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Comparative Scores of Hearing-Impaired and Normally Hearing Children Given the Carolina Picture Vocabulary Test

Barbara Ann McComb
Portland State University

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Title: Comparative Scores of Hearing-Impaired and Normally Hearing Children Given the Carolina Picture Vocabulary Test.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

[redacted]
Mary Gordon-Brannan, Chair

[redacted]
Maria Montserrat-Hopple

[redacted]
Sandra Wilde

It is important that educators use adequate assessment procedures when placing hearing-impaired children in mainstreamed settings. Receptive vocabulary tests are part of the standardized test battery and can provide educators with valuable information. Although there has been a receptive vocabulary test recently developed for use with hearing-impaired children (CPVT), the most commonly used test with this population is the PPVT-R, which is

standardized on normally hearing children. In order to further explore the difference between the receptive vocabulary of hearing-impaired and normally hearing children, a test standardized on hearing-impaired should be used.

The purpose of the present study was to determine if a difference exists between the receptive vocabulary scores of hearing-impaired and normally hearing children on the CPVT. This study also sought to answer the following questions: 1) What is the correlation between the CPVT and the PPVT-R?, and 2) Is there a difference between the z-scores and age equivalent scores of the normally hearing children on the CPVT and the PPVT-R?

Fifty 7- and 8-year olds were selected from the Portland Metropolitan area as subjects. Each subject passed a puretone audiometric screening, had a negative history of ear infections, had not received any speech, language, hearing, or reading services, and received parental permission to be in the study.

Mean z-scores and age equivalent scores on the CPVT and the PPVT-R were computed for the normally hearing subjects in the study. One sample, two tailed t-tests were computed to determine if a difference exists between the performance of the normally hearing subjects on the CPVT and the normative data for the hearing-impaired. The tests were considered significant at the .05 level. A highly

significant difference was found between the z-scores and age equivalent scores of the 7- and 8-year old normally hearing subjects and the normative data for the hearing-impaired. The normally hearing subjects scored higher on the CPVT than the standardized data. These results are consistent with previous research that has shown hearing-impaired children to perform significantly lower than their normally hearing peers on vocabulary tests (Bunch & Forde, 1987; Davis, 1974; Markides, 1970).

Pearson r correlations were used to determine the relationship between the CPVT and the PPVT-R. Weak correlations were obtained between the two tests for the 7- and 8-year old subjects. Kline and Sapp (1989) also found a weak correlation between the CPVT and the WISC-R.

One sample, two tailed t-tests were completed to determine if a difference exists between the z-scores and age equivalent scores of the 7- and 8-year old normally hearing subjects on the CPVT and the PPVT-R. The age equivalent scores of the 7- and 8-year old subjects were found to be higher on the CPVT than on the PPVT-R. A statistically significant difference between the z-scores of the 8 year old subjects was not found.

COMPARATIVE SCORES OF HEARING-IMPAIRED AND NORMALLY HEARING CHILDREN GIVEN THE CAROLINA PICTURE VOCABULARY TEST

by

BARBARA ANN MCCOMB

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The members of the Committee approve the thesis of Barbara Ann McComb presented August 2, 1993.

[redacted]

Mary Gordon-Brannan, Chair

[redacted]

Maria Montserrat-Hopple

[redacted]

Sandra Wilde

APPROVED:

[redacted]

Stephen A. Kosokoff, Chair, Department of Speech Communication

[redacted]

Roy W. Koch, Vice Provost for Graduate Studies and Research

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

As more hearing-impaired children are mainstreamed into the regular classroom, it is critical that educators use adequate assessment procedures so that children are placed into environments where they will be successful (Thompson, Biro, Vethivelu, Pious, & Hatfield, 1987). Standardized tests are an important part of the assessment process because they can give educators information as to how individual children compare with their peers (Luetke-Stahlman & Luckner, 1991). In particular, receptive vocabulary tests can provide educators with valuable information when placing hearing-impaired children into mainstream classrooms. Information regarding receptive vocabulary knowledge can be important because it has been found to be a good predictor of reading ability for hearing-impaired children (Lasasso & Davey, 1987; Paul & Gustafson, 1991), and can be useful to these children for understanding speech (Johansson, Ronnberg, & Lyxell, 1991).

In assessing receptive vocabulary of hearing-impaired children, the finding that significant differences have been observed between children who are normally hearing and those

who are hearing-impaired should be considered (Markides, 1970; Ross, Brackett, & Maxon, 1991). Hearing-impaired children have demonstrated difficulties in understanding synonyms and idiomatic phrases, and in following directions (Ross, Brackett, & Maxon, 1991). It has been documented that a 2- to 5-year delay in receptive vocabulary exists between normally hearing and hearing-impaired children (Markides, 1970). Unfortunately, studies that have shown this delay have consistently used tests that are standardized on normally hearing children (Abraham & Stoker, 1988; Bunch & Forde, 1987; Davis, 1974; Markides, 1970).

The most commonly used test with hearing-impaired children is the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981), a receptive vocabulary test standardized on normally hearing children (Abraham & Stoker, 1988; Bunch & Forde, 1987). The widespread use of the PPVT-R causes great concern since there are no published normative data or standardized signed test procedures for the hearing-impaired population. More critically, hearing-impaired children have been found to score lower on the PPVT-R than their normally hearing peers (Bunch & Forde, 1987).

In order to develop a better understanding of the difference between the receptive vocabulary of hearing-impaired and normally hearing individuals, a test standardized on hearing-impaired children should be

utilized. The most recent vocabulary test developed for the hearing-impaired is the Carolina Picture Vocabulary Test (CPVT) (Layton & Holmes, 1985). It contains more vocabulary test items than any other vocabulary test developed for the hearing-impaired. Knowledge of how normally hearing children perform on the CPVT would allow educators to compare the receptive vocabulary of hearing-impaired and normally hearing children, and therefore, assist in the decision-making process for appropriate educational placement.

STATEMENT OF PURPOSE

The primary research question was to determine if a difference exists between the receptive vocabulary scores of hearing-impaired and normally hearing children on the CPVT.

The research hypothesis is that there is a difference between the z-scores and age equivalent scores of hearing-impaired and normally hearing children on the CPVT. The corresponding null hypothesis is that there is no difference between the performance of hearing-impaired and normally hearing children on the CPVT.

This study also compared the performances of normally hearing children on the CPVT and the PPVT-R to determine inter-test reliability. This comparison led to two ancillary questions:

1. What is the correlation between the CPVT and

the PPVT-R?

2. Is there a difference between the z scores and age equivalent scores of the normally hearing children on the CPVT and the PPVT-R?

DEFINITION OF TERMS

For the purpose of this study, the following definitions were used:

1. Manual Communication: using signs and fingerspelling to communicate (Riekehof, 1981)

2. Oralism/Aural: teaching a hearing-impaired person through speech and speechreading without using signs or fingerspelling (Riekehof, 1981)

3. Post-lingual/Post-language Deafness: a person who becomes deaf after language is acquired (Riekehof, 1981)

4. Pre-lingual/Pre-language Deafness: a person who becomes deaf before language is acquired (Riekehof, 1981)

5. Total Communication: using any and all means of communication (Riekehof, 1981).

CHAPTER II

REVIEW OF THE LITERATURE

ROLE OF ASSESSMENT IN MAINSTREAMING HEARING-IMPAIRED STUDENTS

As the trend toward mainstreaming continues, it is evident that the assessment procedures used to determine the appropriate educational placement of hearing-impaired children in the regular classroom are of critical importance (Bishop, 1979). Adequate assessment procedures will help ensure the appropriate educational placement of hearing-impaired children and further increase their probability of success in the mainstream classroom (Thompson et al., 1987). A critical part of educational assessment involves the use of standardized tests. As part of the evaluation process, standardized tests allow educators to compare students with others of the same age or grade level (Luetke-Stahlman & Luckner, 1991).

IMPORTANCE OF RECEPTIVE VOCABULARY

Language tests can be used to provide educators with information when placing hearing-impaired children into mainstream classrooms. More specifically, performances on receptive vocabulary tests can assist in the decision-making

process when evaluating educational settings for hearing-impaired children. An examination of vocabulary skills has implications for reading ability. LaSasso and Davey (1987) conducted a study to determine if a relationship exists between vocabulary knowledge and the performance of hearing-impaired children on reading comprehension tasks. Fifty prelingually, profoundly hearing-impaired children, aged 10 to 18 years served as subjects in the study. The reading comprehension measures given to the subjects included a cloze task (i.e., the subject identifies the missing word in a sentence) (Salvia & Ysseldyke, 1988) and four question tasks. The question tasks contained multiple choice items, free response items, and items that allowed the subjects to refer back to the text and items that did not. Conclusions drawn from this study revealed a moderate to high correlation between vocabulary knowledge and reading comprehension. LaSasso and Davey concluded that vocabulary knowledge is a good predictor of reading comprehension ability in hearing-impaired children.

Another study that has documented the relationship between vocabulary knowledge and reading ability was conducted by Paul and Gustafson (1991). Forty-two prelingually, profoundly hearing impaired-children aged 10:7 to 18:11 served as subjects in the study. The control group was comprised of 42 normally hearing children, aged 8:0 to

10:11. Subjects were given a picture vocabulary test to assess their comprehension of one or two meanings of high-frequency multimeaning words. Paul and Gustafson found a definite association between test performance and reading achievement level for both normally hearing and hearing-impaired subjects. They suggested that superior readers have a higher receptive vocabulary knowledge.

An analysis of receptive vocabulary skills not only has implications for reading ability, but also for understanding speech. Johansson et al., (1991) compared the Hearing Performance Inventory, a measure of subjectively experienced difficulties in normal listening situations, to objective scores on speechreading tests. Twenty-one moderate-to-severe, post-lingual hearing-impaired individuals participated as subjects in the study. During the study, the subjects were given the Hearing Performance Inventory, two visual speechreading tests, and a cognitive test. Results showed that understanding speech is related to vocabulary knowledge. During the speechreading activities, a larger vocabulary base was found to play a critical role in speechreading ability because presumedly it made guessing the appropriate words easier. In summary, these research findings suggest vocabulary knowledge is of critical importance in the classroom performance of normally hearing and hearing-impaired children.

RECEPTIVE VOCABULARY AMONG HEARING-IMPAIRED CHILDREN

As educators are using receptive vocabulary tests as part of the standardized test battery, it is important to note that researchers have found significant discrepancies between the receptive vocabulary skills of normally hearing and hearing-impaired children (Ross et al., 1991). In general, hearing-impaired children have demonstrated some difficulty with combinations of words that do not convey their dictionary meanings. Synonyms are also difficult for hearing-impaired children to understand because they often learn just one meaning for a particular word. Following directions in the classroom can also be a problem for hearing-impaired children. This is not because they do not understand the task; instead they may not understand some of the vocabulary words used in the instructions (Ross et al., 1991).

STANDARDIZED TESTS ADMINISTERED TO HEARING-IMPAIRED CHILDREN

One of the most serious problems faced by educators is that studies reporting a delay between hearing-impaired and normally hearing children have consistently used tests that are standardized on normally hearing children (Bunch & Forde, 1987; Davis, 1974; Forde, 1977; Markides, 1970). To confirm the seriousness of this issue, Abraham and Stoker (1988) completed a study by examining responses to

questionnaires in 182 educational programs for hearing-impaired children in the United States to determine what types of language assessments were used. Results of the study found that most educators were using language tests standardized on normally hearing children, rather than on hearing-impaired children. Abraham and Stoker (1988) and Montserrat-Hopple (1993) found that some of the most frequently used tests standardized on normally hearing children, but administered to hearing-impaired children, include the Preschool Language Screening (PLS) (Zimmerman, Steiner, & Pond, 1979), Test of Auditory Comprehension for Language (TACL) (Carrow, 1973), Test of Language Development-Primary (TOLD-P) (Hammill & Newcomer, 1982a), Test of Language Development-Intermediate (TOLD-I) (Hammill & Newcomer, 1982b), Boehm Test of Basic Concepts-Revised (BTBC-R) (Boehm, 1986), and the PPVT-R.

RESEARCH ON VOCABULARY DELAYS

Markides (1970) administered the Full-Range Picture Vocabulary Test (FRPVT), (Ammons & Ammons, 1948) to 85 hearing-impaired and 25 normally hearing children. The FRPVT is designed to test the "intelligence" of individuals 2 years old and above. No information is provided about the population used to standardize this test (Salvia & Ysseldyke, 1988). Results of the study found a 2- to 5-year delay in the vocabulary development of hearing-impaired

children when compared to their normally hearing peers.

Another study comparing the receptive vocabulary of normally hearing and hearing-impaired children was conducted by Davis (1974), using the BTBC-R. Twenty-four hearing-impaired children served as subjects. The BTBC-R was standardized on 4,600 normally hearing children in kindergarten, first grade, and second grade. It assesses the knowledge of basic relational concepts of space, quantity, and time. Results of the study showed that as the age of the hearing-impaired children increased, the gap between their vocabulary and the vocabulary of normally hearing children also increased.

The most popular receptive vocabulary test administered to hearing-impaired children, but standardized on normally hearing children, is the PPVT-R. Bunch and Forde (1987) administered the PPVT-R to 102 hearing-impaired children ranging in age from 4:7 to 14:6. The subjects had a loss of 80 dB or greater in the better ear, and were prelingually hearing-impaired. For this study, the PPVT-R was modified. In addition to oral directions given with the presentation of each stimulus page, an index card with the stimulus word printed in one inch high letters was presented. The ceiling criterion was changed from 6 errors in 8 items to 12 errors in 16 consecutive items. Even with these changes, results from this study showed that the mean scores for hearing-impaired children were lower than those of their normally

hearing peers.

MODIFICATION OF STANDARDIZED TESTS

Although the PPVT-R and other similar receptive vocabulary tests are widely used with hearing-impaired children, this widespread use should be investigated due to the fact that there are no published norms or standardized signed test procedures for this population. It seems more reasonable that these examiners utilize vocabulary tests standardized on hearing-impaired. Just as critical is the issue that most test examiners often modify tests standardized on normal-hearing children in order to assess hearing-impaired children (Salvia & Ysseldyke, 1988). Since hearing-impaired children communicate orally and/or manually, it appears that it is common practice for examiners to modify the stimulus demands and/or the response. Directions normally spoken are often signed or pantomimed to hearing-impaired children.

A review of the literature does not reflect any recent examination of tests standardized on hearing-impaired individuals that have been administered to normally hearing individuals for purposes of comparison. If educators are to use tests standardized on hearing-impaired children to assist in mainstreaming, it is critical that they have information as to how hearing-impaired children compare to their normally hearing peers given the same test.

TESTS STANDARDIZED ON HEARING-IMPAIRED CHILDREN

Several receptive language tests are appropriate for use with hearing-impaired children because they have been developed for use with this population. One receptive language test is the SKI-HI Receptive Language Test (SKI-HI) (Longhurst, Briery, & Emery, 1975) that assesses how many word classes in different combinations of length and complexity children understand. It is one of the few tests of semantic relationships. This test uses large colored pictures suitable for young children, and requires pointing as the only response. The great difficulty in utilizing the SKI-HI is that no normative data are currently available for this test (Thompson et al., 1987).

Another test developed for use with hearing-impaired children is the Test of Receptive Language Ability (Bunch, 1981). This test was developed to assess a child's understanding of twelve basic grammatical principles (e.g., singular nouns, comparative adjectives, prepositions, and verb tenses). It was standardized on 92 prelingual hearing-impaired children, ranging in age from 7 to 12 years. Most of the children had severe or profound hearing losses. The test can be administered quickly and easily. The total scores and subscores can be compared to norms for either first grade normally hearing children, or hearing-impaired children ranging in age from 7 to 12 years. The test may be administered to children taught in oral or total

communication, and the only response required is pointing (Thompson et al., 1987).

The Total Communication Receptive Vocabulary Test (TCRVT) (Scherer, 1981) was developed to assess hearing-impaired children's skill in identifying individual words presented in simultaneously signed and spoken language. This test was standardized on 423 children ranging in age from 3 to 12 years (77 hearing, 95 hard-of-hearing, and 251 deaf children). Age conversions for this test are available for both deaf and hearing-impaired children, and for children with normally hearing parents who use total communication and for those children whose parents do not (Thompson et al., 1987).

CPVT

The most recent receptive vocabulary test developed is the CPVT. It was designed to assess the receptive sign vocabulary of hearing-impaired children. The test was standardized on 767 hearing-impaired children from residential and day schools, ranging in age from 2:6 to 16:0. Characteristics that are representative of the hearing-impaired children used in the standardization study include: congenital prelanguage deafness, 80+ dB hearing threshold in the better ear, I.Q. of 80 to 100, parents with normal hearing, and manual signing as the primary mode of communication. The CPVT contains more test items than are

found in other vocabulary tests for hearing-impaired children (Thompson et al., 1987).

Validity of the CPVT

In order to measure validity, the CPVT was compared with several other standardized tests. Validity coefficients ranged from .05 to .5 for the Wechsler Intelligence Scale for Children - Revised (WISC-R) (Wechsler, 1974) and from -.03 to .83 on the Hiskey-Nebraska Test of Learning Aptitude (H-NTLA) (Hiskey, 1966). These correlations suggest that the CPVT does not measure the same mental abilities as the WISC-R and the H-NTLA, which could be due to the fact that the CPVT is a measure of receptive vocabulary and the others are not (Layton & Holmes, 1985).

The CPVT was also compared to a modified version of the TACL. The subjects for this study consisted of 18 oral hearing-impaired children and 8 total communication hearing-impaired children. A statistically significant relationship was found between the raw scores of both tests (oral hearing-impaired $r = .75$, $p < .001$; total communication hearing-impaired $r = .81$, $p, .001$), which indicates that the CPVT is a valid language measure (Layton & Holmes, 1985).

Reliability of the CPVT

Two studies were conducted to determine the internal consistency of the CPVT. The first study, taken from a dissertation written by Walter (in Layton & Holmes, 1985),

consisted of 54 subjects and showed a high correlation of r =.93, which was significant at the .001 level. The second study was conducted by Layton and Holmes (1985) and used the standardization population as subjects. They also found a high correlation of r = .92, which was significant at the .001 level. This suggests that the CPVT has a reliable internal consistency.

To determine the stability of the CPVT, two studies were conducted that revealed high reliability. In the first study, 30 of Walter's (Layton & Holmes, 1985) 54 subjects were randomly selected and administered the CPVT a second time. A test-retest reliability of r =.86 was found and was significant at the .001 level. For the second study, Plymale, Layton, & Holmes (1979) readministered the CPVT to 11 hearing-impaired children that used total communication. They found a reliability of r = .99, which was significant at the .001 level (Layton & Holmes, 1985).

Due to the recent publication of the CPVT, little research has been conducted on this test. One study performed by Kline and Sapp (1989), compared the CPVT with the WISC-R to identify a relationship between receptive language and intelligence in hearing-impaired children. Results of the study found that the means of the two tests were significantly different, and that most correlations were low. The study also found that the scores on the CPVT tended to cluster at the upper end of the scale, which

suggested that the test is too easy.

It is, therefore, essential that receptive vocabulary tests, like the CPVT, be examined to determine whether they can be used as appropriate tools for comparison of vocabulary knowledge between hearing-impaired children and normally hearing children. A serious examination of the test was warranted, if it is to be used in effectively mainstreaming hearing-impaired children.

CHAPTER III

METHODS AND PROCEDURES

GENERAL PLAN OF STUDY

This study investigated the usefulness of the CPVT as an effective assessment tool for placing hearing-impaired children in a mainstreamed setting. The purpose of this study was to determine if there is a difference between the receptive vocabulary scores of the hearing-impaired standardization sample, and the normally hearing subjects on the CPVT. This was determined by administering the CPVT to normally hearing children, and comparing their z-scores and age equivalent scores to the scores of hearing-impaired children contained in the CPVT manual. This comparison was made to determine if there is a difference between the z-scores and age equivalent scores of the two groups. Since the PPVT-R is widely used, it was incorporated in this study and administered to the normally hearing children as a measure of inter-test reliability.

SUBJECTS

Fifty normally hearing children from various schools in the Portland Metropolitan area were selected as subjects for

this study. Subjects ranged in age from 7 years, 0 months through 8 years, 11 months.

Subjects were selected from a group of children who met the following criteria:

1. Approval of parent/guardian was obtained from a signed permission form prior to participation in the study (Appendix A).

2. No record of remedial speech, language, hearing, or reading services was reported by parents (Appendix A).

3. No presence of physical disability was reported by parents or observed by the examiner (Appendix A).

4. Negative history of middle ear problems, was reported by parents (Appendix A).

5. An audiometric screening was passed at 20 dB HL for each of the frequencies of 1000, 2000, and 4000 Hz in both ears (ASHA, 1985).

INSTRUMENTATION

A Maico portable audiometer model 120 was used for the hearing screening.

The CPVT was administered to determine the receptive vocabulary of the subjects. It takes approximately 10 to 15 minutes to administer, and provides the examiner with raw scores, age equivalency scores, and percentile scores. The test consists of a spiral-bound book containing 130 numbered test plates, with four pictures per plate. The test items

were selected from vocabulary lists for deaf children (Silverman-Dresner & Guilfoye, 1972) and lists of signed words in Signing Exact English (Gustason, Pfetzing, & Zawolkow, 1972). Vocabulary test items were chosen using the following criteria: (a) they had to be appropriate for children aged 8 to 18 years, (b) they had to have accepted American Sign Language or Signing Exact English sign equivalent, and (c) they had to be capable of being represented pictorially (Thompson et al., 1987).

The PPVT-R was also administered to determine receptive vocabulary, and assist in the measurement of inter-test reliability. It takes approximately 10 to 20 minutes to administer, and provides the examiner with standard scores, age equivalent scores, percentile scores, and stanine scores. The test consists of two alternate forms, L and M. Each form contains a spiral-bound book with 175 numbered test plates with four line drawings per plate (Compton, 1990).

PROCEDURES

Screening

The hearing screening was conducted in a quiet room in the subjects' home. The subjects responded by raising their hands in response to a pure tone stimulus at 20 dB HL (ANSI, 1972). The subjects were evaluated individually.

Examination

The CPVT and PPVT-R were administered to the subjects in alternating order. Twenty-five of the subjects received the CPVT first and the PPVT-R second, while the other twenty-five subjects received the PPVT-R first and the CPVT second. Forms L and M of the PPVT-R were alternately administered. Both tests were administered according to directions provided in the test manuals. Assessments were completed in the subjects' home environment.

Scoring

For the CPVT, one point was assigned to each test item correctly identified. A maximum of 130 points could be obtained for this test. Similarly, for the PPVT-R, one point was assigned for each test item correctly identified. A maximum of 175 points could be obtained for the test.

DATA ANALYSIS

Data analysis initially included the computation of z-scores and age equivalent scores. One sample, two tailed *t*-tests were then completed to determine if a significant difference exists between the performance on the CPVT of the normally hearing subjects and the normative data for the hearing-impaired. The level of confidence was set at .05.

In order to determine the correlation between the subjects' performances on the CPVT and the PPVT-R, a Pearson r product-moment was computed.

The performance of the subjects' on the PPVT-R was then compared to their CPVT scores to determine if a significant difference exists between the two tests. Z-scores were calculated for the subjects' performances on these receptive vocabulary tests. A one sample, two-tailed *t*-test analysis was performed to determine if a significant difference exists between the subject's z-scores on the CPVT and the PPVT-R. A *t*-test was also used to determine if a difference exists in age equivalent scores on the CPVT and the PPVT-R. The level of confidence was set at .05.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

The purpose of this study was to determine if a difference exists between the receptive vocabulary scores of hearing-impaired children that the CPVT was standardized on, and normally hearing subjects tested in this study. The primary question posed by this study was: Is there a difference between the z-scores and age equivalent scores of hearing-impaired and normally hearing children on the CPVT? The t-test results showed a highly significant difference ($p = .000$) between the z-scores of the normally hearing 7 year old children on the CPVT and the data on the hearing-impaired children (See Table I). The mean z-score for the normally hearing children in this study was 1.12, compared to a mean standardization z-score of 0 for the performance of hearing-impaired children on the CPVT (See CPVT manual). The standard deviation of .12 was obtained for the z-scores of the normally hearing children on the CPVT.

A comparison of age equivalent scores on the CPVT between the normally hearing 7 year old children and the standardized data on the hearing-impaired children was

completed. The mean age equivalent of 13.89 years for normally hearing subjects was significantly higher ($p = .000$) compared to an expected age equivalent of 7 for hearing-impaired children (See Table II). Note that the normally hearing subjects did not reach a ceiling on the CPVT, therefore results from this study may not reflect true age equivalence of each of the subjects. The standard deviation of .35 was obtained for the age equivalents values for the normally hearing subjects.

TABLE I

MEAN z SCORES, STANDARD DEVIATIONS, AND p VALUES FOR 7 YEAR OLD NORMALLY HEARING (N=26) AND HEARING-IMPAIRED CHILDREN (STANDARDIZATION SAMPLE) ON THE CPVT

Hearing Status	Mean z-score	SD	p Value
Normally Hearing	1.12	.12	.000
Hearing-Impaired	0	N/A	

N/A = Not applicable.

TABLE II

AGE EQUIVALENT SCORES, STANDARD DEVIATIONS, AND p VALUES FOR 7 YEAR OLD NORMALLY HEARING (N=26) AND HEARING-IMPAIRED CHILDREN (STANDARDIZATION SAMPLE) ON THE CPVT

Hearing Status	Mean age equivalent	SD	p Value
Normally Hearing	13.89*	.35	.000
Hearing-Impaired	7.0	N/A	

*100% of the normally hearing subjects did not reach a ceiling on the CPVT.

N/A = Not applicable.

t-test results showed a highly significant difference ($p = .000$) between the z-scores of the normally hearing 8 year old children on the CPVT and the data on the hearing-impaired children (See Table III). The mean for the normally hearing children in this study was 1.07, compared to standardization z-scores of 0 for the performance of hearing-impaired children on the CPVT (See CPVT manual). The standard deviation of .09 was obtained for the z-scores of the normally hearing children on the CPVT.

TABLE III

MEAN z SCORES, STANDARD DEVIATIONS, AND p VALUES FOR 8 YEAR OLD NORMALLY HEARING (N=24) AND HEARING-IMPAIRED CHILDREN (STANDARDIZATION SAMPLE) ON THE CPVT

Hearing Status	Mean z-score	SD	p Value
Normally Hearing	1.07	.09	.000
Hearing-Impaired	0	N/A	

N/A = Not applicable.

Age equivalent scores on the CPVT were compared between the normally hearing 8 year old children and the standardized data on the hearing-impaired children. The mean age equivalent of 13.94 years for normally hearing subjects was significantly higher ($p = .000$) compared to an expected age equivalent of 8 years for hearing-impaired children (See Table IV). Note that the normally hearing subjects did not reach a ceiling on the CPVT, therefore

results from this study may not reflect true age equivalence of each of the subjects. The standard deviation of .31 was obtained for the age equivalents values for the normally hearing subjects.

TABLE IV

AGE EQUIVALENT SCORES, STANDARD DEVIATIONS, AND p VALUES FOR 8 YEAR OLD NORMALLY HEARING (N=24) AND HEARING-IMPAIRED CHILDREN (STANDARDIZATION SAMPLE) ON THE CPVT

Hearing Status	Mean age equivalent	SD	p Value
Normally Hearing	13.94*	.31	.000
Hearing-Impaired	8.0	N/A	

*100% of the normally hearing subjects did not reach a ceiling on the CPVT.

N/A = Not applicable.

A second question investigated by this study was: What is the correlation between the CPVT and the PPVT-R? A Pearson r product-moment was computed and a moderate correlation (r = .653) was found between z-scores of the 7 year old normally hearing children on the CPVT and the PPVT-R. In evaluating age equivalent scores, a weak correlation (r = .375) was found between scores of the 7 year old normally hearing children on the CPVT and the PPVT-R.

A weaker correlation (r = .276) was found between the z-scores of the 8 year old normally hearing children on the CPVT and the PPVT-R. A weak correlation (r = .283) was also

determined between the age equivalent scores of the 8 year old normally hearing children on the CPVT and the PPVT-R.

A third question posed by this research was: Is there a difference between the z-scores and age-equivalent scores of the normally hearing children on the CPVT and PPVT-R? A significant difference ($p = .021$) was found between the 7 year old normally hearing subjects on the CPVT and the PPVT-R. (See Table V). The normally hearing subject's z-scores on the CPVT were higher on the average by .23 than their z-scores on the PPVT-R. The standard deviation of .47 was obtained for the z-scores of the normally hearing subjects.

TABLE V

MEAN DIFFERENCES BETWEEN z-SCORES FOR 7 YEAR OLD NORMALLY HEARING CHILDREN ON THE CPVT AND THE PPVT-R (N=26)

	Mean Diff	SD	p Value
z-scores	.23	.47	.021

A significant difference ($p = .000$) was also found between the age equivalent scores of the 7 year old normally hearing subjects on the CPVT and the PPVT-R. The age equivalents were on the average remarkably higher by 5.16 years on the CPVT than the PPVT-R. (See Table VI). However, the 7 year old normally hearing subjects did not reach a ceiling on the CPVT, therefore results from this

study may not reflect true age equivalence of each of the subjects. The standard deviation was determined to be .84.

TABLE VI

MEAN DIFFERENCES BETWEEN AGE EQUIVALENT SCORES FOR 7 YEAR OLD NORMALLY HEARING CHILDREN ON THE CPVT AND THE PPVT-R (N=26)

	Mean Diff	SD	p Value
Age Equivalents	5.16*	.84	.000

*100% of the normally hearing subjects did not reach a ceiling on the CPVT.

A significant difference in test performance (p = .3) was not found between the 8 year old normally hearing subjects on the CPVT and the PPVT-R. (See Table VII). The mean difference was .188, and a standard deviation of .86 was obtained for the z-scores of the normally hearing subjects.

TABLE VII

MEAN DIFFERENCES BETWEEN z-SCORES FOR 8 YEAR OLD NORMALLY HEARING CHILDREN ON THE CPVT AND THE PPVT-R (N=24)

	Mean Diff	SD	p Value
z-scores	.19	.86	.3

A large significant difference (p = .000) was found between the age equivalent scores of the 8 year old normally hearing subjects on the CPVT and the PPVT-R. On the

average, age equivalents on the CPVT highly exceeded the age equivalents on the PPVT-R by 4.29 years. (See Table VIII). However, the 8 year old normally hearing subjects did not reach a ceiling on the CPVT, therefore results from this study may not reflect true age equivalence of each of the participants. The standard deviation was determined to be 1.25.

TABLE VIII

MEAN DIFFERENCES BETWEEN AGE EQUIVALENT SCORES FOR 8 YEAR OLD NORMALLY HEARING CHILDREN ON THE CPVT AND THE PPVT-R (N=24)

	Mean Diff	SD	p Value
Age Equivalents	4.29*	1.25	.000

*100% of the normally hearing subjects did not reach a ceiling on the CPVT.

DISCUSSION

The primary question posed by this study was: Is there a difference between the z-scores and age equivalent scores of hearing-impaired and normally hearing children on the CPVT?

Results of the t-tests showed that there is a highly significant difference between the z-scores and age equivalent scores of the normally hearing subjects and the hearing-impaired archive data. The superior performance by the normally hearing subjects far exceeded this

investigator's predictions, and revealed even greater differences than documented by previous research. Investigations by Bunch and Forde (1987), Davis (1974), and Markides (1970) showed normally hearing children performing better by 3 to 5 years in receptive vocabulary than their hearing-impaired peers, whereas the children in this study reported a considerable larger gap of 6 to 7 years. The highly significant differences found in this study revealed strong clinical implications when utilizing the CPVT as a placement tool for hearing-impaired children in school settings.

This study initially attempted to make predictions about the size of the gap between the receptive vocabulary of normally hearing and hearing-impaired children. However, since all of the normally hearing children did not reach a ceiling on the CPVT, accurate predictions regarding the size of the gap between the receptive vocabulary of normally hearing and hearing-impaired children cannot be made. Given that the highest age equivalence on the CPVT is 14 years, the largest difference between the receptive vocabulary of the normally hearing subjects and the hearing-impaired standardization sample that this study could report is 6 to 7 years. However, 6 to 7 years is a large discrepancy and should be noted for its clinical significance. A vocabulary delay of 7 years could severely limit a child's success in school.

The size of the vocabulary delay may also be influenced by the higher than average receptive vocabulary skills of the normally hearing children that were selected for this study. Although the selections were random, the average age equivalents for the 7 and 8 year old normally hearing children on the PPVT-R were 2 years higher than their chronological ages. Perhaps a ceiling may have been reached if the subjects performance approximated their chronological ages. If a ceiling had been reached, the subject's scores would have more closely approximated a 3 to 5 year receptive vocabulary gap as found in previous research (Davis, 1974), rather than 6 years or greater as found in this study.

In the second question posed by this study, pearson r correlations were used to determine the relationship between the CPVT and the PPVT-R. Weak correlations were obtained between the two tests for the 7 and 8 year old subjects. Kline and Sapp (1989) also found a weak correlation between the CPVT and the WISC-R. Consistent with the present study, Kline and Sapp found scores that tended to cluster at the upper range of the test, suggesting that the CPVT is too easy and that it does not have an adequate ceiling.

The final question posed by this study was: Is there a difference between the z-scores and age equivalent scores of the normally hearing children on the CPVT and the PPVT-R?

Results of the t-tests indicated that there was a significant difference between the z-scores and age

equivalent scores of the 7 and 8 year old normally hearing subjects on the CPVT and the PPVT-R; however, a significant difference was not found between the z-scores of the 8 year old normally hearing subjects. Results that indicate a difference between the scores of the normally hearing children on the CPVT and the PPVT-R are in agreement with previous research that has reported vocabulary delays among hearing-impaired children (Bunch & Forde, 1987; Markides, 1970). However, results showing no difference between the z-scores of normally hearing 8 year olds on the CPVT and the PPVT-R contradict previous findings by Davis (1974) and Markides (1970) who found that as hearing-impaired children become older, the gap between their vocabulary and the vocabulary of normally hearing children increased.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

It is important that educators use adequate assessment procedures when placing hearing-impaired children in mainstreamed settings. Receptive vocabulary tests are part of the standardized test battery and can provide educators with valuable information. Although there has been a receptive vocabulary test recently developed for use with hearing-impaired children (CPVT), the most commonly used test with this population is the PPVT-R, which is standardized on normally hearing children. In order to further explore the difference between the receptive vocabulary of hearing-impaired and normally hearing children, a test standardized on hearing-impaired should be used.

The purpose of the present study was to determine if a difference exists between the receptive vocabulary scores of hearing-impaired and normally hearing children on the CPVT. This study also sought to answer the following questions: 1) What is the correlation between the CPVT and the PPVT-R?, and 2) Is there a difference between the z-scores and age equivalent scores of the normally hearing children on the

CPVT and the PPVT-R?

Fifty 7- and 8-year olds were selected from the Portland Metropolitan area as subjects. Each subject passed a puretone audiometric screening, had a negative history of ear infections, had not received any speech, language, hearing, or reading services, and received parental permission to be in the study.

Mean z-scores and age equivalent scores on the CPVT and the PPVT-R were computed for the normally hearing subjects in the study. One sample, two tailed *t*-tests were computed to determine if a difference exists between the performance of the normally hearing subjects on the CPVT and the normative data for the hearing-impaired. The tests were considered significant at the .05 level. A highly significant difference was found between the z-scores and age equivalent scores of the 7- and 8-year old normally hearing subjects and the normative data for the hearing-impaired. The normally hearing subjects scored higher on the CPVT than the standardized data. These results are consistent with previous research that has shown hearing-impaired children to perform significantly lower than their normally hearing peers on vocabulary tests (Bunch & Forde, 1987; Davis, 1974; Markides, 1970).

Pearson r correlations were used to determine the relationship between the CPVT and the PPVT-R. Weak correlations were obtained between the two tests for the 7-

and 8-year old subjects. Kline and Sapp (1989) also found a weak correlation between the CPVT and the WISC-R.

One sample, two tailed t-tests were completed to determine if a difference exists between the z-scores and age equivalent scores of the 7- and 8-year old normally hearing subjects on the CPVT and the PPVT-R. The age equivalent scores of the 7- and 8-year old subjects were found to be higher on the CPVT than on the PPVT-R. A statistically significant difference between the z-scores of the 8 year old subjects was not found.

IMPLICATIONS

Research Implications

Further research on the CPVT with different age levels is indicated. A replication of this study with younger children, e.g. age 4, could be conducted to ensure that a ceiling on the CPVT is reached, and the gap between the receptive vocabulary of normally hearing and hearing-impaired children could be more accurately measured.

Additional studies could develop standardization data for the CPVT using a sample of hearing-impaired children with varying degrees of hearing loss and who are mainstreamed. This standardization should include modifications in test administration utilizing total communication, such as written words and signing with voice, which would allow the CPVT to target a wider range of the

hearing-impaired population.

Future studies with the CPVT could also include a replication of the present study using a sample population with a mean age equivalent on the PPVT-R that is closer to the subjects' chronological ages. This may be beneficial in examining the relationship between the receptive vocabulary of normally hearing and hearing-impaired children.

Another study could standardize the PPVT-R on hearing-impaired children. Since the PPVT-R is the most widely used test with hearing-impaired children, this study would provide educators with standard test procedures to use when giving the PPVT-R to hearing-impaired children, and with normative data to compare hearing-impaired children to their hearing-impaired and normally hearing peers.

Clinical Implications

Results of this current study are not offered as conclusive evidence, but it appears that there is at least a 6 year, 11 month gap between the receptive vocabulary scores of normally hearing and hearing-impaired 7- and 8-year old children. It would be important for educators to be aware of this significant gap in receptive vocabulary delay in hearing-impaired children when using the CPVT, and the extent to which it may affect their reading ability and success in the classroom.

It is in the opinion of this investigator that the CPVT

should be used with great caution. The large receptive vocabulary gap reported in this study may lead educators to draw inaccurate conclusions when comparing vocabulary abilities of hearing-impaired children to their normally hearing peers. Hence, implementation of the CPVT may result in inappropriate classroom placement of hearing-impaired children. The CPVT does not seem applicable to mainstreamed hearing-impaired children that do not closely resemble the CPVT standardization population.

It is this researcher's opinion that the CPVT can be used effectively with a select group of hearing-impaired children. It is quick, easy to administer and score, and uses pictures that are appropriate and clear. However, the CPVT could be used with a much larger population of hearing-impaired children if it was also standardized on mainstreamed hearing-impaired children using total communication.

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APPENDIX A

PARENTAL CONSENT FORM

Dear Parent,

My name is Barbara McComb and I am a graduate student in Speech and Hearing Sciences at Portland State University. I am conducting a study on vocabulary differences between hearing-impaired and normally hearing children who are between the ages of 7 years, 0 months and 8 years, 11 months. I would like permission for your child to participate in the study.

If you permit your child to be included, I will screen your child's hearing and then ask him or her to point to pictures that I name. The screening and test will last approximately 30 minutes for your child. You are welcome to attend and observe the testing.

There is no physical risk to your child involved. All test results are available to you upon request. Although testing may not directly benefit you or your child, it will help speech-language pathologists in the future.

Your child's name and any information that your child gives will be kept confidential. You may withdraw your child's participation at any time, for any reason. I will be supervised by Maria Montserrat-Hopple, Instructor/Clinical Supervisor, at Portland State University. If you have any questions or concerns related to this research, please contact me or my supervisor at Portland State University, 725-3533.

If you choose to allow your child to participate, please answer the following questions about your child and sign the informed consent form. Thank you for your time and cooperation.

Name:_____ Date of birth:_____

Address:_____ Phone:_____

_____

History of ear infections:

less than 6 _____ more than 6 _____

History of speech, language, hearing, or reading services:

yes _____ no _____

Presence of a physical disability:

yes _____ no _____

Describe: _____

INFORMED CONSENT FORM

I, _____, hereby agree to allow my child _____ to serve as a subject in the research project investigating the difference in mean scores between normally hearing and hearing-impaired children given the Carolina Picture Vocabulary Test conducted by Barbara McComb.

I understand that my child will receive a hearing screening, and will point to pictures when given the Carolina Picture Vocabulary Test and the Peabody Picture Vocabulary Test-Revised. He or she will be required to participate for approximately 30 minutes.

I understand that the possible risks to my child associated with this study are an inconvenience, and a demand on his or her time.

It has been explained to me that the purpose of this study is to determine if there is a difference between the vocabulary scores of normally hearing and hearing-impaired children given the Carolina Picture Vocabulary Test.

My child may not receive any direct benefit from participation in this study, but his or her participation may help to increase knowledge which may benefit others in the future.

Barbara McComb has offered to answer any questions I may have about the study and what is expected of my child in the study. I have been assured that all information my child gives, and the identity of all subjects will be kept confidential.

I understand that my child is free to withdraw from participation in this study at any time.

I have read and understand the foregoing information and
agree to allow my child to participate in this study.

Parent/Guardian
Date:_____ Signature: _____

_____

If you experience problems that are the result of your child's participation in this study, please contact the Chair of the Human Subjects Research Review Committee, Office of Grants and Contracts, 345 Cramer Hall, Portland State University, (503)
725-3417.

APPENDIX B

CAROLINA PICTURE VOCABULARY TEST

Carolina Picture Vocabulary Test Score Sheet

NAME _____ AGE _____ SEX _____

PARENT/GUARDIAN _____

ADDRESS _____ PHONE _____

SCHOOL _____ TEACHER _____

EXAMINER _____ YEARS OF SIGNING _____

AVERAGE HEARING LOSS: RE _____ LE _____

	Year	Month	Day
Date Tested			
Date of Birth			
Age			

NUMBER	ITEM	KEY	RESPONSE
4.0 • 1	HAT	(2)	
to 2	INSECT	(4)	
4.5 3	AIRPLANE	(2)	
4	HOUSE	(4)	
5	CHICKEN	(1)	
6	COLD	(1)	
7	CAMERA	(4)	
8	TREE	(4)	
9	PAPER	(3)	
4.6 •10	EAT	(3)	
to 11	LIGHT	(3)	
4.11 12	BARN	(1)	
13	PIG	(4)	
14	BUTTER	(1)	
15	CAT	(3)	
16	UGLY	(1)	
17	PEN	(4)	
18	WASH	(2)	
19	SANDWICH	(3)	
5.0 •20	SIT	(4)	
to 21	WALK	(2)	
5.6 22	HANDKERCHIEF	(2)	
23	ANGER	(1)	
24	PERFUME	(4)	
25	BOX	(4)	
26	TOWEL	(1)	
27	MAIL	(4)	
28	LAUGH	(1)	
29	FIGHT	(4)	
30	WITCH	(1)	
31	LETTER	(4)	
32	WRITE	(1)	
33	HAMBURGER	(4)	
34	PURSE	(1)	
35	DIRTY	(2)	
36	POLICEMAN	(2)	
37	BOTTLE	(4)	
38	SNAIL	(3)	
39	ARROW	(4)	
40	SAD	(1)	
6.0 •41	CATERPILLAR	(4)	
to 42	CITY	(1)	
6.11 43	HOSPITAL	(2)	
44	HOT	(1)	
45	SOLDIER	(3)	
46	GIFT	(3)	
47	ORANGE	(3)	
48	TIGER	(3)	
49	CLOCK	(2)	
50	PICTURE	(2)	
51	SQUIRREL	(1)	
52	MOUSE	(1)	
53	DENTIST	(2)	
54	FOREST	(2)	
55	TORNADO	(2)	
56	TISSUE	(4)	
57	LOOK	(3)	
58	MIRROR	(4)	
59	WINTER	(3)	
7.0 •60	COOK	(1)	
to 61	BALANCE	(4)	
7.5 62	BREAD	(2)	
63	NEEDLE	(4)	
64	PRIZE	(1)	
65	CAGE	(4)	
66	BASKET	(1)	
67	EAGLE	(1)	
68	SEWING	(2)	
69	JAIL	(4)	
8.0 •70	JAR	(4)	
to 71	BLADE	(1)	
9.0 72	VEGETABLE	(3)	
73	GLUE	(3)	
74	MAYONNAISE	(4)	
75	DANCE	(3)	
76	RUG	(4)	
77	ROOM	(4)	
78	FOOTBALL	(2)	
79	PEACH	(2)	
80	SLOW	(3)	

NUMBER		ITEM	KEY	RESPONSE
9.6 to 11.6	*81	LUMBER	(3)	
	82	LICENSE	(4)	
	83	AIM	(4)	
	84	EMPTY	(3)	
	85	NARROW	(3)	
	86	SOFA	(1)	
	87	CEMETERY	(4)	
	88	SMOOTH	(4)	
	89	SALAD	(3)	
	90	COLD	(1)	
	91	BALD	(4)	
	92	KITCHEN	(3)	
	93	TARGET	(4)	
	94	GLOBE	(3)	
	95	FAR	(2)	
	96	CALENDAR	(3)	
	97	ALIKE	(2)	
	98	JUNK	(1)	
	99	DAMAGE	(4)	
	100	BRIDGE	(3)	
	101	MAGAZINE	(3)	
	102	CASTLE	(1)	
	103	AUTUMN	(3)	
	104	HURRICANE	(4)	
	105	MIX	(4)	

NUMBER	ITEM	KEY	RESPONSE
106	RESTAURANT	(4)	
107	WEDDING	(1)	
108	VASE	(2)	
109	VITAMIN	(1)	
110	BAKERY	(1)	
111	CREATE	(4)	
112	AMBULANCE	(2)	
113	THIN	(2)	
114	COACH	(4)	
115	UNEQUAL	(4)	
116	ADD	(1)	
117	PRACTICE	(3)	
118	COLLEGE	(1)	
119	DESTROY	(3)	
120	FLUID	(1)	
121	QUARREL	(1)	
122	CONSTITUTION	(2)	
123	FUNERAL	(1)	
124	SELFISH	(1)	
125	CONFUSE	(4)	
126	WAR	(2)	
127	INDUSTRY	(1)	
128	PIONEER	(1)	
129	NOON	(2)	
130	CURIOUS	(2)	

Other Test Data _____

_____

Ceiling _____
Errors _____
Raw Score _____
Projected Score _____

Age Equivalency _____
Adjusted Age Equivalency _____
Percentile _____
Standard Score _____

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APPENDIX C

PEABODY PICTURE VOCABULARY TEST - REVISED

FORM M TEST ITEMS AND ABBREVIATED INSTRUCTIONS

Administering the TRAINING ITEMS

For most subjects under age 8: Use Plates A, B, and C. Administer as many training item series as necessary to secure three consecutive correct responses.
For most subjects age 8 and over: Use Plates D and E. Administer as many training item series as necessary to secure two consecutive correct responses.

Training Plate	INITIAL PRACTICE SERIES WORDS & KEYS	ADDITIONAL PRACTICE WORDS & KEYS Alternate Series X	Alternate Series Y	Alternate Series Z
A	bed (1)	baby (2)	spoon (4)	dog (3)
B	chair (4)	banana (3)	knife (1)	kitten (2)
C	sleeping (2)	eating (1)	crawling (3)	crying (4)
D	ship (2)	airplane (4)	canoe (3)	truck (1)
E	mopping (1)	riding (2)	sawing (4)	mowing (3)

(Complete directions are given in Part I of the Manual.)

Administering the TEST ITEMS

Basal: Highest 8 consecutive correct responses
Ceiling: Lowest 8 consecutive responses containing 6 errors
Starting Point: For a subject assumed to be of average ability, find the person's age circled in the margin, and begin the test with that item. Otherwise consult Part I of the Manual for further instructions.
Recording Responses and Errors: Record the subject's response (1, 2, 3, or 4) for each item administered. For each error, draw an oblique line either through the plate number of the item missed, or through the geometric figure, as illustrated below:

12 full . . . . . (3) 2 ♡ or 12 full . . . . . (3) 2 ♡

Every eighth figure is identical to help determine the basal and ceiling.

NOTE: Ages in circles refer to the lowest age in a 6- or 12-month interval. For example, item 1 is the starting item for ages 2-6 through 3-5, and item 30 for ages 5-0 through 5-5. Use item 110 for ages 16-0 and over.

	Plate Number	Word	Key	Response	Error
2%	1	car	(2)		○
	2	ball	(4)		[ ]
	3	money	(3)		△
	4	broom	(2)		⌇⌇
	5	bee	(3)		♡
	6	bottle	(1)		☆
	7	circle	(4)		◇
	8	candle	(2)		○
	9	plant	(1)		[ ]
5%	10	reading	(4)		△
	11	ladder	(2)		⌇⌇
	12	full	(3)		♡
	13	mail	(4)		☆
	14	horn	(1)		◇
4	15	pulling	(1)		○
	16	neck	(3)		[ ]
	17	gate	(2)		△
	18	kangaroo	(2)		⌇⌇
	19	lock	(3)		♡
4%	20	kite	(1)		☆
	21	desk	(3)		◇
	22	pouring	(4)		○
	23	farmer	(4)		[ ]
	24	broken	(1)		△
	25	picking	(4)		⌇⌇
	26	ambulance	(1)		♡
	27	somersault	(2)		☆
	28	time	(3)		◇
	29	bush	(1)		○
8	30	whale	(2)		[ ]
	31	wooden	(2)		△
	32	catching	(4)		⌇⌇
	33	cobweb	(3)		♡
	34	river	(3)		☆
6%	35	track	(1)		◇
	36	peeking	(4)		○
	37	pail	(1)		[ ]
	38	sharing	(3)		△
	39	caterpillar	(3)		⌇⌇
9	40	branch	(2)		♡
	41	saddle	(2)		☆
	42	dentist	(3)		◇
	43	eagle	(2)		○
	44	rough	(4)		[ ]
	45	counter	(1)		△
	46	uniform	(4)		⌇⌇
	47	jewelry	(1)		♡
	48	furniture	(3)		☆
	49	coin	(1)		◇
9%	50	tugging	(2)		○
	51	liquid	(4)		[ ]
	52	ankle	(4)		△
	53	floating	(1)		⌇⌇
	54	binocular	(3)		♡
7	55	wrist	(2)		☆
	56	hive	(4)		◇
	57	argument	(1)		○
	58	printing	(4)		[ ]
	59	waiter	(3)		△
	60	root	(2)		⌇⌇
	61	walrus	(2)		♡
	62	swamp	(1)		☆
	63	angle	(2)		◇
	64	jaw	(4)		○
8	65	entertainer	(1)		[ ]
	66	directing	(2)		△
	67	artist	(3)		⌇⌇
	68	shore	(2)		♡
	69	pair	(3)		☆
9	70	ceiling	(4)		◇
	71	secretary	(4)		○
	72	cliff	(1)		[ ]
	73	flaming	(3)		△
	74	funnel	(3)		⌇⌇
	75	woolly	(4)		♡
	76	nutritious	(3)		☆
	77	construction	(2)		◇

Plate Number	Word	Key	Response	Error
	78 thimble	(1)		○
	79 grain	(4)		□
10	80 furious	(1)		△
	81 sorting	(1)		Ω
	82 musician	(2)		♡
	83 greeting	(3)		☆
	84 competition	(3)		◇
11	85 weary	(3)		○
	86 antler	(4)		□
	87 harvesting	(1)		△
	88 snarling	(1)		Ω
	89 plastering	(3)		♡
12	90 triplet	(4)		☆
	91 assisting	(1)		◇
	92 grooming	(2)		○
	93 tropical	(2)		□
	94 scholar	(4)		△
13	95 applauding	(4)		Ω
	96 bugle	(2)		♡
	97 nuisance	(1)		☆
	98 gnawing	(3)		◇
	99 easel	(3)		○
14	100 compass	(2)		□
	101 escorting	(4)		△
	102 wedge	(3)		Ω
	103 beverage	(1)		♡
	104 cubical	(4)		☆
15	105 arctic	(2)		◇
	106 pod	(3)		○
	107 fragment	(3)		□
	108 banister	(1)		△
	109 composer	(4)		Ω
16	110 archaeologist	(4)		♡
	111 parallel	(4)		☆

Plate Number	Word	Key	Response	Error
	112 astonished	(3)		◇
	113 liberated	(1)		○
	114 portable	(2)		□
	115 physician	(4)		△
	116 canine	(3)		Ω
	117 agriculture	(4)		♡
	118 solar	(2)		☆
	119 precipitation	(2)		◇
	120 hovering	(3)		○
	121 amphibian	(1)		□
	122 dome	(3)		△
	123 descending	(1)		Ω
	124 embracing	(1)		♡
	125 judicial	(2)		☆
	126 mason	(4)		◇
	127 fowl	(3)		○
	128 lubricating	(1)		□
	129 porcelain	(2)		△
	130 appraising	(3)		Ω
	131 beacon	(4)		♡
	132 attire	(4)		☆
	133 nape	(2)		◇
	134 salutation	(2)		○
	135 concave	(3)		□
	136 incisor	(1)		△
	137 dwelling	(1)		Ω
	138 orating	(1)		♡
	139 illumination	(4)		☆
	140 submerging	(4)		◇
	141 laminated	(2)		○
	142 convergence	(2)		□
	143 angler	(2)		△
	144 receptacle	(1)		Ω
	145 enticing	(3)		♡

Plate Number	Word	Key	Response	Error
	146 stamen	(3)		☆
	147 expunging	(3)		◇
	148 prodigy	(1)		○
	149 encumbered	(3)		□
	150 depleted	(4)		△
	151 recumbent	(1)		Ω
	152 equestrian	(2)		♡
	153 caliper	(4)		☆
	154 impale	(1)		◇
	155 ellipse	(4)		○
	156 apparition	(2)		□
	157 gable	(4)		△
	158 rapture	(3)		Ω
	159 edifice	(4)		♡
	160 perusing	(2)		☆
	161 portal	(1)		◇
	162 bovine	(2)		○
	163 mendicant	(3)		□
	164 arable	(3)		△
	165 morass	(3)		Ω
	166 ingenious	(2)		♡
	167 sibling	(1)		☆
	168 laciniate	(1)		◇
	169 deciduous	(4)		○
	170 casement	(4)		□
	171 copious	(2)		△
	172 bumptious	(4)		Ω
	173 imbibing	(4)		♡
	174 consternation	(3)		☆
	175 pedagogue	(1)		◇

Calculating Raw Score

Ceiling item _____

minus errors* _____

Raw score _____

*Count errors between highest basal and lowest ceiling only

FORM L

TEST ITEMS AND ABBREVIATED INSTRUCTIONS

Administering the TRAINING ITEMS

For most subjects under age 8: Use Plates A, B, and C. Administer as many training item series as necessary to secure three consecutive correct responses.
For most subjects age 8 and over: Use Plates D and E. Administer as many training item series as necessary to secure two consecutive correct responses.

Training Plate	INITIAL PRACTICE SERIES WORDS & KEYS	ADDITIONAL PRACTICE WORDS & KEYS Alternate Series X	Alternate Series Y	Alternate Series Z
A	doll (4)	fork (1)	table (2)	car (3)
B	man (2)	comb (3)	sock (4)	mouth (1)
C	swinging (3)	drinking (4)	walking (1)	climbing (2)
D	wheel (4)	zipper (2)	rope (1)	rake (3)
E	giant (1)	bride (3)	witch (4)	royal (2)

(Complete directions are given in Part I of the Manual.)

Administering the TEST ITEMS

Basal: Highest 8 consecutive correct responses
Ceiling: Lowest 8 consecutive responses containing 6 errors
Starting Point: For a subject assumed to be of average ability, find the person's age circled in the margin, and begin the test with that item. Otherwise consult Part I of the Manual for further instructions.
Recording Responses and Errors: Record the subject's response (1, 2, 3, or 4) for each item administered. For each error, draw an oblique line either through the plate number of the item missed, or through the geometric figure, as illustrated below:

~~32~~ envelope . . . . (2) 4 Ω or 32 envelope . . . . (2) 4 Ω

Every eighth figure is identical to help determine the basal and ceiling.

NOTE:
Ages in circles refer to the lowest age in a 6- or 12-month interval. For example, Item 1 is the starting item for ages 2-6 through 3-5, and Item 30 for ages 5-0 through 5-5. Use Item 110 for ages 16-0 and over.

	Plate Number	Word	Key	Response	Error
2½ 3	1	bus	(4)		○
	2	hand	(1)		□
	3	bed	(3)		△
	4	tractor	(2)		Ω
	5	closet	(1)		♡
	6	snake	(4)		☆
	7	boat	(2)		◇
	8	tire	(3)		○
	9	cow	(1)		□
3½	10	lamp	(4)		△
	11	drum	(3)		Ω
	12	knee	(4)		♡
	13	helicopter	(2)		☆
	14	elbow	(4)		◇
4	15	bandage	(4)		○
	16	feather	(1)		□
	17	empty	(3)		△
	18	fence	(4)		Ω
	19	accident	(2)		♡
4½	20	net	(2)		☆
	21	tearing	(4)		◇
	22	sail	(1)		○
	23	measuring	(2)		□
	24	peeling	(3)		△
	25	cage	(1)		Ω
	26	tool	(4)		♡
	27	square	(4)		☆
	28	stretching	(1)		◇
	29	arrow	(2)		○
5	30	tying	(2)		□
	31	nest	(1)		△
	32	envelope	(2)		Ω
	33	hook	(3)		♡
	34	pasting	(4)		☆
5½	35	patting	(1)		◇
	36	penguin	(1)		○
	37	sewing	(2)		□
	38	delivering	(1)		△
	39	diving	(2)		Ω
6	40	parachute	(3)		♡
	41	furry	(4)		☆
	42	vegetable	(4)		◇
	43	shoulder	(3)		○
	44	dripping	(2)		□
	45	claw	(4)		△
	46	decorated	(3)		Ω
	47	frame	(1)		♡
	48	forest	(3)		☆
	49	faucet	(2)		◇
6½	50	group	(3)		○
	51	stem	(3)		□
	52	vase	(3)		△
	53	pedal	(1)		Ω
	54	capsule	(2)		♡
7	55	surprised	(4)		☆
	56	bark	(2)		◇
	57	mechanic	(2)		○
	58	tambourine	(1)		□
	59	disappointment	(4)		△
	60	awarding	(3)		Ω
	61	pitcher	(3)		♡
	62	reel	(1)		☆
	63	signal	(1)		◇
	64	trunk	(2)		○
8	65	human	(2)		□
	66	nostril	(1)		△
	67	disagreement	(1)		Ω
	68	exhausted	(2)		♡
	69	vine	(4)		☆
9	70	ceremony	(4)		◇
	71	casserole	(2)		○
	72	vehicle	(4)		□
	73	globe	(3)		△
	74	filing	(3)		Ω
	75	clamp	(2)		♡
	76	reptile	(2)		☆
	77	island	(1)		◇

	Plate Number	Word	Key	Response	Error
	78	spatula	(3)		◯
	79	cooperation	(4)		□
10	80	scalp	(4)		△
	81	twig	(2)		Ω
	82	weasel	(2)		♡
	83	demolishing	(4)		☆
	84	balcony	(1)		◇
11	85	locket	(1)		◯
	86	amazed	(3)		□
	87	tubular	(1)		△
	88	tusk	(1)		Ω
	89	bolt	(3)		♡
12	90	communication	(4)		☆
	91	carpenter	(2)		◇
	92	isolation	(1)		◯
	93	inflated	(3)		□
	94	coast	(3)		△
13	95	adjustable	(2)		Ω
	96	fragile	(3)		♡
	97	assaulting	(1)		☆
	98	appliance	(1)		◇
	99	pyramid	(4)		◯
14	100	blazing	(1)		□
	101	hoisting	(1)		△
	102	arch	(4)		Ω
	103	lecturing	(4)		♡
	104	dilapidated	(4)		☆
15	105	contemplating	(2)		◇
	106	canister	(1)		◯
	107	dissecting	(3)		□
	108	link	(4)		△
	109	solemn	(3)		Ω
16	110	archery	(2)		♡
	111	transparent	(3)		☆

Plate Number	Word	Key	Response	Error
112	husk	(1)		◇
113	utensil	(2)		◯
114	citrus	(3)		□
115	pedestrian	(2)		△
116	parallelogram	(1)		Ω
117	slumbering	(3)		♡
118	peninsula	(4)		☆
119	upholstery	(2)		◇
120	barricade	(4)		◯
121	quartet	(4)		□
122	tranquil	(3)		△
123	abrasive	(1)		Ω
124	fatigued	(3)		♡
125	spherical	(2)		☆
126	syringe	(2)		◇
127	feline	(2)		◯
128	arid	(4)		□
129	exterior	(1)		△
130	constellation	(4)		Ω
131	cornea	(2)		♡
132	mercantile	(1)		☆
133	ascending	(3)		◇
134	filtration	(1)		◯
135	consuming	(4)		□
136	cascade	(4)		△
137	perpendicular	(3)		Ω
138	replenishing	(1)		♡
139	emission	(3)		☆
140	talon	(3)		◇
141	wrath	(3)		◯
142	incandescent	(4)		□
143	arrogant	(2)		△
144	confiding	(3)		Ω
145	rhombus	(3)		♡

Plate Number	Word	Key	Response	Error
146	nautical	(3)		☆
147	tangent	(1)		◇
148	inclement	(4)		◯
149	trajectory	(1)		□
150	fettered	(1)		△
151	waif	(3)		Ω
152	jubilant	(2)		♡
153	pilfering	(4)		☆
154	repose	(2)		◇
155	carrion	(3)		◯
156	indigent	(2)		□
157	convex	(1)		△
158	emaciated	(2)		Ω
159	divergence	(4)		♡
160	dromedary	(2)		☆
161	embellishing	(2)		◇
162	entomologist	(3)		◯
163	constrain	(1)		□
164	infirm	(1)		△
165	anthropoid	(3)		Ω
166	specter	(4)		♡
167	incertitude	(2)		☆
168	vitreous	(1)		◇
169	obelisk	(1)		◯
170	embossed	(4)		□
171	ambulation	(2)		△
172	calyx	(2)		Ω
173	osculation	(3)		♡
174	cupola	(4)		☆
175	homunculus	(4)		◇

Calculating Raw Score

Ceiling item _____

minus errors* _____

Raw score 

*Count errors between highest basal and lowest ceiling only