

ENVIRONMENT AND THE DRAW-A-MAN TEST: THE PERFORMANCE OF INDIAN CHILDREN

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THE Goodenough Draw-a-Man Test was administered to 325 Indian children aged six through eleven in the Hopi, Zuni, Zia, Papago, Navaho, and Sioux tribes. This was one of a wide variety of psychological tests and socio-psychological methods used to throw light on the mental, social and physical development of Indian children.¹

The Draw-a-Man Test was chosen because it seemed probable that Indian children would be under little or no experiential handicap in this test. As it turned out, the Indian children did better than white children, and the study became to some extent a study of environmental influence on children's performance on the Draw-a-Man Test.

The argument advanced by Goodenough for the value of the test is that in young children a close relationship is apparent between concept development as shown in drawing, and general intelligence. . . . The order of development in drawing is remarkably constant, even among children of very different social antecedents—close agree-

ment, both as regards the method of indicating the separate items in a drawing and the order in which these items tend to appear. This is especially true as regards the human figure, probably because of its universal familiarity. (3, p. 12)

Several studies have been made of Indians with the use of the Draw-a-Man Test. Goodenough (4), in 1926, reported for 79 Indian children in the Hoopa Valley (California) Reservation School an average IQ of 85.6. These children were in Grades 1 to 4. Telford (15), in 1932, reported results on the Draw-a-Man Test for 225 North Dakota Indian children. These children ranged from kindergarten through sixth grade. The average IQ was 88.6, and there were no consistent changes in IQ with age. However, he found an increase of IQ with length of schooling for the first two years, after which there was no change. Telford was interested in the relationship between the degree of Indian blood and the test performance, and he concluded that his results show a lack of any consistent relationship between the two.

In 1933 Eells (2) reported a study of Alaskan children whom he classified as Eskimos, Aleuts, and Indians. The Indians lived in Southeastern Alaska. His results were:

	IQ	
Eskimo	89.6	(364 children)
Aleuts	93.3	(105 children)
Indians	91.6	(58 children)

Rohrer (13) reported in 1942 on a study of Osage (Oklahoma) children. The Osage Indians are well off, finan-

¹ This is one of a series of articles reporting an intensive study of the development of Indian children. Techniques used in the study were drawn from psychology, anthropology, sociology, and medical science. Representatives of these sciences worked together in planning, conducting, and interpreting the results of the study under the auspices of the Committee on Human Development of the University of Chicago and the United States Office of Indian Affairs, which supported the study financially and worked with the University of Chicago group in planning and conducting it. Articles like the present one will appear in appropriate journals to describe the various aspects of the study. These will serve to document a series of monographs designed to integrate and interpret the material of each of the tribes.

cially. English is their language. Their children go to the public schools. The Draw-a-Man Test was given to 125 (out of 331) Osage children in Grades 1 to 3 of the elementary schools of a community. Children in outlying schools were omitted. An equal number of white children in the same classrooms were tested. The mean IQ for the Indian children was 103.8; for white children, 102.9.

Dennis (1) gave the Draw-a-Man Test to 152 Hopi children aged six through ten, in 1941. The average IQ was 108.3, with a significant sex difference. Boys averaged 116.6 and girls averaged 99.5. Since many of the children tested by Dennis were tested again in the present study, our results will be of special interest in comparison with those of Dennis.

Russell (14) gave the Draw-a-Man Test and collected spontaneous drawings from 41 Zuni children. He found an average IQ of 105, with no significant sex difference.

SELECTION OF SUBJECTS AND SAMPLING PROCEDURES

Children from six Indian tribes were tested in the present study. The tribes were: Sioux, Navaho, Papago, Hopi, Zuni, and Zia. The Hopi, Zuni, and Zia Indians practically all live within their respective pueblo towns. The other tribes are much larger in population and cover wider areas of land. The Navaho, with 50,000 people, inhabiting an area of 23,570 square miles, much of which is unfit even for grazing, are spread over the widest territory. The Sioux and Papago have large reservations, with a dispersed population. The Hopi number about 3500 living in eleven villages on three mesas surrounded by the Navaho Reservation.

Where the population is dispersed, as

on the Sioux, Navaho, and Papago reservations, there is usually a wide variation of living conditions, economic welfare, amount of schooling, and contact with the neighboring white culture. Consequently, two or more communities were chosen for study in these tribes in an effort to discover variations within a given tribe.

When the communities which were to be studied had been selected there remained the problem of selecting the children to be tested. The principles followed in selection of subjects were: (1) All children from six through eleven were to be tested unless the number was too large. (2) If the number was too large, a random sample of this group was to be made if possible. (3) If a random sample could not be obtained, the sampling procedure was to be described and recorded in detail.

The list of children, with their ages, was in each case taken from the school census. In some tribes the birth dates are not always definite or accurate. The recorded age of a child was checked by asking him and his parents his age. In some doubtful cases, church records were of value in establishing the age. Where the contact with white culture was precarious, birth dates were not available for all children and in a few cases the field workers had to be content with getting an estimate of the year of birth.

Information is summarized in Table 1 for each of the tribes, giving number of children in the various communities and numbers actually tested, and describing sampling procedures that were used.

The Arthur Performance Test was given to the same groups of children (5). We succeeded in giving the Arthur test to a larger proportion of our sample than the proportion from whom we secured drawings. We got drawings

TABLE I
DATA ON SELECTION AND SAMPLING

TRIBE	HOPI		ZUNI	ZIA	NAVAHO	PAPAGO		SIOUX	
COMMUNITY	ORAIBI	FIRST MESA			SHIPROCK	TOPAWA	HICKIWAN-GUVO	KYLE	PINE RIDGE
No. of children 6 through 11	53	52 *	c. 300 †	36	c. 150 ‡	60	59 §	c. 100	c. 300
No. of children in sample	53	52	42	36	57	60	59	43	26
No. of children tested	46	32	42	32	47	48	25	30	23

* Excludes children from the Tewa-speaking pueblo of Hano, and also some 25 children of predominantly Tewa affiliation in the other pueblos.

† About half of the children attend the Indian Service day school, the others going to a Catholic or a Christian-Reformed mission school. There is said to be no great difference between those who attend a mission school and those who attend the government day school. Every sixth name was taken from the Indian Service school roll and these children, together with their siblings, made up the sample.

‡ This number is a rough estimate. There were 57 children attending day school, and they constituted the sample.

§ In this isolated area, about 40 per cent of the children have never been to school. Most of those who were tested were in school.

|| The research supervisor, a stranger to the communities, selected the samples so as to make the blood mixture conform to the pattern of the reservation, with correct percentage of full bloods, intermediate mixed bloods, and predominantly white mixed bloods.

from more than 80 per cent of those who took the Arthur test in six of the nine groups. The range was from 42 to 100 per cent. Accordingly, we used the Arthur test data on those who took the Draw-a-Man Test to find out whether our Draw-a-Man groups were representative samples.

We have tried to determine how representative our samples were by asking two questions: (1) Is the group from whom we secured drawings representative of the larger group whom we tested with the Arthur test? (2) Is the group tested with the Arthur test representative of the entire group of children in the community?

In answer to the first question we inferred that a group from whom we secured drawings was representative of the larger group who took the Arthur test if the mean Arthur IQ's of the "Arthur" group and its subgroup were nearly the same. This proved to be the case in all of our groups. The greatest difference between the mean Arthur IQ's of the larger group and the group for which we have drawings is 2.8 points, in the case of the Oraibi (Hopi) group. This difference could easily occur as a result of chance.

In answer to the second question, we are sure in some cases that the group tested with the Arthur test is representative of the entire group of children in the community, and uncertain on this point in other cases.

We can put the groups into categories with reference to the confidence we may have that the group actually tested with the Draw-a-Man Test represents the total group of children in the community. These categories are:

- A. The group tested is almost surely representative of the total group.
Zia, Hopi (Oraibi)
- B. The group tested is probably representative of the group given the Arthur test,

and this group is probably representative of the whole group.

Zuni, Sioux (Kyle), Hopi (First Mesa)

- C. We cannot say that the group tested is representative of the whole group, but the group tested is probably representative of the group given the Arthur test.
Sioux (Pine Ridge), Navaho (Shiprock), Papago (Hickiwan-GuVo)

The Papago (Topawa) group does not fit any of these categories and will be discussed later.

ADMINISTRATION AND SCORING OF THE TESTS

The test was administered by teachers in the schools which the children attended during the school year 1942-43. In most cases, the regular classroom teacher administered the test. In a small proportion of cases, one teacher gave the test to all the children in a school. A few tests were given by field research workers to children who were not in school. The Draw-a-Man Test was given as the ninth drawing in a series of drawings or paintings, of which the first eight were "free drawings." In the first eight drawings the children were free to choose size of paper, medium, and subject. The teachers were instructed to exert just as little influence as possible. The "free drawing test" was a projective test, designed for the study of personality manifestations. This free drawing experience probably had some effect on the children's Draw-a-Man performance. Although the teachers were given the instructions in Goodenough's manual, teachers as well as children appear to have been habituated to the "free drawing" conditions so that a considerable variety of drawings resulted from the Draw-a-Man assignment. A few children colored their drawings, others drew women, and others drew men in the act of performing various operations. While this

unusual freedom made scoring difficult, and caused us to throw out a few drawings in which significant details were covered by paint or were hidden behind other objects, it probably reduced the tendency of the teachers to make suggestions to the children about their drawings. Thus the drawings were obtained when teachers and children were relatively "relaxed." The Navaho (Shiprock) drawing test was given first in the series, before the "free drawings."

The tests were scored according to Goodenough's standards.² We scored drawings for children from six through eleven, whereas Goodenough does not recommend the test for use with subjects older than ten. Our reason for using the tests of the eleven-year-olds was to secure more cases for statistical study. The effect of including eleven-year-olds in the study is to lower the average IQ of the group.

RESULTS

The mean IQ's obtained on the Draw-a-Man Test for the various groups of children in the study are shown in Table 2. This table also shows the mean Arthur IQ's for the Draw-a-Man groups, and the mean Arthur IQ's for the larger groups who were tested with the Arthur test. This last figure is for children in the age group six to fifteen, and therefore is based upon a larger group than the number actually shown in the first column. Since there was no systematic variation

² While we were developing our scoring technique, we sent a set of 20 Indian children's drawings to Miss Goodenough, who helped us by asking one of her research assistants, Miss Harriet Blodgett, to score these drawings. We compared our scores with those of Miss Blodgett, and changed our methods on several points to agree with hers. Each of our drawings was scored by two persons. One of us (M. K. G.) scored all the drawings, and the others of us (I. E. P. and R. J. H.) each scored half of them. The two scores for each drawing were averaged.

of Arthur IQ with age, comparison of the mean values of the Arthur IQ for the larger group with the mean values of the Arthur IQ for the smaller group should help us to decide whether the smaller group is representative of the larger group.

Table 2 also gives the Draw-a-Man IQ's for a group of white children in a small middle-western city. This group comprised nearly all of the ten-year-olds in the town, and is a fairly good cross-section of middle-western white children. All but eight of the 66 children were ten years old, the other eight falling between eleven and eleven years and three months. For this group of white children we do not have Arthur IQ's, but we have IQ's on the Cornell-Coxe Performance Test which has some elements in common with the Arthur test.

The Indian children exceeded the norms for white children by a statistically significant amount in seven of the nine groups. They exceeded their own Arthur IQ's in seven of the nine groups. The white children scored lower on the Draw-a-Man Test than on the Cornell-Coxe. It appears that the Indian children gave a definitely superior performance to that of white children on the Draw-a-Man Test.

Mean IQ's and standard deviations are given for each tribal group and for the midwest group on the Draw-a-Man Test in Table 3.

Sex differences were manifested in several of the groups. In the Pueblo groups (Zuni, Zia, and Hopi), the boys were definitely superior to the girls at all age levels between six and eleven. The Sioux boys showed a smaller superiority over the girls, but one which is statistically significant. The Navaho group showed no difference between the sexes. The Papago Topawa group showed the girls definitely superior to

TABLE 2
DRAW-A-MAN IQ COMPARED WITH ARTHUR IQ

	NO. GIVEN DRAW-A-MAN TEST AGE 6-11 *	MEAN IQ DRAW-A-MAN, AGE 6-11 *	MEAN IQ DRAW-A-MAN, AGE 6-10 *	MEAN IQ ARTHUR, AGE 6-11 *	MEAN IQ ARTHUR, AGE 6-15 *
Hopi (Oraibi)					
Boys	24	120.5	123.2	116.6	
Girls	22	99.5	102.3	107.4	
Total	46	110.5	112.7	112.2	115.0
Hopi (First Mesa)					
Boys	15	126.7	133.8	110.5	
Girls	17	108.6	108.9	111.2	
Total	32	117.1	119.6	110.9	110.7
Zuni					
Boys	18	122.1	122.1	99.6	
Girls	24	104.0	107.8	100.0	
Total	42	111.7	114.5	99.9	99.6
Zia					
Boys	17	116.4	120.1	96.6	
Girls	15	101.9	100.9	92.2	
Total	32	109.6	110.9	94.5	96.5
Navaho (Shiprock)					
Boys	20	110.1	107.0	98.6	
Girls	27	109.4	110.8	91.3	
Total	47	109.7	109.5	94.4	95.9
Papago (Topawa)					
Boys	24	101.8	102.1	93.0	
Girls	25	115.2	116.6	106.4	
Total	49	108.5	109.7	99.7	99.4
Papago (Hickiwan-GuVo)					
Boys	13	104.9	106.9	84.1	
Girls	12	102.2	103.4	90.8	
Total	25	103.6	105.2	87.5	86.9
Sioux (Pine Ridge)					
Boys	10	107.8	107.3	100.5	
Girls	13	97.6	99.2	101.6	
Total	23	102.0	102.6	101.1	102.6
Sioux (Kyle)					
Boys	14	116.9	117.8	97.7	
Girls	16	110.3	112.2	100.1	
Total	30	113.6	115.0	98.9	101.1
Midwest (Whites)				(Cornell- Coxe)	
Boys	28	98.3		116.0	
Girls	38	103.4		110.2	
Total	66	101.2		112.7	

* Inclusive.

the boys on the Draw-a-Man and the Arthur tests. The Hickiwan-GuVo group showed no statistically significant difference between the sexes, in a small sample. The middle-western white group showed a slight superiority of girls over boys on the Draw-a-Man Test, while the boys had an equal margin of superiority over the girls on the Cornell-Coxe test. Neither of these differences is statistically significant.

Dennis's results for his total group are slightly lower than ours. This is probably due to the fact that he included one school (Hotevila) which did not appear in our sample and which tested lower than the other two schools. He found a mean IQ of 108.3 for 152 children, aged six through ten. Our data gave an average of 115.6 for 66 children, aged six through ten. Dennis found the girls to average 99.5 and the boys 116.6.

TABLE 3
MEAN DRAW-A-MAN IQ'S AND SD'S FOR TRIBAL GROUPS

GROUP	HOPI	ZUNI	ZIA	NAVAHO	SIoux	PAPAGO	MIDWEST (WHITE)
No.	78	42	32	47	53	74	66
Mean IQ	113.3	111.7	109.6	109.7	109.1	106.9	101.2
SD	17.4	20.7	17.2	16.3	16.9	20.6	19.0

Our results on Hopi children can be compared with those of Dennis (1), who tested most of these same children a year earlier with the Draw-a-Man Test. Our results are in substantial agreement with those of Dennis. He has given us his IQ's for the 64 children who were tested by us as well as by him. Omitting one case on which we disagreed with him about the age of the subject, we present a comparison of the results in Table 4.

We found the girls to average 105.6 and the boys 127.0. The difference between the sexes Dennis found to be 17 points, while we found it to be 21 points. The product-moment coefficient of correlation between our results and Dennis's was 0.52.

Dennis found the average IQ of the girls to decrease with age, while that of the boys increased with age. His differences were not quite statistically reliable. We, too, found the average IQ

TABLE 4
COMPARISON OF CHICAGO AND DENNIS RESULTS ON THE HOPI DRAW-A-MAN TEST

	ORAIBI			FIRST MESA		
	No.	MEAN IQ		No.	MEAN IQ	
		CHICAGO	DENNIS		CHICAGO	DENNIS
Boys	14	120.8	115.9	15	130.2	128.2
Girls	17	98.9	98.9	17	107.1	107.5

of the Hopi girls in this test to decrease with age, but that the boys remained practically constant.

To study further the relation between age and Draw-a-Man IQ, we divided our subjects into three age groups, 6-7, 8-9, 10-11; and calculated mean IQ's for each sex and each community. There were no consistent trends with age. We then combined both sexes and all the tribal groups into four age groups, with results as shown in Table 5.

TABLE 5
DRAW-A-MAN IQ IN RELATION TO AGE

AGE	6-7	8-9	10	11
Number	98	105	69	51
Mean IQ	112.2	108.3	110.2	105.8

Our results on Zuni children do not agree very well with those of Russell (14), who found a mean IQ of 105 with no sex difference. Our girls' scores agree fairly well with those of Russell, but our boys' scores are much higher. Since Russell's sample and our sample of boys are both small, 14 and 18 respectively, it is natural to look into the sampling procedures as a possible source of the differences. Our sampling procedure has been described. Russell tested the children in the summer school operated by the Indian Service in the farming community of Nutria, where a portion of the Zuni residents live each summer. It seems possible that some selective factors may have operated to send an atypical group of boys to summer school in this community.

To find out what relation there was between performance on the Draw-a-Man Test and performance on the Grace Arthur Performance Test, we calculated product-moment correlation

coefficients for the Zuni, Hopi (Oraibi and First Mesa combined), Navaho (Shiprock), Sioux (Pine Ridge and Kyle combined) and Papago (Topawa) data. The results are shown in Table 6.

TABLE 6
CORRELATION COEFFICIENTS OF DRAW-A-MAN AND GRACE ARTHUR IQ'S

GROUP	<i>r</i>
Zuni	.10 ± .10
Hopi	.21 ± .07
Navaho (Shiprock)	.23 ± .09
Sioux	.33 ± .08
Papago (Topawa)	.64 ± .06

These coefficients are quite low, with the exception of that for Topawa. They are much lower than we should expect among white children. For the mid-west children the correlation coefficient of Cornell-Coxe IQ with Draw-a-Man IQ is $.63 \pm .05$. The correlation coefficient of Stanford-Binet IQ with Draw-a-Man is $.50 \pm .06$ for the mid-west group. Goodenough found an *r* of .75 between Stanford-Binet and Draw-a-Man IQ's for white children.

DISCUSSION OF RESULTS

We shall organize our discussion around the following topics:

1. A critique of the Draw-a-Man Test.
2. The superiority of boys over girls in most of the Indian groups.
3. The superiority of Indian over white children.

Is the Draw-a-Man Test a useful test of intelligence for Indian children of the tribes we have studied? We cannot answer this question with finality, for we lack data on an undeniably true criterion of intelligence for these children, such as their ability to make socially and personally satisfactory re-

sponses to the problems with which they are commonly confronted in their lives. Our answer must be indirect and somewhat unsatisfactory.

Many test experts believe that the Arthur is a better test of general intelligence than the Draw-a-Man because the former consists of a variety of types of performance, and the latter of but one type. If we should assume that the Arthur Performance Test is a good test of general intelligence for these children, we would infer from our data that the Draw-a-Man test is not a good test of general intelligence for any of our groups except possibly the Papago (Topawa) group, because the coefficients of correlation between Arthur and Draw-a-Man IQ's are low for all except the Papago (Topawa) group.

Following out this assumption, Goodenough's argument for the close relationship in young children between concept development as shown in drawing and *general* intelligence might be modified to suggest that concept development is *one aspect* of general intelligence. As such, it may or may not be closely related with other aspects of general intelligence. In this case the Draw-a-Man Test might be expected to measure this one aspect of intelligence. If so, this aspect—namely, concept development—appears to be more closely related to other aspects of intelligence in white American culture than in most of the Indian cultures which we have studied.

It might be supposed that to the extent that Indian children are living in organized groups which are successfully meeting the stern conditions imposed on them by the natural environment and by their own social organization, they would be stimulated to observe, take an active interest in and deal in a systematic, organized manner with the world of man and nature, and to

form unified concepts out of the flux of particulars observed through their senses. As a result, the children would develop the ability at an early age to form concepts of the detailed form and organization of the human body which are tested in the Draw-a-Man Test.

Dr. Laura Thompson has applied this hypothesis to the Hopi groups, as follows:³

One sex, (the boys) is stimulated to become aware of, take an active interest in and express through the medium of ritual dramas certain aspects of the world of nature (including man, animals, kachinas, the elements, etc.) while the other sex (girls) have interests increasingly narrowed with age to house, household tasks, etc. The life which the boys lead, and especially their economic and ceremonial responsibilities, forces them to become more observant and to express themselves aesthetically more than does the life of the girls. The ceremonial complex (especially at First Mesa, where it functions practically intact) provides channels of logico-aesthetic development and expression including the song, the dance, the prayer, graphic arts, and impersonation. On the other hand, the Hopi culture offers the girls less rich mental and emotional development and less creative outlet at the aesthetic level. At Oraibi this is mainly in the form of plaque-making, in which the medium limits the design development more than is the case at First Mesa where painted pottery is the main medium of aesthetic expression.

Drawing experience is probably one of the many interrelated factors which may be operating to produce the result revealed by the test. Concerning this point it should be noted that many of the Indian tribes whose culture and social organization have remained relatively intact in the face of intrusion of white American culture use drawing and painting as a part of the routine of life. Adults in every family do some drawing and painting. The child observes this and imitates his elders in

³ Private communication from Dr. Laura Thompson. For a full account of the lives of Hopi boys and girls, see (16).

the artistic activities which are appropriate to his sex. Furthermore, the Indian Service schools, in recent years, at least, have encouraged children to draw and paint by providing materials, allotting time, and rewarding the more successful ones with opportunities to study art in boarding schools and to sell their products.

We shall now sum up our hypothesis and then attempt to apply it in the interpretation of our results. The Draw-a-Man Test may be a useful test of one aspect of general intelligence, namely, the ability to form concepts based upon observation. The children of certain Indian tribes are especially stimulated to observe the external world accurately and to form concepts of natural objects, including the human body. Moreover, they are given plentiful opportunity and even encouraged or required to draw and paint these concepts.

How does this hypothesis account for the observed sex differences among the various tribes? The Pueblo boys and the Sioux were definitely superior to the girls. There was no difference between the sexes in the Navaho group. The girls were superior to the boys in the Papago (Topawa) group.

Superiority of the boys over the girls in the Hopi group has already been explained according to the hypothesis. Similar considerations apply in the Zuni and Zia pueblos. An anthropologist writes the following of the Zia pueblo:

From the time a boy can handle a pencil or a brush he is encouraged to draw and to paint. His subjects are usually animals, although cowboys riding or roping are likewise frequent subjects. Parents and siblings encourage the youngsters with admiration and criticism. Girls rarely draw pictures except in school, but by the time the children start school the boys are much more advanced in their ease of handling pencils and colors and even more in their ability to put their accurate observations of animal forms and movements onto paper. The pueblo expects

its boys to be able to paint animals upon the house walls at Christmas to encourage fertility, as well as to work later at painting the ceremonial masks, altars, and other ceremonial paraphernalia. Girls are expected to paint nothing but the conventionalized designs used on pottery. (9)

Some further information is given by the analysis of the free drawings of the children, which shows that the boys draw more animals and human figures than the girls, who draw more houses. Table 7 reports the relative frequencies of animal or human figures in the free drawings for the various tribes (11).

If we had only the results from the Pueblo groups, we should point out that the boys draw human and animal figures almost twice as often as girls, and we should suggest that in this fact lies part of the explanation of the boys' superiority over the girls in the Draw-a-Man Test. But the Navaho (Shiprock) boys also exceed the girls in the frequency of their human and animal drawings, yet they do not do better than the girls in the Draw-a-Man Test. And the Sioux boys and girls draw such figures equally often, yet the boys exceed the girls on the test. Consequently, the relative frequency of drawing human and animal figures under the conditions of our "free drawing" test cannot be taken as a strict correlate of performance on the Draw-a-Man Test.

Analysis of the free drawings of the Hopi children with respect to their treatment of space and their use of the medium was made by a university teacher of art. He found that

the boys draw with increasing assurance, as though they felt secure in what they are doing, whereas the girls seem to draw with increasing hesitation and uncertainty. The difference becomes more pronounced as they grow older.—The drawings indicate a generally superior ability of boys over girls. (12)

The superiority of Papago (Topawa) girls over boys in our data is probably

due to an accident in our sampling for the Draw-a-Man Test. In Table 2 it will be seen that in the group which took this test the girls exceeded the boys on the Arthur as well as this test. Yet in the larger Topawa group (aged 6 through 15) there was no significant sex difference on the Arthur test. Hence it would seem reasonable to suppose that the smaller group (aged 6 through 11) which took the Draw-a-Man Test was not a representative sample of Topawa children. This supposition is partially verified by the fact that the

but that one sex is not encouraged more than the other to practice drawing.⁴

The results of the testing in the other Papago (Hickiwan-GuVo) group do not throw much light on the question.⁵ The number of cases was small, and a considerable proportion of the children did not attend school and were not tested. Hence we cannot be sure that we have a representative sample from this group.

Our hypothesis may be applied to the Sioux as follows: As a part of their adaptation to a hunting and fighting

TABLE 7

SEX DIFFERENCES IN RELATIVE FREQUENCIES OF ANIMAL OR HUMAN FIGURES IN FREE DRAWINGS
(Percentage frequencies of animal or human figures, ages 5-18)

GROUP	ORAI BI	FIRST MESA	TOPAWA	HICKIWAN-GUVO	ZIA	ZUNI	KYLE	PINE RIDGE	SHIPROCK
Boys	13	31	14	18	44	28	12	19	25
Girls	8	19	11	19	31	16	15	17	13

four girls aged 6-11 who took the Arthur but not the Draw-a-Man Test averaged 87 on the Arthur test, while the five boys who took the Arthur but not the Draw-a-Man Test averaged 99 on the Arthur test. If these children had all taken the Draw-a-Man Test, it seems probable that the sex difference in favor of the girls on the Draw-a-Man Test would have been somewhat reduced.

To find out whether there was anything in the life of Papago children that would favor one sex or the other on a test of this sort, we asked Mrs. Ruth Evelyn Jones, the teacher on the Papago Reservation who supervised the administration of the drawing test, to describe the typical experience of Papago children with drawing. She writes that there is the usual sex difference in the objects drawn by boys and girls in their free time in school,

way of life, the Sioux developed a tradition of scouting, which required keen systematic observation of details and memory of them in interrelationship, even though their significance was not immediately known. This tradition further included the putting-together of details into constructs, such as "so-and-

⁴ For a full account of the lives of Papago boys and girls, see (8).

⁵ One case of the Hickiwan-GuVo group was excluded in calculating the mean score because it deviated unusually far from the mean. This was a case of a boy aged six years and seven months who earned an IQ of 189 on the Draw-a-Man Test. On the Arthur test he was sixth in the group of 25, with an IQ of 104. His teacher, unaware of his superior standing on the Draw-a-Man Test, wrote the following about him, "J— is interested in none of his school work except drawing, which he does very well. It is very hard to get him to study. As soon as my back is turned, he starts drawing or coloring. Often I have to take his paper and pencil away to get him to do his work." As is customary in calculating the mean of a small number of scores, the extreme score of this boy was omitted in calculating the mean of his group.

so has been in this neighborhood recently," "a person with such-and-such personal appearance must have left these marks of his presence." This was part of the male tradition, and was handed from father to son. It is still in the male tradition for the Sioux, although the fighting and hunting life has dissolved. Dr. Macgregor (10), anthropologist working in the Sioux country, reports that keen observation and memory for details are striking characteristics of present-day Sioux, and that boys are encouraged by the men to train themselves in this way. Homburger (7), in his report on child-rearing among the Sioux, says that the little boys are encouraged to play hunting and cowboy games. These would keep alive this tradition.

Thus the superiority of Sioux boys over girls on the Draw-a-Man Test may be explained as due to training in the formation of concepts based upon observation. But the Kyle group, both boys and girls, are superior to the Pine Ridge group. How is this to be explained? Assuming that the Pine Ridge tests are a representative sample of the performance of Pine Ridge children, which has not been established, the following explanation seems possible: Kyle is a rural community, while Pine Ridge is the reservation headquarters and is much more influenced by white culture. The Sioux tradition is much stronger at Kyle. Furthermore, the children in the Kyle community, both boys and girls, are actively engaged in work with animals and with the land, and they roam the countryside more freely. These facts suggest that the Kyle group might be expected to be superior generally to the Pine Ridge group on a test of concept formation based on sense observation.

The lack of sex difference in the Navaho (Shiprock) tests is explained

by Dr. Dorothea Leighton as follows:⁶

It seems quite understandable that little or no sex difference appears on the Shiprock tests which are limited to children under 12 years. There are no art expectations of Navaho children of either sex, and little graphic art experience. Both sexes see ceremonial drypaintings, see their mothers weave designs in blankets, may see their fathers make silver jewelry. Few girls would be weaving designs by the age of 11 or 12, equally few boys taking any part in silverwork. At the same time, both sexes are accustomed to learning by observation, both have experience of being sent out to herd sheep, to take them to water, to find roaming horses. All of these items would tend to make Navaho children observant of details of nature, including probably human figures, but would give neither sex any special advantage as compared with the other.

The general superiority of the Indian children over white children on the Draw-a-Man Test is the final fact to be discussed in the light of our hypothesis. According to this hypothesis, the children of Indian tribes which have kept close touch with the world of nature and with their indigenous cultures are specially stimulated to observe accurately, to organize their observations and express them aesthetically, and thus they may be expected to do well on the Draw-a-Man Test. White children, and urban white children especially, may have much less chance to form concepts from first-hand observation, but must rely more upon books and words. Following this line of thought we should expect the Indian groups which have been most adapted to the white culture to test more nearly the same as white children. The Pine Ridge group of the Sioux is closest to the white culture, and does test closest to the white norms. The Kyle group of the Sioux are less affected by the

⁶Private communication from Dr. Leighton. For a full account of the Navaho and their children, see Clyde Kluckhohn and Dorothea Leighton (9).

white culture than are the Pine Ridge group, and they score higher on the test. However, this small bit of proof cannot be relied upon heavily, for the Pine Ridge group which we tested was small and may not have been a good sample.

The study made by Rohrer (13) tends to confirm our hypothesis. In his study, Indian and white children who attended the same public school in Oklahoma and lived in much the same way came out about equal and close to the white norms. On the other hand, the earlier studies of the performance of Indian children on the Draw-a-Man Test, reported by Goodenough (4) and by Telford (15), gave these children very low IQ's, and yet they were living on reservations, cut off pretty much from participation in white culture. To understand these earlier results we should probably need to know about the morale of the children, of their families, and of their school teachers, whether the children had grown up in their own homes or in boarding school, and what the school practices were with respect to drawing and painting in those days.

SUMMARY AND CONCLUSIONS

The Goodenough Draw-a-Man Test was given to 325 Indian children of the Sioux, Hopi, Zuni, Zia, Navaho, and Papago tribes in nine communities, in the age group 6 through 11. The subjects were selected so as to represent their communities, and the sampling procedure appears to have been satisfactory in at least five of the nine communities. The results show the Indian children to be superior to white children. Average IQ's range from 117 (Hopi, First Mesa) to 102 (Sioux, Pine Ridge). Boys do significantly better than girls in the Hopi, Zuni, Zia, and Sioux groups. Intelligence quotients

from the Arthur Performance Test were available for the same subjects. Correlation coefficients between Draw-a-Man and Arthur IQ's are low, except for the Papago (Topawa) group, where the correlation is about the same as that found in white groups. There is probably no change of Draw-a-Man IQ with age among the Indian children.

On the hypothesis that the Draw-a-Man Test is a valid test of one aspect of general intelligence, namely, the formation of concepts based upon observation, with the aid of information about the various cultures in which the Indian children grow up, we can give a reasonable explanation for most of our findings, including the superiority of boys over girls in several tribes, and the superiority of the Indian children we studied over white children. The Indian children, and especially the boys, are stimulated to take an active interest in the world of nature, and given much opportunity to form and express concepts of natural objects, including the human body, on the basis of their own observation. Hence they should be expected to do well on a test which relies mainly upon concepts formed from observation and reported by drawing, without any necessary use of language.

From this study we may conclude that:

1. Indian children from the tribes tested do better than white children on the Draw-a-Man Test.
2. Indian boys from Pueblo groups do better than girls on the Draw-a-Man Test.
3. The evidence points strongly to the conclusion that environment affects the performance of children on the Draw-a-Man Test.
4. The validity of the Draw-a-Man Test as a test of general intelligence for use with Indian children is not estab-

lished by this study. However, the hypothesis that the Draw-a-Man Test is valid for one aspect of general intelligence, the ability to form concepts based upon observation, is supported to some extent by cultural data on several of the Indian groups.

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