5-31-1938

An Investigation of Drawing by Pueblo Indian Children

Marian Eller

ELLER

DRAW

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BY

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AN INVESTIGATION OF DRAWINGS BY PUEBLO INDIAN CHILDREN

By

Marian Eller

A Thesis Submitted for the Degree of

Master of Arts in Psychology

University of New Mexico

This thesis, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of the University of New Mexico in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

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PREFACE

The purpose of this study is the investigation of drawings made by Pueblo Indian children. It involves the construction of a scale by which the drawings may be graded.

Acknowledgments are gratefully made to Mrs. A. D. Franchville and Miss Edith R. Merrilees of the United Pueblos Agency and to the many teachers who made it possible to obtain subjects for the investigation. The writer is especially indebted to Dr. Philip H. DuBois of the University of New Mexico, under whose direction the study was completed, for his assistance and his unfailing interest.

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IMPORTANCE OF THE STUDY

There have been many studies of the abilities of Indians but in most of the studies tests have been used which were standardized on groups from non-Indian cultures. It would be of great interest to have a test devised specifically for a particular culture. If such a test were properly constructed and validated it would be a means of making comparisons within the group and could be used in the study of individual cases.

STATEMENT OF THE PROBLEM

This study has as its object the investigation of drawings made by Pueblo Indian children and involves the construction of a scale which might be used in studies of individual cases or of cultural differences.

SOURCES OF THE DATA

The data for the study were obtained from the day schools of the United Pueblos Agency in New Mexico. Twenty-five day schools were visited during the winter of 1937 and 1938 and over 1400 drawings were obtained from children, ranging from age four to age fifteen, in the kindergartens and first eight grades.

A horse was chosen as the subject to be drawn. The following considerations, suggested by Goodenough's[1] study, were held to be important in deciding upon the subject:

1. It must be something with which all the Indian children are familiar.

2. It must present as little variability in its essential characteristics as possible.

3. It must be simple in its general outline, so that even little children will be able to attempt it, yet sufficiently complicated in its detail to tax the abilities of older children.

4. It must be something of universal interest and appeal.

[1]Goodenough, F. L., Measurement of Intelligence by Drawings. Yonkers-on-Hudson, New York: World Book Company, 1926, 177 pp.

For the purpose of this study the subject of a horse was felt to be superior to that of a man for several reasons. All Indian children seem to be interested in horses. For many generations Indians have used horses and it is something with which they are all familiar. It was also felt that the horse was superior to the man on account of the clothing. Clothing worn by the Pueblo Indians tends to vary considerably and is seldom exactly like that worn by white people.

In addition to the drawings personal information about each child was obtained. Records were kept of their ages, exact dates of birth whenever possible, grade in school, sex, and a rating as to intelligence as given by the teacher. These ratings were made according to the following scale:

1. Definitely retarded in intelligence
2. Dull
3. Slightly below average in mental ability
4. Average
5. Above average in intelligence
6. Bright
7. Very superior in intelligence

REVIEW OF RELATED STUDIES

There are many studies found in two different fields of literature which have to do with this study: first, those concerned with race differences, and second, those which deal with the drawings of children.

The question of race differences continues to be a problem. Many tests have been given to different national and racial groups but the evidence is still conflicting. It is so difficult to control the variables that the problem is far from settled. Dale Yoder,[2] after studying the literature carefully, says that there are three distinct viewpoints represented in the current literature. He says: "The first accepts the fact of race superiority and inferiority and is interested in re-stating it and usually adducing additional evidence to support the thesis. The second viewpoint considers race inferiority possible but not adequately demonstrated, and is usually concerned in balancing arguments for and against the idea. The third is a skeptical group, highly critical of the means used to demonstrate race inferiority and of the results so obtained and generally insisting upon racial equality."

[2]Yoder, Dale, "Present Status of the Question of Racial Differences," Journal of Educational Psychology, 19:463-470, 1928.

One reason that there have been such marked differences in opinion and differences in test results has been that conditions have not been sufficiently controlled. In addition to this factor there is the problem of the kind of tests that have been used. In most cases the tests which have been used have been standardized for use upon persons in a different type of culture.

In spite of these shortcomings it is interesting to note the results of some of the studies of race differences, especially those which have to do with the Indians. Telford[3] used the Goodenough test on a group of North Dakota Indians and found an average I.Q. of 88 for the entire group. He found that there was a considerable increase in median I.Q. from the first to the third year spent in school and that beyond this there was no constant change. He said that this indicated that the first two years in school are sufficient to bring the subjects up to a certain level of performance and after that the average I.Q. remains fairly constant. He felt that the increase was due to school training.

[3]Telford, C. W., "Test Performance of Full and Mixed-blood North Dakota Indians," Journal of Comparative Psychology, 14:123-145, 1932.

Haught[4] tested children in the Federal Indian Pueblo schools of New Mexico and in the United States Indian schools in Albuquerque and Santa Fe. He used the Pintner-Cunningham Primary Mental Test for the younger subjects, the National Intelligence Tests for the intermediate, and the Terman Group Test of Mental Ability for the older group. He found that the average intelligence quotient ranged from 71 to 87. He found that from the chronological ages of six to nine years the mental growth of the Southwestern Indian is approximately parallel with his chronological age but about one year retarded. From the age of nine to sixteen, he says, the retardation of the mental age increases from year to year, and somewhat uniformly.

Eells,[5] in a study of the native races of Alaska, found that the average I.Q. of the Indians on the Stanford Revision of the Binet-Simon Scale was 79. He also used the Scale for Measurement of Intelligence by Goodenough. The scores on this test were somewhat higher, the average I.Q. being 91.6. Eells suggests that this difference may be due to the language factor.

[4]Haught, B. F., "Mental Growth of the Southwestern Indian," Journal of Applied Psychology, 18:137-142, 1934.

[5]Eells, W. C., "Mental Ability of the Native Races of Alaska," Journal of Applied Psychology, 17:417-438, 1933.

He says: "There is no definite evidence, however, that all the difference is due to the language factor alone. Variations of cultural background and school experience doubtless have some influence as well."

Eells was also interested in studying the factor of contact with civilization. For this part of the study he used pure-blooded Eskimos. He grouped the schools into three distinct classes: (1) "primitive", where the natives were living under conditions little affected by contact with white "civilization"; (2) "semi-contact", where they had frequent but not constant contact with such "civilization"; (3) "full-contact", where they were living in villages in close contact with "civilization." The Stanford-Binet showed a very slight increase with increasing contact with civilization; the Goodenough showed the opposite. The differences in both cases were very small, however. Eells' conclusion was that environment has little effect on the I.Q.

Another study of the effect of environment is one by Arlitt.[6] He tested 343 white, Italian and negro children with the Stanford Revision of the Binet Test. He found that while there was a difference in intelligence which seemed to be due to race alone, there was

[6]Arlitt, A. H., "On the Need for Caution in Establishing Race Norms," Journal of Applied Psychology, 5:179-183, 1921.

also a marked disparity between children of the same race but different social status. He concluded by saying, "Race norms which to not take the social status factor into account are apt to be to that extent invalid."

Sandiford and Jamieson[7] studied the mental capacity of southern Ontario Indians. They found that the median I.Q. depended upon the kind of test used. They found an I.Q. of 80 on the National Intelligence Test, 97 on the Pintner-Non-Language Mental Test, 92 on the Pintner-Paterson Scale of Performance Tests, and 78 on the Pintner-Cunningham Primary Mental Test. These results indicate a severe language handicap on the verbal tests.

Garth[8] has done much work in the field of race differences. With the help of Serafini and Dutton he tested children from the United States Indian schools, using the National Intelligence Tests, Scale A, Form I. He found that the approximate I.Q.'s of full blood Indians of the plains and southwestern tribes is 69. He says that there is a constant tendency for the I.Q.'s

[7]Sandiford, P., and Jamieson, E., "The Mental Capacity of Southern Ontario Indians," Journal of Educational Psychology, 19:313-328, 1928.

[8]Garth, T. R., Serafini, T. J., and Dutton, D., "The Intelligence of Full Blood Indians," Journal of Applied Psychology, 9:382-389, 1925.

to increase with education. He concludes his study by saying: "Because of differences in social status and temperament we cannot conclude that our results are true and final measures of the intelligence of Indian children."

Although the results of all of these studies are not exactly the same, in most cases they lead to the conclusion that the test results are influenced not only by the amount of knowledge of English required by the test, but also by the particular racial samplings which are used. Pintner[9] says that it is only by testing adequate samplings of national groups within their own countries that one may approximate true knowledge of racial or national differences in intelligence. He states also that it is impossible to make any really valid comparisons of races by translating tests from one language into another and comparing the results. It is obvious, he asserts, that the language handicap remains, even when such efforts are made; the comparisons are made unreliable, in addition, because of the failure of testers to equate the social status of the races or of the samplings of the races which are studied.

[9]Pintner, R., "Non-language Tests in Foreign Countries," School and Society, 26:374-376, 1927.

There are also many studies which deal with the drawings of children. Goodenough[10] devised a system of scoring the drawings of children by which their intelligence could be measured. The system was founded upon the analysis of thousands of performances of children of both sexes and of every stage of mental development from two to fifteen years. The Goodenough Intelligence Scale can be briefly described as follows:

1. It uses a child's single drawing of a man.

2. It is non-verbal.

3. It can be used chiefly with children from mental age four to mental age ten.

4. Its reliability for a single unselected age group in this range lies between .80 and .90.

5. For separate age groups in the same range it yields an average correlation of .76 with the Stanford Revision of the Binet Scale.

Since the Goodenough Intelligence Scale was devised, most studies of children's drawings have been based upon its use. Several studies have already been mentioned in connection with the intelligence of Indians.

[10]Goodenough, F. L., Measurement of Intelligence by Drawings, Yonkers-on-Hudson, New York: World Book Company, 1926, 177 pp.

The Goodenough Intelligence Scale was used in the studies by Telford[11] and Eells.[12] Drawings by children have also been used in studies by Williams,[13] Mott,[14] and Menzel.[5] In addition to the study of normal children this method has also proved useful in the study of abnormal children and adults. McElwee[16] and Brill[17] have found it successful in such studies. All of these studies show that there is a close relationship between the drawings and general intelligence.

[11]Telford, C. W., "Test Performance of Full and Mixed-blood North Dakota Indians," Journal of Comparative Psychology, 14:123-145, 1932.

[12]Eells, W. C., "Mental Ability of the Native Races of Alaska," Journal of Applied Psychology, 17:417-438, 1933.

[13]Williams, M. L., "The Growth of Intelligence as Measured by the Goodenough Drawing Test," Journal of Applied Psychology, 14:239-256, 1930.

[14]Mott, S. M., "The Development of Concepts (A Study of Children's Drawings)," Journal of Genetic Psychology, 48:199-214, 1936.

[15]Menzel, Emil W., "The Goodenough Intelligence Test in India," Journal of Applied Psychology, 19:615-625, 1935.

[16]McElwee, E. W., "Profile Drawings of Normal and Subnormal Children," Journal of Applied Psychology, 18:599-603, 1934.

[17]Brill, M., "The Reliability of the Goodenough Draw a Man Test and the Validity and Reliability of an Abbreviated Scoring Method," Journal of Educational Psychology, 26:701-708, 1935.

PROCEDURE

The first step in this study was to procure the drawings. Through the assistance of Mrs. A. D. Franchville of the United Pueblos Agency, and with the cooperation of the teachers, over 1400 drawings were obtained from children in the day schools of the pueblos. The drawings were made under standardized conditions. First the tester made certain that each child understood the meaning of the word "horse". Then the following directions, based on those used in the Goodenough Intelligence Test, were given:

"On these papers I want you to make a picture of a horse. Make the very best picture that you can. Take your time and work very carefully. I want to see whether the boys and girls in _____ school can do as well as those in other schools. Try very hard and see what good pictures you can make."

In practically all cases the children were interested and apparently did their best. The pictures obtained ranged from unrecognizable scribbles to detailed and interesting pictures, examples of which may be found on pages 28 to 31.

The pictures were each graded according to a preliminary scale of seventy-three points.[18] An attempt

[18] The revised scale is given on page 22.

was made to define the points in the scale so that they could be scored as objectively as possible, in order that there would be little variation in ratings by different judges or by the same judge at different times. They were based chiefly upon the presence or absence of various parts of the body, and the relationship of these parts to one another.

For the purpose of validating each point 955 cases were used, those for which there was accurate and complete information as to age and grade placement.

The most important requirement for determining the validity of each point was a regular and fairly rapid increase in the percentage of children succeeding with the point at successive ages. Each point was recorded separately, and curves were plotted, showing the percentage of successes at each age level.

The next step was to analyze and interpret the data.

INTERPRETATION OF THE DATA

After evaluating each point, thirteen points were discarded and sixty were retained. The thirteen points eliminated were as follows:

1. Eyebrow shown.
2. Glance directed toward the front.

3. Lips clearly indicated

4. Teeth shown

5. Neck attached to body at correct point

6. Correct shape of hoofs.

7. General shape of legs correct.

8. Belly indicated.

9. Body drawn without obvious irregularities in shape.

10. Shading.

11. High degree of movement.

12. Motor co-ordination --lines correctly drawn, no errors in positions, no transparencies.

13. Fetlock joint shown.

These points were rejected because too small a percentage of children showed them or because they were difficult to grade objectively. None of these points fulfilled the requirement of a regular and fairly rapid increase in the percentage of children succeeding at successive ages.

Table I presents the percentages of children at each age level from age four to age fifteen succeeding with each of the sixty points which were retained. Figures, I, II, III, IV, and V show the same data graphically, except that data for age fifteen were omitted because there were only 15 subjects of that age. The list of points included in the present form of the scale are as

TABLE I

PERCENTAGE OF CHILDREN SUCCEEDING WITH EACH POINT

Point No.	Percentage Succeeding by Age											
	Age 4	5	6	7	8	9	10	11	12	13	14	15
	N= 20	53	119	130	103	113	116	98	96	65	27	15
1	40	64	92	98	100	100	100	100	100	100	100	100
2	15	24	56	79	92	98	98	99	99	100	100	100
3	0	2	4	5	10	32	21	30	39	38	38	67
4	10	11	25	33	45	62	61	67	69	77	73	93
5	5	4	2	8	22	41	27	46	59	62	54	73
6	50	74	89	98	98	100	100	100	100	100	100	100
7	40	70	80	91	90	92	88	96	94	94	100	100
8	40	49	63	81	81	83	97	96	99	94	100	100
9	35	49	80	89	93	98	99	98	99	98	100	100
10	0	4	8	12	19	34	24	41	52	48	67	80
11	0	2	0	3	9	15	12	27	41	37	52	53
12	0	0	1	2	4	5	8	17	26	22	41	40
13	65	79	84	82	92	88	87	100	100	100	93	100
14	15	2	3	13	18	30	34	43	43	52	30	67
15	0	9	5	19	19	19	33	41	50	57	37	53
16	0	13	9	23	23	36	37	52	57	65	74	47
17	0	0	3	5	7	15	23	34	36	34	37	33
18	0	0	1	2	4	9	8	16	28	28	26	13
19	15	30	50	67	69	82	74	91	91	82	89	87
20	10	11	18	24	30	47	38	54	64	57	59	60
21	0	8	13	19	26	39	31	46	34	48	48	40
22	0	2	3	5	19	35	27	38	49	60	44	53
23	35	53	74	82	92	97	98	100	100	100	100	100
24	10	9	11	20	39	48	52	62	74	80	81	73
25	5	9	18	16	39	46	51	62	69	77	74	80
26	5	4	15	20	40	55	53	66	72	82	85	87
27	10	19	28	49	68	67	61	79	86	88	96	93
28	0	0	0	2	5	5	9	15	25	18	33	33
29	0	0	2	8	17	20	32	38	40	37	48	40
30	0	0	1	5	18	38	31	44	61	56	52	53

TABLE I

(continued)

PERCENTAGE OF CHILDREN SUCCEEDING WITH EACH POINT

Point No.	Percentage Succeeding by Age											
	Age 4	5	6	7	8	9	10	11	12	13	14	15
	N= 20	53	119	130	103	113	116	98	96	65	27	15
31	45	92	97	99	100	100	100	100	100	100	96	100
32	5	15	36	61	66	82	82	87	95	94	89	80
33	10	25	29	35	44	47	54	72	65	74	67	87
34	0	0	0	1	4	15	17	27	34	46	22	27
35	0	0	1	1	3	8	15	16	31	26	22	20
36	25	66	87	97	100	99	99	99	100	97	96	100
37	0	2	2	11	31	49	42	57	73	72	70	60
38	0	0	3	3	6	15	28	34	35	42	30	7
39	0	0	1	3	11	36	32	44	56	63	48	40
40	0	0	12	15	17	34	24	45	54	57	44	40
41	0	0	5	5	7	20	16	33	32	46	37	20
42	10	23	13	17	24	37	40	44	39	46	52	40
43	10	9	8	1	9	19	18	22	28	38	26	27
44	10	25	19	25	30	44	38	50	45	60	37	60
45	0	0	2	18	23	48	48	55	69	74	81	47
46	0	0	0	3	7	13	9	19	20	28	11	27
47	5	9	17	30	45	52	64	62	72	72	59	93
48	0	0	0	0	7	4	8	16	25	22	19	7
49	10	21	39	55	64	81	77	83	87	83	81	93
50	5	2	6	12	27	39	46	52	67	76	78	67
51	20	74	77	93	97	98	97	98	100	100	96	93
52	10	51	54	55	61	69	74	72	85	91	96	67
53	0	2	8	12	26	28	26	44	56	63	52	53
54	5	15	13	23	19	27	31	36	48	40	19	27
55	5	0	0	2	6	10	11	17	14	22	7	7
56	30	57	63	72	89	86	87	91	94	97	85	93
57	30	58	76	92	92	93	91	93	90	94	89	93
58	0	0	0	0	1	7	7	14	22	14	22	20
59	0	0	0	0	1	7	9	12	20	19	19	20
60	0	0	3	6	9	10	16	18	33	20	33	7

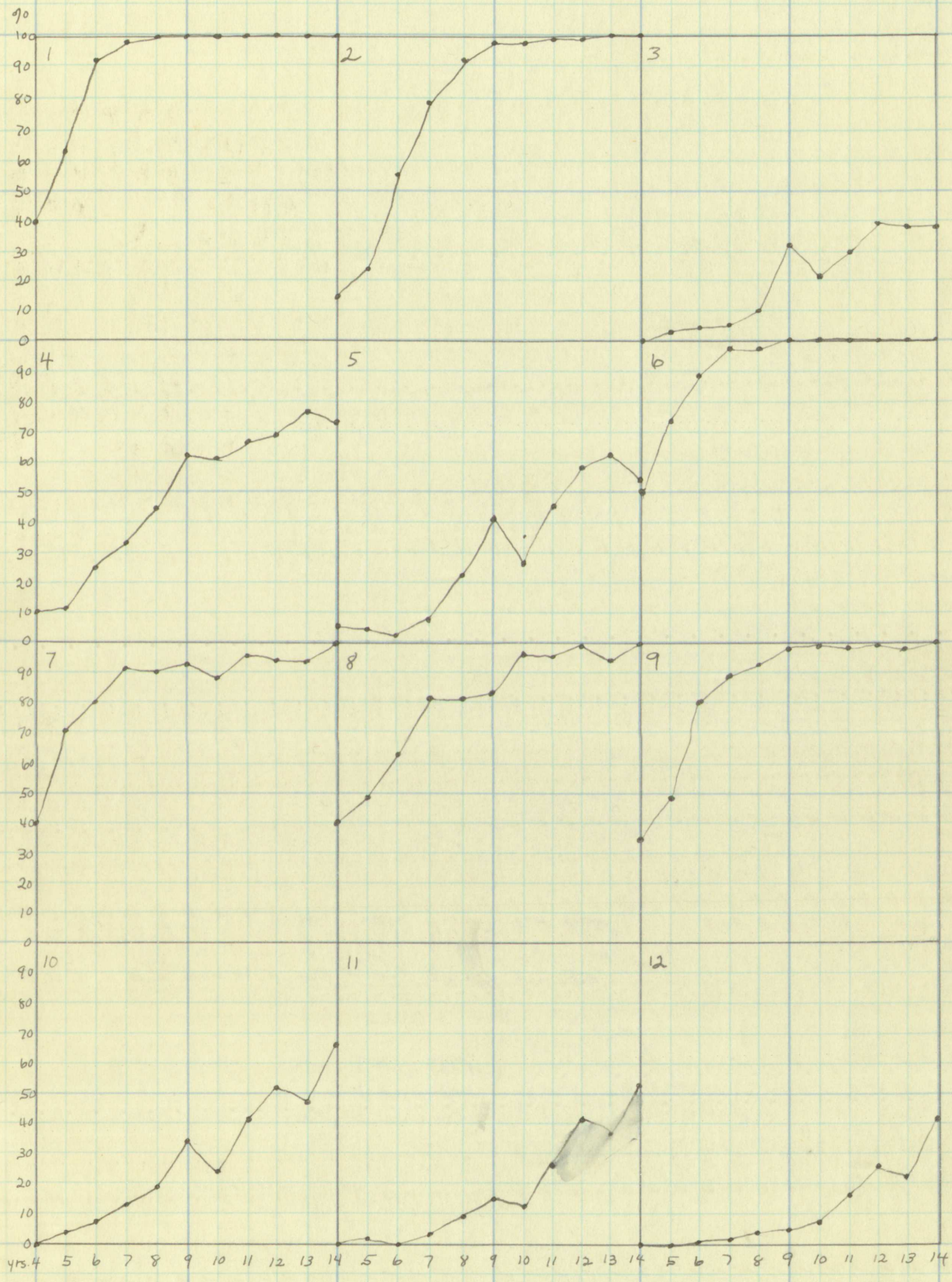

Figure 1. Percentage of Children Succeeding with Points 1-12 Inclusive.

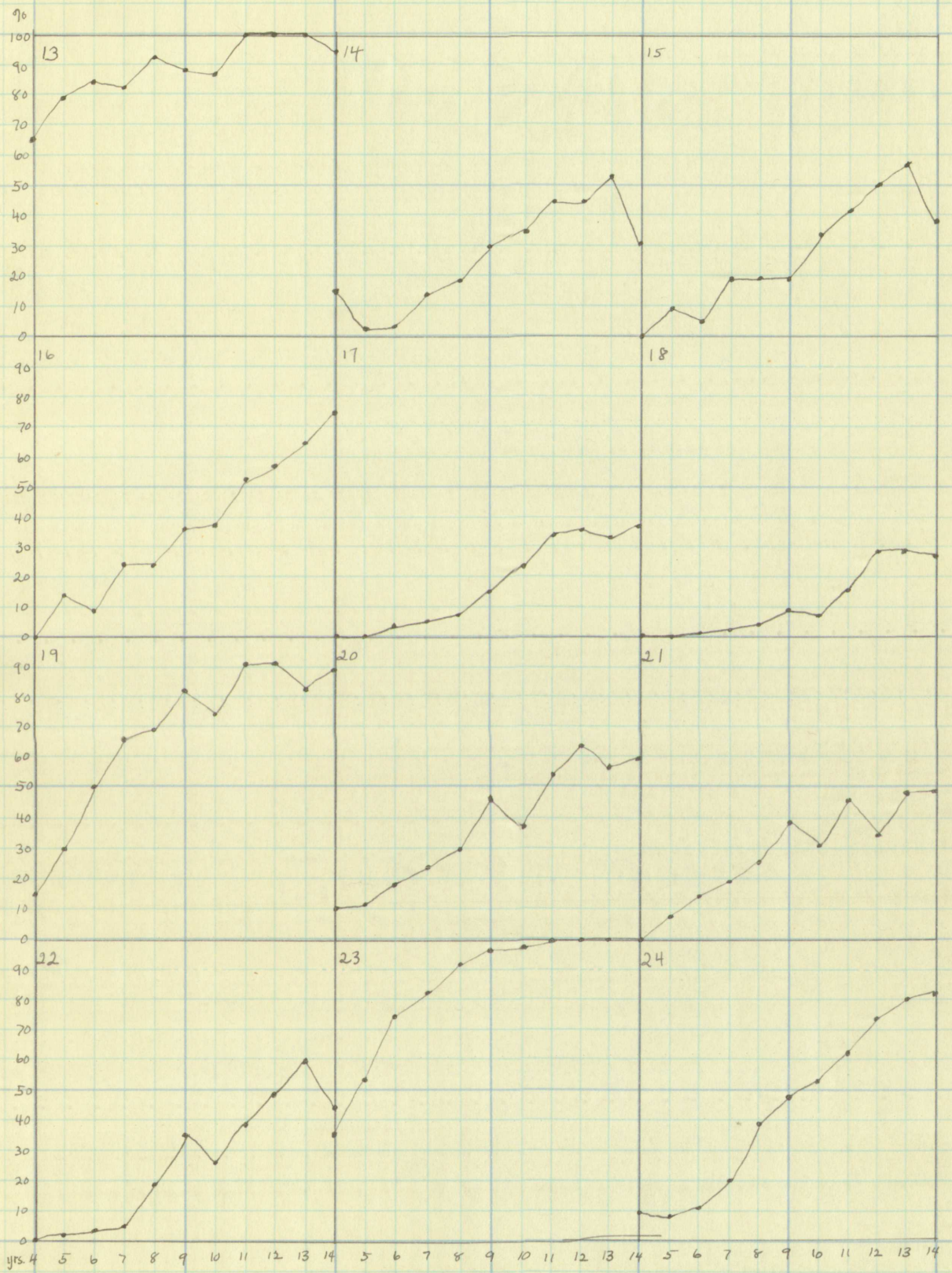

Figure 2. Percentage of Children Succeeding with Points 13-24 Inclusive.

Figure 3. Percentage of Children Succeeding with Points 25-36 Inclusive.

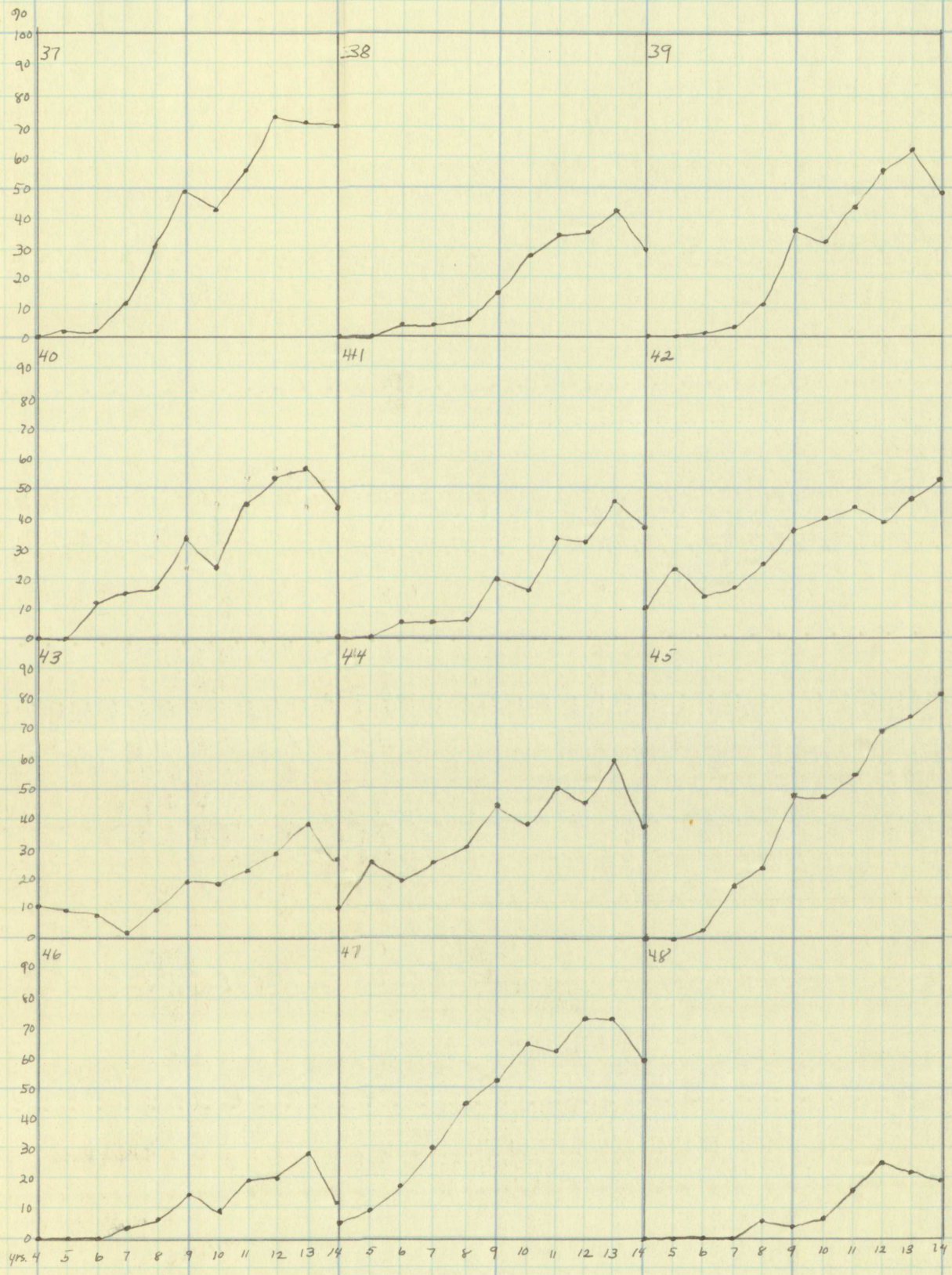

Figure 4. Percentage of Children Succeeding with Points 37-48 Inclusive.

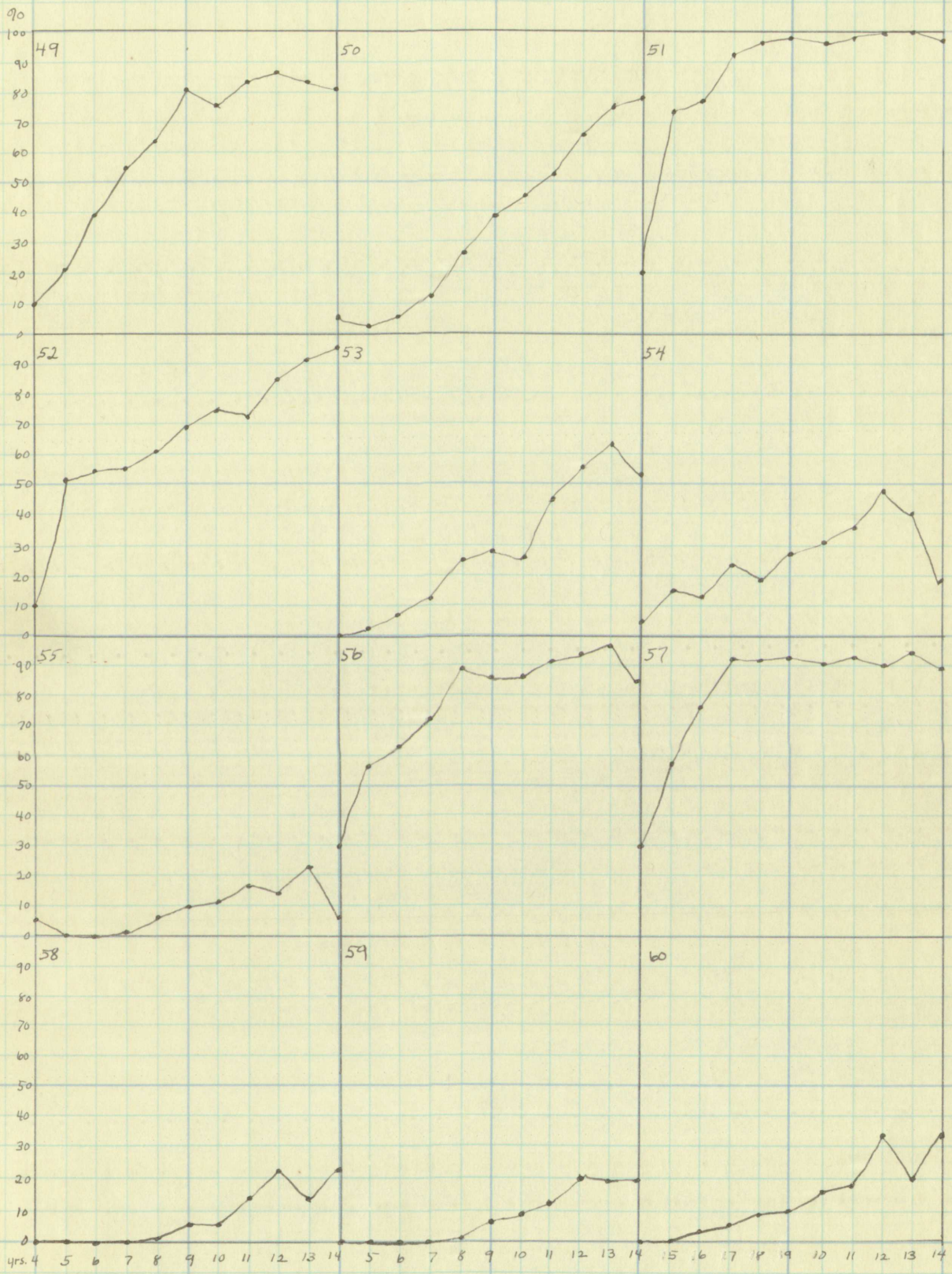

Figure 5. Percentage of Children Succeeding with Points 49-60 Inclusive.

follows:

1. Head present. Any clear method of representing the head. Features alone, without any outline for the head itself, are not credited for this point.

2. Head proportion. The length of the head must be greater than the width.

3. Lower jaw shown. There must be some indication of differentiation from the rest of the head.

4. Shape of nose. The nose must be somewhat squared. If it is rounded or pointed it is not credited for this point.

5. Forehead indicated. This may be shown either by a curve or by shading.

6. Any indication of an ear.

7. Both ears shown.

8. Ears pointed.

9. Proportion of ears. The length of the ears must be greater than the width.

10. Forelock present. Any clear method of indicating the forelock.

11. Position of forelock. Must be on the main axis of the face and must be closer to the ears than to the eyes.

12. Forelock shown without transparency. The outline of the head must not show through.

13. Eye shown. Either one or two eyes may be shown. Any method is satisfactory.

14. Shape of eye. The width of the eye must be greater than the distance from the top to the bottom. In profile drawings the eye often has the shape of a sector of a circle. In such cases the point is credited.

15. Pupil shown. The pupil must be present in both eyes if both are shown. A dot with a curved line above it is not credited, since the dot is considered as representing the eye itself in such cases.

16. Nostril shown. Any clear method of representation. It is often shown by a dot or circle.

17. Position of nostril. It must be above the mouth and close to the end of the nozzle.

18. Shape of nostril. Must be somewhat elliptical in form. A dot or circle is not credited.

19. Mouth shown. Any clear method of representation.

20. Position of mouth. Must be in the lower half of the nozzle.

21. Shape of mouth. If the mouth is shown by a straight line, it must be longer than half of the width of the nozzle or more than one tenth of the total length of the head. If the mouth is open, it must be definitely shaped, mere indentation is not sufficient.

22. Cheek shown. May be shown by a curve or by shading.

23. Neck present. Any clear indication of the neck as distinct from the head and trunk.

24. Proportion of neck. The length of the neck must be greater than the width.

25. Shape of neck. The neck must be wider toward the body.

26. Position of neck. The neck must be higher than the body unless the animal obviously has its head down.

27. Mane present. Any clear indication of a mane. It is usually shown by many short lines indicating hair.

28. Mane shown without transparencies. The lines of the body must not show through.

29. Chest or shoulder indicated. Any clear indication by which the chest or shoulder is differentiated from the neck. It is usually shown by a curved outline or by modeling.

30. Elbow indicated. Any indication of the elbow where the fore legs join the body. It is usually shown by a curved line.

31. Legs shown. Any method of representation clearly intended to indicate the legs. The number need not be correct.

32. Correct number of legs. Four legs must be shown.

33. Legs the same length.

34. Attachment of fore legs. They must be attached at front of body and in such a way that one appears to be on

one side and one on the other. This is usually done by the top of one leg partially obscuring the other.

35. Attachment of hind legs. They must be attached at the rear of the body and in such a way that one appears to be on one side and one on the other. This is usually done by the top of one leg partially obscuring the other.

36. Leg proportion. Legs must have more than linear dimension.

37. Thigh indicated. Any clear indication of the thigh where the hind leg joins the body. It is usually shown by a curved line.

38. Knee joints indicated. Any indication of knee joints in the fore legs. This is usually shown by a bend in the leg.

39. Knee joints indicated. Any indication of knee joints in the hind legs. This is usually shown by a bend in the leg.

40. Fetlock shown. This may be shown by a curved line indicating a bump or by small lines indicating hair.

41. Fetlock must be shown on all legs.

42. Hoofs shown. This is credited if a hoof is shown just on one leg. It is usually shown by a line which separates the hoof from the rest of the leg.

43. Hoofs shown on all legs.

44. Proportion of legs. The height of the legs must be greater than the width of the body.

45. Proportion of legs. The width of the legs must be smaller at the ankle than at any other part.

46. Correct space between the legs. This point is credited only when all four legs are shown.

47. Withers, loin, or croup shown. These are usually shown by a curve in the upper outline of the horse.

48. Bodily contour indicated. This is a superior point. It is credited when there is some indication of thickness as well as length and breadth.

49. Proportion of body. The body must be at least twice as long as it is wide and not over three times as long.

50. Buttock indicated. This is indicated by a curved line at the rear of the horse.

51. Tail indicated. This is credited if there is any indication of a tail.

52. Tail. The tail must have the appearance of being made of hair. This is usually done by the presence of a number of separate lines.

53. Shape of tail. The tail must be smaller near its attachment to the body.

54. Attachment of tail. The tail must be attached so that its outline is continuous with the back. The tail must be clearly differentiated from the body.

55. Movement indicated. Any indication of movement such as walking or running.

56. Motor co-ordination. The lines must be reasonably firm. They must meet fairly well, without a great deal of overlapping or without gaps. Sketchy lines are credited as they are characteristic of the superior drawings.

57. Ears present without transparencies. The outlines of the head or of the other ear must not show through.

58. Position of ears. The ears must be at the top of the head, not at the sides.

59. Shape of ears. The ears must be pointed at the top but not at the bottom.

60. Position of eye. The eye must be in the upper half of the head and toward the center.

Examples of some of the drawings, together with their scoring, are shown in Figures VI to XII.

A distribution of the total scores by age is shown in Table II and the means and standard deviations for the different age groups are given in Table III. The differences between the means of the different age groups are given in Table IV. The differences in means are reliable from age four through age nine. There is little difference between the means of age nine and age ten. At present this cannot be explained.

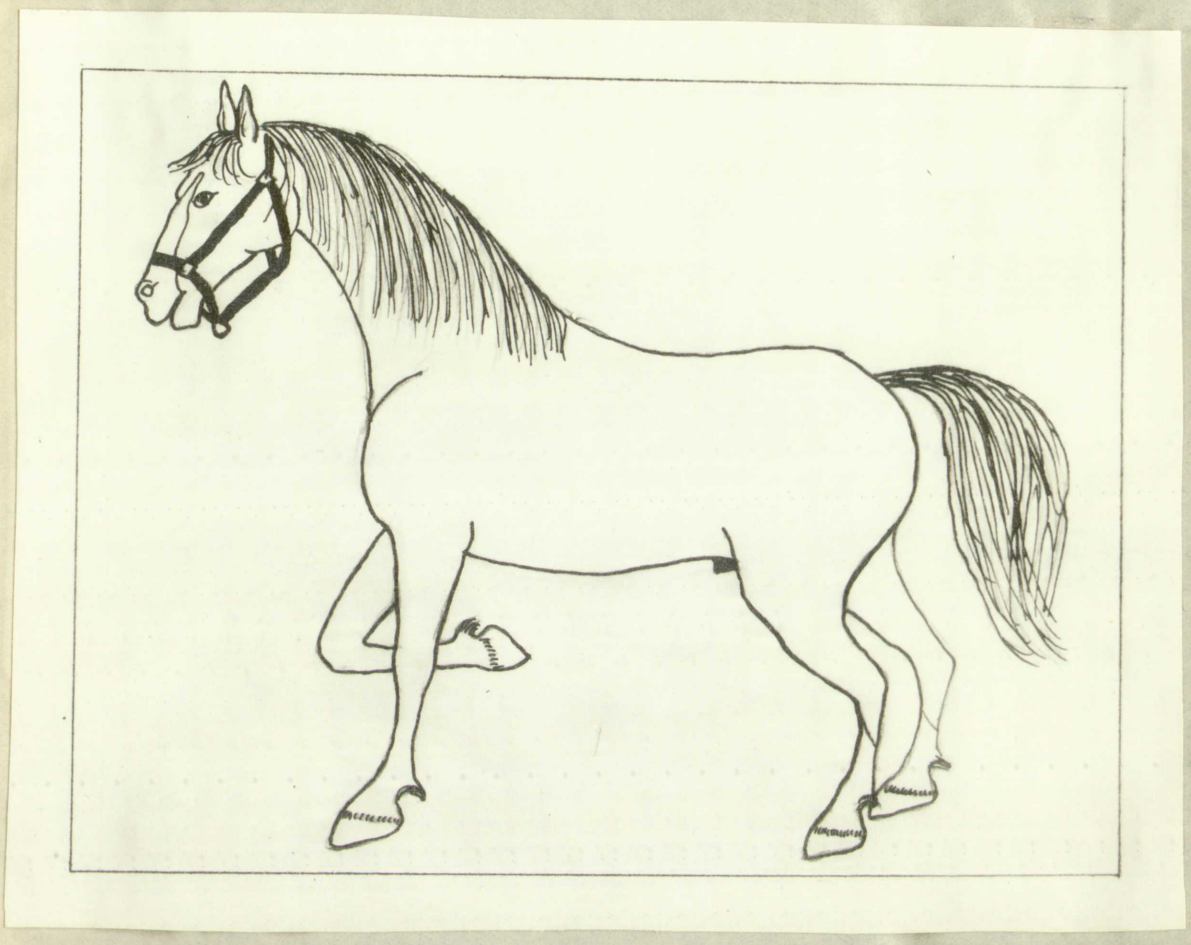

Figure 6. Drawing by a Fifteen Year Old Indian Boy. Points: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 57, 60. Total Score 57.

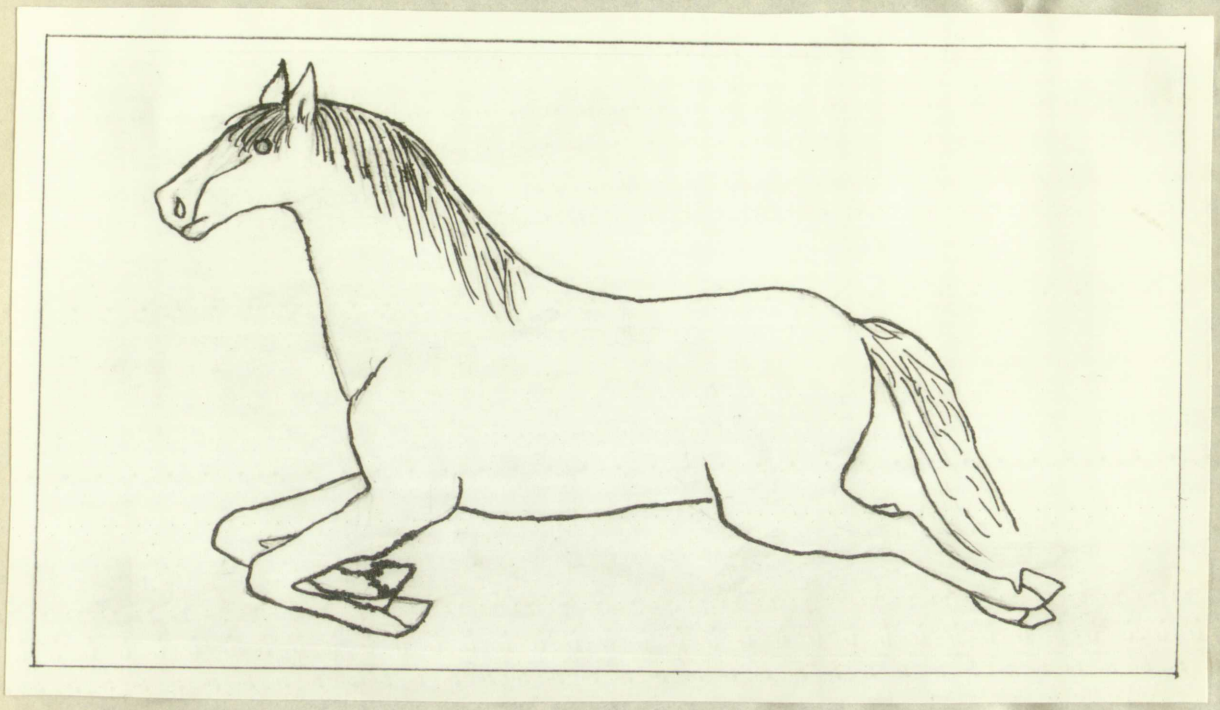

Figure 7. Drawing by an Eleven Year Old Indian Boy. Points: 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59. Total Score 52.

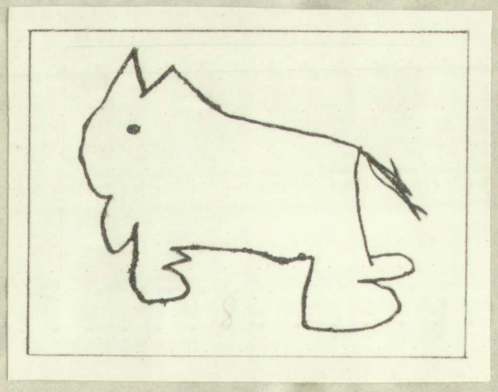

Figure 8. Drawing by a Five Year Old Indian Girl. Points: 1, 6, 7, 8, 13, 31, 36, 51, 52, 54, 56, 57. Total Score 12.

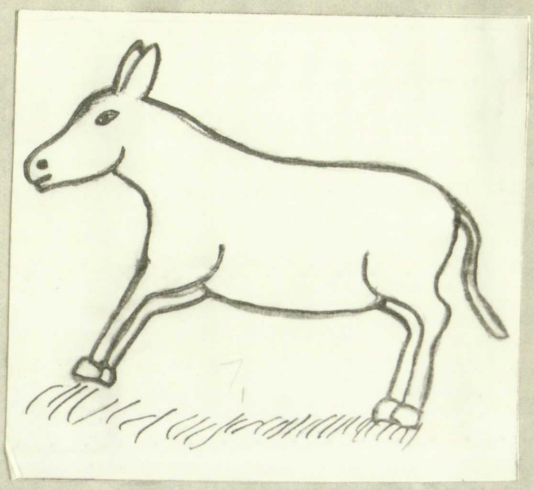

Figure 9. Drawing by a Nine Year Old Indian Boy. Points: 1, 2, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 30, 31, 32, 33, 35, 36, 37, 39, 42, 43, 51, 56, 57, 59, 60. Total Score 33.

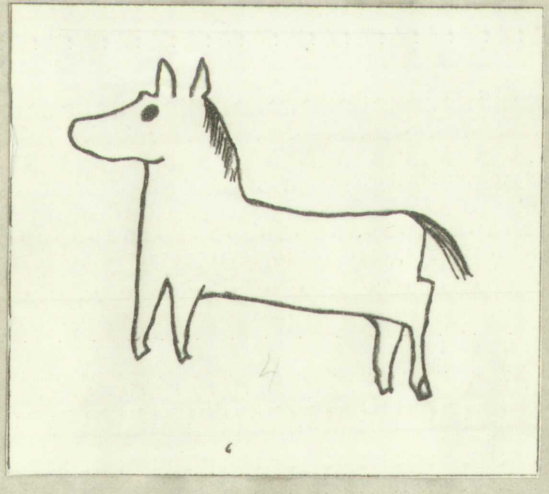

Figure 10. Drawing by a Seven Year Old Indian Boy. Points: 1, 2, 5, 6, 7, 8, 9, 13, 22, 23, 25, 27, 31, 32, 33, 36, 45, 49, 51, 52, 53, 54, 56, 57, 60. Total Score 25.

Figure 11. Drawing by a Ten Year Old Indian Boy.
Points: 1, 2, 3, 4, 6, 7, 8, 9, 13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 36, 37, 38, 39, 40, 41, 44, 45, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57.
Total Score 44.

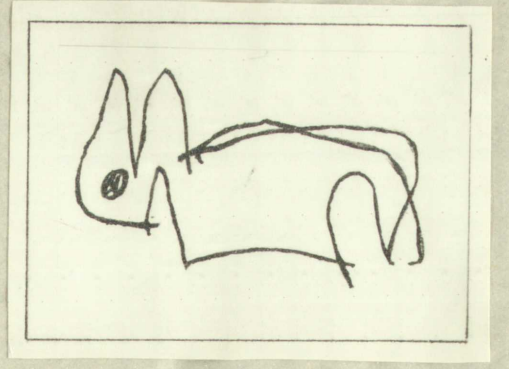

Figure 12. Drawing by a Five Year Old Indian Girl.
Points: 1, 6, 7, 8, 9, 13, 23, 31, 36, 57.
Total Score 10.

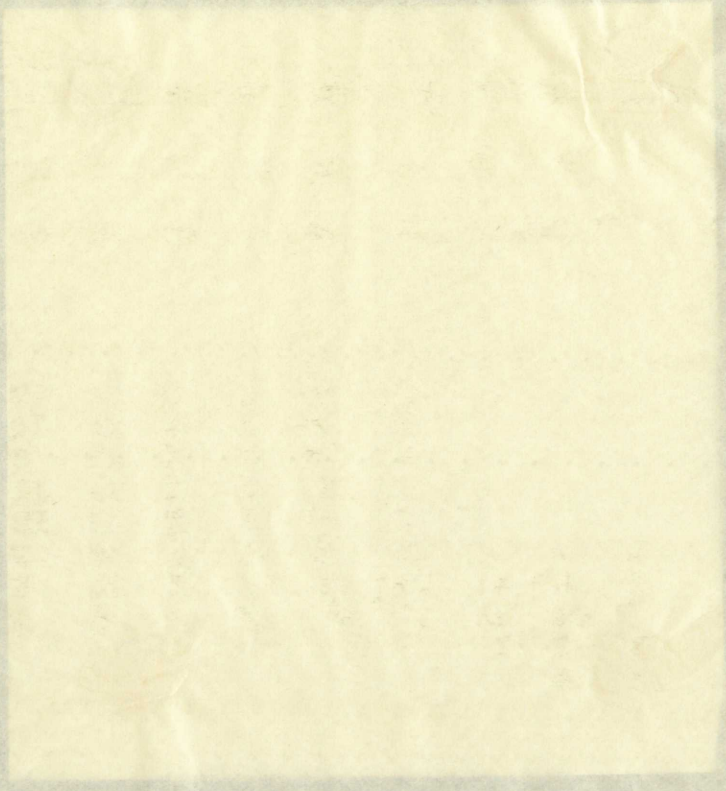

TABLE II

DISTRIBUTION OF TOTAL SCORES BY AGE

Age	4	5	6	7	8	9	10	11	12	13	14	15
N	20	53	119	130	103	113	116	98	96	65	27	15
Score												
55-59									2			
50-54					1	4	3	8	12	7	3	
45-49					1	5	6	14	12	14	5	4
40-44					3	8	9	8	13	6	2	4
35-39				2	3	10	9	11	15	11	4	
30-34				5	9	20	12	13	12	12	7	2
25-29		1	7	10	19	16	31	21	16	9	4	3
20-24	1	5	15	44	29	28	32	18	10	5	2	2
15-19	2	7	44	48	31	20	13	5	4	1		
10-14	2	20	38	17	6	2	1					
5-9	4	13	14	4	1							
0-4	11	7	1									

TABLE III

TEST SCORE MEANS AND STANDARD DEVIATIONS
OF DIFFERENT AGE GROUPS

Age	N	Mean	S. D. of Dist.	S. D. of Mean
4	20	7.00	6.20	1.36
5	53	11.85	5.98	.82
6	119	15.82	5.30	.49
7	130	19.88	5.60	.49
8	103	23.62	7.80	.77
9	113	28.83	9.75	.92
10	116	29.00	8.95	.83
11	98	33.98	10.55	1.07
12	96	37.03	10.60	1.08
13	65	37.96	9.45	1.17
14	27	37.31	9.25	1.78
15	15	36.84	9.30	2.40

TABLE IV

DIFFERENCES IN MEANS OF DIFFERENT AGE GROUPS

Ages	Diff. in Means	S.D. of Diff.	Diff. / S.D. of Diff.
4 and 5	4.85	1.59	3.05
5 and 6	3.97	.95	4.18
6 and 7	4.06	.69	5.88
7 and 8	3.74	.91	4.11
8 and 9	5.21	1.20	4.34
9 and 10	.17	1.24	.14
10 and 11	4.98	1.35	3.69
11 and 12	3.05	1.52	2.66
12 and 13	.93	1.59	.58

In more than twenty points of the scale, the curve drops from age nine to age ten, then continues to rise.

The reliability of the scale was computed by the "split-scale" method, and corrected by the Spearman-Brown prophecy formula for the reliability of a test when doubled. For this purpose the scale was divided into two parts. The points were equated according to the total percentage of children succeeding with the point and according to the percentage of children succeeding at each age level. This was done by a comparison of the curves. The points in the first part are: 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 30, 32, 34, 37, 38, 55, and 58. Those in the second part are: 8, 10, 13, 17, 25, 29, 31, 33, 35, 36, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 57, 59, and 60. The

results of the correlations are shown in Table V. For the entire group, taken as a whole, the reliability was .94. For ages four to nine, inclusive, taken separately the average reliability was .79.

TABLE V

TEST SCORES CORRELATED IN "SPLIT-SCALE" METHOD

Age	N	Correlation
4	20	.64
5	53	.80
6	119	.87
7	130	.78
8	103	.73
9	113	.90
Total (4-15)	955	.94

Correlations between ratings made by the teachers and scores on the test were computed for several age groups, for all the second grade children, and for the seven year old children in the second grade. These correlations were all too low to be of much value, the correlations for ages four, six and eight being .13, .06, and .02 respectively. The correlation of teachers' ratings and total score for the second grade children was -.06.

Total scores and grade placement were correlated for the two largest schools combined. The results of these correlations are given in Table VI. The average

correlation for ages seven to twelve taken separately was .32.

At the same time that the drawings of a horse were made, the children made pictures of a man according to the Goodenough Intelligence Scale. The scores made on these tests by 122 seven year old children were correlated with the scores made on the drawings of a horse. The correlation of these two sets of scores was .38±.05.

TABLE VI

CORRELATION OF SCORES WITH GRADE PLACEMENT

Age	N	Correlation
7	26	.04
8	18	.41
9	26	.53
10	34	.38
11	19	.33
12	29	.21

CONCLUSIONS

1. This study had as its object the investigation of drawings made by Pueblo Indian children. It involved the construction of a scale based on the drawings of a horse. The scale consists of sixty points, or units of measurement.

2. Average attainment on this scale, as measured by the number of points in each drawing, increases fairly regularly from age four to age nine. The differences between each successive age level are significant by conventional statistical standards. There is a further increase from age nine to age ten but this increase is considerably less than in the lower age levels and is not statistically significant. From age ten to age thirteen there are further increases in average scores but only between age ten and age eleven is the difference reliable. Such validity as the scale as a whole may have is limited to the lower age levels.

3. By correlating scores by the "Split-Scale" method and correcting the correlations obtained by the Spearman-Brown prophecy formula for the reliability of a test when doubled, reliabilities for separate age levels from four to nine were found to range from .64

to .90, with an average of .79. For all ages taken together, from four to fifteen, the reliability is .94.

4. What function is measured by the scale has not been adequately determined. Evidence for its measuring intelligence is found in an average correlation of .32 with grade placement in the two largest schools, ages seven to twelve taken separately. The highest correlations are .41 for eight year olds and .53 for nine year olds. At seven years and below it seems probable that proper grade placement for the children has not yet been adequately determined and above nine years the validity of the scale itself is highly questionable.

5. For seven year old children the scale correlates .38 $\pm$ .05 with the Goodenough Intelligence Scale. When corrected for attenuation this correlation becomes .51. This correlation is sufficiently high to indicate that to some extent the same general function is being measured, but it is entirely possible that this scale measures something that is not measured by the Goodenough scale.

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