

THE COLOR PREFERENCES OF FIVE HUNDRED AND FIFTY-NINE FULL-BLOOD INDIANS

BY THOMAS R. GARTH

University of Texas

INTRODUCTION AND PROBLEM

One of the ways of looking for racial differences is to seek them in the field of æsthetics. We have objective facts of a more or less complex character in the art and music of isolated races that suggest just such differences.

In fact popular and a large body of scientific opinion seem to hold to the view that there are fundamental racial differences in æsthetics. Now if there are, *i.e.*, if they are really racial, they are *a priori* native. Being native they are to be regarded as the results of the inheritance factors carried by racial germ plasm.

We mean to say that just a difference, as found, does not mean a difference due to physiological heritage. The differences due to mere environment and circumstance, if these really be found, are not the differences sought.

It is the problem of this experiment, if possible, to find just racial differences, those due to physiological transmission. However in the attempted solution of the main problem other subsidiary problems arise, such for instance, as the influence of education.

Deeming it wise to avoid undertaking the solution of one of the more complex problems of racial æsthetics, we sought a very simple phase of the larger problem by confining our investigation to a study of racial differences in color preference.

It would seem best in an experiment which has for its task the determination of racial differences in color preference to break the problem into three parts:

1. To determine an order of preference for the colors used which might be said to obtain and to find preference values for the colors in the race studied.

2. To ascertain if the preferences, or orders, so determined could be said to be native or acquired for the group.
3. To find out if these preferences are peculiar to the particular race as compared with other races tested under similar circumstances and with the data treated in the same way as the race under consideration.

THE SUBJECTS OF THE EXPERIMENT

In the spring of 1921 the writer visited the United States Indian schools located at Chiloco, Oklahoma, and at Albuquerque, New Mexico, for the purpose of giving psychological tests to Indians. This expedition was financed through the courtesy of the Committee on Grants of the American Association for the Advancement of Science. Because it would seem that the element of education, a very important factor in the experiment, could be more nearly controlled, students in these schools were sought as subjects. In this comparisons with white subjects would be more nearly legitimate.

The group whose tendencies we wish to study here is one of full-blood Indians having the ancestry of Plains and Southeastern Indians and of Plateau Indians. Of the first of these there were 281 individuals and of the second 278.

For purposes of comparison as many Indians of mixed blood as were available, 174, and a group of 560 whites were tested with the same color material. The mixed bloods considered, were in fact, a mixture of white blood and Indian blood of the tribes represented in the full-blood group. Unfortunately the number of these mixed bloods is too small for the drawing of definite conclusions from any comparison with the full-blood Indians, and the white performance. As they performed the experiment, the mixed and full-blood Indians sat side-by-side in the school room and the experiments with the whites were administered under conditions as nearly the same as those for the Indians as was possible.

THE MATERIALS OF THE EXPERIMENT

As to the materials of the experiment they were seven color discs, of Milton Bradley Company's 'standard'

colored papers: Red, Orange, Yellow, Green, Blue, Violet, and White. All the colors are printed on what is called 'coated papers.' By 'standard' it is meant by the makers of the papers 'that particular color in the spectrum which is considered by authorities as the reddest red, the greenest green, the bluest blue,' etc. These discs were one-half inch in diameter and were mounted on white cards $1\frac{1}{2} \times \frac{3}{4}$ inches. In addition to the color discs there were record blanks on which each subject recorded name, sex, age, date, name of school, and, in case he was an Indian, his tribe with degree of Indian blood.

THE PROCEDURE

It was very clearly explained to the subjects that record blanks were to be passed to them and on these they were to give the desired information called for as to age, sex, etc. After this part of the procedure had been carried out they were next told that it was desired to find out just what colors they liked best of the ones to be found in the little envelopes about to be distributed. When these had been distributed, one to each subject, instructions were then given that each individual should throw out all the colors contained in his envelope, on the top of his desk. Then it was said that each individual should select the color out of the seven that he liked best and place it on the record blank opposite the '1'; the one he liked next best he should place just below it and opposite the '2' on the record blank; and the one he liked third best was to be placed under that and opposite the '3,' etc., and after all the colors had been arranged, which would of course make the one liked least of all come last and that would be opposite the '7,' they were to write the name of each color beside the color itself on the record blank before disturbing their orders of preference. Then it would be expected of them that they place the colors—all seven of them—back in the envelopes. But care was taken to see that each subject followed these instructions and also that there was no suggestion of any kind on the part of the experimenter or his assistants as to what the individual's color preference should be.

HANDLING OF THE DATA

The record blanks gave the information desired and the data so obtained were tabulated with due regard for classification with reference to race, sex and education.

In the full-blood Indian group there were of both sexes and all ages ranging from 11 to 21 years, as we have said, 559 cases. This makes a homogeneous group and is sufficiently large for our purposes. The question now is as to how we shall go about determining the order of preference for these colors which obtains in this large group of Indians. The tabulation referred to above which is the first draft of the material, by way of illustration, looks something like the following:

BOYS—FOURTH GRADE—RANKINGS GIVEN THE COLORS

Subject No.....	1	2	3	4	5	6	7	8	9	10	11	12, etc.
Age Yrs.....	11	11	12	12	12	12	13	13	13	13	13	14
Rank given:												
Red.....	1	1	2	1	2	5	3	1	6	3	2	2
Blue.....	3	3	1	2	3	1	1	2	3	1	1	1
Green.....	2	4	3	4	1	3	2	4	4	4	3	3
Purple.....	4	2	5	3	4	2	4	3	1	2	5	4
Orange.....	5	6	4	5	6	4	5	5	2	5	4	5
Yellow.....	6	5	6	6	5	7	6	7	5	7	6	6
White.....	7	7	7	7	7	6	7	6	7	6	6	7

In order to find out the order of preference existing in the data in this first tabulation and to bring same to light, we may do two things: (1) simply average the ranks given to any color, calculate the A.D. and P.E., find the median of the ranks, and having done this for all the colors proceed to arrange our colors according to the ranks of these averages and medians, determining the reliabilities of the differences according to the accepted formula for same; and (2) we may construct a scale of color preference for Indians such as Thorndike constructed for handwriting and Hillegas made for English composition. (See *Teachers College Record*, Vol. II., No. 2, and Vol. XIII., No. 4.)

Both of these methods have their advantages. The first

gives us a rough idea of the tendencies of the data and permits of the use of measures of overlapping which is a matter of importance here; the second will make possible the determination of the preferential value of any color under the experimental conditions and permits of a graphic representation of the relative positions which may be assigned to the several colors on a scale of preference.

THE COLOR PREFERENCE OF INDIANS

Availing ourselves of both methods, we begin with the first of them, as: Table I. gives the average and median

TABLE I

SHOWING CENTRAL TENDENCIES AND THEIR RANKS OF GROUP OF 559 FULL-BLOOD INDIANS IN JUDGING SEVEN COLORS

Ranks of	Ave.	A.D.	P.E.	Med.	Ave.	Med.	Per Cent. Attaining and Exceeding Median of Preceding Color
Red.....	2.5	1.04	.8	2.5	1	1	(Red) 67
Blue.....	3.02	1.4	1.1	3.3	2	2	(Blue) 62
Violet.....	3.6	1.7	1.4	8.9	3	3	(Violet) 64
Green.....	4.09	1.1	.8	4.7	4	4	(Green) 65
Orange.....	4.7	1.3	1.1	5.3	5	5	(Orange) 66
Yellow.....	5.2	1.2	.9	6.1	7	6	(Yellow) 52
White.....	4.9	1.8	1.5	6.5	6	6	

position assigned to the seven colors by the 559 full-blood Indian subjects as well as the sequence of the colors as indicated by the ranking of these. It gives also the overlapping, or measure of per cent. of judgments, of a color attaining and exceeding the median assigned to the color just preceding it. This latter figure indicates whether or not the several sequences as indicated by the respective medians are supported by a fact of difference between them, *i. e.*, as to whether or not they are representative and if not exactly representative whether or not they tend to be so. It will be seen that in this group of full-blood Indians the sequence of the preference for these colors is this, going from most preferred to least preferred: First, Red; Second, Blue; Third, Violet; Fourth, Green; Fifth, Orange; Sixth, Yellow and White. That is, the situation of White and Yellow is undetermined by this handling of the data. The sequence, shown in Table I,

tends to be representative where such a sequence is indicated, as tested by the overlapping, with a slight advantage for the Yellow over White; however this advantage is barely evident.

But this method fails to give us all the facts afforded by the data, for we want to know how much stronger as measured is the preference value of one color than another as reckoned from a common reference point. It is just here that this experiment claims to be different in method from other color preference experiments and experiments for determining the relative 'pulling power' of similar given stimuli. We do not feel that this is the place for a discussion of the relative merits of either method of procedure, but we recommend its use for the purpose of measuring the relative strengths of colors, 'selling points,' advertisements, and similar material.

A COLOR PREFERENCE SCALE

It may not be necessary to describe the derivation of a judgment scale such as that of Thorndike in his Handwriting Scale and that of Hillegas in his Scale for the Measurement of Quality in English Composition and the writer's Scale for Measuring Method of Study of College Students (see *Pedagogical Seminary*, Mar., 1920), but some account of the method of handling this particular mass of data for determining color preference of Indians may be more or less worth while. It was simply a matter of finding how many times out of 559 one color was placed above the other. Table II.

TABLE II

SHOWING NUMBER OF TIMES ONE COLOR WAS PREFERRED TO ANOTHER BY THE GROUP OF 559 FULL-BLOOD INDIANS

The table reads thus: White was preferred to White never, to Yellow 268 times, to Orange 243 times, etc., out of 559.

	White	Yellow	Orange	Green	Purple	Blue	Red
White.....	0	268	243	221	208	155	78
Yellow.....	291	0		147	143	113	79
Orange.....	316	361	0	224	183	128	97
Green.....	338	412	335	0	220	180	149
Purple.....	351	417	376	339	0	229	184
Blue.....	404	446	431	379	330	0	219
Red.....	481	480	462	410	375	340	0

shows this for all colors, as Red was preferred to Blue by 340 out of the 559 pure-blood Indians; Red was preferred to

Purple by 375 out of the 559, was preferred to Green by 410. Yellow was preferred to White by 291 out of the total 559. Since this last was only 53 per cent. of the time, it had practically little advantage over White. Table III. shows what per cent. of the subjects preferred any color above another.

TABLE III

NUMBERS OF TABLE II. EXPRESSED AS PERCENTAGES OF TOTAL JUDGMENTS

To be read: White was preferred to Yellow 47 per cent. of the time, to Orange 43 per cent. of the time, to Green 39 per cent. of the time, etc.

	White	Yellow	Orange	Green	Purple	Blue	Red
White.....	0	47	43	39	37	28	14
Yellow.....	53	0	35	26	25	20	15
Orange.....	56	64	0	40	33	23	17
Green.....	60	73	60	0	39	32	27
Purple.....	63	74	67	60	0	41	33
Blue.....	72	79	77	67	59	0	39
Red.....	86	85	82	73	67	61	0

The next step in deriving a scale of color preference is to take the facts of Table III. and arrange the seven colors in sequence running from least preferred to most preferred and having done this to transmute the necessary percentages into values of D/M.D. by using the table given on pages 24 and 25 of Hillegas' 'A Scale for Measurement of Quality in English Composition' which was derived from a table found in Thorndike's 'Mental and Social Measurements,' page 228.

The reason for using White at all was with the expectation that, since it is achromatic, it would prove to be a zero point in color preference. But it did not serve the purpose of an absolute zero point, so we took it as an *arbitrary* zero point, and upon that constructed our scale. The differences as expressed in terms of Difference divided by Median Deviation for the several colors are these:

Color	Color	Per Cent. of the Time	D/M.D.
Red	preferred to Red	0	—
Blue	" " Red	39	.41
Violet	" " Blue	41	.34
Green	" " Purple	39	.41
Orange	" " Green	38	.40
Yellow	" " Orange	35	.57
White	" " Yellow	47	.11

This gives the following scale values:

Color	Value
White.....	.00
Yellow.....	.10
Orange.....	.68
Green.....	1.08
Violet.....	1.49
Blue.....	1.83
Red.....	2.24

It will be seen that for this group of Indians, there are fairly definitely established preferences for the several colors which stand at almost equal distances on the scale. Violet has more than twice the value of Orange. Red is most preferred of all. It is twenty times as strong as Yellow, three times as strong as Orange, one and one half times as strong as Violet, and one and one fourth times as strong as Blue. Taking Yellow as a base, we have approximately these proportions:

Yellow	Orange	Green	Violet	Blue	Red
1	6	9	13	16	20

This sequence represents a series in arithmetical progression after leaving Yellow. These observations and all those following hold only for the data in hand. We do not know whether or not more data from individuals of such racial stocks as represented here would change the above sequence, however since the group is rather large, it seems to the experimenter probable that this would not change materially the results.

While the above scale gives the order of preference of the seven colors as obtained from the 559 full-blood Indians, the accompanying chart (Fig. 1) gives a graphical representation

A GRAPHIC REPRESENTATION OF COLOR PREFERENCE SCALES SHOWING POSITIONS ASSIGNED THE COLORS AS DETERMINED BY

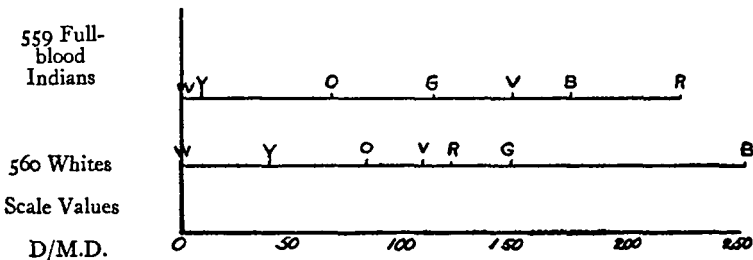


FIG. 1.

of this. In addition there is likewise a graphic representation for a group of white subjects similarly constructed. At the bottom of the chart the values of various points on a scale thus constructed are given. On the line above these we give the positions as derived for the colors on this scale for the group of 559 full-blood Indians.

So much for the sequence of the colors, the reliability of the differences between the members of the sequence and their relative values on a color preference scale for the full-blood Indians. The sequences as indicated tend to be real with the exception of the sequence: Yellow followed by White. The relative preferences of the colors are indicated on the scale.

THE INFLUENCE OF EDUCATION ON COLOR PREFERENCE IN INDIANS

The second problem which we wish to attack after finding a satisfactory sequence of color preferences for our original group of Indians, is stated in the question: Are the color preferences, here indicated, native or acquired? Unfortunately we are not able to go below the fourth grade in the matter of education with our subjects, for all of them had that much school training in the United States Indian schools. And since we cannot go below that in the present case, we shall have to grant that they possessed the nearest approach to native preference our data offers.

We shall, then, take the color preferences of these subjects as a basis of comparison with the color preferences of students of grades higher up. In order to make this study of the influence of education we have made a division of our 559 subjects on a basis of school grades which gives us five sub-groups, starting with the fourth grade, whose compositions are as follows:

Grade	Number
Fourth.....	113
Fifth.....	121
Sixth.....	117
Seventh.....	106
Eighth }	102
Ninth }	
Tenth }	
Total.....	559

The same measures found for the full bloods in the total group, were found for the educational subgroups into which we have divided it, *i.e.*, averages, medians, measures of overlapping. Table IV. contains an array of these measures and

TABLE IV

SHOWING CENTRAL TENDENCIES AND THEIR RANKS FOR SEVERAL GRADE SUBGROUPS OF FULL-BLOOD INDIANS

Fourth Grade—113 Judges

Color	Ave.	A.D.	P.E.	Med.	Ave.	Med.	Per Cent. Attaining and Exceeding Median of Preceding Color
Red.....	2.6	1.4	1.2	2.6	1	1	
Blue.....	3.1	1.1	.9	3.5	2	2	(Red) 73
Green.....	3.4	1.7	1.4	3.7	3	3	(Blue) 57
Violet.....	4.3	1.9	1.6	4.6	4	4	(Green) 64
Orange.....	4.8	1.1	.9	5.3	6	6	(Violet) 50
Yellow.....	4.5	1.3	1.0	5.3	5	5	(Orange) 66
White.....	4.0	1.3	1.1	6.0	7	7	(Yellow) 62

Fifth Grade—121 Judges

Red.....	2.2	1.0	.8	2.1	1	1	
Blue.....	3.1	1.3	1.0	3.1	2	2	(Red) 89
Violet.....	3.6	1.6	1.3	4.0	3	3	(Blue) 68
Green.....	4.2	1.6	1.3	4.9	4	4	(Violet) 63
Orange.....	4.3	1.3	1.0	5.2	5	5	(Green) 59
Yellow.....	4.4	.8	.7	6.2	6	7	(White) 57
White.....	4.8	1.8	1.5	6.1	7	6	(Yellow) 49

Sixth Grade—117 Judges

Red.....	2.1	.9	.7	2.1	1	1	
Blue.....	3.1	1.7	1.4	2.8	2	2	(Red) 79
Violet.....	3.5	1.5	1.2	4.1	3	3	(Blue) 72
Green.....	4.4	1.1	.9	5.1	4	4	(Violet) 71
Orange.....	4.7	1.4	1.1	5.3	5	5	(Green) 58
Yellow.....	5.4	1.0	.8	6.2	7	7	(Orange) 51
White.....	4.8	1.8	1.5	6.1	6	6	(Yellow) 48

Seventh Grade—106 Judges

Red.....	2.4	1.2	.9	2.5	1	1	
Blue.....	3.2	1.3	1.1	3.6	2	2	(Red) 75
Violet.....	3.4	1.6	1.3	3.8	3	3	(Blue) 55
Green.....	4.4	1.2	1.0	5.1	4	4	(Violet) 77
Orange.....	4.5	1.3	1.1	5.5	5	5	(Green) 63
Yellow.....	5.2	1.2	.9	6.1	7	6	(Orange) 63
White.....	4.3	1.8	1.5	6.1	6	6	(Yellow) 50

Eighth, Ninth, and Tenth Grades—102 Judges

Red.....	2.1	1.3	1.1	3.1	1	1	
Blue.....	2.8	1.3	1.1	3.1	2	1	(Red) 50
Violet.....	3.2	1.5	1.2	3.5	3	2	(Blue) 58
Green.....	3.9	1.5	1.2	4.4	4	3	(Violet) 66
Orange.....	4.5	1.2	.9	5.2	5	4	(Green) 73
Yellow.....	5.6	1.1	.9	6.5	7	5	(Orange) 76
White.....	4.9	1.7	1.4	6.5	6	5	(Yellow) 50

the orders of sequence of the colors for each educational subgroup.

While the sequences are not exactly the same, there is very little change in that respect as we proceed from the fourth grade sequence of color preference to the highest school grade sequence.

In the fourth grade the sequence is Red, Blue, Green, Violet, Yellow, Orange, White. In the fifth grade almost the same sequence obtains for averages and medians excepting for the Green and the last three colors, in which the results for averages and medians do not coincide for Yellow and White. While they do in the next higher grade, the sixth, where Yellow goes to the lower end of the scale, they do not in the seventh grade sequence. This contest between Yellow and White may be seen ending up in the highest educational group with White and Yellow about even, but Green never recovers its lost prestige. Red is always in the ascendancy excepting in this last group where the median shows Blue occupying the same rank with it. It should be noted that the measures of overlapping are usually sixty per cent. and above. The table will indicate the cases in which this measure is or is not approaching significance. The conclusion to be reached here is that education from the fourth grade up has very slight effect on the sequence of color preferences of full-blood Indians as indicated by this method of handling the data, though it is true that Blue and Violet tend to move up toward the position given Red—*i.e.*, first place; and White tends to displace Yellow in a few instances.

In order to determine the reliability of the differences in color preference, if any is to be found in moving up the grades, measures of overlapping of the distribution of each grade were obtained on the Fourth Grade distribution as a base. This is shown in Table V. If there is any difference its tendency may be thus measured. As for instance, the facts of this table bear us out in saying that Red experiences no change throughout the grades until we reach the last grade group—that of 8th, 9th, and 10th grades, where the overlapping on the fourth grade is significant. The overlapping is sig-

nificant again in 6th grade for Blue where that color's ranking was better than was the same color's ranking in the 4th grade—*i.e.*, was more preferred. But the overlapping for

TABLE V

SHOWING OVERLAPPING OF SUCCESSIVE SCHOOL-GRADE DISTRIBUTIONS ON THAT OF FOURTH GRADES FOR EACH COLOR FOR FULL-BLOOD INDIANS

	Fourth Grade Medians	Overlapping for 4th Grade on			
		Fifth Grade	Sixth Grade	Seventh Grade	8th-10th Grades
Red.....	2.6	45%	44%	50%	63%
Blue.....	3.5	49	36	56	54
Violet.....	4.6	42	45	37	31
Green.....	3.4	70	79	79	63
Orange.....	5.3	49	54	59	51
Yellow.....	5.3	72	73	68	74
White.....	6.0	52	52	54	51

TABLE Va

SHOWING AGES OF FULL-BLOOD INDIANS FOR EACH EDUCATIONAL SUBGROUP

	Fourth Grade	Fifth Grade	Sixth Grade	Seventh Grade	8th-10th Grades
Ave.....	14.5 yrs.	15.4 yrs.	16.2 yrs.	17.7 yrs.	18.5 yrs.
A.D.....	2.4	1.6	1.5	1.7	1.8
P.E.....	2.0	1.3	1.2	1.2	1.4

that color is not significant elsewhere, not even in the highest grades. The situation with respect to Violet and Green reveals this, that the overlapping for Violet becomes significant (see table) in the 7th grade and increases in significance in the highest grade and that Green shows significant differences in the grades above the 4th, but it is not of a constantly increasing significance. This is likewise true of Yellow. In all, these measures of overlapping indicate that no great change of an increasing nature is brought about in color preference by education except in the case of Violet and Red. Violet increases and Red loses in preference.

COLOR PREFERENCE SCALES FOR EDUCATIONAL SUBGROUPS

As in the case of the group of 559 proper we have derived separate scales for the educational subgroups for the purpose

of comparison of 'pull' of colors in the grades. These scales and their graphic representation are given here in Table VI.

TABLE VI
COLOR PREFERENCE SCALES FOR EDUCATIONAL SUBGROUPS—
FULL-BLOOD INDIAN CHILDREN

<i>Fourth Grade</i>		<i>Fifth Grade</i>		<i>Sixth Grade</i>	
Color	Scale Value	Color	Scale Value	Color	Scale Value
White.....	.00	White.....	.04	White.....	.07
Yellow.....	.41	Yellow.....	.00	Yellow.....	.00
Orange.....	.48	Orange.....	.23	Orange.....	.29
Violet.....	.67	Green.....	.57	Green.....	.51
Green.....	1.05	Violet.....	.95	Violet.....	1.25
Blue.....	1.31	Blue.....	1.36	Blue.....	1.90
Red.....	1.84	Red.....	2.01	Red.....	2.35

<i>Seventh Grade</i>		<i>Eighth, Ninth, and Tenth Grades</i>	
Color	Scale Value	Color	Scale Value
White.....	.00	White.....	.00
Yellow.....	.11	Yellow.....	.26
Orange.....	.52	Orange.....	1.26
Green.....	.59	Green.....	1.60
Violet.....	1.37	Violet.....	2.09
Blue.....	1.44	Red.....	2.39
Red.....	1.88	Blue.....	2.46

and Fig. 2 (which gives the graphic representation of similarly treated white groups each of about the same size as these Indian groups). The scales only and not the tables from which they were derived are given here for the sake of economizing space.

As we derived these scales for the grade groups, five in number, for fourth, fifth, sixth, seventh grades, each a scale, and one scale for eighth, ninth, and tenth grades combined in one, we discovered that our original arbitrary zero point, the achromatic White, which served very well in the large scale for full bloods had shifted very slightly in two of the educational subgroups, *i.e.*, in the fifth and sixth grades. That is to say, White was preferred to Yellow in both of these educational groups, but it found its place below the Yellow again in the last two of the educational subgroups, the seventh and the 8th-9th-10th grade subgroups. We cannot account for this and do not wish to speculate to any extent on its significance. If it has any significance in being preferred to Yellow, in these two instances that significance is

very slight, and this may lie in the fact that the contest of Yellow with the other chromatic samples was so great that it overshadowed the contest of these with just no color, White. It will be observed that Red maintains its position as most preferred in all the educational subgroups until we

A GRAPHIC REPRESENTATION OF COLOR PREFERENCE SCALES SHOWING POSITIONS OF COLORS FOR VARIOUS EDUCATIONAL GROUPS OF WHITES AND FULL-BLOOD INDIANS

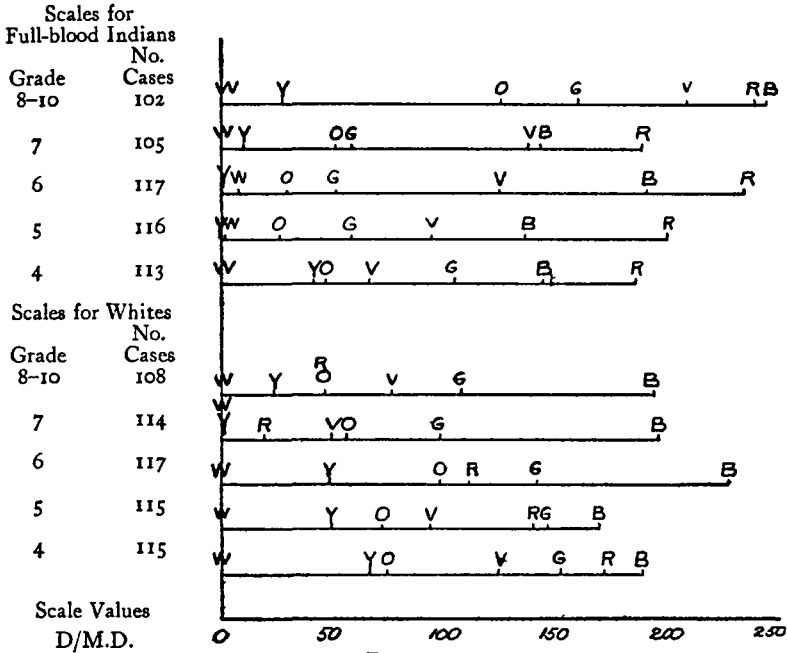


FIG. 2.

come to the most educated subgroup where it barely succumbs to a slight preference for Blue, when we examine the chart and the accompanying scales for each grade subgroup.

Red starts in the fourth grade subgroup with four times the preference given to Yellow and shows nearly nine times that of Yellow in the last two most educated subgroups. In its contest with Violet, it loses some of its 'pull' over that color, starting with three times and ending up with one and one tenth times the 'pull' it had over that color. It starts with a 'pull' equal to one and one half times that of Blue and is slightly inferior in 'pull' to it in the most educated group.

Since the factor of age has been to a certain extent controlled along with education (See Table Va.) no detailed study of that factor will be made here. On the average age increases with education.

SEX DIFFERENCES IN COLOR PREFERENCE AMONG THE INDIANS

A question arises as to what influence sex has on the color preferences of the full-blood Indians. An examination of the literature shows that no striking sex differences obtain for whites. Jastrow found a masculine tendency to prefer Blue for first place and Red for second, and a feminine tendency to place Red first and Blue second (2, 3).

In order to answer the question as to whether there is a sex difference among the subjects representing full-blood Indians we have separated our 291 males from our 268 females and found for the two sex groups the facts as represented in Tables VII. and VIII., which give the sequences of averages

TABLE VII
SHOWING CENTRAL TENDENCIES AND SEQUENCES OF POSITIONS ASSIGNED TO THE
COLORS BY MALES AND FEMALES OF FULL-BLOOD INDIANS

I. For Males, 291 Cases

Color	Ave.	A.D.	P.E.	Med.	Rank of:		Per Cent. Attaining and Exceeding Median of Preceding Color
					Ave.	Med.	
Red.....	2.4	1.7	1.3	2.5	1	1	
Blue.....	3.4	.9	.7	3.3	2	2	(Red) 79
Violet.....	3.5	1.8	1.4	3.8	3	3	(Blue) 58
Green.....	8.9	1.6	1.3	4.5	4	4	(Violet) 61
Orange.....	4.5	1.0	.8	5.2	5	5	(Green) 67
Yellow.....	5.0	1.1	.9	5.8	6	6	(Orange) 64
White.....	5.0	2.0	1.6	6.3	6	7	(Yellow) 59

II. For Females, 268 Cases

Red.....	2.4	1.2	.9	2.3	1	1	
Blue.....	2.6	1.3	1.0	2.7	2	2	(Red) 62
Violet.....	3.6	1.3	1.0	4.1	3	3	(Blue) 77
Green.....	4.3	1.2	.9	5.0	4	4	(Violet) 69
White.....	4.6	2.0	1.6	5.4	5	5	(Green) 59
Orange.....	4.8	1.1	.9	5.4	6	5	(Green) 62
Yellow.....	5.5	1.3	1.0	6.5	7	6	(Orange) 70

and medians and the overlapping of one color distribution over the preceding one in the sequence. Also we have derived color-preference scales for the sex groups which accompany these tables. As to the sequences, they are more or less definite for the sex groups and are practically the same for the males and females with this exception, that the females place White above Yellow and equal in 'pull' to Orange, the males placing it last. The experimenter thinks he can account in part for this high rating of White on the part of the females by the fact of recency, since at the time the experiment was administered the older female students were preparing for graduation and he was warned of this fact by the teacher of domestic science in one of the schools. For that reason it is only in all probability a temporary tendency which spread from the older students down the grades. This is supported by the fact that the lower grade students tend to place White lower in the scale than do the older students of this sex.

TABLE VIII

SHOWING OVERLAPPING OF POSITIONS ASSIGNED BY MALES ON FEMALE DISTRIBUTION
Per Cent. of Male Judgments Attaining and Exceeding Median of Female Median Position for Each Color

Red.....	52
Blue.....	76
Violet.....	48
Green.....	41
Orange.....	49
Yellow.....	37
White.....	61

TABLE VIIIa

SCALE VALUES FOR MALE AND FEMALE INDIAN COLOR PREFERENCE

<i>Males (291)</i>		<i>Females (265)</i>	
Color	Scale Value	Color	Scale Value
White.....	.00	Yellow.....	.00
Yellow.....	.45	White, Orange.....	.74
Orange.....	.86	Green.....	1.05
Green.....	1.24	Violet.....	1.62
Violet.....	1.43	Blue.....	2.36
Blue.....	1.47	Red.....	2.56
Red.....	2.67		

An examination of the facts of Table VIII shows a tendency for the males to place Blue lower than females, and Yellow higher and White lower, since the overlapping for the

first is 76 per cent. and for the last two colors is respectively 37 per cent. and 61 per cent. However this difference with respect to the first color, Blue, does not alter the sequence in that instance. It merely indicates that the females esteem Blue more highly than do the males, but not to the extent of placing it above Red. An examination of the two color preference scales for the two sexes bears us out in this statement for if we should eliminate White from the males' scale entirely the scale value for Blue would be 1.02 and examination of the females' scale shows that Blue has a preference value of 2.36. The two scales for the sexes show other interesting features as Orange has nearly twice the scale value (eliminating White from the scale) for the females as it has for the males and under the same conditions rather less value with the males than it has for the females as have all the colors. Still these sex differences do not alter the race sequences of the color preferences, we believe.

RACIAL DIFFERENCES IN COLOR PREFERENCE

In order to answer the third question as to whether or not these full-blood Indians differ from mixed bloods and whites in their color preferences, we shall compare *first*, tendencies of the racial groups and their differences, and, *second*, the color preference scales for these groups. Only in the case of the whites shall we study the influence of education on these representatives of that race, and bring the facts so derived to bear on the array of facts obtained in the previous study of the influence of education on the Indians. This will not be possible in the case of the mixed bloods because of the fact, noted above, of the inadequacy of the number of individuals in this group.

Tables IX. and X. show the averages and medians of the positions assigned to the colors by the group of 174 mixed bloods and by the group of 560 whites as well as the ranks of these averages and medians: Table XI. shows the white group broken up into educational subgroups corresponding to those of the full bloods.

An examination of these various measures will show for

TABLE IX

SHOWING CENTRAL TENDENCIES AND THEIR RANKS OF GROUP OF 174 MIXED-BLOOD INDIANS IN JUDGING COLORS

Color	Ave.	A.D.	P.E.	Med.	Ave.	Med.	Per Cent. Attaining and Exceeding Median of Preceding Color
Red.....	2.7	1.0	.5	3.01	2	2	(Blue) 56
Blue.....	2.6	1.2	.6	2.8	1	1	(Red) 62
Violet.....	3.6	1.6	.8	4.2	3	3	(White) 66 or
Green.....	4.4	1.4	.6	4.9	5	4	(Violet) 66
Orange.....	5.1	1.0	.5	5.7	6	5	(Green) 72
Yellow.....	5.3	1.3	.6	6.2	7	6	(Orange) 62
White.....	4.1	1.7	.7	4.2	4	3	(Violet) 50

TABLE X

SHOWING CENTRAL TENDENCIES AND THEIR RANKS OF GROUP OF 560 WHITES IN JUDGING COLORS

Color	Ave.	A.D.	P.E.	Med.	Ave.	Med.	Per Cent. Attaining and Exceeding Median of Preceding Color
Blue.....	2.2	1.1	.9	2.2	1	1	(Blue) 83
Green.....	3.4	1.3	1.0	3.8	2	2	(Green) 51
Red.....	3.8	1.7	1.4	4.2	3	3	(Red) 60
Violet.....	3.9	1.2	.9	4.6	4	4	(Violet) 61
Orange.....	4.4	1.2	1.0	5.1	5	5	(Orange) 61
Yellow.....	4.7	1.3	1.0	5.6	6	6	(Yellow) 60
White.....	4.9	1.7	1.5	6.3	7	7	

the mixed bloods and for whites, sequences different from that of full bloods, as:

	Rank						
	1	2	3	4	5	6	7
Full Bloods.....	Red	Blue	Violet	Green	Orange	Yellow	White
Mixed Bloods.....	Blue	Red	Violet	White	Green	Orange	Yellow
Whites.....	Blue	Green	Red	Violet	Orange	Yellow	White

Blue and Red are scarcely different for mixed bloods and in the case of whites, Red and Green are so nearly alike that any discrimination will be more or less arbitrary. The reliability of the several sequences as representing real differences may be observed by examining the above designated tables.

It will be necessary now to measure the overlapping of the positions on the scale assigned to the colors by the different racial groups. (See Table XI.)

TABLE XI

A. SHOWING THE OVERLAPPING OF FULL-BLOOD INDIANS ON MIXED BLOOD AND WHITE MEDIANS FOR POSITIONS OF EACH COLOR

Color	Per Cent. of Full-blood Judgments Attaining Median Position Assigned by:	
	174 Mixed Bloods	560 Whites
Red.....	39	23
Blue.....	63	83
Violet.....	47	41
Green.....	48	66
Orange.....	43	59
Yellow.....	51	58
White.....	68	51
Range.....	39-68	23-83

B. SHOWING THE OVERLAPPING OF FULL-BLOOD INDIANS ON MEDIAN OF WHITES FOR EACH GRADE GROUP

	Per Cent. of Full-blood Indian Judgments Attaining and Exceeding Medians for Positions of Each Color:				
	Fourth Grade	Fifth Grade	Sixth Grade	Seventh Grade	8th-10th Grades
Red.....	38	26	14	12	11
Blue.....	74	76	71	79	56
Violet.....	51	40	35	21	33
Green.....	43	63	77	72	67
Orange.....	64	51	29	63	59
Yellow.....	50	69	62	61	67
White.....	34	43	48	54	50

Now if the measures of overlapping of full bloods over whites and mixed bloods may be taken as indicating tendencies toward real differences in the groups, we may say that these comparisons of the blood groups show that for each color there is more tendency toward real difference in color preference between full bloods and whites than between full bloods and mixed bloods because the measures of overlapping are on the whole more significant for full bloods on the white than on the mixed-blood distribution. The overlapping in the former case runs from 23 per cent., in the case of Red, to 83 per cent., in the case of Blue, and is smallest in the case of White, 51 per cent. That is, the differences in preference for Red and Blue are real for the groups—full

bloods and whites—and are very much alike for White, Violet, and Yellow. As to the overlapping of full blood on mixed-blood distribution, this runs from 39 per cent. in the case of Red to 68 per cent. in the case of White, with that of Blue 63 per cent. There is more tendency to difference in the case of White than in the case of Blue and Violet, here.

COLOR PREFERENCE SCALES FOR WHITES AND MIXED BLOODS

So much for the determination of indicated racial group differences, but we believe that insofar as the comparison of white and full-blood Indian color preference is concerned, it will be more definitely represented by a comparison of the color preference scales. In the case of the mixed-blood scale, such comparisons are not nearly so legitimate, because of the disparity of the number of subjects, here only 174 in the mixed-blood group, while there are 560 whites and 559 full bloods.

Color preference scales for the 174 mixed bloods and the 560 whites were constructed in the same way that such scales were made for the full-blood Indians. These are given below. Figure 1 affords a graphic representation of the white scale along with that of the full-blood scale, and Figure 2 gives this for the mixed-blood scale. These comparisons are permissible: The white subjects gave to Yellow four times the

COLOR PREFERENCE SCALE FOR WHITES—560 JUDGES

Color	Scale Value
White.....	.00
Yellow.....	.41
Orange.....	.82
Violet.....	1.08
Red.....	1.23
Green.....	1.49
Blue.....	2.49

COLOR PREFERENCE SCALE FOR MIXED-BLOOD INDIANS—174 JUDGES

Color	Scale Value
Yellow.....	.00
Orange.....	.30
Green.....	.75
White.....	.94
Violet.....	1.01
Red.....	1.46
Blue.....	1.53

value given it by the Indians, reckoning from White as a point of reference. To Orange, they give about the same, according it only slightly more preference. Violet has more 'pull' for the Indians than it does for the whites, while Green 'pulls' harder on the latter than on the former, something like a third more, if we may express these relations in terms of scale positions. Further, Red is esteemed nearly twice as much by the Indians as by the whites, and Blue has something like three fifths of the value for them that it has for the whites.

Because of the smaller group, 174 judges, deriving the Mixed-blood Scale, we do not feel disposed to make very definite comparisons between it and those for the full bloods and whites. But if the scale as it stands had been derived by a group of judges of the same size as the other racial groups we could say, taking Yellow as a reference point in all scales, that the mixed bloods have somewhat less regard for Orange than the whites and much less than the full bloods. The 'pull' of Green, and the 'pull' of Orange stand in about the same ratio with them, that they do with the whites. This is likewise true of Blue and Orange. But they are more like the full bloods when the 'pulling powers' of Violet and Red are taken in relation to Orange. However, we only suggest by this what might be ascertained if the group of mixed bloods were equal in size to that of the other racial groups.

COMPARISON OF INFLUENCE OF EDUCATION ON WHITES AND INDIANS

We have not yet finished the discussion of racial differences in color preference, for the data affords other possibilities still. We have noted that the sequence of color preferences of full-blood Indians changes only slightly with education if we may take the groups as representative of full-blood Indians. Is this so with the whites? We have seen that the median positions assigned to the several colors by a race group differ in many points for the large groups of whites and Indians as measured by overlapping of Indian

distribution on the white distribution. Do these tendencies to differ exist in the educational subgroups? Or does education tend to eliminate these differences? We have observed the tendency for a few colors to change in relation to 'pulling power' as education increases with the full-blood Indians. How does this fall out for the whites? In fact, these, and many other questions may be asked in this connection.

Table XII. gives the central tendencies of positions assigned to the colors by the whites of various grade subgroups, their sequences and the tendencies toward real differences for the colors in a designated sequence. The tables show that Red tends to lose in preference value with education and Green to gain. This is not supported by the findings of some other investigations. See Winch (1). Green starts with third place in the fourth grade, and gains second place in the sixth grade, and maintains this position, while Red falls to fourth place, in this last educational subgroup, from that of second place in the first two grade subgroups. Otherwise there is practically little change in the sequence as found in going from one grade group to the other for the white judges. This is quite different in the case of the full bloods where Green instead of gaining fell away early in the grades and Red tended to remain first instead of falling as it did with the whites. Violet displaces Red for the whites in the most educated white subgroup, but, though it encroaches on it, it never displaces that color in the educational subgroups of full-blood Indians.

Table XIII. shows scales derived for the educational subgroups of whites. Fig. 3 offers a graphic representation of

A GRAPHIC REPRESENTATION OF COLOR PREFERENCE SCALE FOR 174 MIXED-BLOOD INDIANS

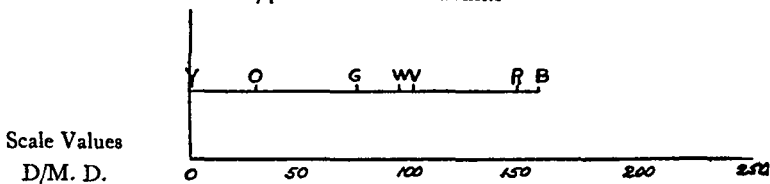


FIG. 3.

the same scales. As to the comparative effect of education

TABLE XII

SHOWING CENTRAL TENDENCIES AND THEIR RANKS FOR SEVERAL EDUCATIONAL
SUBGROUPS OF WHITES*Fourth Grade—115 Judges*

Color	Ave.	A.D.	P.E.	Med.	Ave.	Med.	Per Cent. Attaining and Exceeding Median of Preceding Color
Blue.....	2.8	1.1	1.0	2.5	1	1	
Green.....	3.6	1.4	1.1	4.0	3	3	(Red) 72
Red.....	3.3	1.8	1.4	3.2	2	2	(Blue) 65
Violet.....	4.0	1.5	1.2	4.5	4	4	(Green) 60
Orange.....	4.4	1.3	1.2	5.1	5	5	(Violet) 66
Yellow.....	4.6	1.4	1.2	5.4	6	6	(Orange) 60
White.....	5.5	1.6	1.4	6.1	7	7	(Yellow) 70

Fifth Grade—115 Judges

Blue.....	2.2	1.1	.9	2.3	1	1	
Green.....	3.54	1.4	1.2	4.0	3	3	(Red) 59
Red.....	3.51	1.6	1.2	3.8	2	2	(Blue) 79
Violet.....	4.1	1.4	1.1	4.6	4	4	(Green) 64
Orange.....	4.6	1.4	1.1	5.3	5	5	(Violet) 66
Yellow.....	4.7	1.6	1.2	5.4	6	6	(Orange) 62
White.....	5.3	1.6	1.2	6.7	7	7	(Yellow) 66

Sixth Grade—117 Judges

Blue.....	1.9	1.0	.8	2.0	1	1	
Green.....	3.5	1.9	1.5	3.8	2	2	(Blue) 89
Red.....	3.8	1.5	1.2	4.2	3	3	(Green) 59
Violet.....	4.1	1.4	1.2	4.6	4	4	(Red) 63
Orange.....	4.9	1.3	1.0	6.3	5	6	(Yellow) 45
Yellow.....	5.0	1.1	.9	5.9	6	5	(Violet) 77
White.....	4.9	1.3	1.0	6.3	5	6	(Yellow) 56

Seventh Grade—105 Judges

Blue.....	2.0	.9	.8	2.1	1	1	
Green.....	3.4	1.4	1.2	4.0	2	2	(Blue) 83
Red.....	4.3	1.7	1.4	4.9	4	3	(Green) 66
Violet.....	4.2	1.4	1.1	5.0	3	4	(Red) 51
Orange.....	4.3	1.3	1.0	4.9	4	3	(Green) 79
Yellow.....	4.8	1.4	1.0	5.7	6	5	(Violet) 50
White.....	4.5	1.7	1.5	5.8	5	6	(Yellow) 52

Eighth, Ninth, and Tenth Grades—108 Judges

Blue.....	2.1	1.1	.9	1.9	1	1	
Green.....	3.3	1.4	1.1	3.3	2	2	(Blue) 84
Red.....	4.3	1.6	1.2	4.9	4	4	(Violet) 57
Violet.....	3.9	1.4	1.1	4.5	3	3	(Green) 73
Orange.....	4.3	1.4	1.1	4.9	5	4	(Violet) 57
Yellow.....	4.9	1.3	1.0	5.9	6	5	(Red) 65
White.....	5.1	1.7	1.5	6.1	7	6	(Yellow) 65

on the relative 'pull' one color has over another in the two races we noted for the full-blood Indians that Red increases its 'pull' over Yellow, nearly doubling its effect with increase

TABLE XIII

COLOR PREFERENCE SCALES FOR EDUCATIONAL SUBGROUPS—560 WHITE CHILDREN

<i>Fourth Grade</i>		<i>Fifth Grade</i>		<i>Sixth Grade</i>	
Color	Scale Value	Color	Scale Value	Color	Scale Value
White.....	.00	White.....	.00	White.....	.00
Yellow.....	.65	Yellow.....	.53	Yellow.....	.49
Orange.....	.74	Orange.....	.72	Orange.....	.98
Violet.....	1.22	Violet.....	.94	Violet, Red.....	1.09
Green.....	1.52	Red.....	1.39	Green.....	1.39
Red.....	1.71	Green.....	1.44	Blue.....	2.39
Blue.....	1.90	Blue.....	1.71		

<i>Seventh Grade</i>		<i>8th, 9th, and 10th Grades</i>	
Color	Scale Value	Color	Scale Value
White, Yellow.....	.00	White.....	.00
Red.....	.19	Yellow.....	.22
Violet.....	.49	Red, Orange.....	.48
Orange.....	.56	Violet.....	.78
Green.....	.97	Green.....	1.08
Blue.....	1.97	Blue.....	1.94

of education for the subjects considered, but with the whites, Red loses in relative 'pull' over Yellow; as in the fourth grade it is nearly three times as strong as Yellow, but in the last grade subgroup it is twice as strong only. This is due to the fact that Red was a diminishing factor all along the above mentioned grade scales. The Red started with the whites with a 'pull' one and one half times that of Violet, and ends up with a little more than half the 'pull' of Violet. The fact is, Red always 'pulls' harder in the Indian Scale relatively, as compared with Violet, than it does in the white Scale. The situation of relative 'pull' of Red and Blue as influenced by education, thus indicated, is this for the two races: for Indians, in term of 'pull' for the lowest grade, Red is to Blue as 100 is to 71, but in the highest grade subgroup it is 100 to 102; and for whites, in lowest grades Red is to Blue as 100 is to 110 and for highest grade subgroup it is 100 to 404; that is Red lost 73 per cent., almost three fourths of its 'pull' here. An examination of the graphic representation of the scales will make plain these and similar relations. In

addition the scales indicate that as we go along up the educational scales, taking both tables and graphic representations as guides, the whites lose somewhat their appreciation of all colors but Blue, which seems to be very highly valued, being more so with the highly educated, but the full-blood Indians appear to experience no such 'repression' of color preference, on account of education (4).

THE QUESTION OF BACKGROUND

In the treatment of the data we have had nothing to say of the effect of background which of course has played its part and whatever has been said of a color's preference is to be taken of that color as on a White background. When we have said 'Red' we might have said 'Red-on-White,' etc. To have given the experiment with colors having no background would have been impractical as a field enterprise.

In justification of the use of the White background we note that Indians use much of it in decorative work, as in feather designs, bead-work, blankets, pottery, etc. These show Red, Green, Brown, Black, etc., on White. But we rarely see the White with absolutely no colorative design. The writer recalls an almost white Navajo blanket with a very few small red and black squares to rejoice the eye. Another blanket was immaculately white to begin with, but on this a representation of an Indian ceremonial of more or less sacred significance was decorated with a procession of human (Indian) figures garbed in bright red and green uniforms, and the whole was set off by a few other colors much less conspicuous. While for the Indians White may be esteemed as a background, the experimental results show that just blank background is not what the Indian, or the white individual, desires.

SUMMARY

1. There is for full-blood Indians a rather definite sequence of color preference for all the seven colors used in this experiment excepting Yellow and White, in which cases the preference for the former over the latter is not very conclusive. There is likewise a definite tendency for a preference sequence

of these seven colors for the whites, but the tendencies as determined for both races, by overlapping and scale positions are not so strong for them as for the full bloods. For the mixed bloods the sequence is even less secure as indicated by overlapping. For the three racial groups the sequences of the color preferences are:

	Rank						
	1	2	3	4	5	6	7
Full Bloods.....	Red	Blue	Violet	Green	Orange	Yellow	White
Mixed Bloods.....	Blue	Red	Violet	White	Green	Orange	Yellow
Whites.....	Blue	Green	Red	Violet	Orange	Yellow	White

From a statistical standpoint, as well as from the standpoint of judgment scales, the data indicates race differences in color preference, between full bloods and whites, and, by the test of overlapping, between the full bloods and the mixed bloods, but the differences are not so great for them as thus indicated.

2. Since the sequences of the colors are almost identical in all Indian educational subgroups, it may be said that this factor, education, has very little influence over the color preference with the Indian. In consequence we may say that for them their preference tendencies, on the whole, are stubbornly native.

3. Full-blood Indians are aware of more decided preferences, in general, than are the whites, in judging colors, if we abide by the objective results, disregarding the two exceptions, *i.e.*, the latter's high esteem for Blue and clear-cut discrimination between White and Yellow.

4. Among the Indians there are no outstanding differences between the sexes to the extent of altering the race differences. What slight tendencies there are for differences in this respect may be accounted for by the immediate influence of education.

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