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An analysis of mental imagery in grades two, three, four and five

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THESIS

AN ANALYSIS OF MENTAL IMAGERY IN GRADES TWO, THREE, FOUR AND FIVE

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CHAPTER I

THE PROBLEM

I. Definition of Imagery

Imagery may be defined as a picture seen in one's mind. It is the ability to create pictures, to hear sounds, to smell odors, to taste, and to feel in one's mind as one reads.

All these factors contribute to the varying degrees of mental imagery possessed by different individuals.

It may be assumed that people visualize when they read. A writer may give a description of a person or a place, and the reader can recreate the scene in his own mind. The reader's picture may be clear or it may be vague. However, since every individual is different the same sentence or paragraph may appear differently to the subjects being tested. To illustrate, the following sentence was presented to a group of children and the accompanying responses were given:

The boy jumped over the fence.

1. A picket fence - about four feet high. Boy was going swimming. He had his bathing suit on. There was a river behind the fence. He jumped over the fence and went into the water.

2. Saw a boy jumping over a white picket fence. It was in the country. He was wearing a farm hat, had overalls on - chasing a dog - dog ran into a hole - boy found him.
3. I saw the boy jumping over a green fence. There was a gate on one side of the fence. I saw a garage with a car outside.
4. I saw a boy in my yard jumping over the white iron fence. He had blue dungarees on, a white shirt and sneakers. He ran out of the yard and down the street.
5. A small wooden fence - the boy had khaki pants and a yellow sweater - looked like my friend Lloyd - we were playing Scatter - he was running to hide and he jumped over the fence.
6. I saw a white picket fence like in a garden - a boy was in the middle of the garden - ran and jumped over the fence. There was a dog with him and he jumped over, too.
7. A boy wearing navy blue shorts. He jumped over a little black iron fence in a garden separating two lawns. He looks like a boy on our street.

8. A house, flowers and grass - saw a high silver fence and the boy was climbing the fence trying to get away from another boy who was chasing him.
9. A boy jumped a white wooden fence - he had on brown pants, sweatshirt, red and blue cap - brown shoes. The gate was locked and he wanted to get out of the yard.
10. A stone wall - he was walking on it and then he jumped over it - he saw his friends playing ball and wanted to join them.

II. Statement of the Purpose

It can be readily seen from the above responses that images did vary greatly. Although the same basic sentence was read by each child, many interpretations were given. This established the fact that mental pictures in individuals may differ greatly.

In this study an attempt was made to measure imagery by means of a test consisting of paragraphs and isolated sentences.

Form A was made up of paragraphs.

Form B was made up of isolated sentences.

This type of test was decided upon in order to determine whether sentences lacked enough stimuli to evoke an image or did the paragraphs provide the necessary stimuli needed.

Assuming then, that imagery existed, it was felt that the subjects needed help to describe their imagery enough to be measured. This help was given in the checklist.

Since verbal fluency differs in each child and could affect the scores, it was felt the checklist would eliminate that factor of influence..

III. Statement of the Problem

In general, this study will attempt to discuss if paragraphs evoked more vivid mental pictures than did isolated sentences.

Specifically, it will present data which will attempt to answer the following questions:

1. What is the effect on imagery of increasing stimuli?
2. What is the correlation between imagery and mental age?
3. How equivalent are Forms A and B of the imagery test at various grade levels?
4. Was there any significant difference in mental imagery of Forms A and B for boys and girls?
5. What is the relationship between Language mental age and mental imagery?
6. What is the relationship between Non-Language mental age and mental imagery?
7. Can the instrument be used at primary level?

CHAPTER II

PROCEDURE

The purpose of this Analysis of Mental imagery in Grades Two, Three, Four, and Five, was to discover if increasing the stimuli, that is, using paragraphs, caused any increase in imagery scores as compared with imagery scores on simple sentences.

The experiment attempted to answer the following questions:

1. What is the effect on imagery of increasing the stimuli?
2. What is the correlation between imagery and intelligence?
3. How equivalent are Forms A and B on the imagery test?
4. Is there any significant difference in mental imagery of Forms A and B between boys and girls?
5. What is the relationship between Language mental age and mental imagery?
6. What is the relationship between Non-Language mental age and mental imagery?
7. Can the instrument be used at primary level?

Answers to the above questions were obtained by using the following procedure:

1. To determine the effect of increased stimuli on imagery, paragraphs were constructed and

used in this instrument. The imagery scores obtained from the use of these paragraphs were correlated with the imagery scores obtained from the simple sentences.

2. To obtain information concerning the mental factors, the California Short-Form Test of Mental Maturity[1] was administered to all pupils. Grades 2 and 3 used the Primary Form; Grades 4 and 5 the Intermediate.

3. In a previous study of mental imagery conducted by Carlton M. Singleton[2] a series of stimuli sentences was constructed. There were ten sentences in each of two forms - Form A and Form B. This experiment utilized Form B of that previous study - in its original form. The paragraphs constructed by the writers incorporated the stimuli sentences of Form A of the same study. The correlation between Forms A and B was determined by the Pearson Product Moment formula.

4. The difference in mental imagery between the boys and girls used in this experiment was determined by the Pearson Product Moment formula.

5. The relationship between Language factors and mental imagery was determined by correlating the mental imagery scores and the Language scores obtained from the California Short-Form Test of Mental Maturity.[3]

6. The relationship between Non-Language mental factors and mental imagery was determined by correlating the mental imagery scores and the

[1]E.T.Sullivan, W.W.Clark, E.W.Tiegs. California Short-Form Test of Mental Maturity, California Test Bureau, Los Angeles 28, California, 1950.

[2]Carlton M. Singleton. Analysis of Imagery, Incomplete Dissertation, Boston University

[3]E.T.Sullivan, W.W.Clark, E.W.Tiegs. Op. Cit.

Non-Language scores obtained from the California Short-Form Test of Mental Maturity.[1]

7. In order to determine whether this instrument could be used successfully at the primary grade level, the vocabulary of the paragraphs constructed by the writers was aimed at the third grade reading level.

This experiment included a population of 185 pupils in the elementary schools of an industrial suburb of Boston. The Grades used were 2, 3, 4, and 5.

The following table shows the distribution by Sex and Grade of the 185 pupils used in this study:

Table I

Grade	2	3	4	5	Total
Boys	16	35	12	37	100
Girls	10	34	12	29	85
Total	26	69	24	66	185

Table I shows that the boys outnumbered the girls in each grade. In the total population there were 100 boys and 85 girls. Grades Three and Five contained approximately three times as many pupils as Grades Two and Four.

[1]Ibid.

The following table shows the distribution according to Sex and Chronological Age of the 185 pupils used in this study:

Table II

	Boys	Girls	Total
6.11 - 7.4	11	4	15
7.5 - 7.10	4	8	12
7.11 - 8.4	17	14	31
8.5 - 8.10	9	15	24
8.11 - 9.4	9	9	18
9.5 - 9.10	7	8	15
9.11 - 10.4	14	10	24
10.5 - 10.10	14	14	28
10.11 - 11.4	7	2	9
11.5 - 11.10	4	1	5
11.11 - 12.4	1	0	1
12.5 - 12.10	1	0	1
12.11 - 13.4	2	0	2

Table II shows that the Chronological Ages of the 185 pupils used in this study ranged from 6 years 11 months to 13 years 4 months.

Since one of the purposes of this experiment was to discover if increasing the stimuli, that is, using paragraphs,

caused any increase in imagery scores as compared with imagery scores on simple sentences, ten paragraphs were constructed by the writers using the stimuli sentences of Form A as the base. It was necessary to devise paragraphs that would not detract from the original sentences, rather, if anything enhance or enlarge the picture. An attempt was made to keep additional action from the paragraphs since it was felt that action would tend to increase the number of separate pictures that might be seen.

The following paragraphs are the ones used as Form A. The underlined sentence in each paragraph is the original sentence of the previous study by Carlton M. Singleton[1].

Sample

Beside the road was a fence. On the other side of the fence was a large field. Far away over the field was a house. The boy jumped over the fence.

1. It was Jimmy's birthday. Some of his friends were coming to his party. The ice cream, cake, and candy were ready. On the table was a bowl of crisp salt potato chips. Jimmy thought birthdays were fun.

2. The room was warm and clean. The loaves of bread had just been taken out of the oven. They were set on the table to cool. The heat from the bread rose up. The good smell of fresh baked bread filled the air. A breeze came in from the open window beside the table. It blew softly on the golden brown crusts.

[1]Carlton M. Singleton. Op. Cit.

3. The playroom was full of all kinds of toys lying around. On the floor was a pile of blocks. Beside it was a child. Suddenly, the child's tower of blocks fell down.

4. The room was hot. On the floor of the room was a thick green rug. Across the room the windows were shut tight. The boy walked barefoot across the thick green rug.

5. The room felt warm and cozy. The lamp in the corner was brightly lit. Soft music came from the radio on the table. She stretched back in the chair.

6. The air at the beach was warm and pleasant. The sky and the water were very blue. The wind was puffing softly at the little boats and the sand. On the sand was a lunch basket filled with all kinds of good things to eat. Eating outdoors was the best part of the day.

7. It was late at night. The express train was on its way to the big city. Everyone in the tiny village was in bed and asleep. With a loud shriek the train flew past the crossing. All was quiet and still again in the village.

8. One garden on Elm Street was very pretty. Around the garden, was a fence. Behind it stood the house. A walk cut through the garden and led to the house. The garden was filled with red roses.

9. When Carl came out of the cold water at the beach, he thought he would never get warm again. But soon, the hot noon sun felt hot on his bare back.

10. The children were playing tag in the schoolyard. One little boy was "it." He tried to catch a girl. She had to run fast to get away from him. She ran until she thought her lungs would burst.

The following sentences are the original ones used in the Singleton study. They were used as Form B.

Sample

The boy jumped over the fence.

1. The bowl was filled with crisp salt nuts.
2. The sweet smell of fresh apple pie filled the room.
3. The dishes fell to the floor.
4. The boy was squeezing blue clay between his fingers.
5. She bent over to touch her toes.
6. Eating the picnic lunch was the part they liked best.
7. Making lots of noise the car speeded past the street.
8. The field was full of purple violets.
9. The boy shivered as he fell into the cold water.
10. She walked miles until every muscle was exhausted.

As a means of recording the mental imagery responses to the stimuli sentences a Checklist[1] was used with each form. The Checklist questions attempted to measure visual imagery, scope of the imagery, clarity of the imagery, constancy of the imagery, and whether the image was a memory or creative picture. The method of scoring the Checklist is explained on page 14.

[1]Op. Cit.

Considering the fact that the school population being used in this experiment consisted of children ranging from the second grade to the fifth grade, it was necessary for the examiners to agree on a procedure that would be suitable for the range in ages. It was agreed to use the following wording:

"Boys and girls: Sometimes when we read we see pictures in our minds. Sometimes we don't see any pictures. The pictures that we do see can be different. Not all are clear. We may see only part of a picture. We may see colors, hear sounds, smell something, or even taste or feel things."

"When you read the word that I'm going to write on the blackboard, tell me what picture you see in your mind." (Note to the teacher: Print word CANDY on board. Emphasize that they do not <u>need</u> to see an image. Allow the children to give spontaneous remarks on the images they have seen. Continue the same procedure with color, sound, smell, taste, and feeling using the same word).

After hearing the various responses, point out the differences and say: "You see, there are no right or wrong answers. This is <u>not</u> a test. Now, we are going to try the same thing with a whole sentence instead of one word." (Note to the teacher: Print sample sentence on the blackboard - THE BOY JUMPED OVER THE FENCE. Have the children read it and

close their eyes to see if they have a picture. Go through the same procedure as with the single word. Then administer Form B of the Imagery Checklist.)

Every child in grades 3, 4, and 5 had a mimeographed copy of each sentence to read. The children of grade 2 were tested individually, thus the examiner needed only one copy of each sentence to show as she tested each child. To make sure the children were not to be tested on their reading ability, it was decided that the teacher would read every sentence aloud. The children closed their eyes to see if the sentence brought them a picture. After opening their eyes they began filling in the Checklist.

In grade 2 each child was test individually and the teacher marked the Checklist according to the responses given. In grades 3, 4, and 5 the teacher read the Checklist with the children. They were able to fill in their own responses.

The children of grades 3 and 4 were tested in their reading groups while the children of grade 5 were tested as a class. Each examiner gave two or three sentences a day until the ten sentences of Form B were completed.

After one week had elapsed Form A of the Imagery Checklist was administered, using the stimuli sentences in paragraph form. In general, the same technique employed with

Form B was repeated. However, after the children read the paragraph aloud, the teacher wrote the original stimuli sentence contained in each paragraph on the blackboard.

Scoring

The Checklist questions for each sentence in both Form A and Form B followed a unified pattern. The first question simply asked if a picture was seen or not. This did not enter the scoring. The second question measured scope. This question was sub-divided and each part was scored as follows: An entire scene was given two points, part of a scene one point, one object only no point.

The next set of questions measured visual imagery. One point was given for each descriptive word checked. If, by chance, a descriptive word was reported more than once, it was counted as one point. To equate this score, the total was divided by ten.

Another question, consisting of two parts, sought to determine whether the image seen was a memory or creative picture. Two yes answers were considered a memory picture. One yes and one no or two no's constituted a creative picture. These responses were not counted in the total imagery score.

Clarity of the image was measured by another question. Two points were given for a clear picture, one point for a

picture that was clear only in parts and blurred in others. No point was given to a blurred image.

An attempt was made to measure imagery other than visual such as tasting, smelling, hearing, and feeling. One point was given for each item checked.

The last question was a measure of constancy of the image. This was an attempt to determine whether exposing the stimuli in paragraphs instead of simple sentences caused any change in the constancy of the images. A percentile of constancy was figured.

CHAPTER III

ANALYSIS AND TREATMENT OF THE DATA

Table III is a distribution of 185 second, third, fourth and fifth grade children showing the chronological age of each child. The ages range from 13 years, 10 months, to 6 years, 11 months. The mean is 9 years, 4 months. The standard deviation is 16.17.

Table III

Chronological Ages

Chronological Ages of 185 Second,

Third, Fourth and Fifth Grade Pupils

Class Intervals	f
13 - 4 - 13 - 10	1
12 - 9 - 13 - 3	1
12 - 2 - 12 - 8	2
11 - 7 - 12 - 1	3
11 - 0 - 11 - 6	9
10 - 5 - 10 - 11	31
9 - 10 - 10 - 4	29
9 - 3 - 9 - 9	14
8 - 8 - 9 - 2	27
8 - 1 - 8 - 7	34
7 - 6 - 8 - 0	17
6 - 11 - 7 - 5	17
	N =185

SD = 16.17

M = 9 - 4

Table IV shows the mental ages of 185 second, third, fourth and fifth grade pupils. The mental ages range from 15 years, 7 months to 5 years, 9 months. The mean is 10 years, 1 month. The standard deviation is 21.42.

Table IV

Mental Ages

Mental Ages of 185 Second, Third,

Fourth and Fifth Grade Pupils

Class Intervals	f
15 - 1 - 15 - 7	1
14 - 6 - 15 - 0	2
13 - 11 - 14 - 5	1
13 - 4 - 13 - 10	5
12 - 9 - 13 - 3	4
12 - 2 - 12 - 8	10
11 - 7 - 12 - 1	14
11 - 0 - 11 - 6	16
10 - 5 - 10 - 11	2
9 - 10 - 10 - 4	26
9 - 3 - 9 - 9	29
8 - 8 - 9 - 2	17
8 - 1 - 8 - 7	22
7 - 6 - 8 - 0	5
6 - 11 - 7 - 5	4
6 - 4 - 6 - 10	7
5 - 9 - 6 - 3	2
	N = 185

SD = 21.42

M = 10-1

Table V shows the Intelligence Quotients of 185 second, third, fourth and fifth grade pupils. The intelligence qoutients ranged from 154 to 71. The mean is 109.46. The standard deviation is 15.33.

Table V

Intelligence Quotient

Intelligence Quotient Scores of 185 Second, Third, Fourth and Fifth Grade Pupils

Class Intervals	f
148 - 154	2
141 - 147	4
134 - 140	4
127 - 133	16
120 - 126	18
113 - 119	24
106 - 112	40
99 - 105	33
92 - 98	20
85 - 91	14
78 - 84	8
71 - 77	2
	N = 185

SD = 15.33

M = 109.46

Table VI-A is a frequency distribution of 185 second, third, fourth and fifth grade pupils showing the test results for Form A. The scores ranged from 112 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 56.65. The standard deviation is 19.88.

Table VI-A

Form A

Imagery Test Scores of 185 Second, Third,

Fourth and Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
106 - 112	1	+8	+ 8	64
99 - 105	0	+7	+ 0	0
92 - 98	6	+6	+36	216
85 - 91	7	+5	+35	175
78 - 84	11	+4	+44	176
71 - 77	16	+3	+48	144
64 - 70	30	+2	+60	120
57 - 63	25	+1	+25	25
50 - 56	24	0	0	0
43 - 49	17	-1	-17	17
36 - 42	18	-2	-36	72
29 - 35	13	-3	-39	117
22 - 28	11	-4	-44	176
15 - 21	3	-5	-15	75
8 - 14	0	-0	- 0	0
0 - 7	3	-7	-21	147
	N = 185		84	1,524

$$C = \frac{84}{185} = \frac{.45}{7}$$

3.15 correction factor

$$SD = \sqrt{\frac{fd^2}{N} - c^2}\ xi$$

$$SD = \sqrt{\frac{1524}{185} - .2025}\ xi$$

$$SD = \sqrt{8.04 \times 7}$$

$$SD = 19.88$$

A.M. = 53.50

+3.15

M = 56.65

Table VI-B is a frequency distribution of 159 third, fourth and fifth grade pupils showing the test results of Form A. The scores ranged from 112 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 56.02. The standard deviation is 20.23.

Table VI-B

Form A

Imagery Test Scores of 159 Third,

Fourth and Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
106 - 112	1	+8	+ 8	64
99 - 105	0	+7	+ 0	0
92 - 98	5	+6	+30	180
85 - 91	7	+5	+35	175
78 - 84	9	+4	+36	144
71 - 77	11	+3	+33	99
64 - 70	26	+2	+52	104
57 - 63	22	+1	+22	22
50 - 56	19	0	0	0
43 - 49	15	-1	-15	15
36 - 42	16	-2	-32	64
29 - 35	13	-3	-39	117
22 - 28	9	-4	-36	144
15 - 21	3	-5	-15	75
8 - 14	0	-6	- 0	0
0 - 7	3	-7	-21	147
	N = 159		+58	1,350

$C = \frac{58}{159} = \frac{+\ .36}{7}$

2.52 correction factor

$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$

$SD = \sqrt{\frac{1350}{159} - .1296}\ xi$

$SD = \sqrt{8.36} \times 7$

SD = 20.23

A.M. = 53.5
+2.52

M = 56.02

Table VII-A is a frequency distribution of 185 second, third, fourth and fifth grade pupils showing the test results for Form B. The scores ranged from 119 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 56.09. The standard deviation is 20.37.

Table VII-A

Form B

Imagery Test Scores of 185 Second, Third,

Fourth and Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
113 - 119	1	+9	+ 9	81
106 - 112	0	+8	+ 0	0
99 - 105	2	+7	+14	98
92 - 98	2	+6	+12	72
85 - 91	6	+5	+30	150
78 - 84	12	+4	+48	172
71 - 77	17	+3	+51	153
64 - 70	29	+2	+58	116
57 - 63	31	+1	+31	31
50 - 56	19	0	0	0
43 - 49	18	-1	-18	18
36 - 42	18	-2	-36	72
29 - 35	13	-3	-39	117
22 - 28	6	-4	-24	96
15 - 21	3	-5	-15	75
8 - 14	3	-6	-18	108
0 - 7	5	-7	-35	245
	N = 185		+68	1,604

$$C = \frac{68}{185} = +.37$$

$$\frac{7}{2.59} \text{ correction factor}$$

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{1604}{185} - .1369}\ xi$$

$$SD = \sqrt{8.52} - x\ 7$$

$$SD = 20.37$$

A.M. = 53.5

+2.59

M = 56.09

Table VII-B is a frequency distribution of 159 third, fourth and fifth grade pupils showing the test results of Form B. The scores ranged from 119 to 0. They were arranged in class intervals of seven. The assumed mean is 60.5, and the mean is 58.96. The standard deviation is 19.11.

Table VII-B

Form B

Imagery Test Scores of 159 Third,

Fourth and Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
113 - 119	1	+8	+8	64
106 - 112	0	+7	+0	0
99 - 105	2	+6	+12	72
92 - 98	2	+5	+10	50
85 - 91	5	+4	+20	80
78 - 84	12	+3	+36	108
71 - 77	17	+2	+34	68
64 - 70	28	+1	+28	28
57 - 63	29	0	0	0
50 - 56	17	-1	-17	17
43 - 49	12	-2	-24	48
36 - 42	13	-3	-39	117
29 - 35	12	-4	-48	192
22 - 28	4	-5	-20	100
15 - 21	2	-6	-12	72
8 - 14	1	-7	- 7	49
0 - 7	2	-8	-16	128
	N = 159		-35	1,193

$C = \frac{-35}{159} = -.22$

$\quad\quad 7$

$\quad -1.54$ correction factor

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{1193}{159} - .0484}\ xi$$

$$SD = \sqrt{7.45} \times 7$$

$$SD = 19.11$$

A.M. = 60.50

$\quad -1.54$

M = 58.96

Table VIII is a frequency distribution of 100 second, third, fourth and fifth grade boys showing the test results of Form A. The scores ranged from 98 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 54.9. The standard deviation is 19.68.

Table VIII

Form A

Imagery Test Scores of 100 Second, Third,

Fourth and Fifth Grade Boys in Frequency Distribution

Class Intervals	f	d	fd	fd^2
92 - 98	5	+6	+30	180
85 - 91	3	+5	+15	75
78 - 84	4	+4	+16	64
71 - 77	7	+3	+21	63
64 - 70	13	+2	+26	52
57 - 63	16	+1	+16	16
50 - 56	11	0	0	0
43 - 49	12	-1	-12	12
36 - 42	10	-2	-20	40
29 - 35	9	-3	-27	81
22 - 28	7	-4	-28	112
15 - 21	2	-5	-10	50
8 - 14	0	-6	0	0
0 - 7	1	-7	- 7	49
	N = 100		-104	794

$$C = \frac{20}{100} = .20$$

$$\frac{7}{1.40} \text{ correction factor}$$

$$SD = \sqrt{\frac{fd^2}{N} - c^2}\ xi$$

$$SD = \sqrt{\frac{794}{100} - .04}\ xi$$

$$SD = \sqrt{7.90}\ x\ 7$$

$$SD = 19.68$$

A.M. = 53.5
+1.4
M = 54.9

Table IX is a frequency distribution of 100 second, third, fourth and fifth grade boys showing the test results of Form B. The scores for Form B ranged from 105 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 52.66. The standard deviation is 20.17

Table IX

Form B

Imagery Test Scores of 100 Second, Third,

Fourth and Fifth Grade Boys in Frequency Distribution

Class Intervals	f	d	fd	fd^2
99 - 105	1	+7	+ 7	49
92 - 98	2	+6	+12	72
85 - 91	3	+5	+15	75
78 - 84	4	+4	+16	64
71 - 77	7	+3	+21	63
64 - 70	13	+2	+26	52
57 - 63	11	+1	+11	11
50 - 56	13	0	0	0
43 - 49	13	-1	-13	13
36 - 42	15	-2	-30	60
29 - 35	9	-3	-27	81
22 - 28	3	-4	-12	48
15 - 21	1	-5	- 5	25
8 - 14	2	-6	-12	72
0 - 7	3	-7	-21	147
	N = 100		-12	832

$$C = \frac{-12}{100} = -.12$$

$$\frac{7}{-.84} \text{ correction factor}$$

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{832}{100} - .0144}\ xi$$

$$SD = \sqrt{8.31 \times 7}$$

$$SD = 20.17$$

A.M. = 53.50

$$\frac{-.84}{M = 52.66}$$

Table X is a frequency distribution of 85 second, third, fourth and fifth grade girls showing the test results of Form A. The scores for Form A ranged from 112 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 59.1. The standard deviation is 19.25.

Table X

Form A

Imagery Test Scores of 85 Second, Third,

Fourth and Fifth Grade Girls in Frequency Distribution

Class Intervals	f	d	fd	fd^2
106 - 112	1	+7	+ 7	49
99 - 105	0	+6	+ 0	0
92 - 98	1	+5	+ 5	25
85 - 91	4	+4	+16	64
78 - 84	7	+3	+21	63
71 - 77	9	+2	+18	36
64 - 70	17	+1	+17	17
57 - 63	9	0	0	0
50 - 56	13	-1	-13	13
43 - 49	5	-2	-10	20
36 - 42	9	-3	-27	81
29 - 35	3	-4	-12	28
22 - 28	4	-5	-20	100
15 - 21	1	-6	- 6	36
8 - 14	1	-7	- 7	49
0 - 7	1	-8	- 8	64
	N = 85		-19	645

$$C = \frac{-19}{85} = -.2$$

$$\frac{7}{-1.4}$$ correction factor

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{645}{85} - .4}\ xi$$

$$SD = \sqrt{7.55}\ x\ 7$$

$$SD = 19.25$$

A.M. = 60.50

-1.40

M = 59.10

Table XI is a frequency distribution of 85 second, third, fourth and fifth grade girls showing the test results of Form B. The scores ranged from 119 to 0. They were arranged in class intervals of seven. The assumed mean is 60.5 and the mean is 60.01. The standard deviation is 20.17.

Table XI

Form B

Imagery Test Scores of 85 Second, Third,

Fourth and Fifth Grade Girls in Frequency Distribution

Class Intervals	f	d	fd	fd^2
113 - 119	1	+8	+ 8	64
106 - 112	0	+7	+ 0	0
99 - 105	1	+6	+ 6	36
92 - 98	0	+5	+ 0	0
85 - 91	2	+4	+ 8	32
78 - 84	8	+3	+24	72
71 - 77	11	+2	+22	44
64 - 70	16	+1	+16	16
57 - 63	20	0	0	0
50 - 56	7	-1	- 7	7
43 - 49	4	-2	- 8	16
36 - 42	3	-3	- 9	27
29 - 35	4	-4	-16	64
22 - 28	3	-5	-15	75
15 - 21	2	-6	-12	72
8 - 14	1	-7	- 7	49
0 - 7	2	-8	-16	128
	N = 85		- 6	702

$$C = \frac{-6}{85} = \frac{=.07}{-.49} \text{ correction factor}$$

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{702}{85} - .0049}\ xi$$

$$SD = \sqrt{8.25 \times 7}$$

$$SD = 20.17$$

A.M. = 60.50

-.49

M = 60.01

Table XII is a frequency distribution of 185 second, third, fourth and fifth grade pupils showing the language results of The California Test of Mental Maturity. The raw scores ranged from 63 to 0. They were arranged in class intervals of seven. The mean is 36.28. The standard deviation is 9.24.

Table XII

Language Scores of 185 Second,

Third, Fourth and Fifth Grade Pupils

Class Intervals	f
57 - 63	4
50 - 56	4
43 - 49	25
36 - 42	76
29 - 35	40
22 - 28	22
15 - 21	10
8 - 14	4
0 - 7	0
	N = 185

SD = 9.24

M = 36.28

Table XIII is a frequency distribution of 185 second, third, fourth and fifth grade pupils showing the non-language results of the California Test of Mental Maturity. The raw scores ranged from 57 to 15. They were arranged in class intervals of three. The mean is 38.71. The standard deviation is 17.99.

Table XIII

Non-Language Scores of 185 Second,

Third, Fourth and Fifth Grade Pupils

Class Intervals	f
55 - 57	1
52 - 54	7
49 - 51	9
46 - 48	17
43 - 45	21
40 - 42	23
37 - 39	24
34 - 36	34
31 - 33	21
28 - 30	13
25 - 27	9
22 - 24	3
19 - 21	1
16 - 18	1
13 - 15	1
	N = 185

SD = 17.99

M = 38.71

Table XIV is a frequency distribution of 66 fifth grade pupils showing the test results of Form A. The scores ranged from 98 to 0. They were arranged in class intervals of seven. The assumed mean is 60.5 and the mean is 56.58. The standard deviation is 21.91.

Table XIV

Form A

Imagery Test Scores of 66 Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
92 - 98	4	+5	20	100
85 - 91	4	+4	16	64
78 - 84	3	+3	9	27
71 - 77	4	+2	8	16
64 - 70	11	+1	11	11
57 - 63	10	0	0	0
50 - 56	6	-1	- 6	6
43 - 49	5	-2	-10	20
36 - 42	6	-3	-18	54
29 - 35	6	-4	-24	96
22 - 28	3	-5	-15	75
15 - 21	2	-6	-12	72
8 - 14	0	-7	0	0
0 - 7	2	-8	-16	128
	N = 66		-37	669

$C = \frac{-37}{66} = -.56$

$\frac{7}{-3.92}$ correction factor

$$SD = \sqrt{\frac{fd^2}{N} - C^2} \times i$$

$$SD = \sqrt{\frac{669}{66} - .3136} \times 7$$

$$SD = \sqrt{9.82} \times 7$$

$$SD = 21.91$$

A.M. = 60.50

-3.92

M = 56.58

Table XV is a frequency distribution of 66 fifth grade pupils showing the test results of Form B. The scores ranged from 105 to 0. They were arranged in class intervals of seven. The assumed mean is 60.5. The mean is 57.77. The standard deviation is 21.21.

Table XV

Form B

Imagery Test Scores of 66 Fifth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
99 - 105	1	+6	6	36
92 - 98	1	+5	5	25
85 - 91	3	+4	12	48
78 - 84	6	+3	18	54
71 - 77	7	+2	14	28
64 - 70	9	+1	9	9
57 - 63	11	0	0	0
50 - 56	8	-1	- 8	8
43 - 49	4	-2	- 8	16
36 - 42	5	-3	-15	45
29 - 35	6	-4	-24	96
22 - 28	0	-5	0	0
15 - 21	2	-6	-12	72
8 - 14	1	-7	- 7	49
0 - 7	2	-8	-16	128
	N = 66		-26	614

$$C = \frac{-26}{66} = \frac{-.39}{7}$$

-2.73 correction factor

$$SD = \sqrt{\frac{fd^2}{N} - c^2}\ xi$$

$$SD = \sqrt{\frac{614}{66} - .1521}\ x\ 7$$

$$SD = \sqrt{9.15}\ x\ 7$$

SD = 21.21

A.M. = 60.50

-2.73

M = 57.77

Table XVI is a frequency distribution of 24 fourth grade pupils showing the test results of Form A. The scores for Form A ranged from 91 to 22. They were arranged in class intervals of seven. The assumed mean is 53.50 and the mean is 56.44. The standard deviation is 14.28.

Table XVI

Form A

Imagery Test Scores of 24 Fourth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
85 - 91	1	+5	+ 5	25
78 - 84	1	+4	+ 4	16
71 - 77	0	+3	0	0
64 - 70	6	+2	+12	24
57 - 63	3	+1	+ 3	3
50 - 56	6	0	0	0
43 - 49	3	-1	-3	3
36 - 42	2	-2	-4	8
29 - 35	1	-3	-3	9
22 - 28	1	-4	-4	16
	N = 24		10	104

$C = \frac{10}{24} = \frac{.42}{2.94}$ correction factor $\frac{7}{}$

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{104}{24} - .1764}\ xi$$

$$SD = \sqrt{4.16 \times 7}$$

$$SD = 14.28$$

A.M. = 53.50

+2.94

M = 56.44

Table XVII is a frequency distribution of 24 fourth grade pupils showing the test results of Form B. The scores for Form B ranged from 98 to 22. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 55.81. The standard deviation is 16.62.

Table XVII

Form B

Imagery Test Scores for 24 Fourth Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
92 - 98	1	+6	+6	36
85 - 91	1	+5	+5	25
78 - 84	0	+4	+0	0
71 - 77	0	+3	+0	0
64 - 70	4	+2	+8	16
57 - 63	7	+1	+7	7
50 - 56	3	0	0	0
43 - 49	3	-1	-3	3
36 - 42	2	-2	-4	8
29 - 35	1	-3	-3	9
22 - 28	2	-4	-8	32
	N = 24		+8	136

$C = \frac{8}{24} = \frac{.33}{7}$ correction factor

$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$

$SD = \sqrt{\frac{136}{24} - .1089}\ xi$

$SD = \sqrt{5.59} \times 7$

$SD = 16.62$

A.M. = 53.50

+2.31

M = 55.81

Table XVIII is a frequency distribution of 69 third grade pupils showing the test results of Form A. The scores ranged from 112 to 0. They were arranged in class intervals of seven. The assumed mean is 53.5 and the mean is 55.39. The standard deviation is 20.3.

Table XVIII

Form A

Imagery Test Scores for 69 Third Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
106 - 112	1	+8	+ 8	64
99 - 105	0	+7	+ 0	0
92 - 98	1	+6	+ 6	36
85 - 91	2	+5	+10	50
78 - 84	5	+4	+20	80
71 - 77	7	+3	+21	63
64 - 70	9	+2	+18	36
57 - 63	9	+1	+ 9	9
50 - 56	7	0	0	0
43 - 49	7	-1	- 7	7
36 - 42	8	-2	-16	32
29 - 35	6	-3	-18	54
22 - 28	5	-4	-20	80
15 - 21	1	-5	- 5	25
8 - 14	0	-6	0	0
0 - 7	1	-7	- 7	49
	N = 69		19	584

$C = \frac{19}{69} = .27$

$\frac{7}{1.89}$ correction factor

$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$

$SD = \sqrt{\frac{584}{69} - .0729}\ xi$

$SD = \sqrt{8.39} \times 7$

$SD = 20.30$

A.M. = 53.50

+1.89

M = 55.39

Table XIX is a frequency distribution of 69 third grade pupils showing the test results of Form B. The scores ranged from 119 to 22. They were arranged in class intervals of seven. The assumed mean is 60.5 and the mean is 61.34. The standard deviation is 17.71.

Table XIX

Form B

Imagery Test Scores for 69 Third Grade

Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
113 - 119	1	+8	+ 8	64
106 - 112	0	+7	+ 0	0
99 - 105	1	+6	+ 6	36
92 - 98	0	+5	+ 0	0
85 - 91	2	+4	+ 8	32
78 - 84	5	+3	+15	45
71 - 77	10	+2	+20	40
64 - 70	15	+1	+15	15
57 - 63	11	0	0	0
50 - 56	6	-1	- 6	6
43 - 49	5	-2	-10	20
36 - 42	6	-3	-18	54
29 - 35	5	-4	-20	80
22 - 28	2	-5	-10	50
	N = 69		+ 8	442

$C = \frac{8}{69} = \frac{.12}{7}$

.84 correction factor

$$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$$

$$SD = \sqrt{\frac{442}{69} - .0144}\ xi$$

$$SD = \sqrt{6.39}\ x\ 7$$

SD = 17.71

A.M. = 60.50

+.84

M = 61.34

Table XX is a frequency distribution of 26 second grade pupils showing the results of Form A. The scores ranged from 98 to 22. They were arranged in class intervals of seven. The assumed mean is 60.5, and the mean is 60.5. The standard deviation is 16.73.

Table XX

Form A

Imagery Test Scores of 26 Second Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
92 - 98	1	+5	+ 5	25
85 - 91	0	+4	+ 0	0
78 - 84	2	+3	+ 6	18
71 - 77	5	+2	+10	20
64 - 70	4	+1	+ 4	4
57 - 63	3	0	0	0
50 - 56	5	-1	- 5	5
43 - 49	2	-2	- 4	8
36 - 42	2	-3	- 6	18
29 - 35	0	-4	0	0
22 - 28	2	-5	-10	50
15 - 21	0	-6	0	0
8 - 14	0	-7	0	0
0 - 7	0	-8	0	0
	N = 26			148

$C = \frac{0}{26} = 0$ correction factor

$$SD = \sqrt{\frac{fd^2}{N} - C^2} \times i$$

$$SD = \sqrt{\frac{148}{26} - 0} \times i$$

$$SD = \sqrt{5.69} \times 7$$

$$SD = 16.73$$

A.M. = 60.5
0
M = 60.5

Table XXI is a frequency distribution of 26 second grade pupils showing the results of Form B. The scores ranged from 77 to 0. They were arranged in class intervals of seven. The assumed mean is 39.50 and the mean is 39.35. The standard deviation is 19.67.

Table XXI

Form B

Imagery Test Scores of 26 Second Grade Pupils in Frequency Distribution

Class Intervals	f	d	fd	fd^2
71 - 77	1	+5	+5	25
64 - 70	1	+4	+4	16
57 - 63	3	+3	+9	27
50 - 56	2	+2	+4	8
43 - 49	5	+1	+5	5
36 - 42	5	0	0	0
29 - 35	1	-1	- 1	1
22 - 28	2	-2	- 4	8
15 - 21	1	-3	- 3	9
8 - 14	2	-4	-15	32
0 - 7	3	-5	- 4	75
	N = 26		- 4	206

$C = \frac{-4}{26} = -.15$

$\frac{7}{-1.05}$ correction factor

$SD = \sqrt{\frac{fd^2}{N} - C^2}\ xi$

$SD = \sqrt{\frac{206}{26} - .0225}\ xi$

$SD = \sqrt{7.90} \times 7$

$SD = 19.67$

A.M. = 39.50

\- .15

M = 39.35

Table XXII

Per cent of Memory, Creative and No Picture Scores of Imagery Tests, Form A and Form B of 185 Second, Third, Fourth and Fifth Grade Pupils

Memory	Creative	No Picture
37.4 per cent	49.7 per cent	12.9 per cent

Table XXII is the per cent of memory, creative and no picture scores for Form A and Form B of the imagery tests for the total population of 185 pupils. Of the total population, 37.4 per cent reported memory images, 49.7 per cent reported creative images, and 12.9 per cent did not report any image.

Table XXIII

Per cent of Constancy for Total Scores of Imagery Tests, Form A and Form B for 185 Second, Third, Fourth and Fifth Grade Pupils

Constant	Not Constant	Not Reported
2469	799	432

Per cent of Constancy: 75.5

Table XXIII is the total of constant, not constant and no picture scores for Form A and Form B of the imagery tests for 185 pupils. Of the total population, 75.5 per cent reported a constant image.

Table XXIV is a general purpose table, composed of the 185 children, listed according to the range of scores in Form A. The child's name is not used but a number is given each child ranging from one to one hundred eighty-five. The first column is the number designated to each child. The second column is comprised of the test results of Form A ranging from highest to lowest. The third column is the score each child received for Form B. The fourth column is the chronological age, the fifth, the I.Q.'s, the sixth, the mental ages, the seventh, sex, the eighth, the grade placement of each child, the ninth, the language scores and the tenth, the non-language scores. There were twenty-six children from grade two, sixty-nine from grade three, twenty-four from grade four, and sixty-six from grade five. There were eighty-five girls and one hundred boys.

Table XXIV

Data Sheet of 185 Second, Third, Fourth and Fifth Grade Pupils

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
1	110.3	113.4	7 - 11	126	10 - 10	G	III	43	35
2	96.5	98.8	10 - 5	126	13 - 2	B	V	47	50
3	94.9	64.1	10 - 2	102	8 - 9	B	III	38	33
4	93.4	84.2	10 - 2	116	11 - 9	G	V	33	50
5	92.4	60.2	7 - 1	126	8 - 11	B	II	39	33
6	92.2	89.9	9 - 11	116	11 - 6	B	V	43	37
7	92.0	80.3	10 - 2	105	10 - 8	B	V	24	48
8	91.9	73.0	10 - 7	103	10 - 11	B	V	33	41
9	91.2	93.3	11 - 9	83	9 - 9	B	IV	26	36
10	90.9	80.4	11 - 5	79	9 - 0	G	V	20	34
11	89.6	74.2	8 - 9	107	9 - 4	G	III	39	35
12	88.8	83.8	10 - 4	120	12 - 5	G	V	43	47
13	86.2	87.9	8 - 2	114	9 - 4	B	III	40	34
14	85.0	78.0	9 - 11	116	11 - 6	G	V	31	49
15	84.5	48.5	7 - 9	104	8 - 1	B	II	40	27
16	83.9	86.4	10 - 7	100	10 - 8	G	V	25	47
17	83.3	103.6	8 - 3	98	8 - 1	G	III	36	31
18	82.4	78.9	8 - 1	128	10 - 4	G	III	49	42
19	82.0	83.9	10 - 8	95	10 - 2	B	IV	19	47
20	81.9	79.1	8 - 2	137	11 - 4	G	III	45	40
21	81.8	74.2	8 - 3	102	8 - 5	G	III	41	35
22	79.3	44.8	7 - 1	111	7 - 10	G	II	35	30
23	79.0	85.2	9 - 7	133	12 - 10	G	V	48	46
24	78.9	63.6	9 - 11	125	12 - 5	B	V	44	46
25	78.2	78.3	8 - 6	122	10 - 4	B	III	42	38
26	77.6	65.1	8 - 4	102	8 - 6	B	II	36	34
27	76.7	67.2	8 - 6	108	9 - 2	B	III	43	31
28	76.7	70.4	10 - 8	102	10 - 11	G	V	32	40

Table XXIV (continued)

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
29	75.9	69.4	8 - 2	115	9 - 4	B	III	37	37
30	75.7	73.1	10 - 0	127	12 - 8	G	V	38	54
31	74.7	74.7	7 - 11	80	6 - 4	B	III	32	19
32	74.4	71.2	10 - 9	128	13 - 9	B	V	60	43
33	73.2	40.5	7 - 0	121	8 - 6	B	II	41	29
34	73.1	71.8	7 - 6	98	7 - 4	G	II	35	26
35	73.1	65.3	8 - 3	125	10 - 4	G	III	40	41
36	72.8	41.6	8 - 1	105	8 - 6	B	II	39	31
37	72.7	68.0	10 - 2	123	12 - 7	G	V	47	44
38	72.6	74.2	8 - 5	142	12 - 0	G	III	45	44
39	72.1	71.6	8 - 9	105	9 - 2	G	III	38	35
40	71.9	75.3	8 - 2	101	8 - 3	G	III	36	32
41	71.3	15.8	7 - 4	91	6 - 8	G	II	28	27
42	70.5	63.4	8 - 10	89	7 - 10	G	III	33	32
43	70.4	63.6	8 - 5	130	9 - 8	G	II	40	36
44	70.1	69.5	10 - 4	89	9 - 3	G	V	34	23
45	70.0	69.0	11 - 4	91	10 - 4	G	V	24	44
46	70.0	64.1	9 - 3	105	9 - 8	G	IV	22	39
47	69.9	63.1	9 - 2	92	8 - 5	G	IV	17	30
48	69.8	74.4	8 - 9	107	9 - 4	G	III	39	35
49	69.7	67.7	8 - 1	115	9 - 4	B	III	32	34
50	69.0	68.1	8 - 5	109	9 - 2	G	III	39	37
51	68.9	72.6	8 - 9	92	8 - 1	B	III	36	31
52	68.4	62.8	8 - 2	129	10 - 7	G	III	44	37
53	68.3	68.9	8 - 6	108	9 - 2	G	III	39	34
54	68.1	72.3	9 - 10	114	11 - 3	G	V	41	36
55	67.7	50.5	9 - 8	109	10 - 6	B	IV	22	48
56	67.2	53.0	9 - 10	148	14 - 7	B	V	60	50
57	67.2	45.8	6 - 11	88	6 - 1	B	II	30	18
58	66.6	73.8	10 - 2	122	12 - 5	B	V	47	43
59	66.5	58.8	9 - 7	121	10 - 9	B	IV	23	50
60	66.1	27.6	7 - 6	98	7 - 4	B	II	36	25

Table XXIV (continued)

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
61	65.9	69.1	8 - 3	109	8 - 11	G	III	35	37
62	65.7	70.0	11 - 6	106	12 - 2	B	V	39	48
63	65.7	59.5	8 - 10	104	9 - 2	G	III	39	34
64	65.5	49.1	7 - 1	132	9 - 4	B	II	41	33
65	65.0	58.5	9 - 2	114	10 - 6	G	IV	25	45
66	65.0	58.7	10 - 9	91	9 - 9	B	V	31	31
67	65.0	52.3	9 - 11	112	11 - 1	G	V	34	42
68	64.4	57.8	9 - 0	101	9 - 1	G	IV	24	31
69	64.2	37.9	10 - 0	106	10 - 7	B	V	32	39
70	64.1	56.8	10 - 1	98	9 - 11	B	V	35	39
71	64.0	60.4	9 - 9	137	13 - 4	G	V	45	54
72	63.7	61.3	10 - 7	112	11 - 10	G	V	36	48
73	63.1	71.4	9 - 11	99	9 - 10	B	III	40	37
74	63.0	67.3	9 - 1	125	11 - 4	G	IV	34	44
75	62.4	32.8	9 - 10	88	8 - 9	B	III	41	30
76	62.2	61.9	10 - 9	93	10 - 0	G	V	29	36
77	62.2	61.7	11 - 4	99	11 - 0	B	V	30	45
78	62.1	53.1	10 - 4	130	13 - 5	B	V	56	44
79	62.0	102.2	12 - 7	101	12 - 10	B	V	45	49
80	61.6	66.7	10 - 6	91	9 - 7	G	V	22	38
81	61.1	68.5	10 - 7	102	10 - 6	B	III	40	42
82	60.9	62.0	9 - 2	105	9 - 8	B	III	43	33
83	60.9	71.8	10 - 2	107	10 - 11	B	V	38	36
84	60.8	34.1	7 - 0	111	7 - 9	G	II	38	26
85	60.6	57.4	9 - 2	112	10 - 3	G	IV	23	44
86	60.2	63.9	8 - 2	118	9 - 8	B	III	39	37
87	60.0	60.4	11 - 4	107	11 - 8	B	V	16	38
88	60.0	0	6 - 11	99	6 - 10	B	II	30	27
89	60.0	54.5	10 - 3	115	11 - 10	B	V	38	46
90	59.9	62.0	10 - 11	82	9 - 0	B	IV	11	43
91	58.8	90.4	8 - 3	103	8 - 6	B	III	35	35
92	58.7	42.5	7 - 8	110	8 - 5	B	II	39	30

Table XXIV (continued)

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
93	58.4	60.7	8 - 10	126	11 - 2	G	III	50	34
94	58.3	77.6	10 - 1	122	12 - 4	G	V	37	52
95	57.7	63.1	8 - 9	116	10 - 2	G	III	44	35
96	57.5	36.7	8 - 1	92	7 - 6	B	III	34	28
97	56.9	60.1	10 - 11	81	8 - 10	G	V	22	30
98	56.9	54.6	8 - 6	113	9 - 8	G	III	43	33
99	56.8	42.7	7 - 2	84	6 - 0	B	II	32	15
100	56.8	68.7	10 - 6	108	11 - 4	G	V	32	46
101	56.3	67.0	9 - 1	104	9 - 5	G	IV	21	38
102	56.3	62.2	9 - 10	109	10 - 9	G	IV	32	41
103	55.5	4.0	7 - 4	141	10 - 4	B	II	40	40
104	55.3	53.8	7 - 7	90	6 - 10	G	II	33	24
105	55.2	51.7	7 - 9	93	7 - 3	B	III	32	28
106	54.7	37.3	10 - 8	77	8 - 2	G	IV	13	31
107	54.6	47.3	8 - 2	103	8 - 5	B	III	34	35
108	54.5	54.6	9 - 5	106	10 - 0	B	IV	22	43
109	54.4	53.1	8 - 11	119	10 - 7	B	IV	37	34
110	53.8	26.8	7 - 7	96	7 - 3	G	II	34	26
111	53.7	68.3	8 - 2	116	9 - 6	B	III	38	37
112	53.1	65.7	8 - 2	124	10 - 2	B	III	42	37
113	52.6	26.7	9 - 3	92	8 - 6	G	IV	11	37
114	52.2	58.6	10 - 7	112	11 - 11	G	V	40	45
115	52.0	3.0	7 - 8	89	6 - 10	G	II	31	26
116	51.9	41.3	8 - 2	132	10 - 9	B	III	43	49
117	51.0	70.5	9 - 9	97	9 - 6	G	III	41	34
118	50.4	61.7	10 - 11	107	11 - 8	B	V	39	43
119	50.0	48.2	13 - 2	86	11 - 4	B	V	26	52
120	50.0	56.5	10 - 9	109	11 - 9	G	V	38	45
121	49.7	51.8	8 - 11	97	7 - 10	B	III	34	31
122	49.6	58.7	7 - 3	93	6 - 9	G	II	31	25
123	49.4	31.5	10 - 7	111	11 - 9	B	V	35	48

Table XXIV (continued)

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
124	49.0	35.0	11 - 1	84	9 - 4	B	V	25	33
125	48.8	66.9	9 - 3	107	9 - 11	B	IV	24	40
126	47.9	63.5	10 - 4	112	11 - 7	B	V	41	40
127	47.6	66.7	8 - 5	101	8 - 6	G	III	36	34
128	47.6	47.0	10 - 5	101	10 - 6	B	V	32	38
129	46.4	42.3	7 - 1	120	8 - 6	B	II	37	33
130	45.7	70.7	8 - 5	127	10 - 9	B	III	47	35
131	45.6	66.0	10 - 6	142	15 - 2	B	V	60	55
132	44.9	42.3	7 - 9	133	10 - 4	G	III	41	39
133	44.8	40.9	8 - 9	141	12 - 4	B	III	49	42
134	44.7	39.9	8 - 11	102	9 - 1	B	IV	14	41
135	44.3	47.5	9 - 2	115	10 - 6	B	IV	28	42
136	44.2	46.6	8 - 0	109	8 - 9	G	III	35	36
137	43.6	63.5	8 - 8	131	11 - 4	G	III	42	43
138	42.9	65.7	10 - 9	85	9 - 7	B	V	28	32
139	42.9	47.8	9 - 7	110	10 - 7	G	IV	23	48
140	42.6	36.3	9 - 10	148	14 - 7	B	V	51	43
141	42.6	47.4	8 - 0	125	10 - 0	B	III	38	40
142	41.9	44.6	7 - 1	114	8 - 1	B	II	38	29
143	41.4	13.0	6 - 11	101	7 - 0	B	II	36	22
144	39.0	56.0	10 - 6	102	10 - 9	B	III	41	41
145	38.9	54.3	8 - 0	85	6 - 10	G	III	27	30
146	38.8	79.8	8 - 4	114	9 - 6	G	III	40	35
147	38.7	53.5	11 - 0	108	11 - 10	B	V	37	47
148	38.6	20.6	13 - 4	75	10 - 0	B	V	19	46
149	38.4	80.4	10 - 2	98	9 - 2	B	V	26	30
150	38.1	54.3	10 - 5	112	11 - 8	G	V	42	40
151	38.0	79.0	9 - 4	107	10 - 0	G	III	40	38
152	38.0	62.5	7 - 10	119	9 - 4	G	III	41	33
153	37.1	47.3	8 - 11	110	9 - 10	B	IV	21	42
154	36.6	59.5	8 - 0	117	9 - 4	G	III	38	36

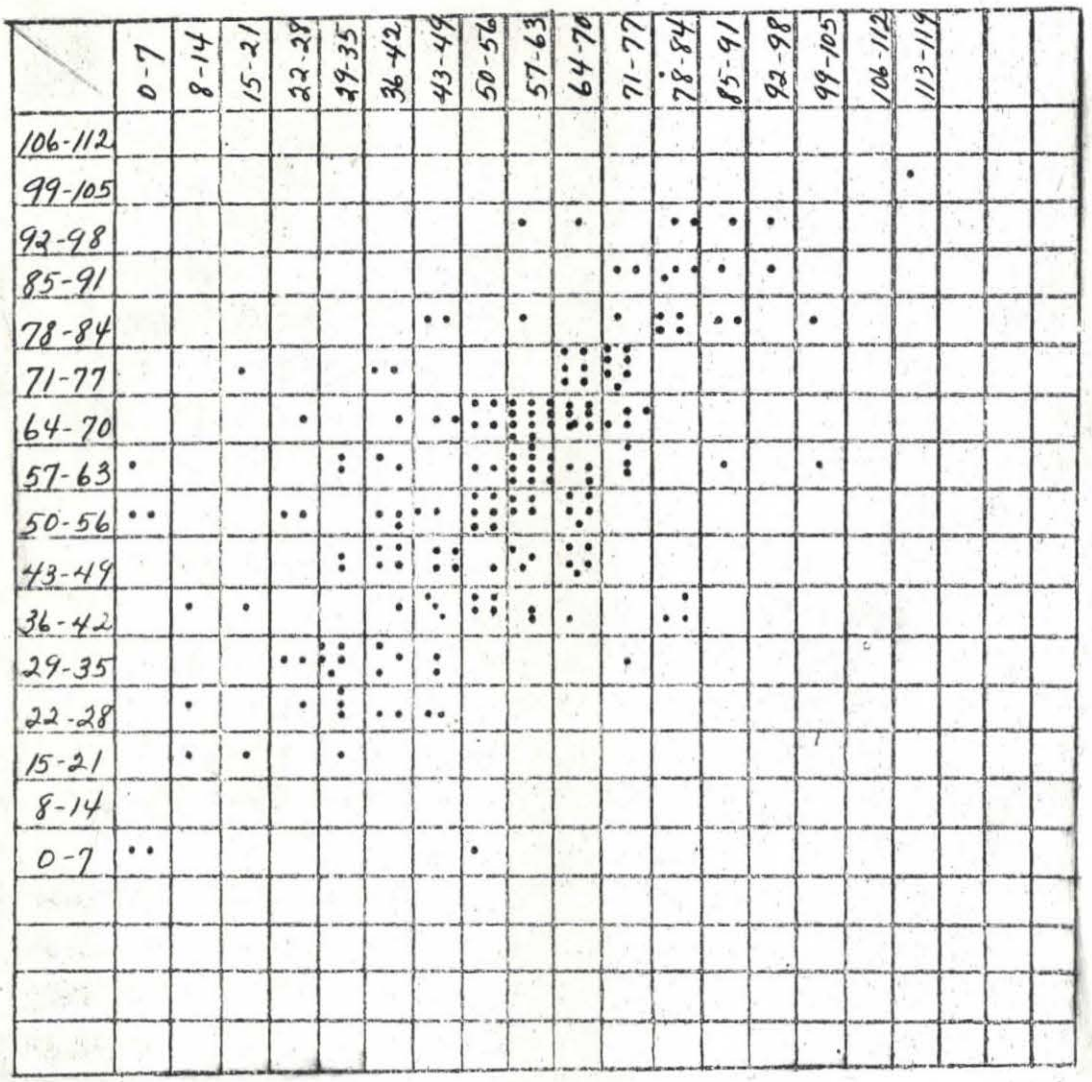
Table XXIV (continued)

No.	Form A	Form B	C.A.	I.Q.	M.A.	Sex	Grade	Lang.	N-Lang.
155	36.6	70.2	8 - 5	112	9 - 6	G	III	37	38
156	34.6	31.6	11 - 9	83	9 - 9	B	V	20	42
157	34.2	44.7	9 - 9	100	9 - 10	B	III	39	38
158	34.0	74.8	9 - 9	100	8 - 9	G	III	40	31
159	33.8	33.6	8 - 2	116	9 - 6	B	III	40	35
160	32.6	33.4	9 - 9	132	12 - 10	G	V	47	47
161	32.1	26.0	10 - 0	99	9 - 11	B	IV	20	44
162	31.7	35.9	9 - 0	94	8 - 6	B	III	36	34
163	30.4	32.1	8 - 9	139	12 - 2	B	III	43	41
164	30.3	38.3	11 - 11	97	11 - 7	B	V	29	52
165	30.2	46.5	10 - 8	108	11 - 6	G	V	39	41
166	30.0	22.0	8 - 2	114	9 - 4	B	III	40	34
167	29.5	38.9	10 - 9	120	12 - 11	B	V	41	54
168	29.3	38.4	10 - 7	108	11 - 5	G	V	32	47
169	28.9	46.2	11 - 5	87	9 - 11	B	V	29	35
170	27.6	58.8	8 - 9	95	8 - 5	B	III	37	32
171	26.4	23.5	7 - 11	128	10 - 2	G	III	38	41
172	24.4	38.5	8 - 7	132	11 - 4	B	III	49	36
173	24.3	11.0	7 - 9	106	8 - 3	G	II	39	29
174	23.4	30.5	10 - 3	95	9 - 10	G	IV	18	45
175	23.4	29.0	11 - 4	119	13 - 6	B	V	49	52
176	22.9	45.1	8 - 5	114	9 - 8	B	III	38	38
177	22.4	33.8	10 - 2	111	11 - 3	G	V	36	41
178	22.3	37.0	8 - 11	112	10 - 0	B	III	41	37
179	22.1	50.7	7 - 4	110	8 - 1	B	II	37	30
180	21.2	29.9	9 - 0	105	9 - 6	B	III	39	36
181	17.7	12.2	10 - 7	134	14 - 2	B	V	57	50
182	17.2	17.6	10 - 6	132	13 - 10	G	V	54	50
183	6.3	4.9	10 - 7	111	11 - 9	G	V	38	45
184	0	54.1	8 - 6	115	9 - 10	G	III	42	35
185	0	0	10 - 7	107	11 - 4	B	V	35	43

Figure I-A is a scattergram showing the correlation between the two tests, Form A and Form B of the total population of 185 second, third, fourth and fifth grade children. The correlation is .61.

FIGURE I-A

Imagery Form B



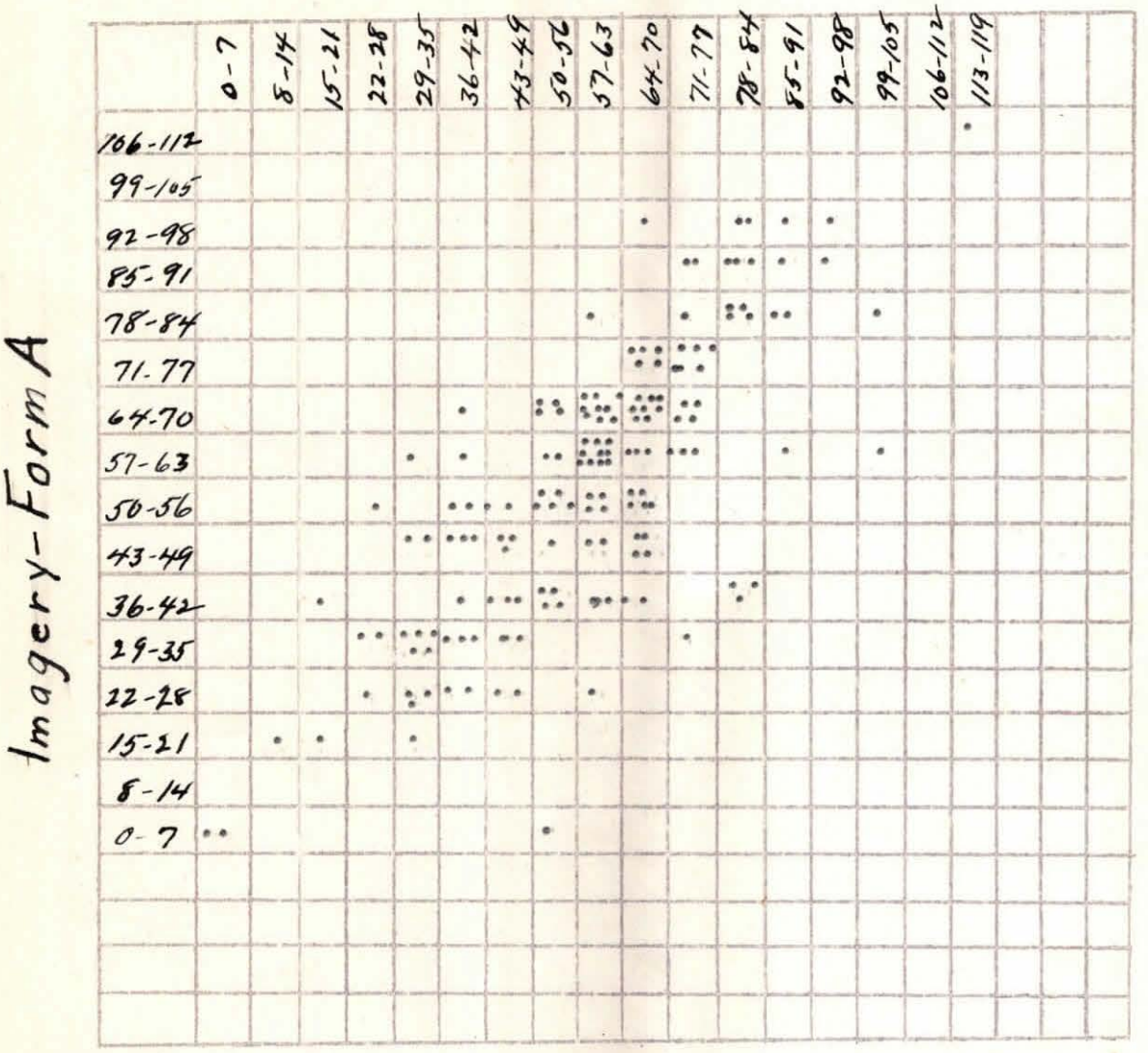
N = 185 r = .61

SCATTERGRAM

Figure I-B is a scattergram showing the correlation between the forms of the two tests, A and B for 159 third, fourth and fifth grade pupils. The correlation coefficient is .73.

FIGURE I-B

Imagery - Form B



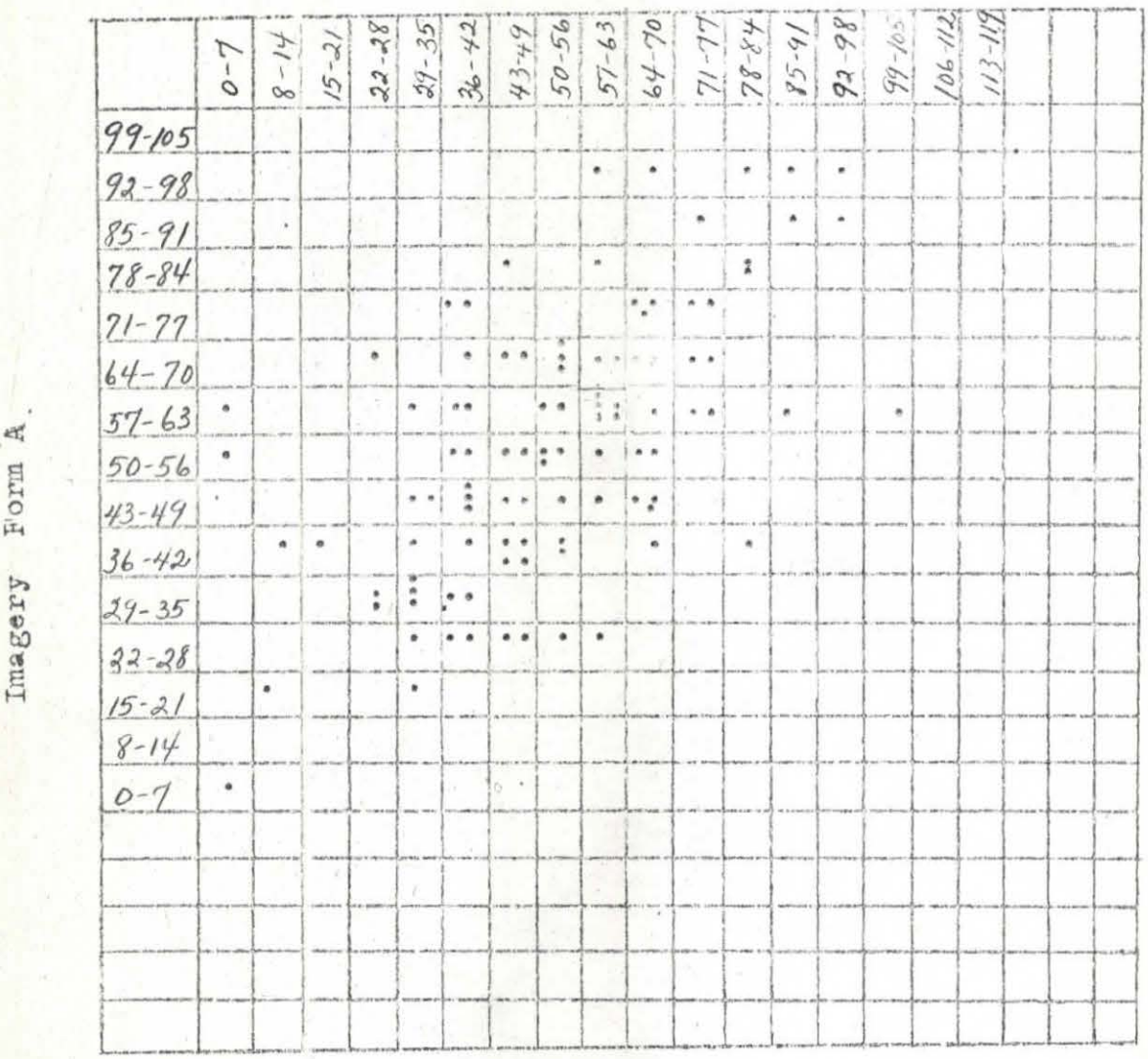
N = 159 r = .73

SCATTERGRAM

Figure II is a scattergram showing the correlation between the two tests, Form A and Form B for 100 second, third, fourth and fifth grade boys. The correlation coefficient is .57.

FIGURE II

Imagery Form B



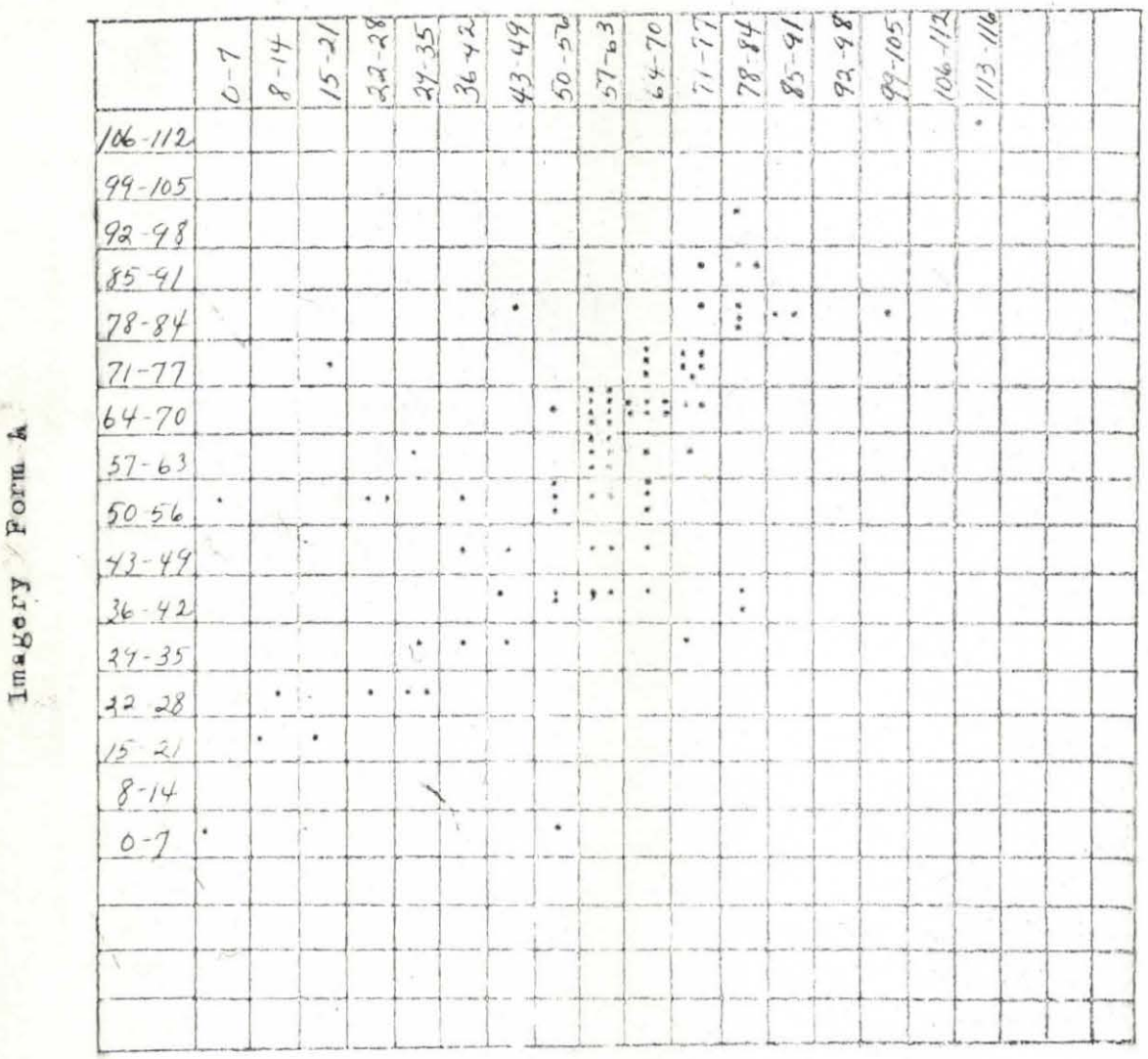
N = 100 r = .57

SCATTERGRAM

Figure III is a scattergram showing the correlation between the two tests, Form A and Form B for 85 second, third, fourth and fifth grade girls. The correlation coefficient is .73.

FIGURE III

Imagery Form B



N = 85

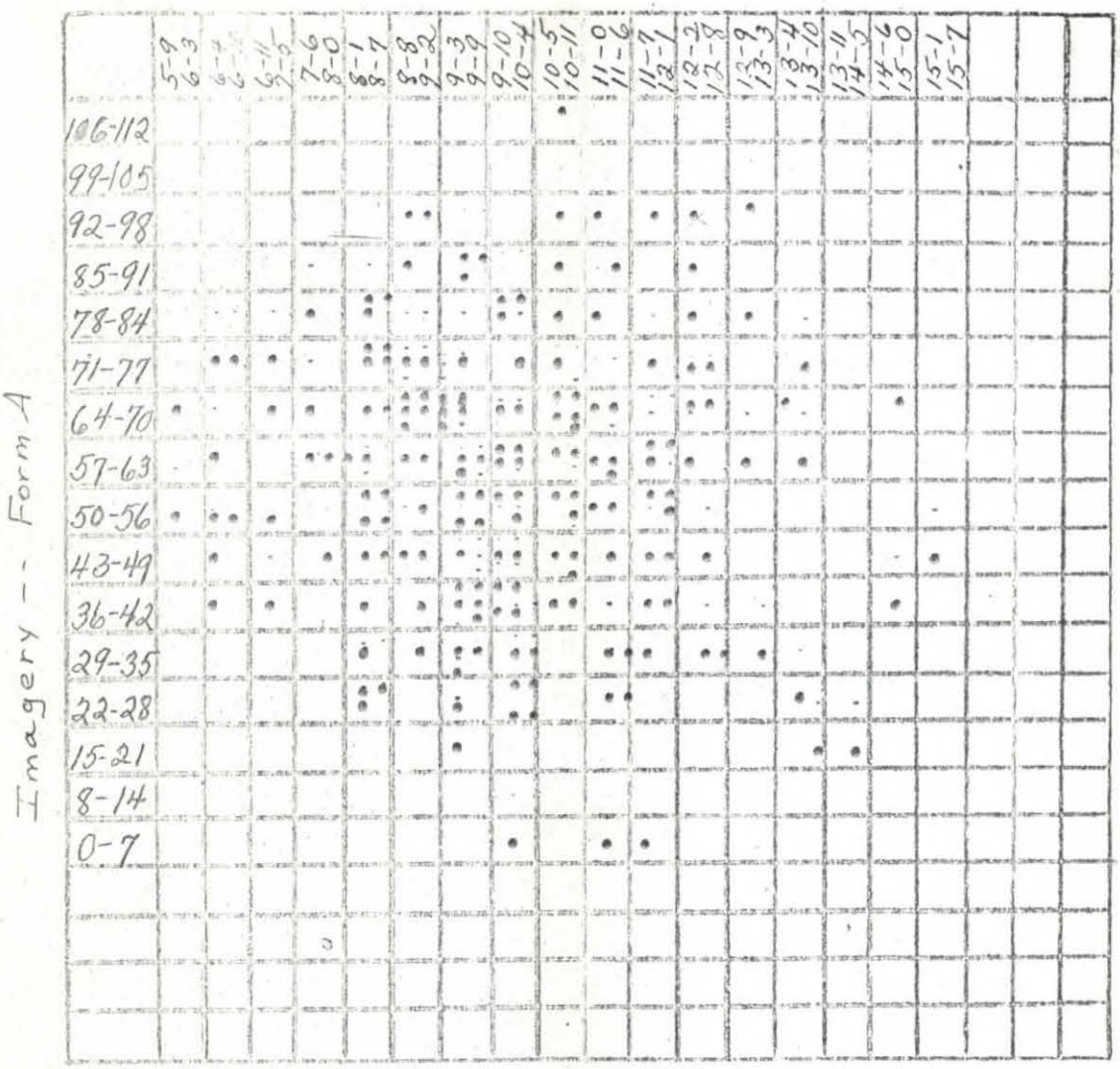
r = .73

SCATTERGRAM

Figure IV is a scattergram showing the correlation between the imagery test, Form A and the mental ages of 185 second, third, fourth and fifth grade children. The correlation coefficient is .02.

Figure IV

Mental Age



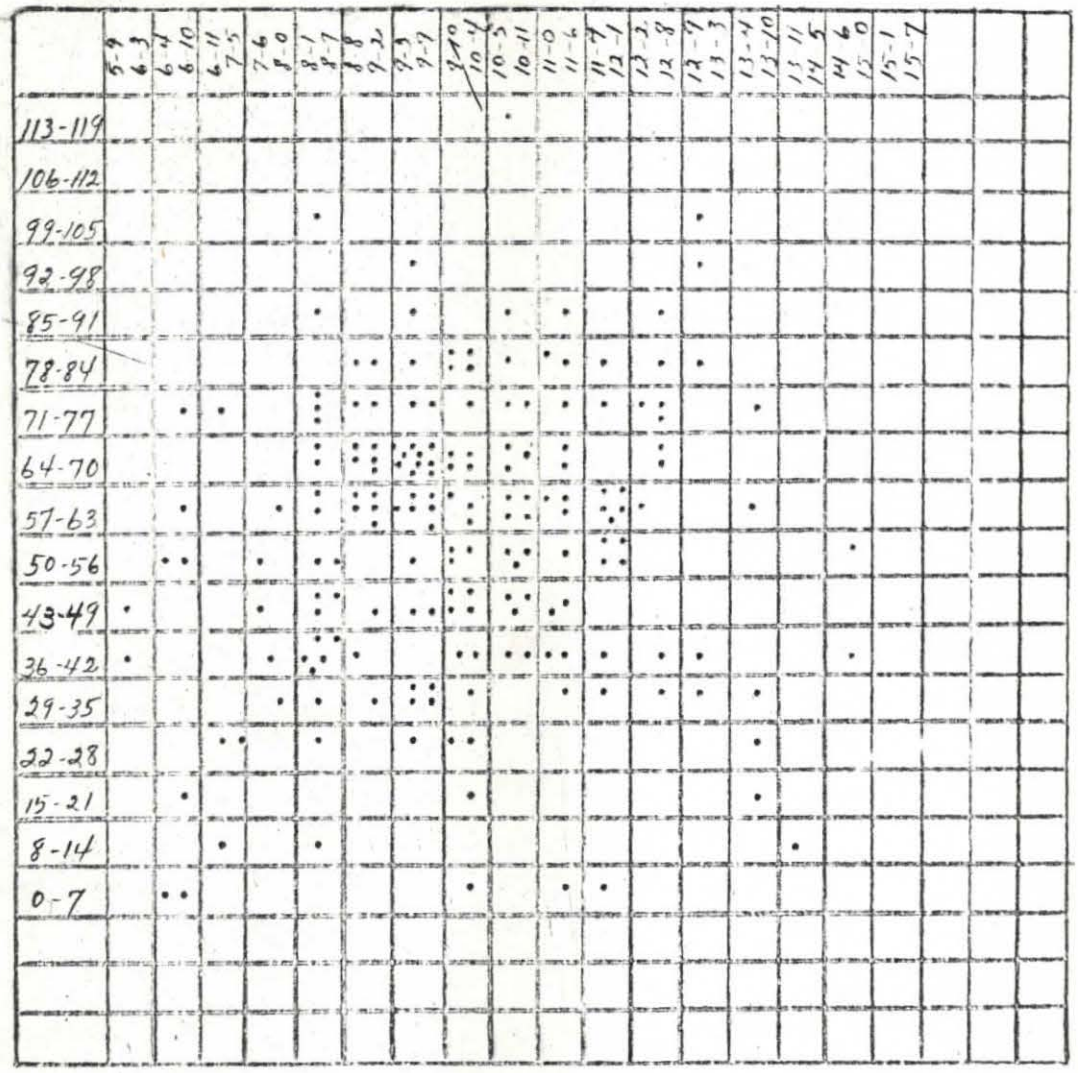
N-185 r-.02

SCATTERGRAM

Figure V is a scattergram showing the correlation between the mental imagery test, Form B and the mental ages of 185 second, third, fourth and fifth grade children. The correlation coefficient is .06.

FIGURE V

Mental Age



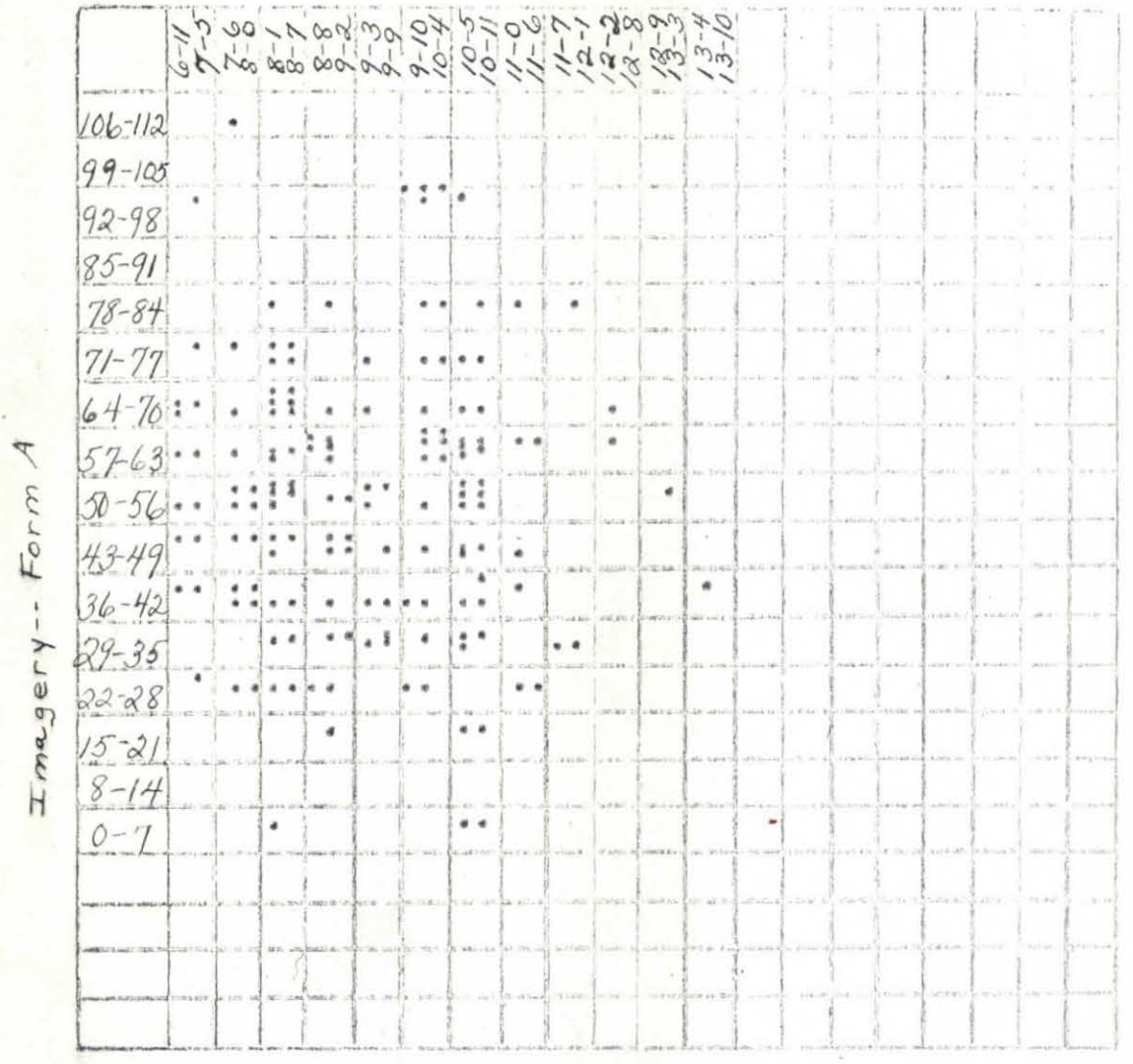
N = 185 r = .06

SCATTERGRAM

Figure VI is a scattergram showing the correlation between the imagery test, Form A and the chronological ages of 185 second, third, fourth and fifth grade children. The correlation coefficient is .05.

Figure VI

Chronological Age



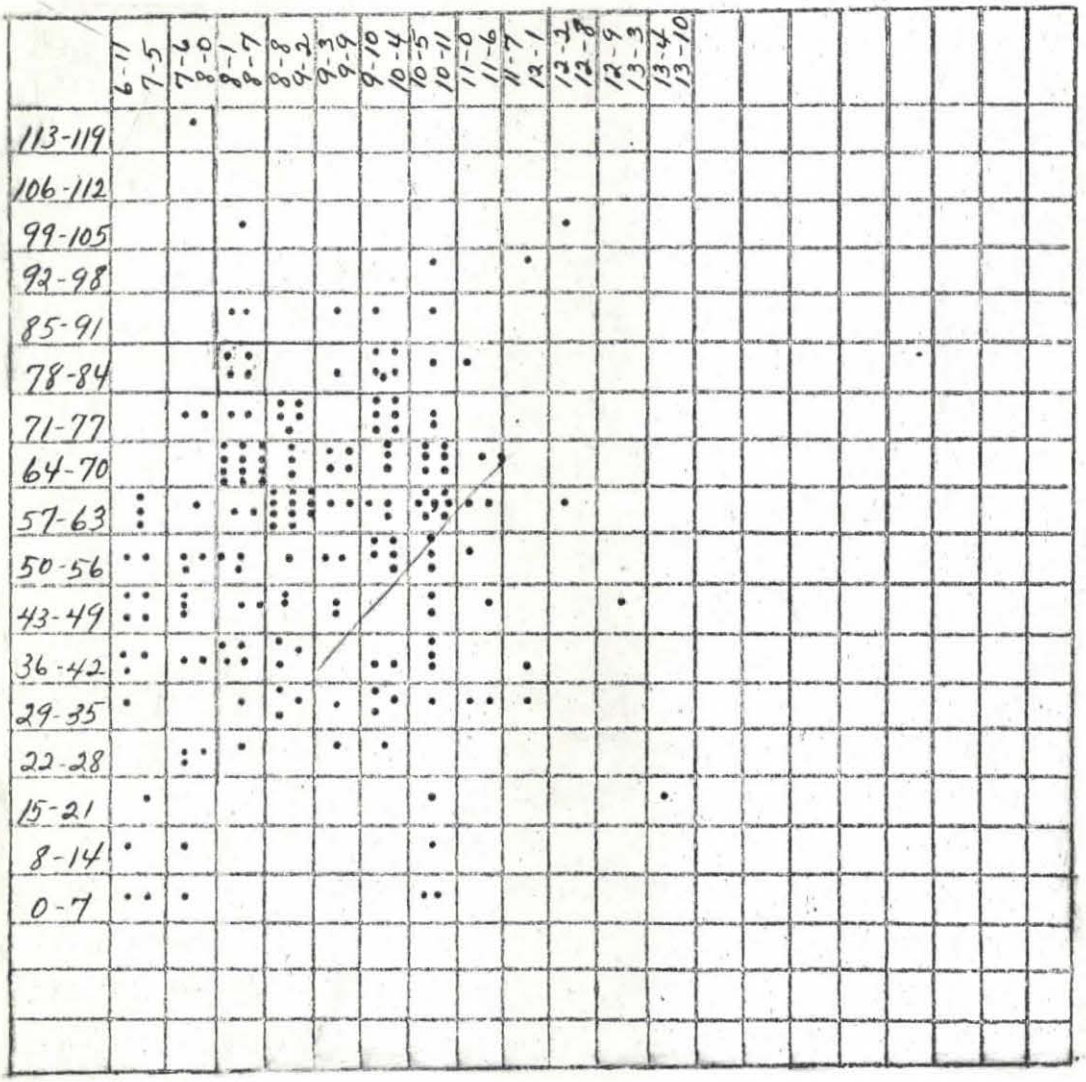
N - 185 r -.05

SCATTERGRAM

Figure VII is a scattergram showing the correlation between the mental imagery test, Form B and the chronological ages of 185 second, third, fourth and fifth grade children. The correlation coefficient is .06.

FIGURE VII

CHRONOLOGICAL AGE



N = 185 r = .10

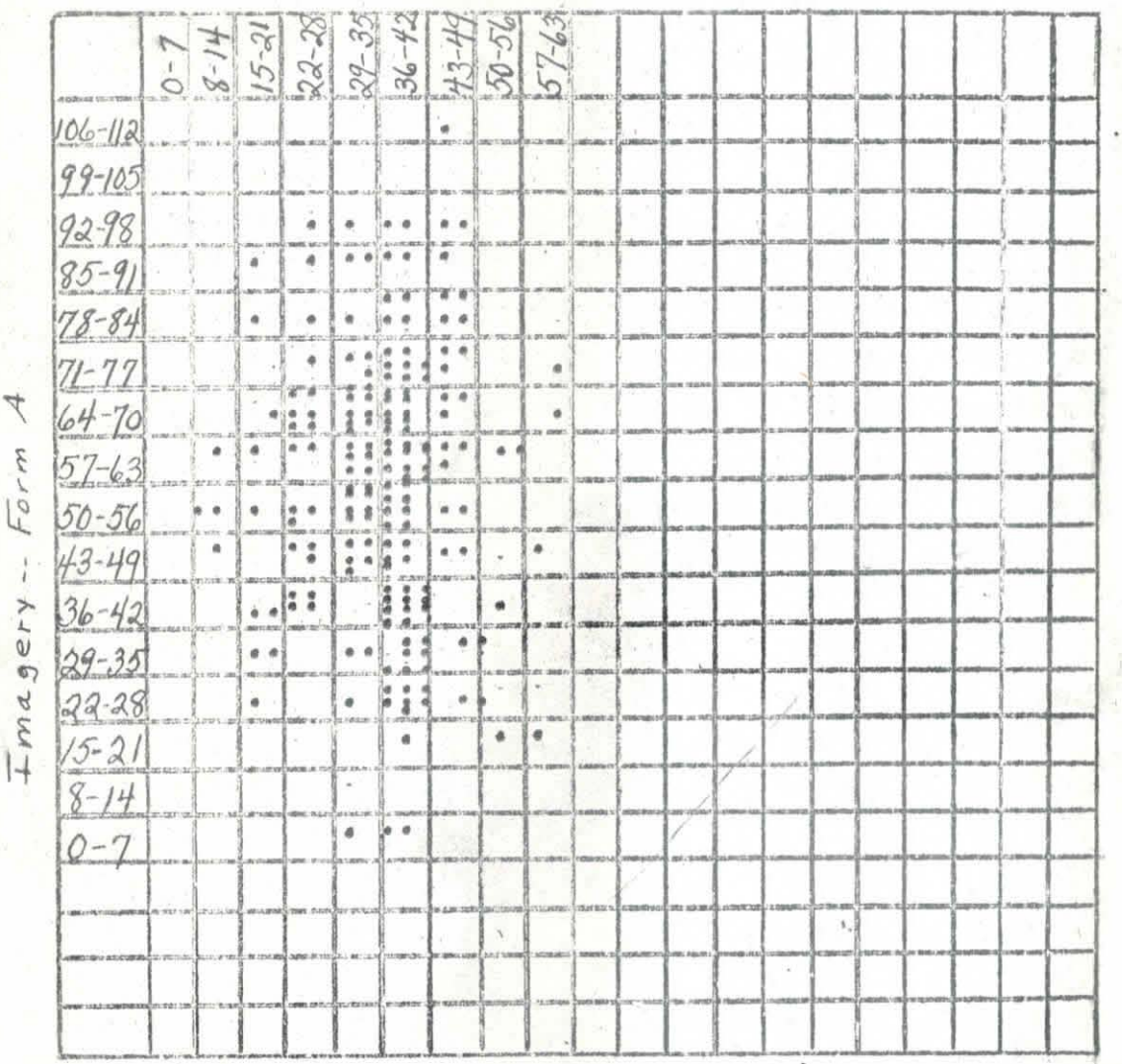
SCATTERGRAM

Figure VIII is a scattergram showing the correlation between the imagery test, Form A and the language raw scores of 185 second, third, fourth and fifth grade children as obtained from the California Mental Maturity Test. The correlation coefficient is .12.

Figure VIII

Language Scores

California Mental Maturity Test



N-185 r -.11

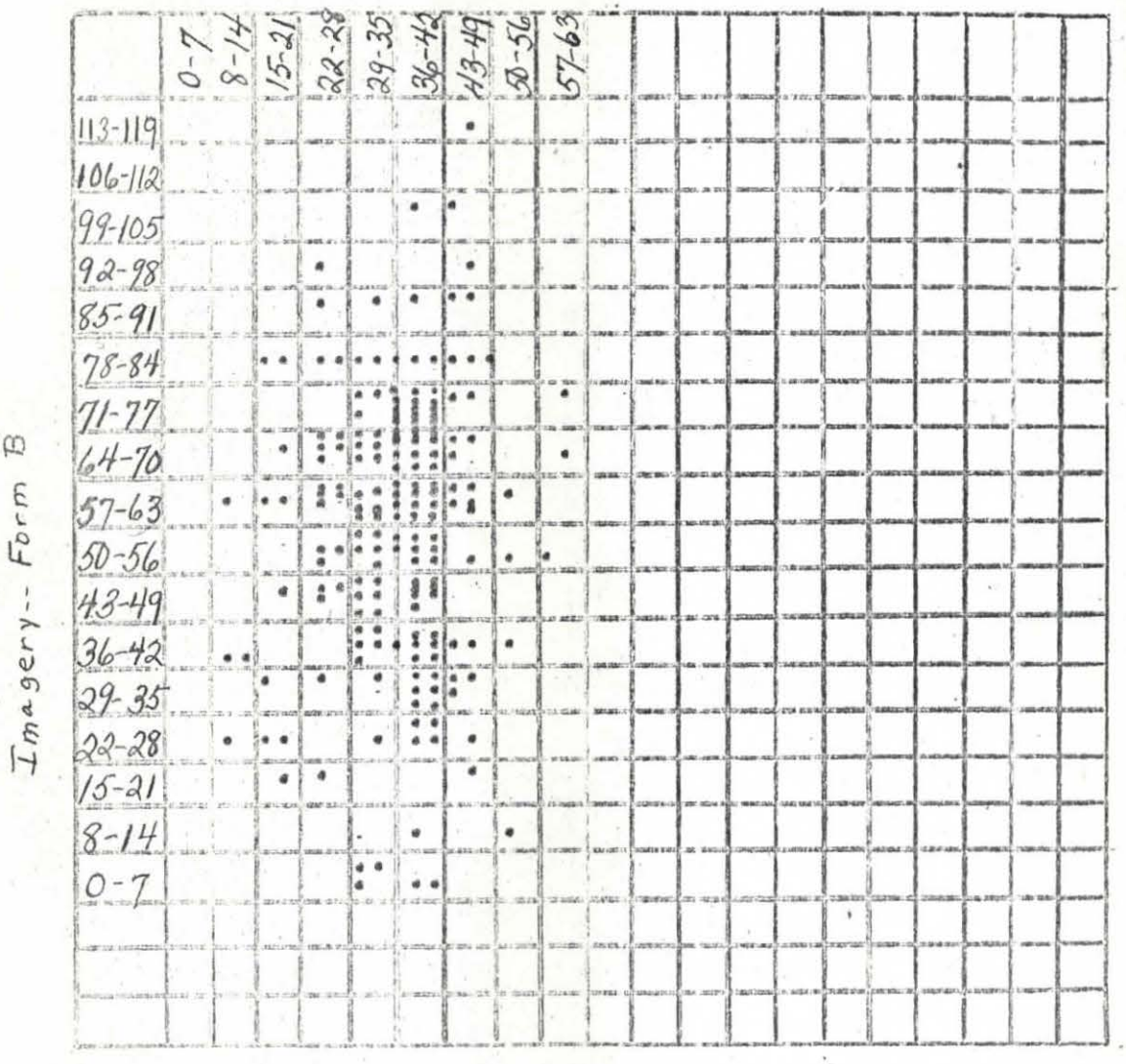
SCATTERGRAM

Figure IX is a scattergram showing the correlation between the imagery test, Form B and the language raw scores of 185 second, third, fourth and fifth grade children as obtained from the California Mental Maturity Test. The correlation coefficient is.10.

Figure IX

Language Scores

California Mental Maturity Test



N- 185 r -.01

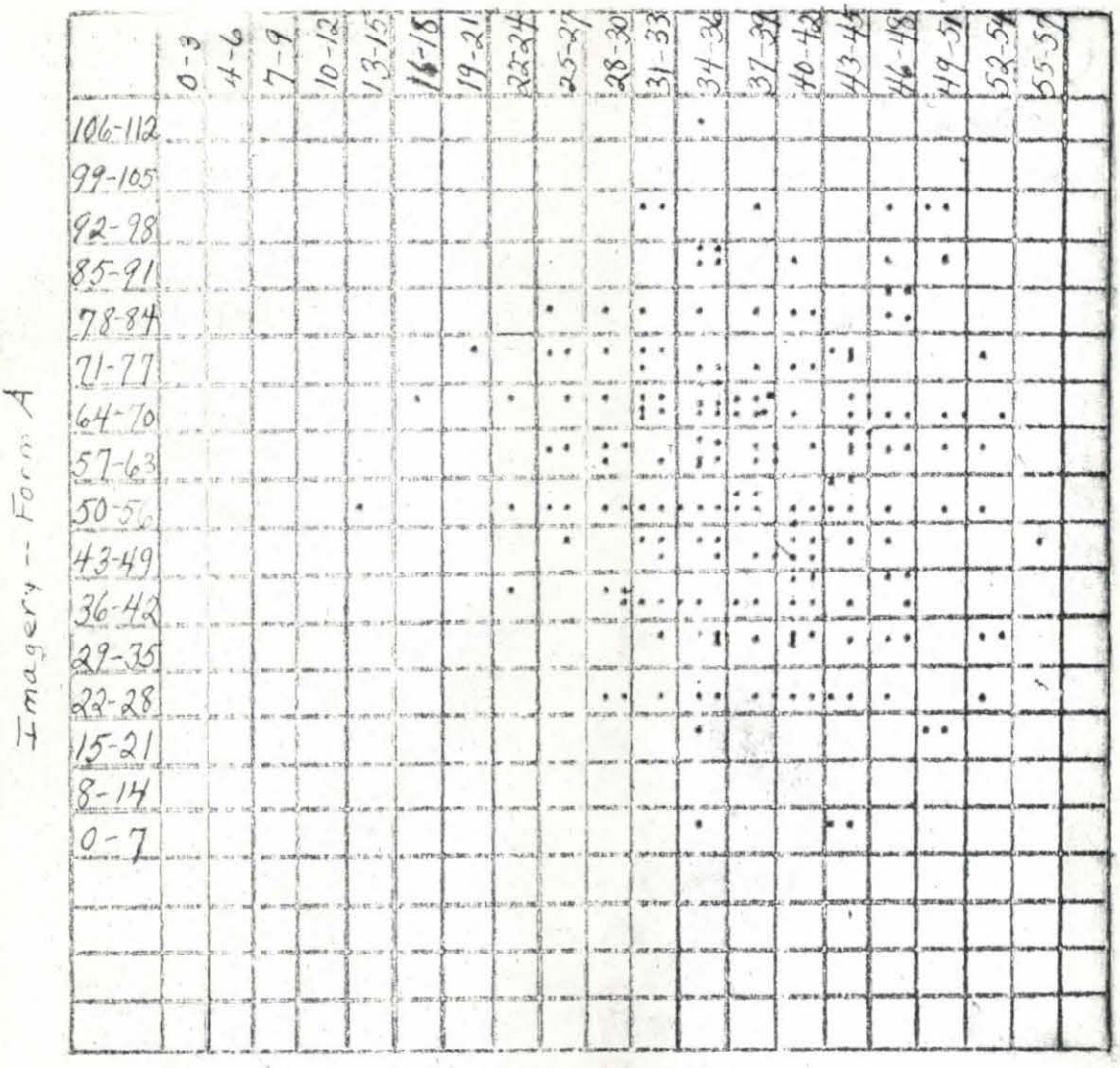
SCATTERGRAM

Figure X is a scattergram showing the correlation between the imagery test, Form A and the non-language raw scores of 185 second, third, fourth and fifth grade children as obtained from the California Mental Maturity Test. The correlation coefficient is .07.

Figure X

Non-Language Scores

California Mental Maturity Test



N-185 r-.07

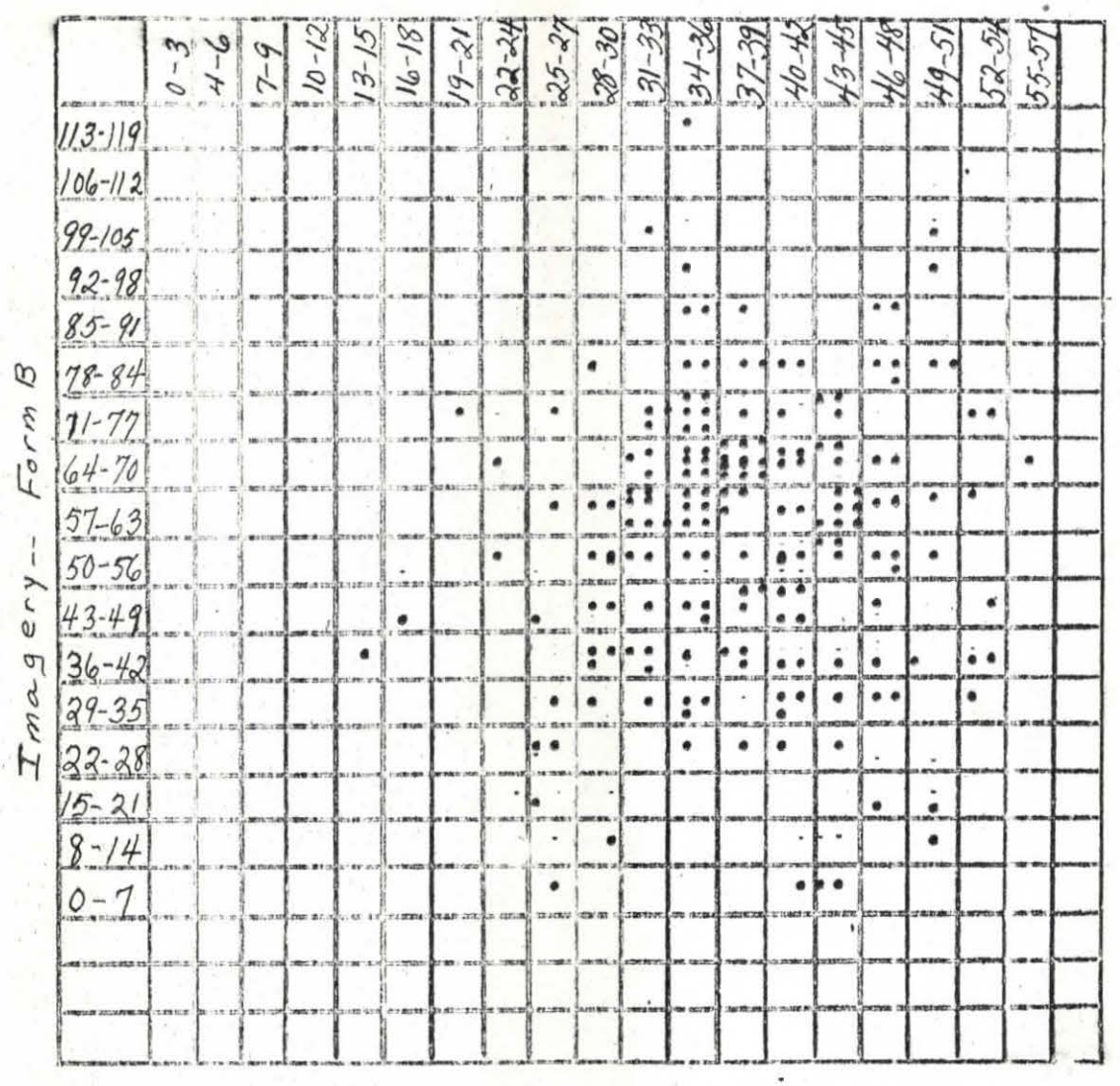
SCATTERGRAM

Figure XI is a scattergram showing the correlation between the imagery test, Form B and the non-language raw scores of 185 second, third, fourth and fifth grade children as obtained from the California Mental Maturity Test. The correlation coefficient is .11.

Figure XI

Non-Language Scores

California Mental Maturity Test



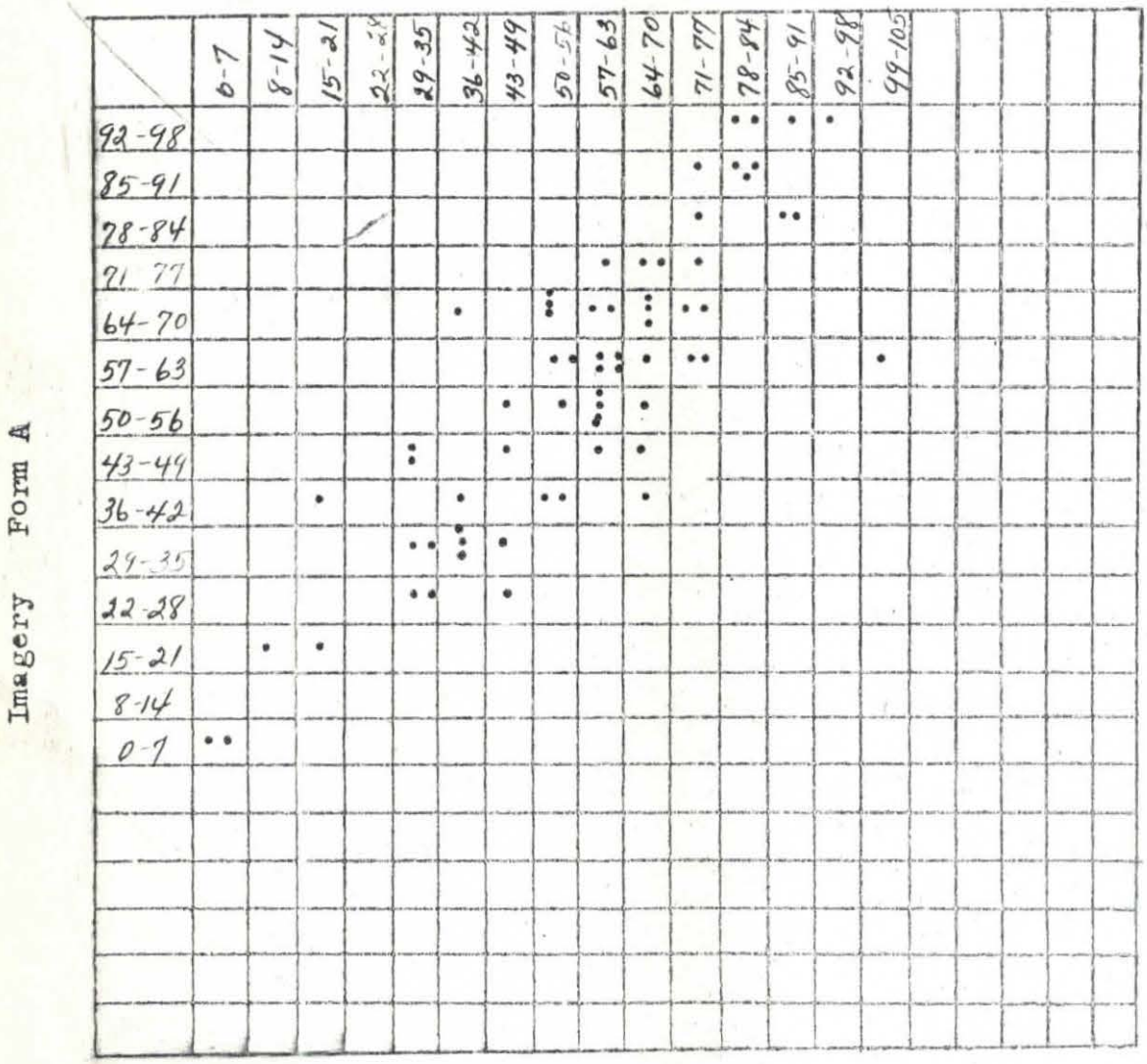
N-185 r-.II

SCATTERGRAM

Figure XII is a scattergram showing the correlation between the two tests, Form A and Form B, of 66 fifth grade pupils. The correlation coefficient is .78.

FIGURE XII

Imagery Form B



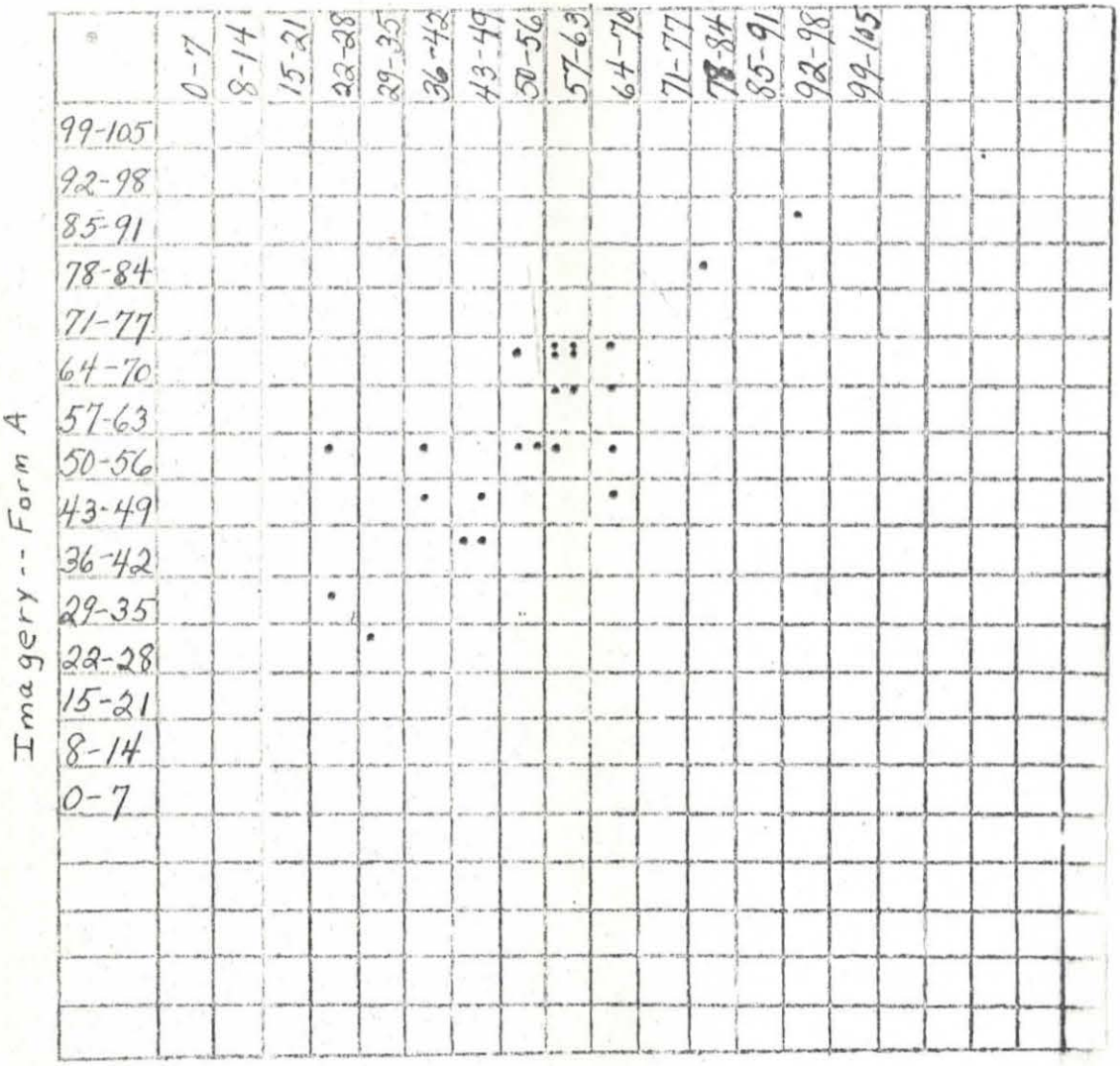
N = 66 r = .78

SCATTERGRAM

Figure XIII is a scattergram showing the correlation between the two tests, Form A and Form B, of 24 fourth grade pupils. The correlation coefficient is .76.

Figure, XIII

Imagery--Form B



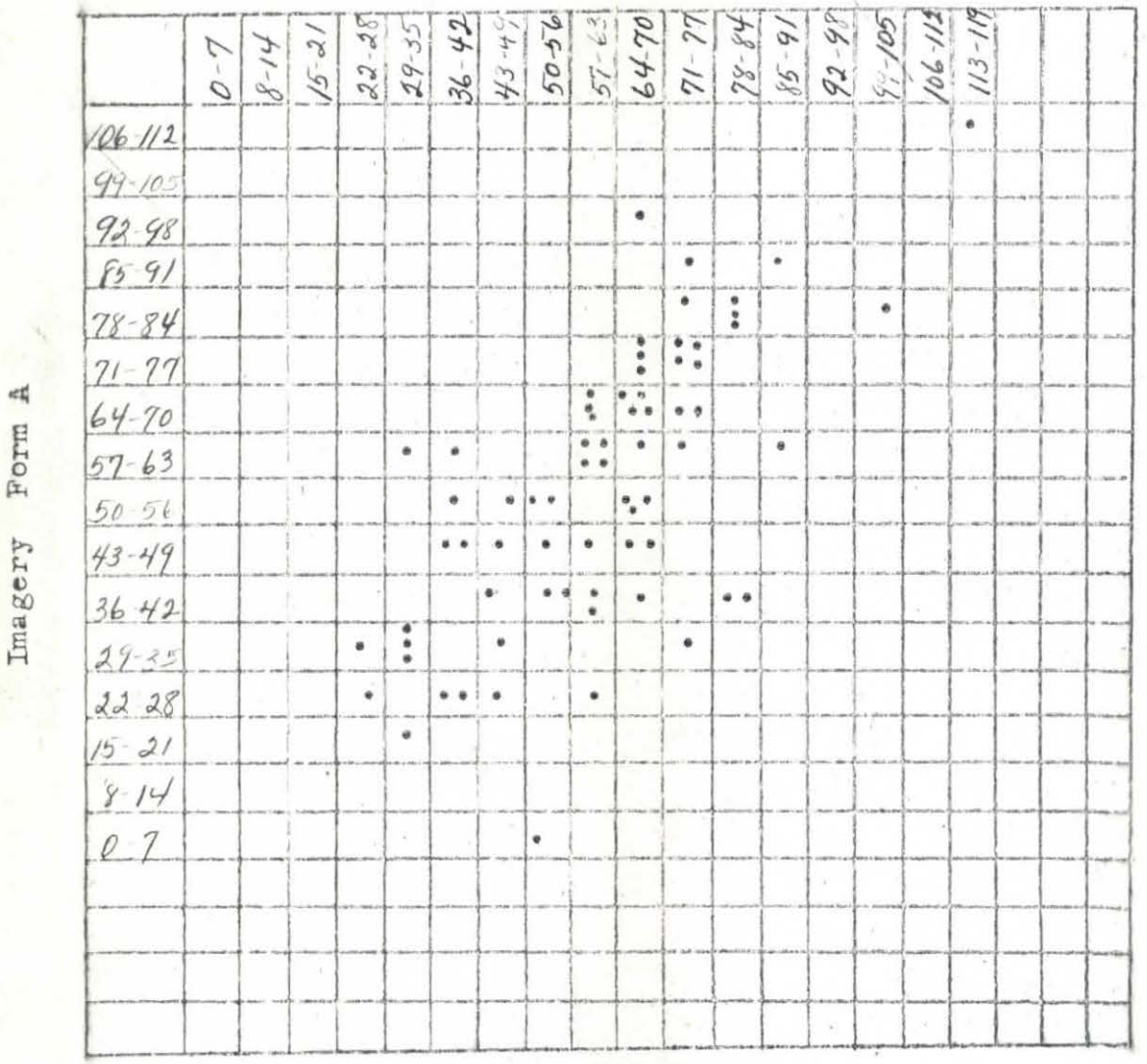
N - 24 r -.76

SCATTERGRAM

Figure XIV is a scattergram showing the correlation between the two tests, Form A and Form B, of 69 third grade pupils. The correlation coefficient is .75.

FIGURE XIV

Imagery Form B



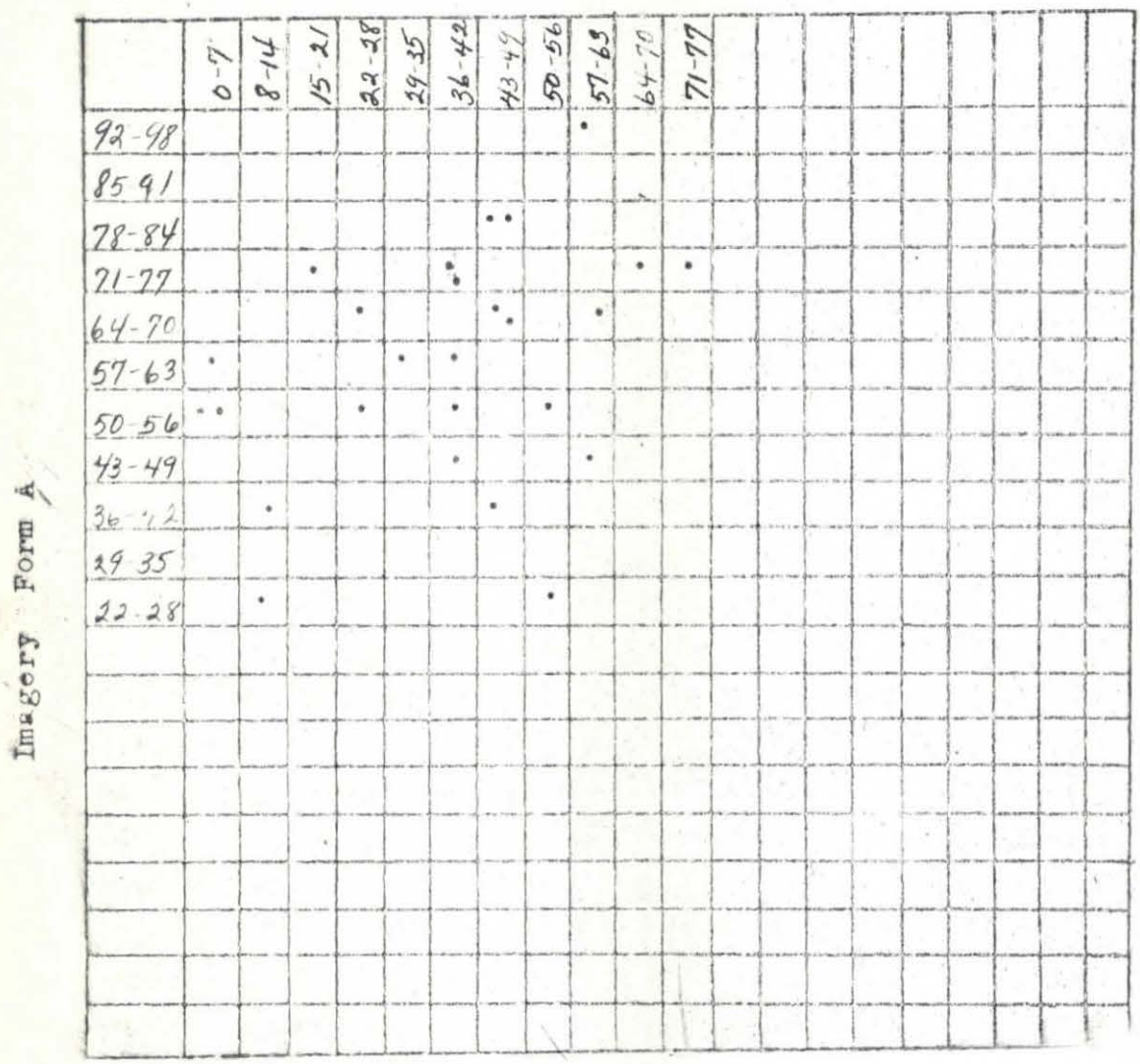
N = 69 r = .75

SCATTERGRAM

Figure XV is a scattergram showing the correlation between the two tests, Form A and Form B, of 26 second grade pupils. The correlation coefficient is .34.

FIGURE XV

Imagery Form B



N = 26 r = .34

SCATTERGRAM

CHAPTER IV

SUMMARY AND CONCLUSIONS

In this study, an attempt was made to measure imagery by means of a test consisting of paragraphs and isolated sentences.

Form A was made up of paragraphs and Form B was made up of sentences. In general, this study attempted to discover if paragraphs evoked more vivid mental pictures than did isolated sentences.

Imagery may be defined as a picture seen in one's mind. It is the ability to create pictures, to hear sounds, to smell odors, to taste and to feel in one's mind as one reads. These mental abilities may differ in varying degrees with the individual. The mental images may be clear, vague, or absent entirely. This study attempted to discover the effect of the two tests on imagery.

Two forms of the imagery test were administered to 185 pupils ranging from the second to the fifth grade. Form B of the imagery test consisted of ten stimuli sentences which had been constructed by Mr. Carlton M. Singleton[1] in a previous study on mental imagery. Form A of this imagery test consisted of ten paragraphs constructed by the authors to give

[1]Carlton M. Singleton. Op. Cit.

more meaning to the stimuli sentences without creating more than one mental image expressed in the stimuli sentences. Form A of the imagery test was administered one week after Form B. Each form was accompanied by a Checklist[1] in which the responses to the stimuli were recorded and by means of which the data was collected. To obtain information concerning the mental factors the California Short-Form Primary Test of Mental Maturity[2] was administered to all second and third grade pupils while the California Short-Form Intermediate Test of Mental Maturity[2] was administered to all pupils in grades four, five and six.

Before the actual testing began, the children were given a simple introduction to the subject of imagery and a simple stimuli sentence in order to acquaint them with the procedure to be followed. Every child in grades three, four and five had a mimeographed copy of each stimuli to read and a Checklist in which to record his responses. The children of grade two were tested individually and the Checklist was marked by the teacher according to the responses given. Reading of the stimuli was done orally by teacher and pupils in all grades to eliminate the possibility of reading difficulty. After reading the paragraph stimuli, the stimuli sentence was reread in isolation for a limited time. Scoring was as objective

[1]Checklist. Op. Cit.

[2]Tests. Op. Cit.

as possible with each response carrying a specific numerical value, Scoring was discussed by the group and questionable points were decided upon.

The scores of the test were analyzed statistically and suggested the following answers to the questions listed in Chapter I:

1. What is the effect of adding more meaning to the sentences upon imagery?

The mean of Form A was 56.65 and the mean of Form B was 56.09 which showed only a .56 difference between mean scores. These figures denoted that no more imagery was present when more meaning was added to the stimuli. The coefficient of .61 denoted a fairly substantial correlation. However, the omission of Grade Two scores gave a coefficient of .73 denoting a more substantial correlation.

2. What is the correlation between imagery and mental age?

The coefficient of .02 with Form A showed a low degree of correlation. The coefficient of .06 with Form B showed low correlation. This indicated practically no degree of relationship.

3. How equivalent are Forms A and B of the imagery test at various grade levels?

The coefficients of correlations for each grade follow.

Grade	No. Cases	r
5	66	.78
4	24	.76
3	69	.75
2	26	.34

The coefficients of grades three, four and five were equivalent.

The means of each grade follow.

Grade	A Mean	B Mean
5	56.58	57.77
4	56.44	55.91
3	55.39	61.34
2	60.50	39.35

The mean scores in grades four and five were equivalent. The difference between mean scores in grade two was felt to be due to the effect of practice on Form B which preceded Form A. The children seemed to gain confidence as they became more familiar with the procedure.

4. Was there any significant difference in mental imagery between Forms A and B for boys and girls?

The mean score for 85 girls on Form A was 59.10 and for 100 boys was 54.90. For girls on Form B it was 60.01 and for boys, 52.66. The mean scores on Form A and B were consistently higher for girls than for boys. The critical ratio of 2.47 on Form B was almost significant. The critical ratio of 1.46 on Form A was not significant.

5. What is the relationship between language mental age and mental imagery?

The coefficient of .12 with Form A scores showed very low correlation which implied practically no degree of relationship. The coefficient of .10 with Form B showed a low degree of correlation. This denoted practically no degree of relationship.

6. What is the relationship between non-language mental age and mental imagery?

The coefficient of .07 with Form A scores denoted a low degree of correlation. The coefficient of .11 with Form B scores denoted a low degree of correlation. This showed practically no degree of relationship.

7. Can the instrument be used at the primary level?

The coefficient of .34 in grade two denoted that the instrument was not used successfully at this level. It is interesting to note that the instrument was used with more effective results in grade three which showed a coefficient of .75. However, it was felt that the effect of practice on the first test given in grade two influenced the correlation in that grade.

8. What is the correlation between imagery and chronological age?

The coefficient of .05 with Form A showed a low correlation. The coefficient of .10 with Form B showed a low correlation. This denoted practically no degree of relationship.

CHAPTER V

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Limitations

The chief limitations to the present study were as follows:

Grade 2:

1. The vocabulary of the checklist was above the children's level of understanding.

2. There was less language fluency in some pupils than in others. This fact may have affected scores recorded orally. Some children were better able to express themselves as to the picture they saw, while others may have seen as much a picture but did not possess the language ability to express themselves.

3. The reading of the word from the checklist may have suggested its picture to the children after the original stimuli.

4. The effect of practice was the fault of the design.

Grades 3 and 4:

1. Most children found that the vocabulary of the checklist was above their level of understanding.

2. The slow group was apt to check all items.

Grade 5:

1. The children who either recorded their responses quickly, or reported no images, had too much time to wait, thereby causing restlessness.

2. Some children seemed to be influenced by their neighbors as to the amount of writing that was being done.

Suggestions for Further Research

1. Construction of an imagery test which will be more suitable to measuring imagery in the primary grades.

2. A study to determine whether intermediate grade children score consistently higher in imagery than primary grade children.

3. A study to determine the difference in scores between those reported on a checklist by the children themselves and those scores obtained by oral questioning.

4. An analysis of, and at what points in a given selection, imagery occurs during silent reading.

5. A study to determine whether the presence of imagery slows down or increases the rate of reading.

6. A program of study to discover methods of teaching imagery.

7. A similar investigation reversing the procedure by administering the paragraphs before the sentences, and the results to be compared with those found in this study.

8. Research to show the ranges of differences in imagery of children having identical chronological and mental ages.

BIBLIOGRAPHY

1. Singleton, Carlton M., Analysis of Imagery, Incomplete, Boston University

2. Sullivan, Elizabeth T., et al., California Short-Form Test of Mental Maturity, Primary and Intermediate Series, California Test Bureau, Los Angeles 28, California, 1950.

APPENDIX

FORM A