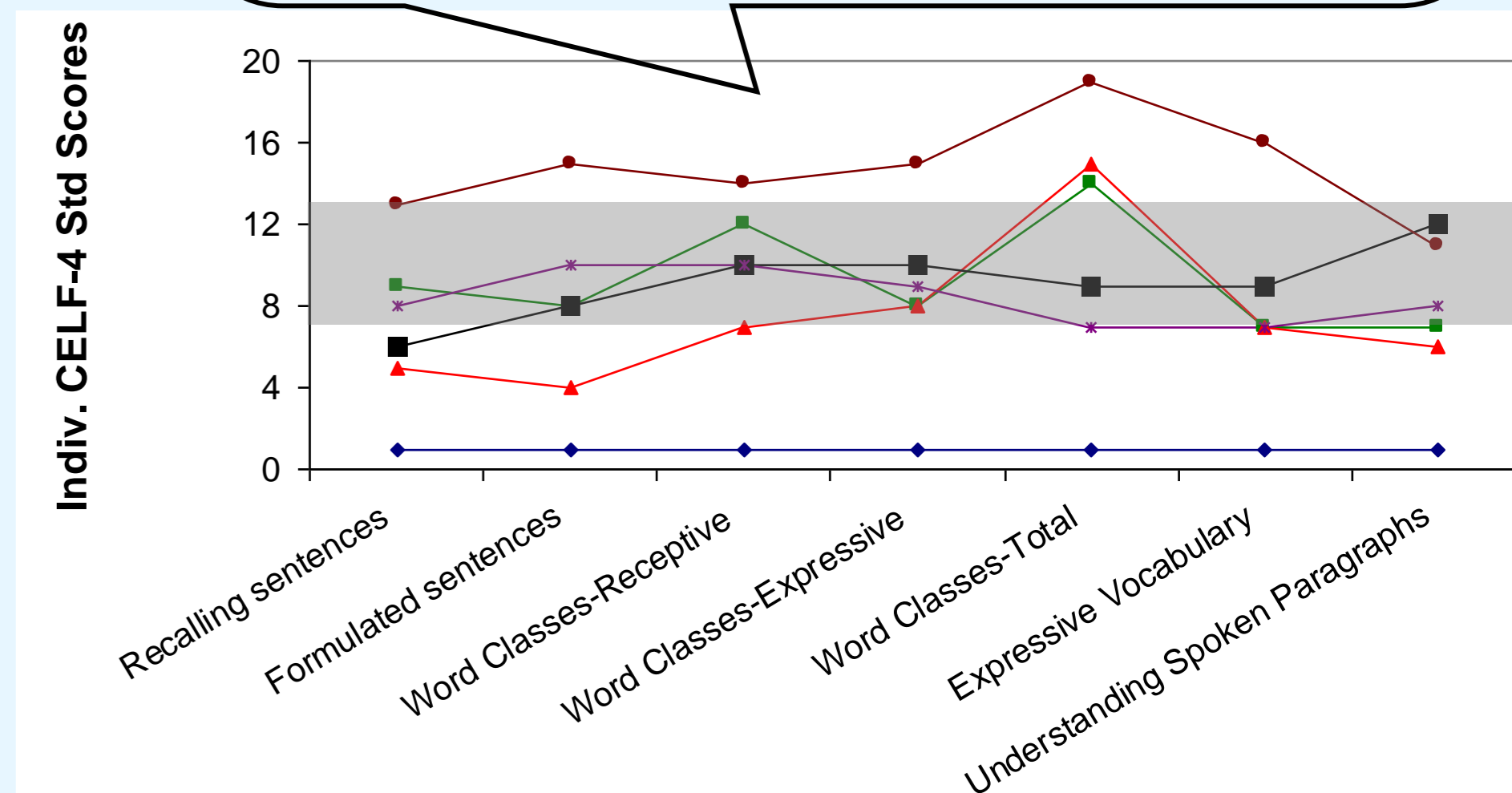
We discussed the results with Rebecca and her Mum and formulated a management plan. The school has been supportive of Rebecca's participation in therapy.

- Ongoing therapy is focusing on improving the clarity of Rebecca's speech production. We work to eliminate processes such as the nasalisation of the "l" sounds, or the simplification of multisyllabic words into two-syllable words
- Pre-therapy, /l/ -->/n/ substitution and absence of /s/ in clusters negatively affected intelligibility.
- To obviate both processes, we focused on oral voice production. Both sounds are corrected because the nasalisation is eliminated and the absent /s/ becomes present.
- Rebecca reports that she now participates more in class and that she now feels confident talking to groups of strangers.
- After 5 months intervention, Rebecca's scores on some language measures (CASL) have improved by one standard deviation.

## Auditory Verbal Therapy

1. Utilise focused audiological management
2. Ensure the immediate fitting of technological aids
3. Present auditory stimulus as the main sensory input
4. Provide early, intense habilitation
5. Adopt a parent-centred approach
6. Teach language and speech through listening
6. Integrate listening into every aspect of daily life
7. Place children in mainstream classes

Pre-therapy CELF-4 subscale scores were variable across participants. The normative mean plus/minus 1 SD is shaded. Recalling sentences and Understanding Spoken Passages were difficult for 3 of the 6 children tested using the CELF-4.



## Results

Pre-therapy results indicate considerable variation in performance:

1. **Speech recognition scores** (% correct) for speech in noise at a +5 dB signal to noise ratio (SNR) are shown in the Table below. This SNR is better than can occur in classrooms containing ~30 children and other noise sources. In NZ classrooms the SNR is typically less than 0 dB (i.e. noise is louder than speech signal) (Valentine, Wilson, Halstead, Dodd, McGunnigle, Hellier, & Wood, 2002).

Hearing aid (HA) / Cochlear implant (CI)	Age (yrs;mnths)	Easy words (%)	Hard words (%)
Right CI	17;7	46.7	20
Right CI	8;7	26.7	13.3
Bilateral HA	5;5	40	26.7
Bilateral HA	10;4	13.3	20
Right CI	10;9	33.3	6.7
Bilateral CI	9;5	46.7	46.7
Bilateral CI	6;8	66.7	33.3
Bilateral HA	14;5	26.7	0
<b>Average</b>	<b>10;5</b>	<b>37.5%</b>	<b>20.8%</b>
<b>SD</b>	<b>4;0</b>	<b>16.3</b>	<b>14.9</b>



In the Lexical Neighbour Test (LNT) 'Easy' words occur frequently and have few lexical neighbours. 'Hard' words are infrequent and have many lexical neighbours.

2. **HAPP-3 phonological error scores** were 7-74% (mean 37%, SD 28%).
3. **Pseudo word reading** standard scores were 65-119 (mean 81, SD 19).
4. **Word reading** standard scores were 45-116 (mean 86, SD 19).
5. **Reading comprehension** standard scores were 56-130 (mean 93, SD 26).

## Pre- versus post-therapy findings for Case#1



- Rebecca's pre-therapy standard scores for CASL (Comprehensive Assessment of Spoken Language) ranged from 67 to 101 (Total Score 80). Scores for Synonyms, Inference & Pragmatic Judgement subtests were below 80.
- Post-therapy, these scores improved and ranged from 86-108. The biggest gain was made for understanding "inference" (67-->87). This is presumably a result of the therapy focus on word meanings, multiple meanings for a given word and focussed attention on non-literal figurative language.
- HAPP-3 showed an improvement in Rebecca's scores with aspects of phonological production (74.1%-->10.3% error). The reduced occurrence of nasalisation and cluster reduction has had the greatest effect on intelligibility.

## Conclusions

- Intelligibility improved with systematic therapy targeting errors in speech production for Case#1. By selecting "high impact" processes, the effect of remediation was probably more dramatic than if other processes had been selected.
- Using AVT techniques, Case#1 has improved her ability to listen, perceive the errors in her speech production, listen to an adult target model and then imitate the sounds produced. An AVT approach was used to improve her ability to hear the different voice quality yielded by nasal versus oral voice projection. This moved in progressive steps from isolated sounds, to word and phrase level. Generalisation to spontaneous conversation has not yet occurred.
- Preliminary results have highlighted the need for assessment and therapy for voice production. This may be particularly helpful for children who have received their CI at a later-than-optimum age.
- Children with CIs need on-going habilitation, not just assistance in the first few years.
- Pre-therapy results are very variable and hence a one-size fits all approach is not appropriate for hearing impaired children.

## Reference

Valentine J, Wilson O, Halstead M, Dodd G, McGunnigle K, Hellier A, & Wood J. (2000). Classroom Acoustics - A New Zealand Perspective. Proc 15th Conference of NZ Acoustical Society, pp 127-142, 2000