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IMPLEMENTING AURAL HABILITATION: A CASE STUDY

Linda Kozma-Spytek

Speech and Hearing 570

Independent Study

May 8, 1981

For Reference

Not to be taken from this room

Directed by: Carol De Filippo, Ph. D.
Helen S. Lane, Ph. D.

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IMPLEMENTING AURAL HABILITATION: A CASE STUDY

Introduction

For most hearing-impaired children, the primary mode for speech perception is auditory-visual. Through vision a hearing-impaired child can distinguish place of consonant articulation, although each place of articulation is not equally visible. Recognition of consonants is influenced to some degree by surrounding vowels. Vowels are not recognized categorically as consonants are, but on a continuum of articulatory positions. Therefore, vowels are more difficult to recognize than consonants. Confusions occur primarily between vowels with similar articulatory positions. In all, there are only approximately 9-14 speechreading movements (visemes) representing some 42 phonemes.

Through audition, hearing-impaired children with the use of appropriate amplification exhibit a range of speech perception abilities. This range includes the perception of spectral cues for speech (e.g., voicing, nasality, voice pitch and low-frequency vowel formants) to the perception of time and intensity patterns alone. It has been shown that audition and vision complement each other and are superior to either vision or audition alone in the perception of speech.

Difficulty in receiving information either visually or auditorily will impede the hearing-impaired child's overall development to an even greater extent than the primary handicapping condition does alone. The results may be added difficulty in language acquisition, speech development and educational achievement. For these children, aural habilitation should be considered in order to strengthen speechreading and/or auditory skills.

One of these children is a hearing-impaired student attending the Central Institute for the Deaf. M.C. was considered by his teachers to have a lipreading

problem which impeded the reception of spoken information. His teachers felt the problem was sufficiently severe to warrant some type of individualized training. M.C. has since been receiving both auditory and speechreading training twice a week with each session lasting 30-40 minutes. This aural habilitation program began January 27, 1981 and will be continued through May 19, 1981.

Educational and Audiologic Information

M.C. is 14-3 years old. He has a profound bilateral hearing loss (105dB HL pure-tone average for the better ear). When the CID word test was administered in 1980, the results showed his recognition skills with a small known set to be fair (R/L - 17/24) and his categorization abilities to be good (R/L - 24/24). When the MTS (Monosyllable-Trochee-Spondee) test was administered in 1980, the results showed his recognition skills with a larger word set to be poor (R/L - 7/30) and his categorization abilities remained good (R/L - 25/30).

M.C.'s hearing-impairment was not suspected until he was 2.0 years old. It was then 8 months before he was seen by a doctor and the hearing-impairment was diagnosed. The etiology is thought to be the rubella syndrome.

At age 3-7, in 1970, M.C. was seen in the Speech, Language, and Hearing Clinics at the Central Institute for the Deaf (CID). The parents were referred to CID by a medical doctor. After the CID evaluation, M.C. was considered to be a candidate for the Parent-Infant Program at CID. He was enrolled in that program for one year (1970-1971). M.C. was then accepted as a day student in the pre-primary classes of CID.

M.C. has had great difficulty in acquiring both speech and language. Early in his education at CID, M.C. was placed in a classroom using a very structured approach to teaching speech and language - a modified version of the McGinnis Method. This seemed to be an appropriate educational placement for M.C. and his progress improved at a slow but steady pace.

At this point in M.C.'s school career, he is a student in the Advanced - Blue Department of CID. This department is made up of older students who have had and are still having difficulty in acquiring and using language and speech. These children are also significantly below grade level educationally. The curriculum consists of speech, language, and academic subjects (e.g., math, social studies, reading, and science).

M.C. is able consistently to understand and formulate syntactically-complete simple sentences. Most complex sentence structures are beyond his ability both in understanding and use. M.C.'s overall speech intelligibility is poor as assessed by informal listening. Nevertheless, M.C. is communicative and uses his language and speech skills to the best of his ability. His teachers report M.C. to be a good student, a diligent worker with sincere interest in learning the material presented in class.

Recent achievement test scores from the American School Achievement Test - Intermediate Battery (1981) and the Stanford Achievement Test (1981) gave the following results:

1. ASAT

C.A. - 14-1 years old
 E.A. - 10-2 years old
 E.Q. - 72
 Av. Gr. Equiv. - 4.9

2. SAT

C.A. - 14-1 years old
 Av. Gr. Equiv. - 4.1
 Av. of the percentile for H.I. of his C.A. - 59th percentile

Psychological test scores on the Hiskey Nebraska Test of Learning Aptitudes (1980) revealed these results:

1. Hiskey Nebraska

C.A. - 13-3 years old
 Deaf L.A. - 10-6 years old
 L.Q. - 81
 Corrected C.A. - 12-11 years old

Procedure and Discussion

There are basically three ways to approach aural habilitation for hearing-impaired children. One approach is to provide training in the modality which is judged to be causing a communication problem. The second approach is to provide training in the stronger of the two modalities; the modality not causing a communication problem. The third approach is to develop and remediate both modalities. This is considered the most conservative approach of the three and the one used in the training M.C. received. Therefore, M.C. received both auditory and speechreading training.

The initial step in any aural habilitation program is an evaluation or screening to determine the child's abilities in each modality. The auditory evaluation consisted of the administration of the GASP! (Glendonald Auditory Screening Procedure), a simple screening test developed by N.P. Erber. The test includes three specific stimulus response tasks: 1) phoneme detection; 2) word identification; and 3) sentence (question) comprehension. This test provides some basic descriptive and diagnostic information on auditory skills.

The visual evaluation included the use of sentences as stimuli, since speech is typically received in the form of sentences. The test sentences included common words and a common sentence form (Subject-Verb-Direct Object-Prepositional Phrase) with moderate contextual redundancy. The test is scored on the basis of key-word recognition. The same type of evaluation was given to test auditory-visual speech perception. In each case 10 different sentences were used. Each sentence was presented only once unless the child requested the tester to repeat the sentence. Only one repetition would be given. The child was to identify each sentence by writing it. During the visual test, the tester spoke without voice and the child's hearing aids were left on.

From the test results, M.C. seemed best able to perceive speech audio-visually, then visually, and then auditorily. The GASP! was administered with M.C. wearing his own hearing aids. This screening test showed that M.C. could reliably detect phonemes, except for unvoiced fricatives. M.C. was able to identify about half the words presented (11/24) and his categorization score was not much better (14/24). The sentence comprehension section of the test was too difficult for M.C. and was not completed. These results suggested that M.C. was capable of perceiving some spectral qualities of speech. A realistic goal for M.C. was considered to be improved identification and comprehension of words in a limited set.

On the visual test, M.C. was able to recognize only about half of the key-words (16/40). He usually dropped out the middle of the sentence presented. The sentences he did write tended to make sense even though much of the original sentence was left out. He asked for repetition of five out of the ten sentences presented. These results suggested that the identification of sentence-length material was a realistic goal for M.C. These results also suggested that M.C. needed training in visual attention span and sequencing, which are considered to be primary factors influencing speechreading ability. On the auditory-visual test, M.C. was able to recognize most of the key-words (34/40). He did not drop out the middle of the sentence presented as often, but he did ask for repetition of six out of the ten sentences.

The auditory training model set forth by N. P. Erber was used throughout M.C.'s training. The model is based on a stimulus-response matrix to define each communication situation. The matrix consists of six stimuli (e.g., phonemes, syllables, words, phrases, sentences, and conversation) from simple to complex. There are four possible responses (e.g., detection, discrimination, identification, and comprehension) from easy to difficult. Within this particular model, the

general auditory training method used was practice on specific tasks. This method, as opposed to a natural, conversational approach or a moderately structured approach, was chosen for a number of reasons. The times M.C. received training were the only times particular listening skills could be practiced. M.C. needed to have his confidence built as a listener. M.C. responded best, and more was accomplished, when this structured type of an approach was used. M.C. used his own hearing aids during training.

M.C.'s auditory training began with the identification of words. Once M.C. was consistently able to identify words in a limited set of approximately twelve, a decision had to be made concerning increasing the difficulty of the task. A more difficult stimulus or a more difficult response task could be chosen. A more difficult response task was chosen which meant M.C. would now be required to demonstrate comprehension of words.

M.C. was able to comprehend words in a limited set of approximately twelve. Even though M.C. was able to identify and comprehend words this does not mean he was able to do so every time. When M.C. did have difficulty identifying or comprehending words, certain adaptive strategies were supplied in order to help M.C. complete the required task without the instructor giving audio-visual clues. There are a number of strategies which were most frequently used. They were: 1) repetition of the stimulus; 2) use of more precise articulation; 3) use of greater segmentation; 4) increasing intensity of the signal or decreasing distance from the child; 5) giving contextual clues; and 6) requiring a simpler response (e.g., discrimination instead of identification).

- - Examples of specific auditory training tasks - -

Identification:

Purpose: Applying labels to speech stimuli which can be discriminated; learning speech patterns.

Response: Point to item named by the speaker, repeat stimulus, write stimulus.

Example of task: Pick a topic and discuss it with the child briefly audio-visually. Then write key words related to the discussion. Present them one at a time. Ask the child to repeat, point to, or write the word said.

e.g.- Topic: Solar System

Discussion: a) number of planets in the solar system
 b) name of the planets in the solar system
 c) order of the planets from the sun

Word List: Mercury
 Venus
 Earth
 Mars
 Jupiter
 Saturn
 Uranus
 Neptune
 Pluto

Comprehension:

Purpose: Understanding the meaning of a spoken stimulus. Making complex associations between sounds and events/objects, or between sounds themselves.

Response: The child performs the required task or answers questions.

Example of task: Cognitive Tasks

A) opposites: Write a list of words. Present them one at a time. The child writes or says the opposite of the word named.

e.g.- Word List

hot
 tall
 strong
 wet
 happy
 white
 over
 night
 loud

B) categorization: Write three headings. Have the child think of words that belong under each heading and write them. Present them one at a time. The child points to or says the heading the word named belongs to.

e.g.- Word List and Headings

<u>clothing</u>	<u>food</u>	<u>animals</u>
shirt	steak	elephant
sweater	potatoes	lion
belt	oranges	monkey
jumper	beans	bear

A method developed by DeFilippo and Scott, called the "Tracking Procedure", was used to provide speechreading practice for the identification of sentence-length material. In this method, the child is read a brief story which he must repeat verbatim as segments of the story are presented. The story is read without voice and the child's aids are left on. If the child makes a mistake as he repeats the segments, he is corrected through repetition, clarifying or emphasizing some aspect of the articulation, making the segments shorter, focusing on a key word or phoneme, or reviewing or previewing contextual information.

This method was very difficult to use with M.C. His speech was so poor it was difficult to know if he was truly repeating the story verbatim. The task itself was also very difficult for him even when using material below his reading level. It was still felt that identification of sentence-length material was appropriate, so another type of story was used to do the tracking procedure.

Instead of using a story from a reader, the child helped to write a story which was then read back to him. This type of story worked much better. He could repeat longer segments, less repetition was required, and frustration was limited. In this way, M.C. was able to gain some confidence in his own ability to perform the task.

One other type of exercise was used for speechreading training. This exercise was used to aid in visual attention span and sequencing. The child was required to attend to a sequence of either phonemes or words and then repeat them in the order they were said. M.C. was never able to attend to and correctly sequence more than four phonemes or words at a time even after repeated practice. He was able to repeat and properly sequence up to seven items in an add-on fashion. In other words, he could remember a string of items and then add on another item as long as the original string of items was repeated.

- - Examples of specific speechreading training tasks - -

Identification:

Purpose: Training the reception of ongoing speech; applying labels to speech stimuli; learning speech patterns.

Response: Repeat stimulus or write stimulus.

Example of task: Pick a topic and elicit sentences from the child about the topic. Form a paragraph. Read the paragraph to the child. Have the child repeat verbatim the segments of the paragraph presented.

e.g.- Topic: Solar System

Paragraph: We talked about the solar system. There are nine planets. We live on the planet Earth. Earth is the third planet from the sun. It has one moon.

Visual Attention Span and Sequencing:

Purpose: Develop visual memory.

Response: Repeat stimulus or write stimulus.

Example of task: A sequence of phonemes or words is said. Child attends to and repeats the sequence in the proper order.

e.g.-A) phonemes
fee foo fah faw

B) words
Yesterday I went to the zoo. I saw:
a monkey, a bear, a lion, and an elephant.
a wolf, giraffe, fish and seal.

Conclusions and Recommendations

The final evaluation showed improved speech perception in all modalities (e.g., auditory, visual, and auditory-visual). The same tests were given at the end of the training program as those given at the beginning of the program. Auditorily, M.C. could detect all the phonemes consistently. He showed good recognition and categorization skills (e.g., Recognition score - 22/24; Categorization - 22/24). All ten questions were completed on the sentence comprehension section with nine being presented auditorily only. A number of adaptive strategies had to be used to elicit the answers.

Visually, M.C. included more key words in his identification of sentences (29/40 key-words). He still seemed to drop out the middle of the sentences, but this did not occur as frequently as in the initial evaluation. He did ask for repetition of five out of the ten sentences presented. Audio-visually, M.C. included no more key-words than he did in his initial evaluation (34/40 key-words). He did ask for less repetition of the sentences presented. During the initial evaluation, he asked for six out of the ten sentences to be repeated. On the final evaluation he asked for no sentences to be repeated.

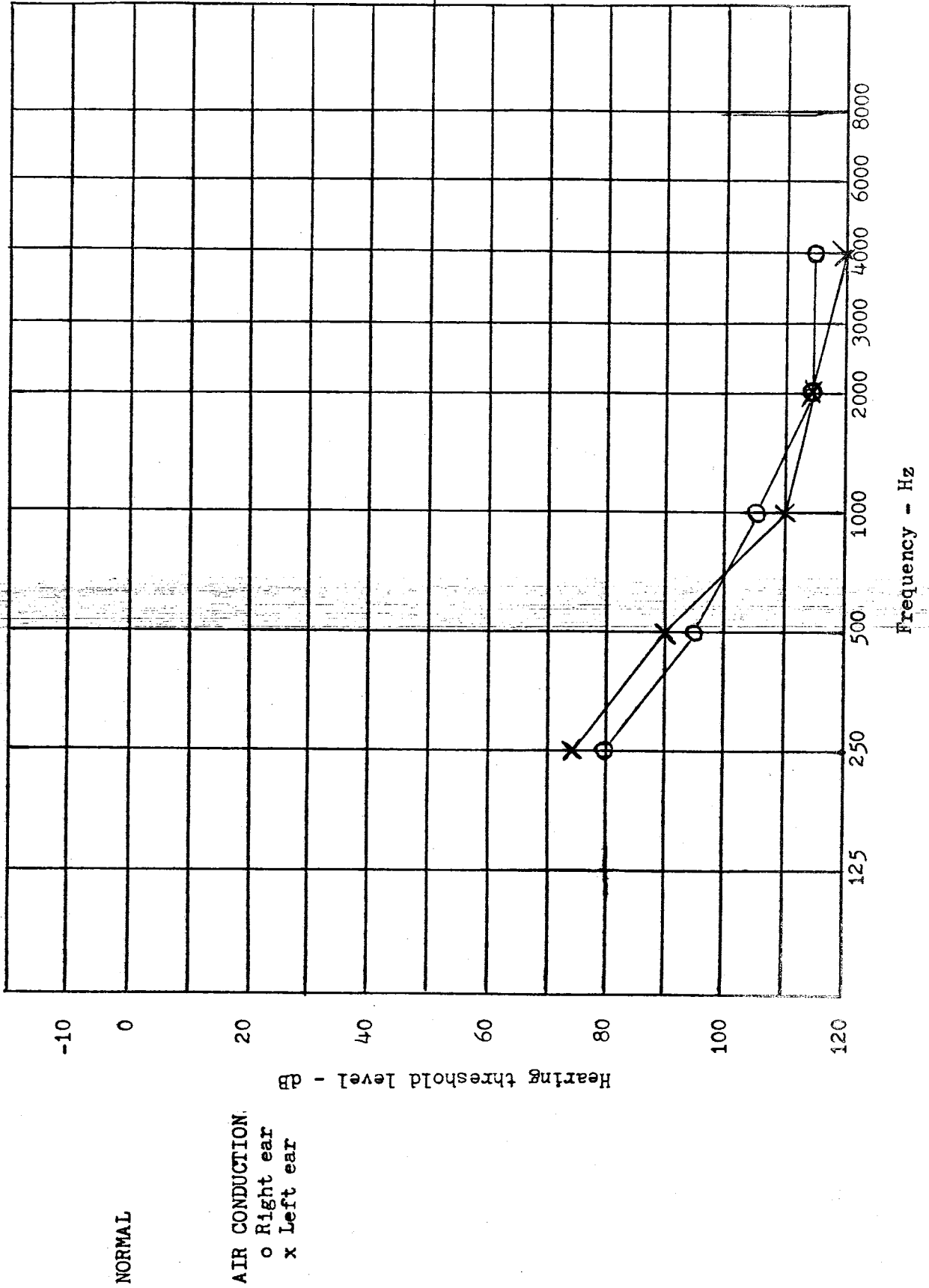
There may be a number of reasons why such improvement was shown in the final evaluation. M.C. was more familiar with the tasks presented and the type of response expected during the evaluation. There may also be some memory for the items presented in the final evaluation since they were the same as those used for the initial evaluation. Another reason may be that his speech perception has improved due to practice and training. M.C. is now more confident of his abilities, asks for less repetition of the stimulus, and is more willing to guess and revise his response when wrong. This is true both for auditory and speechreading tasks. His teachers also report they have seen improvement in his speech perception in the classroom.

Overall, I do feel the training has aided M.C. and by no means has his limit been met. I would recommend that he continue to receive auditory and speechreading training. Auditory work could be done on a more difficult stimulus-response task (e.g., identification and comprehension of sentences). This work will probably still need to be done in a structured setting using a limited set. I also feel M.C. would benefit a great deal from learning that his listening skills are useful in a conversational setting. This will have to be developed gradually. At this point in time, M.C. only enjoys listening as a game. Speechreading work could still be done on sentence-length material by doing some dictation of sentences and using the tracking procedure with different types of stories.

APPENDIX

AUDIOGRAM OF M.C.

DATE: 1/9/1980



NORMAL

AIR CONDUCTION

- o Right ear
- x Left ear

Visual and Auditory-Visual Test Sentences

1. The mailman brought a letter to my house.
2. The monkeys climbed the trees at the zoo.
3. The frog caught a bug in its mouth.
4. The children fed the ducks in the park.
5. The boy threw a baseball over the wall.
6. A cow ate some grass by the fence.
7. My mother dropped the soap on the floor.
8. The cat took some cupcakes off the table.
9. My brother played soccer in the backyard.
10. The policeman watched the cars in the street.

Note: Key-words are underlined.

Visual Test - 2/6/1981 - Child's Responses

1. The man will go my house. (r)
2. The children will go the school.
3. The frog jumped in my mouth.
4. The woman drive the car in the park. (r)
5. The boy throw the baseball ball over the wall.
6. no response (r)
7. The mother drop the dish on the floor.
8. The cat jumped on the table. (r)
9. The brother put dog in the pocket. (r)
10. The policeman stayed on the street. (r)

(r) - a repeated sentence

Key-word score: 16/40

Repetition: 5/10 sentences

Auditory-Visual Test - 2/17/1981 - Child's Responses

1. The mailman put the letter in the house. (r)
2. The monkey climb the tree in the zoo. (r)
3. The frog the bug in the mouth. (r)
4. The children fall down the park.
5. The boy threw the baseball ball over the wall. (r)
6. The cow ate the grass over the fence. (r)
7. The mother drop the soap on the floor.
8. The cat jump the table. (r)
9. The boy played the soccer his backyard.
10. The policeman watched the car on the street.

(r) - a repeated sentence

Key-word score: 34/40

Repetition: 6/10 sentences

GLENDONALD
AUDITORY
SCREENING
PROCEDURE
I

Child: M.C.
Teacher: S. Smith-Spitt
Tester: _____
Date: 5/5/51

How
was
child
tested
?

FA
FM
AT
V

✓	✓	✓

I. PHONEME DETECTION - Place dot(s) in the yes/no box(es) to indicate child's response(s).

	beet	bit	bet	bat	pot	bought	book	boot	but	bird	no sound	nas.	lat.	voiced fric.	unvoiced fric.								
	ee	i	e	a	ah	oo	oo	uh	er		m	n	r	l	z	zh	v	th	s	sh	f	th	
yes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
no																							

II. WORD IDENTIFICATION

Present each word
the same number of times. 2x

Place dot(s) under each
stimulus word to indicate
child's response(s).

	Stimulus											
	shoe	ball	fish	pencil	water	table	airplane	toothbrush	popcorn	elephant	butterfly	Santa Claus
Response	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Identification score: 22/24
Categorization score: 22/24

III. SENTENCE COMPREHENSION (QUESTIONS)

Practice items (A-V):

- How many fingers do you have?
- Where is your mouth?
- What color is the table?

Indicate:

(A-V)
Emphasis
(Gesture)

Test items (Auditory alone):

- What's (your) name?
- What color are your shoes?
- How many people are in your family?
- (Where's) (your) hearing aid?
- When is (your) birthday?
- What is (your) teacher's name?
- What number comes (after) seven?
- How many (legs) does an (elephant) have?
- (Where) do you live?
- How old are (you)?

Response	Comments	number of presentations	✓ if correct (auditory alone)
Michael Collins	My name is Mrs. S.	5	✓
blue + red		2	✓
5		1	✓
on my head	I don't have any	7	✓
Jan.	My B-D is Sept.	10	
Mrs. Pitt Newcott		3	✓
8	1, 2, 3, 4, 5, 6, 7	5	✓
4 legs	used picture	6	✓
St. Louis		2	✓
14	For 21 you 12?	5	✓

Score: 9/10

Visual and Auditory-Visual Test Sentences

1. The mailman brought a letter to my house.
2. The monkeys climbed the trees at the zoo.
3. The frog caught a bug in its mouth.
4. The children fed the ducks in the park.
5. The boy threw a baseball over the wall.
6. A cow ate some grass by the fence.
7. My mother dropped the soap on the floor.
8. The cat took some cupcakes off the table.
9. My brother played soccer in the backyard.
10. The policeman watched the cars in the street.

Note: Key-words are underlined.

Visual Test - 5/1/1981 - Child's Responses

1. The mailman put the letters in my house. (r)
2. The monkey climb the tree in the zoo.
3. The frog ate the bug in the mouth. (r)
4. The children fall on the park. (r)
5. The boy threw the baseball over the fence.
6. no response (r)
7. Mother drop the soap on the floor.
8. The cat jumped on the table. (r)
9. My brother played the soccer ball the backyard.
10. The policeman watched the cars on the street.

(r) - a repeated sentence

Key-word score: 29/40

Repetition: 5/10 sentences

Auditory-Visual Test - 5/5/1981 - Child's Responses

1. The mailman put the letter my house.
2. The monkey climb the tree on the zoo.
3. The frog caught the bug in the mouth.
4. The children fixed the park.
5. The boy threw the baseball over the wall.
6. The cow ate the grass in the fence.
7. The mother drop the soap on the floor.
8. The cat jumped off the table.
9. My brother played the soccer my backyard.
10. The policeman watched the car on the street.

(r) - a repeated sentence

Key-word score: 34/40

Repetition: 0/10 sentences

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