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ABSTRACT

Six formulas designed to predict reading capacity were compared by correlating each with actual reading performance. Two of the formulas, the Science Research Associates Tests of General Ability (IOGA) and the Harris Formula, are based on mental age only; the third, the Los Angeles Formula, employs both mental and chronological age; the fourth, the Bond and Tinker Formula, involves IQ and length of exposure to academic instruction. The fifth method, the Durrell-Sullivan Reading Capacity and Achievement Tests, uses listening comprehension skills to predict reading achievement; and sixth, the Monroe Formula, uses mental, chronological, and arithmetic ages to determine reading capacity. These six formulas were applied to 81 children in average reading groups of grades 3 through 6. Each of the reading capacity scores was correlated with reading achievement scores from administration of the Gates-MacGinitie Reading Test, using the Pearson product-moment correlation coefficient. The Los Angeles Formula was found to have the highest correlation (.62), and the Harris Formula, the lowest (.0°). It was concluded that most of the variance is unaccounted for, and further examination of other variables needs to be undertaken to assess reading capacity as related to reading performance. References and tables are included. (Author/MS)

A COMPARISON OF SIX PREDICTIVE READING CAPACITY FORMULAS WITH ACTUAL READING ACHIEVEMENT FOR CHILDREN IN GRADES 3-6

A THESIS

SUBMITTED TO THE FACULTY

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ABSTRACT

This study correlated six formulas for predicting reading capacity with actual reading performance to determine which formula is most accurate in its prediction.

1. Science Research Associates' Tests of General Ability, hereinafter referred to as the TOGA Formula;

2. the Harris Formula;

3. the Los Angeles Formulas;

4. the Bond and Tinker Formula;

5. Durrell-Sullivan Reading Capacity and Achievement Tests, hereinafter referred to as the Listening Skills Formula; and

6. the Monroe Formula

The Gates-MacGinitie Reading Test was administered to determine actual reading performance of each student.

The six formulas were applied to a population of 81 children in the average reading group of grades 3 through 6 in the Robertsville School of the Marlboro Township School System, Marlboro, New Jersey.

Each of the six reading capacity scores was correlated with the reading achievement scores, using the Pearson product-moment correlation coefficient.

The Los Angeles Formula was found to have the highest correlation. The range of correlation of five of the six formulas was between 0.42 and 0.62. The Harris

Formula was markedly lower than the other five, having a correlation of 0.08. Most of the variance is unaccounted for, and further examination of other variables needs to be undertaken to assess reading capacity as related to reading performance.

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CHAPTER I

THE PROBLEM

Background of the Problem

Each September remedial reading teachers throughout the country face the problem of determining which children should be included in the remedial reading program. They want to include those children who show a sizeable discrepancy between their reading achievement and their reading capacity. However, the real problem is how to determine reading capacity. What criteria should be used?

The formulas by which reading capacity is now being measured use one or more standardized test scores as their criteria. These formulas differ, however, in the type of test scores used and in the relative weights assigned to these scores.

The first two methods investigated in this study use mental age only. The third method employs both mental and chronological age. The fourth method involves IQ and the length of exposure to academic instruction. The fifth method uses listening comprehension skills to predict reading achievement, and the sixth uses mental age,

chronological age, and arithmetic age to determine reading capacity.

If all these techniques are applied to one individual, there will be a discrepancy in the scores determined by the six formulas.

The problem then is to determine which one is most predictive of actual reading performance.

Statement of the Problem

This study shall attempt to determine which of these six formulas assesses reading capacity of pupils in the average reading group in grades 3 through 6 in relation to actual reading performance.

1. Science Research Associates' Tests of General Ability, hereinafter referred to as the TOGA Formula;

2. the Harris Formula;

3. the Los Angeles Formulas;

4. the Bond and Tinker Formula;

5. Durrell-Sullivan Reading Capacity and Achievement Tests, hereinafter referred to as the Listening Skills Formula; and

6. the Monroe Formula.

Definitions of Terms

For the purposes of this study, these definitions are proposed.

Reading Achievement (RA) is the grade level at which an individual is reading as determined by a given standardized reading test.

Reading Capacity (RC) is the level of reading achievement predicted for an individual as determined by a given formula.

Limitations of the Study

The study uses 81 children from the average reading group in grades 3 through 6 now attending the Robertsville School of the Marlboro Township School System, Marlboro, New Jersey. It will not be possible to determine the effect of the teacher on the students as it is not possible to evaluate the significance of this factor in the computation of the data.

Also, the area is changing rapidly from a rural town to a large municipality. As a result, classes are becoming quite overcrowded. It is not possible to predict what effect this factor will have on reading achievement.

Because this is a small population in a given section, the results cannot be interpreted as being true for the entire country.

CHAPTER II

REVIEW OF THE LITERATURE

This review of the literature is divided into two sections. The first section deals with the individual formulas. The second section contains criticisms of reading expectancy formulas.

Six Formulas

All six of the formulas used for measuring reading capacity are based on standardized test scores. But they differ in the type of test scores used and in the weights given to these scores. Therefore, each formula is treated individually in this review of the literature.

Examples of the actual computations involved in these formulas are given in the Appendix. Also included in the Appendix are the tables used with some of the formulas.

TOGA Formula

Science Research Associates' Tests of General Ability (TOGA) (Flanagan, 1957) give a child's mental age, IQ, and grade expectancy. The IQ norms for these nonverbal tests were derived by first equating TOGA raw

scores to grade equivalents on the SRA Achievements Series, using equi-percentile procedures. The grade equivalents were then converted to mental age equivalents by adding a constant of 5.2 (5 years, 2 months), which their experts have determined as the average age at entrance to kindergarten. The raw score is applied to a chart of standardized scores supplied by the publisher.

Harris Formula

Harris (1961) uses a formula for measuring reading capacity which is similar to the TOGA Formula. He multiplies the child's chronological age by his IQ to obtain the mental age and then subtracts a constant of 5.0 (5 years, 0 months), which he feels is the average age at entrance to kindergarten. His formula would read:

$$RC = CA \times IQ - 5.0$$

Los Angeles Formulas

According to Torgerson and Adams (1954), the mental age is one of the best single bases for judging the educational level at which a child can be expected to perform well. Their research indicates that bright children tend to achieve below their potential as indicated by their mental age level, while dull children tend to achieve above their mental age level. They attribute this to the effect that a child's chronological age has

on his attention span, coordination, emotional maturity, social adjustment, and work habits. They cite the following two cases to illustrate their viewpoint:

> If a child has a CA of 8 and an IQ of 150, his MA would be 12. However, it is obvious that a child of 8 could not be expected to achieve at the level of the average 12-year-old because he has not had the life experiences or school experiences which would be typical of 12-year-olds. . . . Another child with a CA of 8 and an IQ of 75 would have an MA of 6 years. Again, it is obvious that the 8-year-old child would be expected to achieve at a somewhat higher level than the average 6-year-old because of his greater life and school experience [p. 84].

Torgerson and Adams (1954) recommend using the Los Angeles Formulas for computing a child's expected achievement age. These formulas were developed by Horn (1941). The formula for the expected achievement age (XA) for a child of age 6 years, 0 months, through 8 years, 5 months, is:

$$XA = \frac{MA + CA}{2}$$

Torgerson and Adams agree with Horn that CA and MA are equally important in predicting achievement. However, they feel that the MA becomes increasingly more effective than CA as a basis for predicting school achievement as the child grows older. Therefore, the formula for the XA for ages 8 years, 6 months, through 9 years, 11 months, is:

$$XA = \frac{3MA + 2CA}{5}$$

while for ages 10 years, 0 months, through 11 years, 11 months, the formula is:

$$XA = \frac{2MA + CA}{3}$$

The mental age is weighted three times as heavily as the chronological age in the prediction of expected achievement for age 12 years and above, so the formula for this age group is:

$$XA = \frac{3MA + CA}{4}$$

Once a child's XA has been computed from available intelligence-test data, it may be translated into an expected grade placement (XGP) by use of the age-grade equivalents table (Torgerson and Adams, 1954) shown in the Appendix with the sample computation.

Bond and Tinker Formula

Bond and Tinker (1957) compute reading expectancy by the following formula: years in school multiplied by IQ plus 1.0.

$$RA = \text{yr. in school} \times IQ + 1.0$$

They assume that a child progresses on a rate indicated by his IQ. Thus, if all the other elements that influence

reading achievement are favorable, a child with an IQ of 150 can be expected to learn new things about one and a half times as fast as the average child; a child with an IQ of 75 can be expected to learn about three-fourths as fast as the average child. The 1.0 is added because the child starts school at grade 1.0 and, after a year in school, the average child is at grade 2.0.

Bond and Tinker obtained their data from an unpublished study by Bond and Clymer cited in Bond and Tinker (1957). The study used a population of 379 children randomly selected in a large midwestern city. The data from this study indicated to them that the Bond and Tinker Formula applied at the fifth-grade level gives estimates of reading expectancy that are close to the observed reading averages for almost every level of IQ.

Listening Skills Formula

Durrell and Sullivan (1945) used a population of 6,000 cases in 19 eastern communities to determine the norms for the Durrell-Sullivan Reading Capacity Test. This test purportedly measures a child's capacity to learn to read in terms of his ability to understand spoken language. The Durrell-Sullivan Reading Capacity Test is a group test of hearing comprehension or language facility. The raw scores are applied to a chart of standardized scores supplied by the publisher.

Monroe Formula

Monroe (1932) used data from a study she conducted which involved 415 children with special reading defects and a control group of 101 school children in what she termed an average American school population.

In this study, Monroe (1932) correlated a child's reading grade individually with his chronological, mental, arithmetic, and spelling grades. From the results of this study she derived a reading index (RI) which measures a child's reading defect. The reading index is obtained by dividing the reading grade (RG) by the average of the chronological grade (CG), mental grade (MG), and arithmetic grade (AG), the average being called the child's expectancy grade. The formula may be written two ways:

$$RI = \frac{RG}{EG}$$

or

$$RI = \frac{RG}{\frac{CG + MG + AG}{3}}$$

According to Monroe (1932), the reading index shows at what percentage of the child's expectancy grade he is performing in the area of reading. She feels that reading expectancy may be determined by computing the

average of the child's chronological, mental, and arithmetic grades, or

$$RE = \frac{CG + MG + AG}{3}$$

This section has dealt with the literature concerning the reasoning behind the six formulas studied in this thesis.

Studies and Criticisms of Reading Expectancy Formulas

Simmons and Shapiro (1968) conducted a study in which expected reading levels were computed according to the Bond and Tinker Formula, the Harris Formula, and the Los Angeles Formulas at grades 6.0, 8.0, 10.0, and 12.0. The comparison was made at IQ levels from 60 to 140. The data revealed that these three formulas did not yield comparable results. At grade 8.0, a student with an IQ of 130 would have the following expectancies:

Bond and Tinker Formula	10.1
Harris Formula	13.1
Los Angeles Formulas	11.6

A student with an IQ of 110 would have these expectancies:

Bond and Tinker Formula	8.7
Harris Formula	10.1
Los Angeles Formulas	9.2

while a student with an IQ of 60 would show these expectancies:

Bond and Tinker Formula	5.2
Harris Formula	2.6
Los Angeles Formulas	3.7 [p. 626].

Simmons and Shapiro (1968) state that only near the middle of the IQ range do these three formulas approach agreement. The Harris Formula provides the highest expectancies in the upper IQ range, while the Bond and Tinker gives the highest expectancies in the lower IQ range. The Los Angeles Formulas appear to be midway between the other two.

Spache (1968) criticizes the formulas and techniques used by Bond and Tinker, Monroe, and the listening comprehension tests.

He notes that a child does not necessarily progress according to his IQ. Therefore, he questions the accuracy of the Bond and Tinker Formula in predicting the reading capacity of individuals. However, Spache states that for predicting the probable achievement of masses of pupils this index is as practical as any method that has been suggested to date.

Spache does not agree with Monroe's assumption that chronological age and arithmetic computation age are appropriate measures of pupil capacity or potential. He states that there is no real support for this assumption nor any evidence that Monroe's reading index is free from the limitations present in the comparison of MA and

reading age.

Spache gives this rationale for listening comprehension as a predictor of reading:

> . . . through the measurement of students' ability to comprehend spoken language we may perhaps evaluate their potential for future functioning in language skills such as reading [p. 119].

However, he emphasizes that the Durrell-Sullivan Reading Capacity Test is too heavily loaded with the verbal factor of intelligence to be an accurate predictor of reading achievement.

Reed (1970) states: "A child's potential for reading is probably much more closely related to the materials and methods used for teaching than some arbitrary index of expectancy" (p. 352). He assumes that the degree of reading retardation depends on the procedure used to measure it and cannot be considered an absolute.

Reed points out that an eighth-grade student who reads at a seventh-grade level and has an IQ of 120 would be judged as being two years to four and one-half years retarded in reading, depending upon the formula used to measure his reading expectancy level. He warns teachers not to depend solely upon the data obtained from reading expectancy formulas to determine reading retardation.

Strang (1964) believes that listening comprehension is the key to a child's reading capacity. She states:

> . . . prognosis for improvement in reading is good (1) when a student's listening comprehension is 75 per cent or better, (2) when he is able to relate to his life experiences the information he gains through listening, and (3) when he can use in his conversation vocabulary and language structure that are as mature as those in the passage read to him [p. 224].

Strang suggests using one of several standardized listening comprehension tests such as the Durrell-Sullivan Reading Capacity Test.

However, Strang does point out some faults of listening comprehension tests. The relationship between comprehension when listening and comprehension when reading varies with the difficulty of the material. Individuals tend to do better in reading than in listening as the material becomes more difficult. Also, listening skills can be improved by instruction. Because some individuals have had more incidental instruction than others, the listening test becomes less valuable for prediction.

This study differs from the previous studies in the following ways: (1) it is the first study to apply all six formulas to one group of students; and (2) it is an empirical study assessing and comparing the reading capacity predicted with the actual reading performance.

CHAPTER III

PROCEDURE

This study used the average reading groups from grades 3 through 6 of the Robertsville School of the Marlboro Township School System, Marlboro, New Jersey. This gave a population of 81 children. The socioeconomic status of the group ranges from very poor to very wealthy, with the majority of the children coming from middle-class homes. Although the majority of the children in this study are caucasian, all ethnic groups are represented. The age range was from 8 years, 5 months, through 12 years, 5 months. The study used 18 children from sixth grade, 21 children from fifth grade, 15 children from fourth grade, and 27 children from third grade.

Data Collection

It was necessary to gather formula-input data on each child by using the following procedure. First, the Science Research Associates' Tests of General Ability (TOGA) were administered in order to obtain a nonverbal IQ score for each individual. The arithmetic section of the Metropolitan Achievement Tests--Elementary Form A was given to the third and fourth grades and the arithmetic

section of the Metropolitan Achievement Tests--Intermediate Form A was given to the fifth and sixth grades in order to obtain an arithmetic score. The cumulative records of each child were checked in order to obtain the chronological age and number of years in school for each child. These biographical data for formula input are shown in Appendix A. These data were applied to the following formulas for each individual.

In the TOGA Formula the raw score was applied to the standardized chart in order to obtain grade expectancy.

The Harris Formula multiplies the child's chronological age by his IQ to obtain the mental age and then subtracts a constant of 5.0 years (5 years, 0 months).

$$RC = CA \times IQ - 5.0$$

The Los Angeles Formula for the expected achievement age for a child of age 6 years, 0 months, through 8 years, 5 months, is the mental age plus the chronological age divided by 2.

$$XA = \frac{MA + CA}{2}$$

The Los Angeles Formula for the expected achievement age for a child of ages 8 years, 6 months, through 9

years, 11 months, is the average of three times the mental age plus two times the chronological age.

$$XA = \frac{3MA + 2CA}{5}$$

The Los Angeles Formula for the expected achievement age for a child of ages 10 years, 0 months, through 11 years, 11 months, is the average of two times the mental age plus the chronological age.

$$XA = \frac{2MA + CA}{3}$$

The Los Angeles Formula for the expected achievement age for a child of 12 years or older is the average of three times the mental age plus the chronological age.

$$XA = \frac{3MA + CA}{4}$$

The Bond and Tinker Formula uses years in school multiplied by IQ plus 1.0.

$$RA = \text{yrs. in school} \times IQ + 1.0$$

The Listening Skills Formula applies the raw score to the standardized chart of the Durrell-Sullivan Reading Capacity Test in order to obtain grade expectancy.

The Monroe Formula computes the average of the

child's chronological, mental, and arithmetic grades.

$$RE = \frac{CG + MG + AG}{3}$$

Finally, the Gates-MacGinitie Reading Test was administered in order to obtain a reading achievement score for each child.

Treatment of Data

Each of the six reading capacity scores was correlated with the reading achievement score, using the Pearson product-moment correlation coefficient (Lyman, 1963).

$$r_{xy} = \frac{N\Sigma(X - \bar{X})\ (Y - \bar{Y})}{NS_xS_y}$$

in which r_{xy} = product-moment correlation coefficient

Σ = "to add"

X = raw score of Variable X

$\bar{X}$ = mean of Variable X

Y = raw score of Variable Y

$\bar{Y}$ = mean of Variable Y

N = number of pairs of scores

S_x = standard deviation of Variable X

S_y = standard deviation of Variable Y

CHAPTER IV

RESULTS

The data from the procedure yielded the results reported in this section. The mean of the scores, the standard deviation, and the correlation coefficient between the formula and the actual reading achievement are given for each formula. The original grade scores obtained for each predictive formula and for actual reading achievement are given in Appendix B.

Findings

Table 1 summarizes the mean, standard deviation, and correlation between each predictive formula and actual reading achievement.

By inspection, it is apparent that there is a range falling between 0.42 and 0.62 for five of the six formulas. The Los Angeles Formula is the highest. Harris' formula is markedly lower than the other five.

Discussion

The findings of this study appear to support Spache's idea that a child does not necessarily progress according to his IQ. However, they do not agree with his

TABLE 1

CORRELATIONS OF PREDICTIVE FORMULAS
WITH ACTUAL READING ACHIEVEMENT

(Grades 3-6, N = 81)

Formula	Mean (grade)	S.D. (grade)	Correlation
TOGA	5.9	2.1	0.50
Harris	6.1	2.1	0.08
Los Angeles	5.5	1.6	0.62
Bond and Tinker	5.6	1.5	0.42
Listening Skills	5.9	1.9	0.53
Monroe	4.9	1.3	0.56

statement that chronological age is not a good measure of pupil potential. The study seems to reinforce Spache's and Strang's idea that listening comprehension is a key to the child's reading capacity. This paper closely supports Reed's statement that the degree of reading retardation depends on the procedure used to measure it. The Los Angeles Formulas, while not perfect, appear to be the best tool available at the present time for predicting reading achievement. This would seem to support Simon and Shapiro, who indicated that the Los Angeles Formulas seemed to be the midpoint of those they studied. The range of correlation is between 0.42 and 0.62 for five of the six formulas.

Most of the variance is unaccounted for, and further examination of other variables needs to be undertaken to assess reading capacity as related to reading performance.

CHAPTER V

SUMMARY AND SUGGESTIONS

Summary

One of the criteria to be considered when admitting a student to a remedial reading program is the discrepancy between his reading achievement and his reading capacity. The reading achievement may be obtained from one of several standardized reading tests. However, there is a problem in determining reading capacity. This study dealt with six formulas which can be used to predict reading capacity:

1. Science Research Associates' Tests of General Ability, hereinafter referred to as the TOGA Formula;

2. the Harris Formula;

3. the Los Angeles Formulas;

4. the Bond and Tinker Formula;

5. Durrell-Sullivan Reading Capacity and Achievement Tests, hereinafter referred to as the Listening Skills Formula; and

6. the Monroe Formula.

The tests used in this study were the Science Research Associates' Tests of General Ability, the

Metropolitan Achievemen' Tests--Elementary Form A, the Metropolitan Achievement Tests--Intermediate Form A, the Durrell-Sullivan Reading Capacity Test, and the Gates-MacGinitie Reading Test.

The Los Angeles Formulas showed the highest correlation. The range of correlation of five of the six formulas is between 0.42 and 0.62. The Harris Formula is markedly lower than the other five.

Suggestions for Further Research

The results of this study suggest the following possibilities for further research: (1) the study could be duplicated using a larger population and a more representative sample of the country; (2) the study could be duplicated using different grade levels; (3) the study could be analyzed by grade level to see if the findings hold true at each individual grade studied in this thesis; and (4) a study could be done to determine the weight of additional elements used in the computation of the data with the possibility of developing a new formula for the prediction of reading capacity.

Some areas that might need examination are possibly a motivation index, an interest index, a perceptual skills index, and a teacher performance index.

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APPENDIX A

BIOGRAPHICAL DATA FOR FORMULA INPUT

Name	Grade	Birth date	Chronological age	Years in school	Arithmetic grade	IQ	Mental age
1. Barbara A.	6	5-17-57	12-0	5.9	5.7	99	11-10
2. Karen A.	6	11-16-57	11-6	5.9	6.0	98	11-3
3. Michael B.	6	10-8-57	11-7	5.9	5.2	119	13-9
4. Thomas F.	6	8-20-57	11-9	5.9	6.5	122	14-4
5. Karen H.	6	7-13-57	11-10	5.9	5.6	103	12-2
6. Joan I.	6	8-18-57	11-9	5.9	6.2	117	13-9
7. Alice L.	6	4-17-57	12-1	5.9	5.5	78	9-5
8. Alice M.	6	1-31-57	12-4	5.9	6.4	94	11-3
9. Ronald C.	6	11-15-57	11-6	5.9	6.5	117	13-5
10. Joseph S.	6	10-6-57	11-7	5.9	4.3	106	12-3
11. Steven S.	6	3-31-57	12-2	5.9	5.2	109	13-3
12. Eric S.	6	2-8-57	12-3	5.9	6.0	120	14-8
13. Rita S.	6	8-17-57	11-9	5.9	5.9	125	14-8
14. Teresa S.	6	9-27-57	11-8	5.9	5.4	140	16-4
15. Robert S.	6	1-18-57	12-4	5.9	5.7	88	10-10
16. Marvin S.	6	3-13-57	12-2	5.9	6.2	120	14-7
17. Karen T.	6	8-27-57	11-9	5.9	5.0	134	15-9
18. Gail V.	6	12-13-56	12-5	5.9	6.2	120	14-11
19. Philip C.	5	8-20-57	11-9	4.9	5.3	92	10-10
20. Ted E.	5	9-7-57	11-8	4.9	4.8	88	10-3
21. Louise G.	5	10-3-58	10-7	4.9	4.6	87	9-3
22. Donna M.	5	10-13-58	10-7	4.9	4.5	113	12-0
23. James M.	5	2-22-58	11-3	4.9	5.3	120	13-6
24. Debbie O.	5	10-3-58	10-7	4.9	4.9	91	10-2
25. Margaret P.	5	5-17-58	11-0	4.9	5.4	96	10-7
26. James R.	5	11-9-57	11-6	4.9	4.6	98	11-4
27. Lisa W.	5	6-6-58	10-11	4.9	4.0	91	9-11
28. Michael T.	5	6-11-58	10-11	4.9	5.2	110	12-0
29. William J.	5	5-24-58	11-0	4.9	5.8	108	11-11

Name	Grade	Birth date	Chrono-logical age	Years in school	Arith-metic grade	IQ	Mental age
30. John S.	5	9-3-58	10-8	4.9	5.7	110	11-9
31. Ronald R.	5	6-17-58	10-11	4.9	5.2	107	10-10
32. Keith O.	5	10-3-58	10-7	4.9	5.3	113	12-0
33. Kelly N.	5	11-3-58	10-6	4.9	4.6	100	10-6
34. Steven L.	5	6-9-58	10-11	4.9	5.1	126	13-9
35. Patti W.	5	8-26-58	10-9	4.9	5.4	100	10-9
36. Edward R.	5	2-8-58	11-3	4.9	5.1	140	15-9
37. Steven R.	5	10-31-58	10-7	4.9	6.1	113	12-0
38. Ira B.	5	7-12-58	10-10	4.9	5.4	119	12-11
39. Steven S.	5	4-14-58	11-1	4.9	5.3	114	12-4
40. Brett B.	4	10-2-59	9-7	3.9	4.7	108	10-4
41. Alan P.	4	8-30-59	9-9	3.9	4.7	98	9-7
42. Anthony P.	4	9-1-59	9-8	3.9	4.1	124	12-0
43. Robert C.	4	11-7-58	10-6	3.9	4.3	89	9-4
44. Robert K.	4	1-18-59	10-4	3.9	4.2	121	12-6
45. Joseph L.	4	4-6-59	10-1	3.9	4.1	76	7-8
46. Steven K.	4	2-21-59	10-2	3.9	4.3	98	10-0
47. Ronald K.	4	12-3-59	9-5	3.9	4.1	106	10-0
48. Mindy M.	4	12-7-59	9-5	3.9	3.5	117	11-0
49. Barry P.	4	6-1-59	9-11	3.9	4.8	114	11-4
50. Chris N.	4	11-4-59	9-6	3.9	3.5	108	10-3
51. David R.	4	2-5-59	10-3	3.9	4.7	89	9-2
52. Patricia W.	4	3-27-59	10-2	3.9	3.8	91	9-3
53. Richard P.	4	7-25-59	9-10	3.9	5.0	103	10-2
54. Ronald B.	4	9-2-59	9-8	3.9	4.4	121	11-8
[illegible]	3	5-27-59	[illegible]0	2.9	3.6	77	7-8
[illegible]	3	10-19-60	[illegible]7	2.9	3.6	116	9-11
[illegible]	3	5-10-60	[illegible]0	2.9	3.8	104	9-4
58. Nicholas S.	3	12-21-59	[illegible]5	2.9	2.6	109	10-3

Name	Grade	Birth date	Chronological age	Years in school	Arithmetic grade	IQ	Mental age
59. Mark C.	3	7-22-60	8-10	2.9	2.9	107	9-5
60. Stephen K.	3	6-9-60	8-11	2.9	3.2	104	9-3
61. Lori P.	3	5-5-60	9-0	2.9	3.2	106	9-7
62. Debbie L.	3	7-12-60	8-10	2.9	3.7	91	8-1
63. Barbara R.	3	8-8-60	8-9	2.9	3.7	121	10-7
64. William C.	3	12-4-59	9-5	2.9	4.1	100	9-5
65. Douglas H.	3	6-5-59	9-11	2.9	3.2	118	11-8
66. Thomas N.	3	10-14-59	9-7	2.9	3.6	99	9-6
67. Laura B.	3	12-31-59	9-5	2.9	3.2	103	9-8
68. Lori H.	3	4-7-60	9-1	2.9	3.7	85	7-9
69. Stephen S.	3	3-30-60	9-2	2.9	2.9	112	10-3
70. Valerie O.	3	11-20-60	8-6	2.9	3.2	89	7-7
71. Caren D.	3	2-10-60	9-3	2.9	3.0	125	11-7
72. Eric S.	3	8-9-60	8-9	2.9	3.7	134	11-9
73. Karen M.	3	11-14-60	8-6	2.9	3.5	104	8-10
74. Susan L.	3	8-26-60	8-9	2.9	3.3	134	11-9
75. Shari W.	3	12-13-60	8-5	2.9	3.3	84	7-1
76. Anthony T.	3	2-18-60	9-3	2.9	2.7	92	8-6
77. Margaret F.	3	9-20-60	8-8	2.9	2.9	97	8-5
78. Beth L.	3	6-10-60	8-11	2.9	2.7	94	8-5
79. Susan M.	3	5-5-60	9-0	2.9	3.0	91	8-2
80. Helen N.	3	6-15-60	8-11	2.9	2.7	117	10-5
81. Janice M.	3	6-29-60	8-11	2.9	3.2	95	8-6

APPENDIX B

ORIGINAL GRADE SCORES FOR EACH PREDICTIVE FORMULA

AND FOR ACTUAL READING ACHIEVEMENT

Name	Reading achievement	TOGA	Harris	Los Angeles	Bond and Tinker	Listening Skills	Monroe
1. Barbara A.	7.6	6.9	6.9	6.6	6.8	7.8	6.2
2. Karen A.	7.6	6.3	6.3	6.0	6.8	7.2	6.1
3. Michael B.	5.3	8.8	8.9	7.7	8.2	7.0	6.6
4. Thomas F.	11.6	9.1	9.4	8.1	8.4	9.3	7.2
5. Karen H.	9.5	6.9	7.2	6.7	7.1	7.8	6.1
6. Joan I.	6.8	8.6	8.9	7.7	7.9	7.0	6.9
7. Alice L.	5.8	4.4	4.5	4.8	5.6	5.0	5.3
8. Alice M.	5.6	6.3	6.7	6.2	6.6	6.7	6.2
9. Ronald C.	9.5	8.6	8.6	7.4	7.9	7.8	7.0
10. Joseph S.	6.1	7.2	7.3	6.7	7.3	6.4	5.8
11. Steven S.	8.8	8.1	8.1	7.7	7.4	10.9	6.4
12. Eric S.	11.6	9.5	9.8	8.7	8.1	8.9	7.1
13. Rita S.	5.8	9.5	9.8	8.3	8.4	8.6	7.1
14. Teresa S.	11.6	11.5	11.4	9.4	9.2	8.2	7.6
15. Robert S.	5.5	5.6	6.0	5.8	6.2	7.5	5.7
16. Marvin S.	9.5	9.5	9.7	8.7	8.1	11.7	7.2
17. Karen T.	8.8	10.7	10.9	9.1	8.9	8.6	7.2
18. Gail V.	7.6	9.5	10.2	8.9	8.1	8.2	7.2
19. Philip C.	6.8	5.6	6.0	5.8	5.5	6.1	5.3
20. Ted E.	5.1	5.1	5.3	5.2	5.3	6.4	4.9
21. Louise G.	5.6	4.1	4.3	4.4	5.3	4.7	4.5
22. Donna M.	4.8	6.9	7.0	6.0	6.5	9.3	5.4
23. James M.	6.8	8.3	8.6	7.4	6.9	8.6	6.2
24. Debbie O.	6.5	4.6	4.9	5.1	5.5	6.7	4.8
25. Margaret P.	5.1	5.6	5.7	5.2	5.7	4.9	5.3
26. James R.	8.8	6.3	6.3	6.1	5.8	9.3	5.3
27. Lisa W.	4.8	4.6	5.1	5.0	5.5	4.6	4.5
28. Michael T.	5.6	6.6	7.0	6.3	6.4	7.0	5.6
29. William J.	6.3	6.9	7.1	6.2	5.3	7.8	5.9

Name	Reading achievement	TOGA	Harris	Los Angeles	Bond and Tinker	Listening Skills	Monroe
30. John S.	8.1	6.6	6.9	6.1	6.4	6.1	5.7
31. Ronald R.	6.8	6.3	6.8	5.6	6.7	5.6	5.5
32. Keith O.	7.6	6.9	7.0	6.0	6.5	5.2	5.7
33. Kelly N.	4.4	5.6	5.6	5.2	5.9	6.7	5.0
34. Steven L.	6.5	8.3	8.9	7.5	7.2	7.2	6.1
35. Patti W.	7.6	5.6	5.9	5.5	5.9	7.0	5.3
36. Edward R.	7.1	10.7	10.9	8.9	7.9	10.0	6.9
37. Steven R.	5.1	6.9	7.0	6.0	6.5	8.6	6.0
38. Ira B.	6.5	7.6	8.1	6.9	6.8	5.2	6.0
39. Steven S.	11.6	7.6	7.8	6.6	6.6	6.1	5.9
40. Brett B.	5.8	5.3	5.4	4.8	5.2	3.0	4.6
41. Alan P.	6.8	4.4	4.7	4.4	4.8	4.3	4.3
42. Anthony P.	5.8	6.9	7.0	5.8	5.8	5.8	5.0
43. Robert C.	5.5	4.4	4.4	4.5	4.5	4.4	4.2
44. Robert K.	9.5	7.2	7.6	6.4	5.7	6.1	5.1
45. Joseph L.	5.1	2.6	2.8	3.2	4.0	5.0	3.5
46. Steven K.	5.3	4.8	5.0	4.8	4.8	5.8	4.3
47. Ronald K.	7.6	4.6	5.0	4.5	5.1	5.0	4.2
48. Mindy M.	6.1	5.6	6.0	5.1	5.6	4.9	4.3
49. Barry P.	5.3	5.9	6.4	5.5	5.5	4.1	4.9
50. Chris N.	3.9	5.3	5.3	4.7	5.2	4.7	4.2
51. David R.	5.1	3.9	4.2	4.2	4.5	5.4	4.2
52. Patricia W.	6.1	4.1	4.3	4.3	4.6	3.6	3.9
53. Richard P.	3.9	4.8	5.2	4.8	5.0	4.6	4.6
54. Ronald B.	5.1	6.6	6.8	5.6	5.7	6.1	5.0
55. Jeffrey K.	4.7	2.6	2.8	3.2	3.2	3.1	3.0
56. James T.	5.8	4.8	5.0	4.2	4.4	4.5	3.8
57. Scott B.	4.1	4.3	4.4	3.9	4.0	3.2	3.7
58. Nicholas S.	4.9	5.0	5.3	4.7	4.2	4.3	3.5

Name	Reading achievement	TOGA	Harris	Los Angeles	Bond and Tinker	Listening Skills	Monroe
59. Mark C.	5.8	4.3	4.5	3.9	4.1	4.4	3.4
60. Stephen K.	4.6	4.0	4.3	3.8	4.0	4.6	3.4
61. Lori P.	3.9	4.5	4.6	4.1	4.1	4.7	3.5
62. Debbie L.	3.4	2.9	3.1	3.2	3.6	4.3	3.2
63. Barbara R.	4.7	5.5	5.7	5.0	4.5	4.0	4.0
64. William C.	5.2	4.2	4.5	4.2	3.9	3.6	3.7
65. Doublas H.	3.6	6.5	6.8	5.7	4.4	4.7	4.2
66. Thomas N.	4.7	4.3	4.6	4.2	3.9	5.0	3.6
67. Laura B.	4.5	4.5	4.8	4.3	4.0	4.5	3.5
68. Lori H.	4.5	2.6	2.9	3.0	3.5	3.7	3.1
69. Stephen S.	4.6	5.0	5.3	4.6	4.2	4.5	3.6
70. Valerie O.	3.5	2.5	2.7	2.7	3.6	3.7	2.9
71. Caren D.	4.9	6.5	6.7	5.4	4.6	6.1	4.1
72. Eric S.	6.0	6.7	6.9	5.3	4.9	4.5	4.4
73. Karen M.	6.0	3.8	4.0	3.4	4.0	4.6	3.4
74. Susan L.	6.0	6.7	6.9	5.3	4.9	4.4	4.3
75. Shari W.	5.2	1.8	2.1	2.6	3.4	4.1	2.7
76. Anthony T.	6.0	3.4	3.6	3.6	3.7	4.5	3.0
77. Margaret F.	4.7	3.2	3.5	3.2	3.8	4.5	3.0
78. Beth L.	6.0	3.1	3.2	3.3	3.7	3.6	2.9
79. Susan M.	5.6	3.1	3.2	3.2	3.6	3.9	3.0
80. Helen N.	4.9	5.2	5.5	4.6	4.4	5.0	3.6
81. Janice M.	4.5	3.2	3.6	3.4	3.8	4.3	3.1

APPENDIX C

EXAMPLES OF COMPUTATIONS OF EACH FORMULA

This appendix contains examples of data for computing the following formulas: the TOGA Formula, the Harris Formula, the Los Angeles Formulas, the Bond and Tinker Formula, the Listening Skills Formula, and the Monroe Formula.

THE HARRIS FORMULA

RC = CA x IQ - 5.0

Case #36 Edward R.

Date of birth	2/8/58
Chronological age	11 years, 3 months (135 months)
IQ	140

RC = (135 x 140) - 5.0

RC = 189 (months) - (5.0)

RC = 15 years, 9 months - 5 years, 0 months

RC = 10.9

THE LOS ANGELES FORMULAS

Case #7 Alice L.

Date of birth	4/17/57
IQ	78
Mental age	9-5 (113 months)
Chronological age	12-1 (145 months)
$XA = \frac{3MA + CA}{4}$	$XA = \frac{3(113) + 145}{4}$
	XA = 121 months
	XA = 4.8

Case #36 Edward R.

Date of birth	2/8/58
IQ	140
Mental age	15-9 (189 months)
Chronological age	11-3 (135 months)
$XA = \frac{2MA + CA}{3}$	$XA = \frac{2(189) + 135}{3}$
	XA = 171 months
	XA = 8.9

THE LOS ANGELES FORMULAS (continued)

Case #47 Ronald K.

Date of birth	12/3/59
IQ	106
Mental age	10-0 (120 months)
Chronological age	9-5 (113 months)

$$XA = \frac{3MA + 2CA}{5}$$

$$XA = \frac{3(120) + 2(113)}{5}$$

$$XA = 117 \text{ months}$$

$$XA = 4.5$$

AGE-GRADE EQUIVALENTS

To be used in changing chronological, mental, or expected achievement ages into the corresponding grade placements.

Age equivalent		
In months	In years and months	Grade equivalent
73	6-1	1.0
74	6-2	1.1
75, 76	6-3, 6-4	1.2
77	6-5	1.3
78	6-6	1.4
79	6-7	1.5
80, 81	6-8, 6-9	1.6
82	6-10	1.7
83, 84	6-11, 7-0	1.8
85	7-1	1.9
86	7-2	2.0
87	7-3	2.1
88, 89	7-4, 7-5	2.2
90	7-6	2.3
91	7-7	2.4
92	7-8	2.5
93, 94	7-9, 7-10	2.6
95	7-11	2.7
96, 97	8-0, 8-1	2.8
98	8-2	2.9
99	8-3	3.0
100	8-4	3.1
101, 102	8-5, 8-6	3.2
103	8-7	3.3
104	8-8	3.4
105	8-9	3.5
106	8-10	3.6
107, 108	8-11, 9-0	3.7
109	9-1	3.8
110	9-2	3.9
111	9-3	4.0
112	9-4	4.1
113, 114	9-5, 9-6	4.2
115	9-7	4.3
116	9-8	4.4
117	9-9	4.5
118	9-10	4.6
119	9-11	4.7

AGE-GRADE EQUIVALENTS (continued)

Age equivalent		Grade equivalent
In months	In years and months	
120, 121	10-0, 10-1	4.8
122	10-2	4.9
123	10-3	5.0
124	10-4	5.1
125, 126	10-5, 10-6	5.2
127	10-7	5.3
128	10-8	5.4
129	10-9	5.5
130, 131	10-10, 10-11	5.6
132	11-0	5.7
133, 134	11-1, 11-2	5.8
135	11-3	5.9
136	11-4	6.0
137	11-5	6.1
138, 139	11-6, 11-7	6.2
140	11-8	6.3
141	11-9	6.4
142	11-10	6.5
143	11-11	6.6
144, 145	12-0, 12-1	6.7
146	12-2	6.8
147	12-3	6.9
148	12-4	7.0
149	12-5	7.1
150, 151	12-6, 12-7	7.2
152	12-8	7.3
153	12-9	7.4
154	12-10	7.5
155	12-11	7.6
156, 157	13-0, 13-1	7.7
158	13-2	7.8
159	13-3	7.9
160	13-4	8.0
161	13-5	8.1
162, 163	13-6, 13-7	8.2
164	13-8	8.3
165	13-9	8.4
166	13-10	8.5
167	13-11	8.6
168, 169	14-0, 14-1	8.7
170	14-2	8.8
171	14-3	8.9

THE BOND AND TINKER FORMULA

Case #36 Edward R.

Number of years in school 4.9

IQ 140

RC = years in school x IQ + 1.0

RC = (4.9 x 140) + 1.0

RC = 6.86 + 1.0

RC = 7.9

THE MONROE FORMULA

Case #36 Edward R.	
Date of birth	2/8/58
Chronological grade	4.9
Mental grade	10.7
Arithmetic grade	5.1

$$RE = \frac{CG + MG + AG}{3}$$

$$RE = \frac{4.9 + 10.7 + 5.1}{3}$$

$$RE = 6.9$$

APPENDIX D

TESTS USED IN THIS STUDY

Examples of the following tests are located in this appendix: the Science Research Associates' Tests of General Ability, the Metropolitan Achievement Tests--Elementary Form A, the Metropolitan Achievement Tests--Intermediate Form A, the Durrell-Sullivan Reading Capacity Test, and the Gates-MacGinitie Reading Tests.