Portions have been extracted from this report to protect the identity of the student.

RIT/NTID AURAL REHABILITATION REPORT
Academic Year 2003 – 2004

Sessions: 9/03 – 5/04
Device: N24 cochlear implant

Speech processors: 3G & Sprint

Background:

Student X attended the Rochester Institute of Technology. He was born with a profound bilateral sensorineural hearing loss secondary to Usher's Syndrome Type I. At the completion of his sophomore year, Student X underwent cochlear implant surgery in the right ear for the Nucleus 24 cochlear implant. He was fit with the external components in August 2002. Over the past two years, Student X has received communication therapy provided by the Audiology Department and one year of speech therapy from the Speech and Language Department at the National Technical Institute for the Deaf (NTID). After one year of consistent CI use and aural rehabilitation therapy, this student demonstrated definite benefit from the use of his cochlear implant. With access to high frequency sounds, he has been able to recognize phonemes and words in small sets. He also reported distance hearing. Here is his summary of the first year of cochlear implant use: *"CI is a part of me. Now I miss it when it's off." "Exceeds expectations – much more environmental awareness."*

AURAL REHABILITATION SERVICES PROVIDED AT NTID/RIT, 2003-2004

Student X was seen for individualized aural rehabilitation services 2x/week during the academic year. Supplemental auditory training videotapes, communication training CD programs and websites were also introduced for additional independent listening practice.

In priority order are the goals Student X established for his aural rehabilitation program:

1. Reduce dependence on visual cues
2. Improve discrimination of high frequency speech sounds
3. Improve decoding abilities for identifying words in auditory only mode
4. Improve comprehension of common phrases
5. Improve speech intelligibility
6. Increase auditory memory

The aural rehabilitation program was composed of the following areas:

- Skill assessment
- Map checks
- Troubleshooting equipment
- Environmental sounds
- Phoneme identification, synthesis & decoding
- Word & phrase recognition
- Auditory tracking

A description of this student's performance on the activities of the aural rehabilitation program is described in the next sections.

Map Checks

This student uses a 3G speech processor. The Ling 6 Sound Test was administered routinely to measure phoneme detection and discrimination. He consistently detected all of the sounds at a close distance for an average conversational level. However, for sounds he identified as barely audible to moderately quiet, user settings were re-evaluated and a remapping was recommended. "m' was typically the softest sound. A wide range of performance results was seen across time with different maps:

oo vs s	50% -100%	ee vs ah	30% - 70%
sh vs ah	60% - 90%	sh vs ee	40% - 100%
ee vs mm	80% - 90%	oo vs m	60% - 100%
sh vs s	30% - 100%		

The higher scores were obtained with more experience and new maps. Reportedly he used loudness cues to differentiate sounds.

Mappings

Student X uses the ACE strategy. Channel 22 and 18 are disabled. Channel 18 caused a pain in his neck when initially stimulated. His last map was in March 03. He was remapped at NTID at 13 months (Sept. 03), 14 months (Oct. 03) and 17 months (Jan. 04) of CI use. Remapping was performed due the results on map checks, reports of reduced audibility and choppy speech. During mappings, threshold (Ts) and Comfort (Cs) levels were re-established. The Ling Sounds were also administered during the mapping to set the maps parameters for increased audibility and discrimination. Student X prefers using an ACE 14400 sensitivity map with the user knob set to 6. Toshiba batteries are recommended with this map. The audiogram completed with the new map created on September 9/11/03 is below.

	250	500	1k	2k	3k	4k	6k	SAT
9/11/03	35	30	25	25	35	30	20	20

Environmental Awareness & Detection:

During his summer internship of '03, this student was able to identify his name and environmentally sounds more easily. He began to recognize the computer printer, telephone ringing, and paper ripping. The ability to hear in background noise also improved. He could identify car horns while driving and sirens. During the academic year, he practiced identifying environmental sounds using the NTID Environmental Sounds Laser disk program. One lesson was on nature sounds. He could differentiate cow mooing, telephone ringing and bird chirping. Thunderstorms and bees were similar.

Phoneme (Consonants & Vowels) Perception:

Perception of consonants and vowels was trained with three programs:
Vowel Power Video Disk Program, KATZ Auditory Training Program and the Utah Learning to Hear Again videotapes.

Vowel Power Videodisk Program

Vowel Power, a MAC hypercard computerized auditory training program was designed at NTID. The program consists of an assessment of 13 vowels in the hVd format (e.g., heed, hid, head, had, heard, hod, who'd, hood, hawed, hide, hoed, how'd, hoid). Vowels are grouped into different lessons based on similar acoustic features: long vowels, dipthongs, short, central, front, back, etc. Orientation to the program was presented in an auditory visual mode. This student did not find the task challenging when speechreading was available. Therefore, after the first lesson, subsequent lessons were presented in the auditory only mode. Each lesson had the following limited set activities: discrimination/identification tasks: same/different, interval forced choice with three items, male word quiz, female sentence. At the end of the lesson a reassessment of all 13 vowels occurred. The results of several lessons are in the table below.

He scored above chance consistently for same/different activities across vowel grouping. Identification of vowels with similar formats, or durations was challenging. Over several weeks, he consistently scored below chance on most of the identification activities. Due to limited progress on this type of activity, the practice with this program was discontinued.

Lessons:	Same/ Different	I. Forced Choice	Male Quiz	Female Sentence	Test 52 items
Pretest					9.6%
Long vowels	NA	NA	NA	NA	19.2%
Dipthongs	80%	65%	45%	35%	7.7%
Short vowels	75%	40%	65%	30%	13.3%
Front vowels	85%	75%	60%	55%	15.4%
Central vowels	60%	60%	30%	85%	19.2%
Back vowels	85%	55%	45%	40%	25.4%
High vowels	90%	55%	0%	50%	21.2%

KATZ Auditory Training Program

The Katz Auditory Training program was designed by Dr. Jack Katz. The program teaches phoneme and word identification. There are several levels of training: phoneme, word and sentence assessment, introduction of phonemes, phoneme identification, phonemic synthesis, and phoneme decoding, repeat phoneme assessment. The 68-item Phoneme Recognition Test is administered in the live condition. Based upon the error analysis of the test, phoneme training is initiated. Over a 30-week period, he had 20 minutes of phoneme practice 1-2x/week. Phonemes were initially grouped with distinct acoustic features (i.e., different consonant manner cues and vowels with different F1 formants.) Set sizes ranged from 4 to 6 phonemes. Each set included at least one vowel to aid with developing real words for the phonemic synthesis practice. For limited set sizes, this student could identify consonant and vowel pairs that differed in duration, nasality and voicing cues. He scored 75-100 correct on the phoneme identification tasks. This student's auditory memory could retain the correct identification for the phonemes for the synthesis task (i.e., n + I + t = knit). However, a breakdown occurred during the decoding tasks. He inconsistently identified the phonemes in the words generated from the synthesis activity (i.e., knit = n + I+t). Decoding was the most difficult level of the program. The results of the Phoneme Recognition test revealed that phoneme identification among a large set of items remains difficult. However an improvement was noted in the ability to identify consonants based on manner cues. He reported that the Katz program was a valuable tool for teaching phoneme perception and as a pronunciation tool.

Utah Learning to Hear Again Videotapes

This student was presented with recorded pairs of words with continuants or plosives in initial and final positions. In the initial position, scores ranged from 61-88% and 84% in the final position. Word length was also assessed using the Utah videotapes. Student X scored 70-78% on trochees vs monosyllables. Scores on identification of familiar phrases ranging in word length and set size (i.e. 2-4 items) ranged from 63-90%.

Auditory Tracking:

This year, Student X continued to track portions of "1984" text from a cassette. There were 10-minute sessions. He also tracked recordings of short stories, and poetry. He primarily tracked the story based on punctuation stops. Web-based materials were also incorporated into the sessions. Attached to this report are recommended sites for tracking and phoneme identification and word identification tasks.

Summary of Performance Results

Test	***1mo***	***2mo***	***5mo***	***9mo***	***12m***	***19m***	***21m***
Phoneme Recognition Test **Consonants** **Vowels**	*13%* *15%* *0%*						*16%* *10%* *25%*
Speechreading-CID Sentences		***70/92***					
Adult **Early Speech Perception Test**				***Level 2 Patt. Perc.***		***Level 3 Spondee words***	***Level 3 Spondee words***
Clark-Katz Phoneme Test Consonants Vowels				 8% 11%		 16%	
Nucleus Level A Screening Test (Word length)	80%			95%	95%		90%
Nucleus Level B Screening Test (Sentence Length)					90%		90%
Nucleus Level C Screening Test (Vowel formants)					70%		
Nucleus Word Pattern Discrimination	70%			90%			
Nucleus High Contrast Place	*50%*			***70%***			

This year, Student X has continued to see benefit from his cochlear implant. On a questionnaire comparing pre-implant to post implant experience he reported the following*: "I can hear most environmental sounds, I hear people talking across the room. Being able to hear what people are saying helps me figure it easier…. It's like an aid to lipreading. The cochlear implant helps me slow down and think more about what I'm saying and how I'm saying it."*

It is recommended that this student continue to participate in an aural rehabilitation program to optimize his maps and facilitate his progress. Specific goals identified include the following:

1. Reduce dependence on visual cues
2. Improve discrimination of high frequency speech sounds
3. Improve decoding abilities for identifying words in auditory only mode
4. Improve comprehension of common phrases
5. Improve speech intelligibility (Student X was also enrolled in speech therapy.)
6. Increase auditory memory

Resources

Speechreading and auditory training curriculums for self practice:
Seeing and Hearing Speech, Sensimetrics CD
http://www.seeingspeech.com/
Sound and Beyond (CDs) Available 2005 from Cochlear Corporation

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