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Color Preferences Related to the Personality Variables of N Intraception and N Achievement

Mary Anne Safely Kelbley
Loyola University Chicago

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by

Mary Anne Safely Kelbley

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VITA

Mary Anne Safely Kelbley was born in Cedar Rapids, Iowa, and attended public and parochial schools there until graduation from Immaculate Conception High School. She attended Marquette University and The University of Illinois, and received her BA degree in psychology from Coe College, Cedar Rapids, Iowa. She received her MA degree in Experimental Child Psychology from The University of Iowa. While completing work for her doctorate at Loyola University, she was employed by several marketing research companies and advertising agencies in Chicago. At present, she is doing free-lance work for a New York marketing research firm.

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CHAPTER I

Introduction

On a common sense level, it would seem that certain aspects of an individual's personality structure are reflected in his "taste" or aesthetic preference. Knapp has stated:

> The a priori case to be made for the proposition that aesthetic preference is an excellent index of temperament and personality is thoroughly convincing. Certainly aesthetic preference draws directly upon motivation and affect, taps many unconscious determinants, is directly involved in the operation of at least several defence mechanisms, and shows wide variation between and marked consistency within persons. The average layman, unencumbered by formal psychological theory, rightly feels that he may judge another with quick and intuitive confidence by observing his dress, his car, his home, and his wife, and by inferring from an evaluation of his 'taste' the psychological qualities behind them. (1958, p. 367)

The present investigation was an attempt to assess certain personality characteristics by means of an objective measure of aesthetic preference. Specifically, the study was concerned with the relationship between needs for Intraception and Achievement to certain color preferences.

The number of studies attempting to ascertain relationships between personality variables and color preference is small, and there is much to be desired by way of research before color preferences can be used as a practical method of personality evaluation. The findings to be reported in the present

chapter, however, provide sufficient positive evidence to warrant further exploration in the area.

Experimental verification of existing relationships between personality variables and color preferences would provide a diagnostic tool in personality evaluation having the following advantages over other instruments of psychological appraisal:

1. Economy in terms of time and money

2. Possible attention-holding advantages over other personality tests due to greater "intrinsic" interest in the test materials

3. Personality assessment without respondent knowledge of the purpose of the measure, thus minimizing deceptive responses or possible objection to the "personal" nature of personality test items.

High interest in the test materials together with a relatively short time of administration might make this method of personality evaluation particularly useful with individuals whose attention span is short, such as children and certain abnormal personalities.

Review of Literature Relating Color Preferences to Personality Characteristics

Investigations in which color preferences have been studied in relation to personality characteristics as measured by standardized personality tests have been conducted by Compton (1962), Barrett and Eaton (1947), Knapp (1958),

McClelland (1958), Van Eeckhoutte (1920), and Rakshit (1946).

Compton (1962) tested 145 university freshmen women majoring in home economics in terms of their preferences for tints, shades or saturated colors. Stimuli were five-inch by seven-inch plain weave cotton fabric swatches in a tint, shade and saturated hue of red, yellow, orange, blue, green and purple. Each of the three colors of a given hue was presented with each of the other two colors, for a total of 18 pair comparisons. A score of ten or more points or choices out of a possible twelve preference points for tint, shade or saturated hue was required for inclusion in one of these preference groups; furthermore, consistent preference had to be maintained as shown by retest reliability after a two-week interval. Analysis of variance showed that the preference groups did not differ significantly in terms of interest in the occupational fields of clothing merchandising, designing and textile testing (as measured by the Johnson Home Economics Interest Inventory) or in terms of the personality variables of dominance, self-acceptance, good impression, flexibility and femininity (as measured by the California Psychological Inventory). It was found, however, that students preferring deep shades and saturated hues scored significantly higher ($P < .01$) on sociability than those preferring tints. Individuals with high sociability scores are described in the California Psychological Inventory Manual as being outgoing, forward and sociable, while those with low scores are described as conventional, quiet, submissive,

detached and passive in attitude.

Barrett and Eaton (1947) had each of 114 female college students choose between a saturated color and a corresponding tint and shade for each of 18 Milton Bradley[1] colored papers. In addition, each S took a battery of personality tests. Since ten Ss had no definite preferences and only ten preferred shades, only the results from 45 Ss preferring tints and 49 Ss preferring saturated colors were analyzed. The percent occurrence of certain personality test responses was greater for individuals preferring saturated colors than for those preferring tints, as shown in Table 1.

The writers interpreted the findings of Table 1 as indicating that "individuals who prefer colors respond more directly and with greater interest to the objects and objective events of the external environment, while the persons who prefer tints view the external world from the point of view of subjective values and live more in their own thoughts." (p. 232) The writers believe that these two ways of "experiencing life" are closely related to Rorschach's concepts of introversiveness and extratensiveness. Specifically, Barrett and Eaton interpreted the results presented in Table 1 as follows:

> Those individuals who live more in their thoughts than in the external world might well make more responses when asked to indicate their associations to words than those individuals who are more accustomed to responding directly to external events. That these differences are due to a qualitative difference in responsiveness to the environment and not due to differences in general verbal aptitude was

[1] Commercial brand name

Table 1

Percent Occurrence of Certain Personality Test Results for Women Preferring Saturated Colors and Women Preferring Tints

Personality Test Result	Preference for Saturated Colors vs. Tints: Saturated Colors Preferred	Preference for Saturated Colors vs. Tints: Tints Preferred
Few free associations to words from Jung's word association list	83%	53%
High annoyance score on Adams and Lepley Personal Audit	45	18
Low morale score on Minnisota Personality Scale	76	50
Tendency to overestimate number of dots on cards	40	15
Slow in completing Cason Annoyance Test	86	64
Score toward masculine end of Terman and Miles Attitude-Interest Analysis Test	57	31
Belief that own emotions are usually or almost always recognized by behavior	74	55
Report of few changes of mind on social or economic issues	43	25

checked by comparing the linguistic scores (L-scores) for the two groups on the American Council on Education Psychological Examination. There were no significant differences in verbal ability for the color and tint groups as measured by the L-scores on this test. (p. 228)

Individuals who respond directly to objective situations should check many sources of irritation which are included in such a list (as the Personal Audit). Individuals who react in terms of subjective values may or may not be responsive to such situations, their emotional reactions depending more upon internal factors than upon external circumstances. (p. 228)

It is suggested that the subjects who respond directly to external events would have low morale scores in difficult and disturbing times (World War II; A-bomb). Those individuals preferring color in this experiment would be expected to have low morale scores, whatever kind of morale scores they might have under other circumstances. On the other hand, individuals whose equilibrium is determined by subjective values might be expected to respond less uniformly and directly to social catastrophies and, as a group, to show higher morale in difficult times than those individuals who respond objectively. (p. 229)

...(T)hose individuals who preferred color were more likely to score toward the masculine end of the (Terman-Miles) scale than were the subjects who preferred tints. Inasmuch as men reputedly respond more objectively and women more subjectively, such results would fit into the general interpretation which has been suggested. (p. 230)

The persons who preferred color tended to give a larger estimate of the number of dots on a piece of cardboard than did those subjects who preferred tints. While this difference may not suggest to the reader a difference between objective and subjective attitudes toward life, it does nevertheless fit into Rorschach's identification of some of the outstanding characteristics of the introversive and extratensive individuals....(The) introversive, which in this study is being identified with choice of tints, is more stable and more cautious while the extra-

tensive is more impulsive and lively. The low estimate of the number of dots may be illustrative of the greater cautiousness of the tint group. (p. 229)

The subjects who preferred color took a longer time to complete Cason's Annoyance Test, data which might be explained by the fact that as individuals who were unaccustomed to give subjective reactions, they would require a longer time to make decisions than the tint people, for whom such responses are habitual. That the difference in speed is not merely a difference in tempo of work is suggested by the fact that when asked to trace as rapidly as possible a path through a pencil and paper maze, the subjects who preferred color were fairly reliably faster, as a group, than the subjects who preferred tints. The color group would be expected to be faster when a direct, objective response is required, that being a kind of response to which they are accustomed. (p. 229)

...(T)hose subjects who preferred colors reported more often than did the tint people that they believed that their emotions were recognized by their friends and acquaintances. Responding objectively to external stimuli would ordinarily result in emotions being recognized and might thus account for these results. (p. 230)

It is a popular conception that subjective reactions are inconsistent. Whatever alternative explanations there may be, the fact is that the tint group, to whom subjectivity is being ascribed, reported themselves less consistent (than the color group) over a period of time in their attitudes on certain social and economic issues as measured in the Personal Audit. (p. 230)

In a study by Knapp (1958) the development of the "Tartan Test" of aesthetic preference is described and performance on this instrument related to the psychological variable n Achievement as measured by the standard, group-administered test devised by McClelland and his associates. Ss were 68 Wesleyan undergraduates, about equally divided between freshmen

(for whom n Achievement scores had been obtained six months earlier) and sophomores (for whom the scores had been obtained a year and a half earlier). Product moment correlations were established between n Achievement measures and preference rankings assigned to photographic reproductions, in color, of each of 30 Scottish tartans constituting the Tartan Test. The ten tartans yielding the highest positive correlations (ranging from .07 to .18), and the ten yielding the highest negative correlations (ranging from -.20 to -.07) were then singled out for further consideration. Although the order of the correlations was generally low, the predominant color (red or blue) differed markedly for the "positive" and the "negative" groups of tartans, as shown in Tables 2 and 3. Blue appears in a significant degree in seven of the ten "positives," and none of the "negatives;" red is the dominant color in seven of the "negatives" and only one of the "positives." The author concludes that preference for red is consistently associated with low n Achievement, while preference for blue is associated with high n Achievement.

Supporting evidence for Knapp's findings is provided by McClelland (1958). Using a method of scoring achievement motivation from expressive "doodles" or "scribbles," McClelland correlated the n Achievement scores of a group of five-year-olds with their choices of colored crayons in making their doodles. He found a correlation of .45 ($P < .05$) between n Achievement and preference for blue and green over red and yellow.

Table 2

Number of Tartans in Knapp's "Tartan Test" in Which Blue is "Present" and "Not Present," by Type of Relationship Between Group Preference for the Tartans and *n* Achievement

Type of Relationship Between Tartan Preference and *n* Achievement	Number of Tartans in Which Blue is "Present" and "Not Present"	
	Blue Present	Blue Not Present
Positive	7	3
Negative	0	10

Note: $X^2 = 7.50$ (with Yates Correction) $P < .01$

Table 3

Number of Tartans in Knapp's "Tartan Test" in Which Red is "Present" and "Not Present," by Type of Relationship Between Group Preference for the Tartans and n Achievement

Type of Relationship Between Tartan Preference and n Achievement	Number of Tartans in Which Red is "Present" and "Not Present"	
	Red Present	Red Not Present
Positive	1	9
Negative	7	3

Note: $X^2 = 5.20$ (with Yates Correction) $P < .03$

According to a summary of an investigation conducted by Van Eeckhoutte (1920), for 52 children of both sexes, ranging in age from 4 to 14 years, there was always a dominance of preferred and of "antagonistic" color, and these dominances corresponded to type of affective reaction as shown by the Rorschach test.

Rakshit (1946) classified East Indian adults (ages 20 to 45) into groups of 62 extroverts and 69 introverts on the basis of the Neymann-Kohlstedt New Diagnostic Test for Introversion-Extroversion. Ss were asked to arrange color stimuli (four and one-half centimeter square "cartons") in rank order of preference. Findings showed that extroverts generally preferred the darker over lighter green, yellow, violet and red, whereas introverts usually preferred the lighter over the darker colors.

Rather than using personality tests (as in the previously reviewed studies), Thomaschewski (1935) related color preferences to various personality traits as rated from teachers' observations. In the color preference test, more than 700 German school children, aged 4 to 16, were asked to select from 25 colors the five most liked and the three most disliked. Relations reported by Thomaschewski are presented in Table 4.

Norman and Scott (1952) have criticized Thomaschewski's study on the basis of the "subjective evaluation" of personality traits by teachers, the "variability" of the relationships, the overlap in semantic significance of the words used (for example,

Table 4

Judged Personality Traits of Children Found to be Related to Certain Color Choices

Color Choice	Personality Trait Found to be Related to Color Choices
Blue, black, violet	Calmness
White	Seriousness
Orange, red	Sociability
Black	Depression
Orange	Erotic tendency
Green, violet	Sensitivity
Strong red	Health, vigor, joyousness
Light blue (in young children)	Nervousness
Red tones (persistently chosen)	Feeble-mindedness or abnormality

"How does 'sensitivity' differ from 'nervousness'?"), and the great heterogeneity in age of Ss.

On the basis of a long list of references, Napoli (1951) reports that there is "repetitive" evidence in the form of clinical case records of a "definite affinity" between choice of colors for finger painting and certain emotional states and personality types. The following notes summarize Napoli's conclusions:

1. Blue is the dominant color used by males. Normal use by a male denoted masculinity, security, drive and sincerity. Abnormal (extreme) use denotes sadistic, impulsive and violent behavior. The addition of black to blue reflects a despondency state.

Excessive use of blue by a female shows a self-identification as the female complement. Exclusive use often indicates insincerity, schemingness, and rejection of the female's own sexuality.

2. Green is the secondary dominant color for males. Its use by males reflects individuals who are highly emotional but controlled in this emotionality, and also indicates a creative potential within the individual.

Use of green as the dominant color by a female shows a rejection of her sexuality and identification with the male.

3. Red is a dominant color for females. Use of red is normal for both sexes below the age of five or six, but use by a male above these ages indicates that he is overprotected,

may be under female domination, or has difficulty in psychosexual identification.

4. Yellow is another dominant female color. "Constructive" use by females usually shows good social values, and awareness and acceptance of men. "Perverted" use may indicate a deceptive, inadequate and misrepresenting female, or a flirt or coquette.

Use of yellow by normal males is judicious, and reflects his "proper values for the female." Excessive use indicates lack of development or failure in meeting life's situations as a man.

5. Black is used much more by males than by females, but no interpretation for this has been found. For both sexes, black is used as representing certain intellectual concepts. Excessive use had denoted evasion, fears, death, depression and unexplained emotionality.

6. Brown is used by a majority of both sexes to represent the negative aspects of everyday living.

7. Purple is often used by individuals of both sexes with good heterosexual relationships and adjustments. Excessive use can represent sincere and deep depression but with an optimistic outlook. Purple is often used by males with good leadership qualities.

8. Mud is obtained by mixing too many colors together without foresight or plan. It is used by individuals of both sexes who are destructive without remorse, who may be irrespon-

sible, or who are inadequate. It is also used by normal individuals who are adequate but not developed in skill and who are easily discouraged.

Evidence on Test-Retest Reliability of Color Preferences

Since the present investigation is concerned with the relationship between personality characteristics and color preferences, the degree to which the latter can be reliably measured, in terms of stability over time for individual Ss, is of interest. The following studies provide evidence for the consistency with which individuals judge colors on different occasions.

In an early study by Major (1895), 137 color stimuli were rated for affective value from five to sixteen times by three Ss, with a one-week interval between ratings. No quantitative measures of reliability are reported, but Major noted, for each individual, a "quite unexpected" constancy of judgment.

Wissler (1901) reports a study in which 28 Columbia freshmen judged seven colors in terms of "like" or "dislike." When the students re-judged the colors as seniors, 20 of them indicated color preferences identical to the preferences recorded in their freshman year.

In a study by Yokoyma (1921), four Ss made pair comparison judgments of the affective value of seven colors and repeated the procedure after about a five-month interval. The stability of the affective judgments over this period was

indicated by the percent agreement in rank orders of color preference for each of the Ss. Results are presented in Table 5.

Bradford (1913) retested individual rank order preference for 15 colors after a two-week interval and again after one year. Results are presented in Table 6.

In a study by Guilford (1939), 20 men rated 316 colors for affective value. Every S rated the colors twice, on two different days, so that the reliability coefficients of individual observers could be determined. These coefficients ranged from .62 to .81, with a median of .71.

In a study by Warner (1949) on the color preferences of psychiatric groups, each of 300 Ss was given four presentations of each of 30 color pairs. Warner measured the trial to trial consistency in preference judgments of individual Ss by computing the percent agreement in each of the 9,000 sets of four trials contained in the data. The average percent agreement was 81.5%--a figure which Warner reports is 59.8 times as large as the standard error of the theoretically expected percent agreement of 50%.

On the basis of the evidence presented in the preceding paragraphs, it is concluded that for the single observer who judges the same color at different times, the constancy of hedonic judgment is high.

Present Problem

The present Investigation was conducted to determine the relationships, if any, between (a) the need for

Table 5

Percent Agreement for Individual Subjects Between Original Rank Order of Preference for Seven Colors, and Rank Order of Preference Determined After a Five-Month Interval

Subject Number	Percent Agreement Between Original Rank Order of Colors and Rank Order After a Five-Month Interval
1	64.3%
2	90.5
3	100.0
4	92.9

Table 6

Rank Order Coefficients of Correlation Determined for Individual Subjects Between Original Preference Orders of Fifteen Colors and Preference Orders Determined After Intervals of Two Weeks and One Year

	Rank Order Correlations Between Original Color Preference Rankings and Rankings After Intervals of Two Weeks and One Year	
Subject Number	Two Week Interval	One Year Interval
1	.81	
2	.94	.87
3	.94	.81

Intraception and preference for tints vs. saturated colors, and (b) the need for Achievement and preference for blue vs. red. The need for Intraception (n Int) and the need for Achievement (n Ach) were measured by the Edwards Personal Preference Schedule (EPPS). Manifest needs associated with the Intraception and Achievement variables of the EPPS are as follows:

> n Int: To analyze one's motives and feelings, to observe others, to understand how others feel about problems, to put one's self in another's place, to judge people by why they do things rather than by what they do, to analyze the behavior of others, to predict how others will act. (EPPS, 1959, p. 11)

> n Ach: To do one's best, to be successful, to accomplish tasks requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to be able to do things better than others, to write a great novel or play. (EPPS, 1959, p. 11)

A relationship between n Int and preference for tints vs. saturated colors was postulated on the basis of the work of Compton (1962), Rakshit (1946), and Barrett and Eaton (1947) which has been reviewed in detail in previous pages. Briefly, the relevant findings and interpretations are as follows:

1. Compton (1962) found that women preferring saturated colors scored significantly higher in "sociability" than those preferring tints.

2. Rakshit (1946) found that introverts tended to prefer lighter over darker colors, while for extroverts the reverse was true.

3. Barrett and Eaton (1947) found that the percent occurrence of certain personality test responses differentiated between college women preferring saturated colors and those preferring tints. According to the writers' interpretations of the results, persons who prefer saturated colors respond "objectively" to the environment, whereas persons preferring tints respond "subjectively."

The qualities of "sociability," "extroversion," and "objective" mode of responding to the environment, as opposed to "low sociability," "introversion," and "subjective" mode of responding to the environment would appear to be related to low and high needs for Intraception respectively.

A relationship between n Ach and preference for blue vs. red was postulated on the basis of studies by Knapp (1958) and McClelland (1958), reviewed in detail in previous pages. Briefly, the findings of these researchers were:

1. In a color test using Scottish tartans, Knapp (1958) found that preference for red was associated with low n Ach, while preference for blue was associated with high n Ach of college Ss.

2. Using five-year-old children as Ss, McClelland (1958) found a significant positive correlation between n Ach and preference for blue and green over red and yellow.

It may be assumed that n Ach as measured by Knapp and McClelland bears a relationship to achievement motivation as measured by the EPPS.

Specifically, the purpose of the present research was to test the following hypotheses:

1. Ss with high n Int will prefer tints over saturated colors.

2. Ss with low n Int will prefer saturated colors over tints.

3. Ss with high n Ach will prefer blue to red.

4. Ss with low n Ach will prefer red to blue.

CHAPTER II

Method

Materials

Color Preference Questionnaire. A color preference questionnaire is presented on the following page. Colors were fully saturated blue, red, green, violet, orange and yellow and a corresponding lighter tint of each of these hues. Color stimuli (one-inch by one and one-half-inch color chips cut from papers manufactured by the Craftint Company) were presented to Ss in four different sequences which were selected at random, with the following qualifications:

1. Each color appeared twice in the right- and twice in the left-hand column.

2. Within a column, the first and last three colors included at least one saturated color and one tint.

Color sequences were as follows:

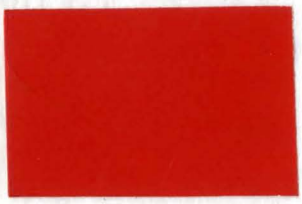
Sequence 1		Sequence 2		Sequence 3		Sequence 4	
V	BT	B	YT	R	Y	V	OT
YT	VT	BT	R	VT	RT	Y	V
G	B	O	G	V	B	O	BT
R	Y	GT	RT	BT	OT	GT	R
RT	GT	OT	VT	G	O	RT	YT
OT	O	Y	V	YT	GT	B	G

Note: B = Blue, R = Red, G = Green, V = Violet, O = Orange, Y = Yellow. "T" signifies "tint."

Sequence 3

Please rank the following colors in order of your preference by writing a number on the line beside each color. Write a "1" next to the color you like best, a "2" next to the color you like next best, and so on until you have ranked all the colors. The color you like least will have a rank of "12."

Please be sure to rank <u>all</u> the colors, giving each color a <u>different</u> rank.












The color preference questionnaire was constructed for the application of the method of rank order. Guilford (1954, ch. 8) points out that this method bears a resemblance both to the method of successive categories (method of successive intervals or "single stimuli") and to the method of pair comparisons. It resembles the former in that stimuli (color samples in the present investigation) are arranged by the S along some psychological continuum (color preference in the present study). It differs, however, in that there is only one stimulus to a category.

The method of rank order resembles the method of pair comparisons in that each stimulus is, in essence, compared with every other stimulus. Any stimulus S_j may be said to have been judged "greater than" all stimuli that are ranked lower in the list and judged "less than" all those ranked higher. Since both methods force the S to make the maximum number of discriminations, both the pair comparison and rank order methods provide as much discriminatory information as it is possible to obtain from the Ss. In contrast to the method of pair comparisons, in the rank order method all stimuli are present for simultaneous observation. Also, while the method of pair comparisons allows S to deviate from a strictly consistent rank order, the method of rank order does not.

As is the case with the methods of successive categories and pair comparisons, scale values referring to an interval scale can be assigned to stimuli judged by the method

of rank order.

Color preferences were determined in the present investigation by the method of rank order because of the ease and economy of time with which twelve stimuli could be judged with reference to one another.

The Edwards Personal Preference Schedule. The Edwards Personal Preference Schedule (EPPS) is a forced-choice inventory developed by the Psychological Corporation (EPPS, 1959). It measures the relative importance within the individual of fifteen relatively independent[1] normal personality variables, including n Intraception and n Achievement, as defined on page 19. These variables purport to have their origin in a list of manifest needs or motives presented by H. A. Murray, et al. (1938)

The EPPS consists of 225 items or pairs of statements. for each pair, the S is asked to choose the statement "most characteristic" of himself. Each of the fifteen personality variables in the EPPS is paired twice with each of the other variables. If, in each of the comparisons, the S has chosen the statement for a given variable as being more characteristic of himself than the statements for the other variable, his score on this particular variable would be "28"--the maximum

[1] In the EPPS Manual, 120 intercorrelations of the fifteen personality variables are reported. The correlations are, in general, quite low, the highest being .46. The highest correlation for the Intraception variable was with n Exhibition (-.22); the highest for the Achievement variable was with n Abasement (-.28). (EPPS, 1959, p. 20)

score that can be obtained for any given personality variable. To obtain a score of "0" for any given variable, the S would always have to regard the statements for this variable, in the 28 comparisons in which it appears, as being less characteristic of himself than the paired statements for the other variables.

The EPPS may be group-administered and takes approximately 45 minutes to complete. The S is provided with a booklet of test items and either a "regular" (hand scoring) answer sheet or an IBM answer sheet. Complete instructions for marking each type of answer sheet are printed on the cover of the booklet. There is no time limit on the test, but Edwards advises that Ss be encouraged to work as rapidly as possible.

In constructing the EPPS an attempt was made to minimize social desirability as a factor influencing responses to the test items. Statements constituting the EPPS were scaled for social desirability using the psychological scaling method of successive intervals. When statements from two different variables were paired to make up an item in the EPPS, the statements were selected so that the social desirability scale values would be comparable. The extent to which this matching was successful is indicated by the intraclass correlation of .85 between social desirability scale values of the paired statements making up the items.

College student norms for the EPPS are based on data obtained from 29 colleges and universities. The normative sample was composed of 749 women and 760 men. Percentile norms

were established for men and women on each of the personality variables. The percentiles corresponding to raw scores on n Int and n Ach are given in Table 18 of the Appendix.

Split-half reliability coefficients or coefficients of internal consistency were computed using data from the 1509 Ss in the college normative group. The coefficients ranged from .60 to .87. The values for n Int and n Ach were .79 and .74 respectively. Test-retest coefficients or stability coefficients were computed using the records of a group of 89 students who took the EPPS twice with a one-week interval separating the two administrations. These coefficients ranged from .74 to .88. For n Int and n Ach the values were .86 and .74 respectively.

In addition to the fifteen personality variables, the EPPS also provides a measure of test consistency based upon the number of identical choices made in two sets of the same fifteen items. Thus the consistency score may range from 0 to 15. If a S obtains a low consistency score (Edwards suggests less than "9"), his scores on the personality variables may be questioned. For consistency scores of 9, 10 and 11, Edwards reports that the probabilities are .30, .15 and .06 respectively that the S is responding on the basis of chance alone.

Subjects and Procedure

All data were collected by the present experimenter on February 7, 1967.

Ss were 89 students (40 men and 49 women) in two Introductory Psychology classes at Loyola University in Chicago.

Ss first were given the color preference questionnaire. Each of the four color sequences was presented in equal numbers to men and women in each class, in so far as this was possible.

Immediately following the color preference questionnaire, the EPPS was administered using, in all cases, the "regular," hand scoring, answer sheet. After the EPPS test booklets were distributed, Ss read the directions on the cover silently. In accordance with Edward's instructions, E urged the Ss to answer all items, even though some of the choices might be difficult to make.

Ss were not required to sign their names to either of the test forms, but they recorded their ages on the EPPS answer sheet. After completing the EPPS, Ss were requested to fold the EPPS answer form over the color preference questionnaire so that the two forms could be matched for each S.

In compiling the data, nine Ss were eliminated because their consistency scores on the EPPS were "9" or below and five were eliminated because they did not fill out the EPPS completely. Age distributions for the remaining 32 men and 43 women are shown in Table 7. Color sequence distributions for the usable Ss are shown in Table 8.

For purposes of the present investigation, high and

low n Int were defined as follows:

High n Int:

Men: At 64th percentile or above

Women: At 66th percentile or above

Low n Int:

Men: At 39th percentile or below

Women: At 35th percentile or below

High and low n Ach were defined as follows:

High n Ach: At 50th percentile or above

Low n Ach: At 49th percentile or below

It should be noted that both psychology classes ranked the colors in a theatre under conditions of artificial illumination. Other specifications of the experiment (size of stimuli, background color of the questionnaire, and so forth) may be easily replicated. Under the exigencies of the present experimental situation, however, it was not possible to control and specify the level of illumination under which the colors were viewed. Thus a question may arise concerning the extent to which the spectral character of an illuminant might influence the appearance of the color stimuli and therefore result in different preference rankings when the type of illumination changes.

A study by Luckiesh (1916) provides some evidence that color preferences tend to remain stable despite differences in illumination. By the rank order of merit method, Luckiesh had

Table 7

Frequency Distribution of Ages

of Male and Female Subjects

	Frequency of Age	
Age	Men	Women
17	-	2
18	19	22
19	7	8
20	3	6
21	1	3
22	2	1
25	-	1

Table 8

Frequency Distributions of Color Sequence on Color Preference Questionnaire for Male and Female Subjects

Color Sequence	Frequency of Color Sequence	
	Men	Women
1	9	11
2	9	11
3	7	12
4	7	9

15 Ss judge 15 color samples (four-inch squares of Zimmermann[1] colored papers) under light from an incandescent tungsten lamp. operating at 7.9 lumens per watt and also under daylight from the blue sky as it entered a large window. The time elapsing between the two rankings varied between one and four weeks for individual Ss. Luckiesh noted that the type of illumination made little difference in color preference. The present writer found a rank order correlation of .878 ($P < .01$) between the mean color preference ranks[2] established under the two conditions.

Scaling of Data

Approaches to Scaling Rank Order Data. Guilford (1954, ch. 8) proposes two general approaches to interval scaling from rank order judgments. One he calls the normalized-rank approach, the other the comparative-judgment approach. The latter method was rejected for treatment of the present data because, according to Guilford, it usually presupposes a large N, preferable over 100, and a small number of stimuli, preferably not more than 10. The former approach seemed more suitable because it can be used with almost any number of Ss and the number of stimuli should be fairly large.

It should be noted that in utilizing the normalized rank approach, the assumption is made that the distribution of the particular sample of stimuli being judged is normal or near

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[1] Commercial brand name.

[2] Mean rankings were estimated by the present writer on the basis of Luckiesh's graphic representation.

normal. Guilford points out, however, that with departure from normality, "the worst that can happen is failure to achieve a scale of exactly equal units." (1954, p. 194) Nevertheless, it should be cautioned that the scale values computed in the present investigation must be viewed as approximations to strictly interval values. To the extent of departure of the stimuli from a normal distribution, the scaling procedure only approaches equality of units.

An alternative to scaling the color stimuli by the normalized rank approach would have been to place the stimuli in a "pooled" rank order, thus providing the complete composite ranking for the set of stimuli judged by a number of Ss. This would provide merely a set of values on an ordinal scale. Another alternative would be to obtain the average ranks for a group of Ss. Since rank values are strictly ordinal numbers, the means of ranks would have little numerical meaning. Medians could, however, be legitimately computed, but the results would again be nothing more than ordinal numbers. Since interest was in providing some estimate of the magnitude of the difference between stimuli in terms of preference, it was decided to utilize the normalized rank approach, with the above mentioned reservations in accepting the resulting values as "true" interval values.

Normalized Rank Procedure. When a S places a set of n objects in rank order, assigning the objects ranks of 1 to n, there results a rectangular distribution in which each object

occupies as much space as any other object. While the rank values, as numbers, are equidistant, the objects ranked are probably not equidistant on the continuum in question.

To give the twelve color stimuli of the present study numerical values that are in line with interval scale positions, it was assumed that the stimuli are normally distributed. Under this assumption, each stimulus again occupies the same amount of area in the distribution, and the rank order is preserved. But equal areas shaped by the normal curve do not mean equal intervals on the base line, as they do on an ordinal scale; rather, they mean increasing intervals as we go out from the mean; that is, the distances between neighboring objects are smaller as we go toward their central tendency and larger at the extremes. Since there are twelve stimuli occupying the total surface under the normal distribution curve, each one takes up 12% of the area.

Guilford terms the values corresponding to percentages under the normal curve which come to the middle of the ranked areas the centile positions of the stimuli. The centile position (P) is given by the formula:

$$P = \frac{(R_i - .5)100}{n}$$

where R_i signifies the rank value[1] and n signifies the number of things ranked. P represents the area under the normal distribution below the median of the interval assigned to the stimulus. From the normal-curve values, the corresponding z values may be obtained to represent linear distances from the mean on the base line.

Since z values are awkward numbers to use, Guilford recommends that a linear transformation to values of a convenient type be made. For this purpose, he proposes a C Scale of 11 units, with a mean of 5.0 and a standard deviation of 2. Guilford presents a table (1954, p. 577) for convenience in using the normalized rank approach. The table gives immediately C scale values corresponding to different numbers of things ranked, thus making it unnecessary to compute centile positions. Table 9 gives the linear scale values, C, corresponding to twelve rank values, R_i.

In scaling the color stimuli for various groups of Ss, tables of the format shown in Table 10 were set up. Each cell of the table represents the frequency with which each stimulus was assigned a given rank and rank value. The frequencies in the columns are now regarded as distributions on the new scale

[1] In the present study, the custom of instructing Ss to assign the most preferred stimulus a rank of "1" was followed. This was done because the S naturally thinks in terms of "first place," "second place," and so on. In order to make the rank numbers used in treatment of the data correspond to increasing magnitudes of stimuli, Guilford (1954, ch. 8) suggests that the series of ranks denoted by r_i be assigned a series of rank values, R_i, that are in exact reverse order to the original ranks. R_i is related to r_i by the equation $R_i = n - r_i + 1$.

Table 9

Guilford's C-Scale Values Corresponding to the Rank Values of Twelve Stimuli

Rank Value (R_i)	C-Scale Value Corresponding to Rank Value
12	8
10-11	7
8 - 9	6
6 - 7	5
4 - 5	4
2 - 3	3
1	2

Table 10

Format for Matrix of Frequencies With Which Each of $\underline{n}$ Stimuli is Ranked in Each of $\underline{n}$ Positions by N Subjects, Showing Ranks, Rank Values, and Stimuli Designations

Rank (r_i)	Rank Value (R_i)	Stimulus Designation				
		S_a	•••	S_j	•••	S_n
r_1	R_1	f_{1a}	•••	f_{1j}	•••	f_{1n}
•	•	•••••••••••••••••••••				
r_i	R_i	f_{ia}	•••	f_{ij}	•••	f_{in}
•	•	•••••••••••••••••••••				
r_n	R_n	f_{na}	•••	f_{nj}	•••	f_{nn}

of C values. Under the assumption that these are interval-scale values, the mean (M_c) for each column may now be computed, giving response values R_j. The means were computed according to the formula:

$$R_j = \frac{f_{ji}C}{f_{ji}}$$

where f_{ji} signifies the frequency in the "i"th column of the "j"th row.

Actual matrices for the various groups of Ss for which scale values were computed in the present study are given in Tables 21 through 24 (n Intraception) and Tables 27 through 30 (n Achievement) of the Appendix.

CHAPTER III

Results

A preliminary inspection of the raw data indicated differences in the findings by sex. Therefore, results were analyzed separately for men and women.

n Intraception

Results of Scaling by the Normalized Rank Order Procedure. It was hypothesized that:

> Ss with high n Int will prefer tints over saturated colors,
>
> Ss with low n Int will prefer saturated colors over tints.

Chart 1 indicates the color preference scale values for high and low n Int groups of male Ss; Chart 2 is the comparable chart for female Ss.

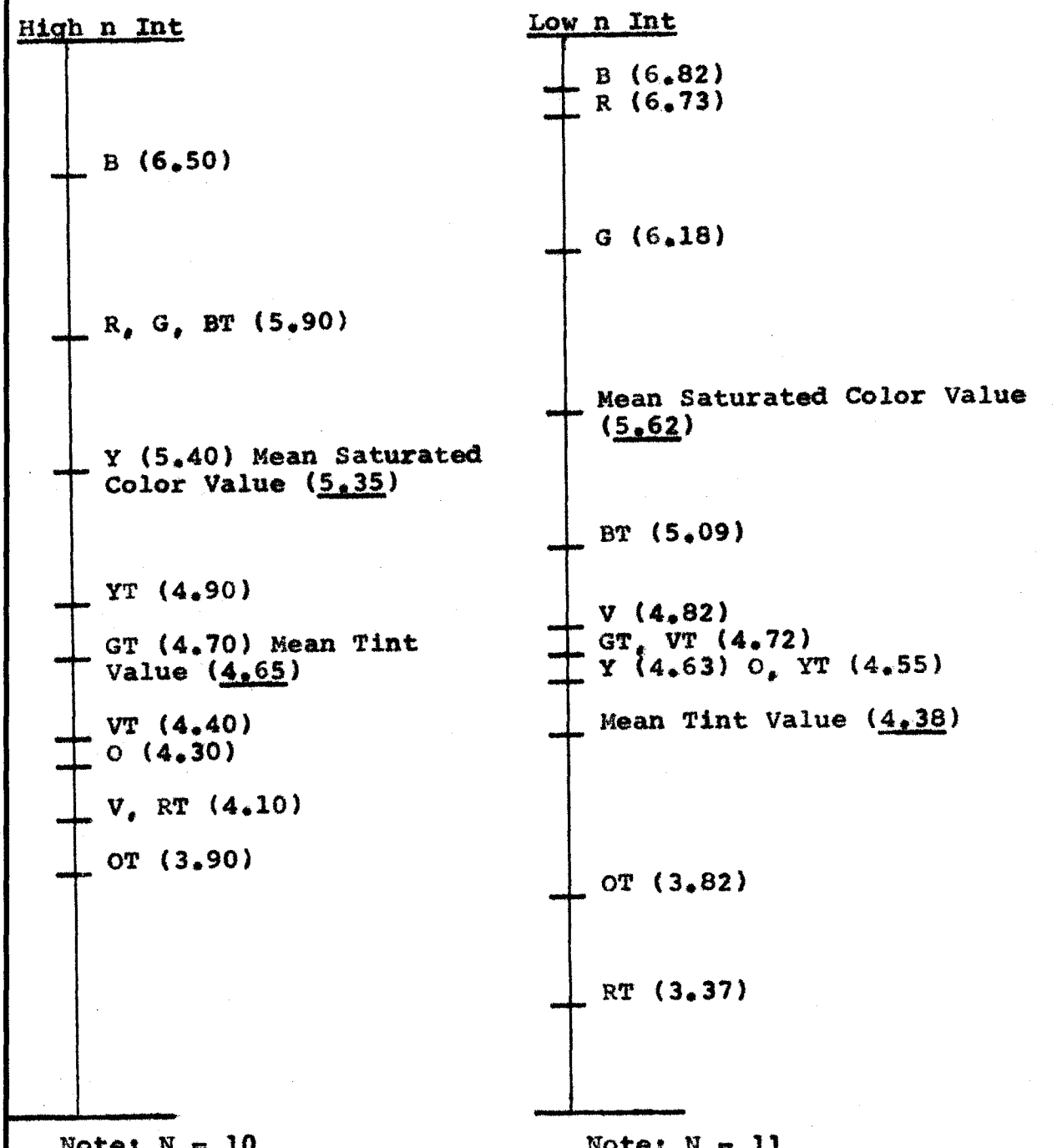
For both high and low n Int groups of men and women, t-tests were conducted to determine the statistical significance of the differences in scale values. The null hypothesis tested with respect to mean tint and mean saturated color values was:

> The mean scale value for tints is the same as the mean scale value for saturated colors.

To test this hypothesis, for each S the sum of the C-values for tints of each hue and the sum for saturated colors of each hue were obtained, and t-values computed from these sums.

Chart 1

Color Preference Scale Values for Male Subjects of High and Low n Intraception

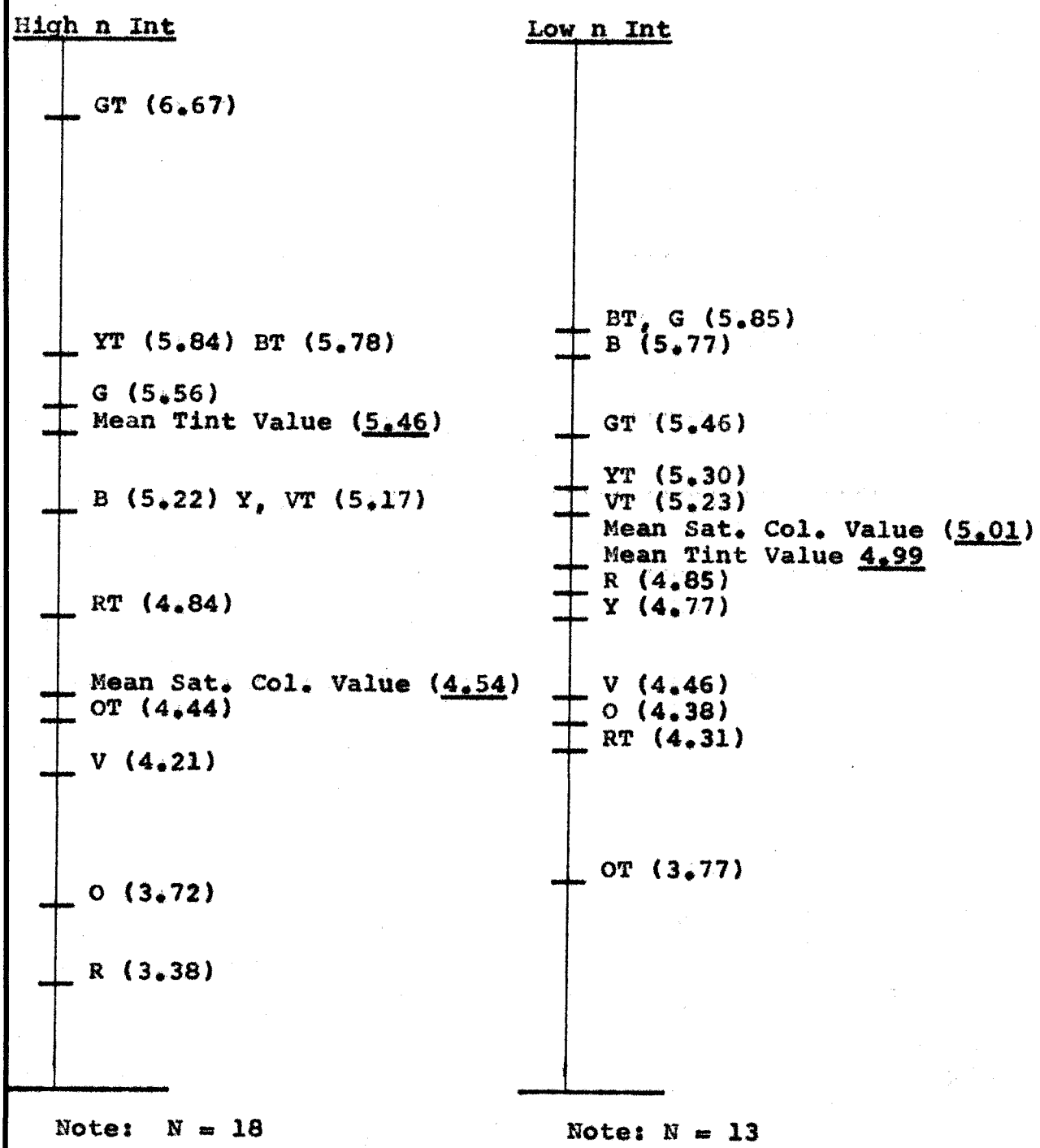


Note: N = 10

Note: N = 11

Chart 2

Color Preference Scale Values for Female Subjects of High and Low n Intraception



The null hypothesis tested with respect to scale values for individual hues was, in each case:

> The individual scale value for tint is the same as the individual scale value for saturated color.

This hypothesis was tested by computing *t*-values based on the C-scale values for tints and for saturated colors of individual hues.

It was decided that the null hypotheses would be rejected if "*t*" had a value so large that the probability associated with its occurrence was equal or less than P = .01.

Chart 1 shows that, for male *Ss*, both high and low *n* Int groups tended to prefer saturated colors to tints. The degree to which saturated colors were preferred, however, tended to be greater for low than for high *n* Int men; that is, as a group, low *n* Int men preferred saturated colors to tints by 1.24 scale points, whereas high *n* Int men preferred saturated colors by .70 scale points. For low *n* Int men the mean saturated color value was significantly greater than the mean tint value beyond the .01 level of confidence (*t* = 3.50). For high *n* Int men, the difference between the mean tint value and the mean saturated color value was not statistically significant.

For high *n* Int men, the only significant difference in scale values for individual hues was a greater value for saturated red than for red tint, significant beyond the .05 level of confidence (*t* = 2.57).

For low *n* Int men, saturated red and green were

significantly greater in scale values than their tints beyond the .01 level of confidence (*t*'s = 6.85 and 3.55 respectively). Saturated blue and orange were significantly greater in scale values than their tints beyond the .10 level of confidence (*t*'s = 2.11 and 2.21 respectively). The scale values for saturated violet and yellow were not significantly greater than the scale values for their respective tints.

Chart 2 shows that, as a group, high *n* Int female *Ss* preferred tints to saturated colors by .92 scale points, in accordance with the hypothesis. Low *n* Int women tended to prefer saturated colors to tints, also in accordance with the hypothesis, but by only .02 scale points. For high *n* Int women, the mean tint value was significantly greater than the mean saturated color value beyond the .01 level of confidence (*t* = 3.21). For low *n* Int women, the difference between the mean tint value and the mean saturated color value was not statistically significant.

For high *n* Int women, the scale value for violet tint was significantly greater than the value for saturated violet beyond the .01 level of confidence (*t* = 2.95). The scale value for red tint was significantly greater than the value for saturated red beyond the .02 level of confidence (*t* = 2.86). The scale value for green tint was significantly greater than the value for saturated green beyond the .05 level of confidence (*t* = 2.52). The scale value for orange tint was significantly greater than the value for saturated

orange beyond the .10 level of confidence (*t* = 1.90). Scale values for yellow and blue tints were not significantly greater than the scale values for their respective saturated colors.

For low *n* Int women, the only statistically significant difference for individual hues was a greater value for violet tint than for saturated violet, significant beyond the .10 level of confidence (*t* = 1.82).

Results of Further Statistical Analyses. For each *S* in high and low *n* Int groups, a "tint score" was obtained by summing the rank values assigned to each of the six tints. Table 11 shows the mean tint scores of men and women in high and low *n* Int groups. The table indicates that for both men and women, tints tended to be more highly preferred by high *n* *Ss* than by low *n* Int *Ss*.

The significance of differences between the means of high and low *n* Int *Ss* was determined through *t*-tests. Since there was a theoretical basis for predicting the direction of the difference between means, the region of rejection was one-tailed. The null hypothesis was:

> The mean tint score for low *n* Int *Ss* is less than or equal to the mean tint score for high *n* Int *Ss*.

It was decided that the null hypothesis would be rejected if "*t*" had a value so large that the probability associated with its occurrence was equal to or less than P = .05. Table 11 shows that, for women, the null hypothesis may be rejected at

Table 11

Mean Tint Scores and *t*-Values for Differences Between the Means of Men and Women in High and Low *n* Intraception Groups

	n Intraception Group		
	High *n* Int	Low *n* Int	*t*-Value
Men	34.90	31.91	1.06
Women	44.00	39.15	2.51**

**$P < .01$

Note: Tint scores for individual *Ss* are given in Tables 19 and 20 of the Appendix

the .01 point of confidence; thus, for women, the alternative hypothesis that the mean tint score is greater for high than for low n Int Ss was accepted. For men, the null hypothesis could not be rejected at the specified point of significance.

For each S in high and low n Int groups, the proportions preferring tints to saturated colors was determined for each of the six hues. Tint preference was defined as the assignment by the S of a higher rank (resulting in a greater numerical rank value) to the tint than to the saturated color. Results for male Ss are given in Table 12, those for female Ss in Table 13.

Table 12 shows that the proportion preferring tint was greater for high than for low n Int men for five of the six hues -- blue, red, green, violet, and orange. Table 13 shows that the proportion preferring tints was greater for high than for low n Int women for three of the six hues -- red, green, and orange.

The significance of difference in proportions of high and low n Int Ss preferring tint or saturated color of each hue was determined by means of chi square tests.[1] Data for each

[1] Using the formula incorporating correction for continuity:

$$x^2 = \frac{n\left(|bc - ad| - \frac{n}{2}\right)^2}{(a + c)(b + d)(a + b)(c + d)}$$

Table 12

Frequencies and Proportions of Choice of Tint vs. Saturated Color for Each of Six Hues, With Chi Square Values -- Male Subjects of High and Low n Intraception

n Intraception Group	Preference for Tint vs. Saturated Color				Chi Square
	Blue Tint Preferred		Saturated Blue Preferred		
	Freq.	Prop.	Freq.	Prop.	.44
High n Int	3	.300	7	.600	
Low n Int	1	.091	10	.909	
	Red Tint Preferred		Saturated Red Preferred		
	Freq.	Prop.	Freq.	Prop.	.85
High n Int	3	.300	7	.700	
Low n Int	0	-	11	1.000	
	Green Tint Preferred		Saturated Green Preferred		
	Freq.	Prop.	Freq.	Prop.	.44
High n Int	3	.300	7	.700	
Low n Int	1	.091	10	.909	
	Violet Tint Preferred		Saturated Violet Preferred		
	Freq.	Prop.	Freq.	Prop.	.07
High n Int	7	.700	3	.300	
Low n Int	6	.545	5	.455	

Table 12 (Continued)

n Intraception Group	Preference for Tint vs. Saturated Color				Chi Square
	Orange Tint Preferred		Saturated Orange Preferred		
	Freq.	Prop.	Freq.	Prop.	.04
High n Int	4	.500	6	.600	
Low n Int	3	.273	8	.727	
	Yellow Tint Preferred		Saturated Yellow Preferred		
	Freq.	Prop.	Freq.	Prop.	.05
High n Int	4	.400	6	.600	
Low n Int	6	.545	5	.455	

Table 13

Frequencies and Proportions of Choice of Tint vs. Saturated Color for Each of Six Hues, With Chi Square Values -- Female Subjects of High and Low n Intraception

n Intraception Group	Preference for Tint vs. Saturated Color				Chi Square
	Blue Tint Preferred		Saturated Blue Preferred		
	Freq.	Prop.	Freq.	Prop.	.11
High n Int	11	.611	7	.389	
Low n Int	8	.615	5	.385	
	Red Tint Preferred		Saturated Red Preferred		
	Freq.	Prop.	Freq.	Prop.	6.71**
High n Int	15	.833	3	.167	
Low n Int	4	.308	9	.692	
	Green Tint Preferred		Saturated Green Preferred		
	Freq.	Prop.	Freq.	Prop.	.45
High n Int	12	.667	6	.333	
Low n Int	5	.385	8	.615	
	Violet Tint Preferred		Saturated Violet Preferred		
	Freq.	Prop.	Freq.	Prop.	.15
High n Int	13	.722	5	.278	
Low n Int	10	.769	3	.231	

Table 13 (Continued)

n Intraception Group	Preference for Tint vs. Saturated Color				Chi Square
	Orange Tint Preferred		Saturated Orange Preferred		
	Freq.	Prop.	Freq.	Prop.	3.45≠
High n Int	14	.788	4	.222	
Low n Int	5	.385	8	.615	
	Yellow Tint Preferred		Saturated Yellow Preferred		
	Freq.	Prop.	Freq.	Prop.	.001
High n Int	10	.555	8	.435	
Low n Int	8	.615	5	.385	

**P< .01

≠P< .10

chi square test were provided in twelve two-by-two contingency tables represented by the frequencies of Tables 12 and 13. In each case, the null hypothesis was:

> The proportion of high n Int Ss preferring tint to saturated color is the same as the proportion of low n Int Ss preferring tint to saturated color.

The obtained values of X^2 are shown in Tables 12 and 13.

For men, none of the values of X^2 reached significance at the .10 level of confidence. For women, the value for red was significant beyond the .01 level and the value for orange was significant beyond the .10 level. To get an indication of the strength of the relationship between n Int and preference for red and orange tints, phi coefficients were computed.[1] The phi coefficient, or fourfold point coefficient, provides an indication of the degree of association between two variables when each variable is expressed as a dichotomy. The phi coefficients were .47 for red and .34 for orange.

High and low n Int women were divided into those who preferred both red and orange tint and those who did not prefer the tints of both of these hues. Frequencies and proportions of choices are given in Table 14. A chi square test was performed to test the null hypothesis:

> The proportion of high n Int women preferring both red and orange tint is the same as the proportion of low n Int women preferring both red and orange tint.

---

[1] Using the formula: $$r_\phi = \frac{bc - ad}{\sqrt{(a + c)(b + d)(a + b)(c + d)}}$$

Since the resulting value of chi square was 9.38 ($P < .01$), the null hypothesis was rejected. A phi coefficient computed to indicate the degree of the association between red and orange tint preference and n Int had a value of .55.

n Achievement

Results of Scaling by the Normalized Rank Order Procedure. It was hypothesized that:

> Ss with high n Ach will prefer blue to red.
>
> Ss with low n Ach will prefer red to blue.

Chart 3 indicates the color preference scale values for high and low n Ach groups of male Ss; Chart 4 is the comparable chart for female Ss.

For both high and low n Ach groups of men and women, t-tests were conducted to determine the statistical significance of the difference in scale values of saturated red and saturated blue. The null hypothesis tested was:

> The scale value for saturated blue is the same as the scale value for saturated red.

The t-values were computed on the basis of C-values for saturated red and blue.

It was decided that the null hypothesis would be rejected if "t" had a value so large that the probability associated with its occurrence was equal to or less than P = .10.

Chart 3

Color Preference Scale Values for Male Subjects of High and Low n Achievement

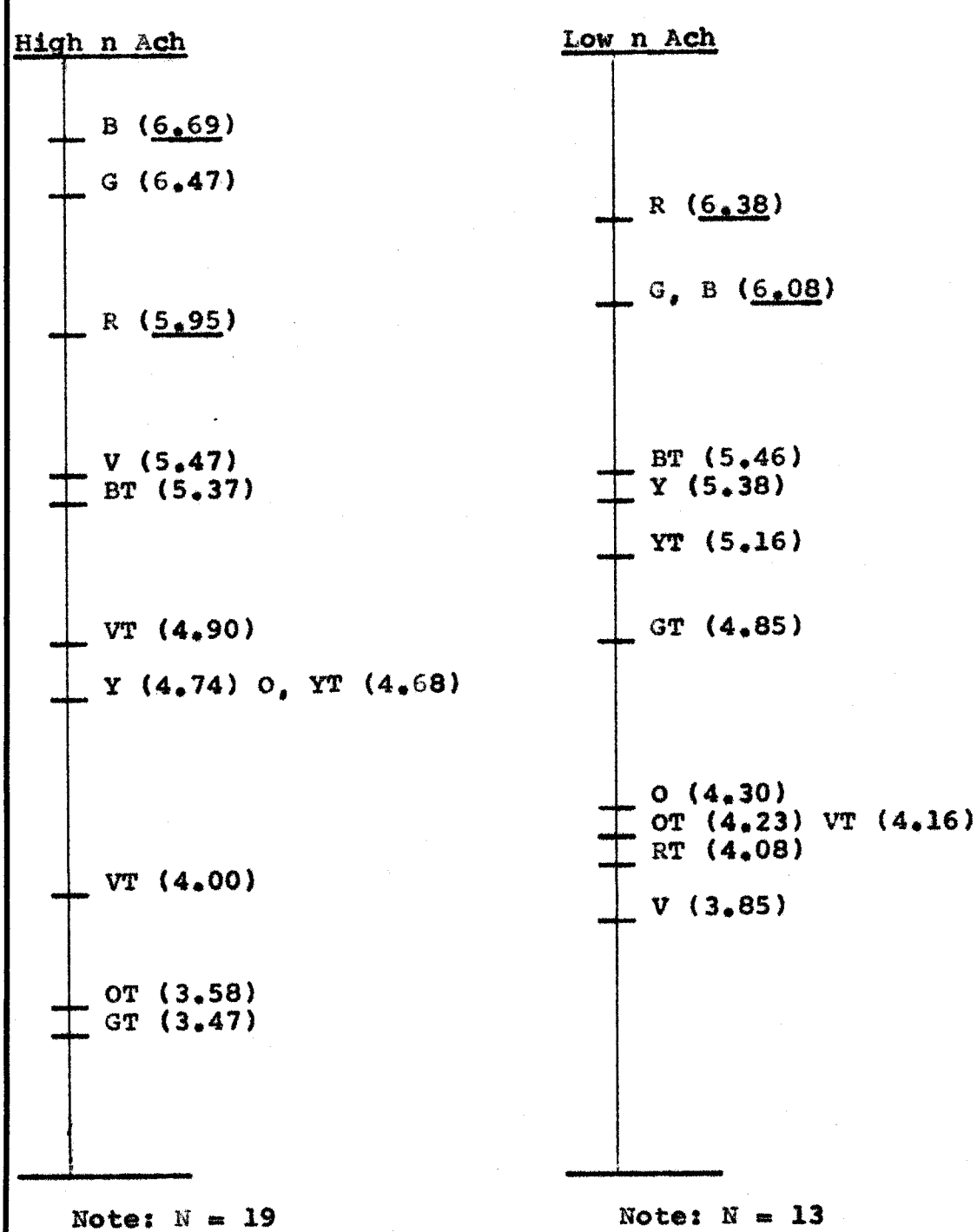
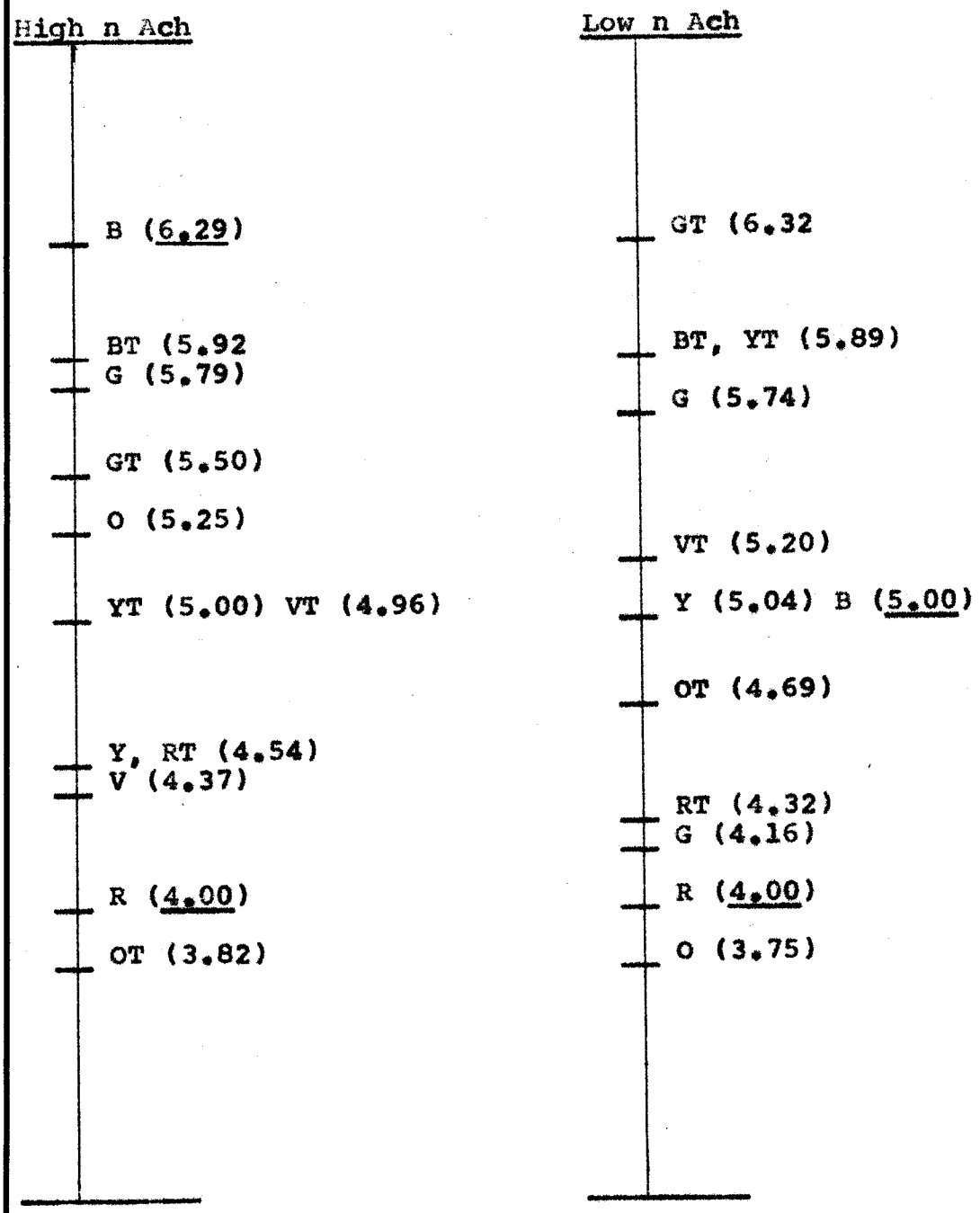


Chart 4

Color Preference Scale Values for Female Subjects of High and Low n Achievement



Note: N = 24

Note: N = 19

Chart 3 shows that, in accordance with the hypothesis, male Ss of high n Ach preferred blue to red by an average of .74 scale points, and male Ss of low n Ach preferred red to blue by an average of .30 scale points. Neither of these differences, however, was statistically significant.

Chart 4 shows that, for female Ss, both high and low n Ach groups tended to prefer blue to red. The degree to which blue was preferred, however, tended to be greater for high n Ach women than for low n Ach women; that is, as a group, high n Ach women preferred blue to red by 2.29 scale points, whereas low n Ach women preferred blue to red by 1.00 scale points. Both of these differences, however, were statistically significant. The difference for high n Ach women was significant beyond the .01 level of confidence ($t = 4.54$), and the difference for low n Ach women was significant beyond the .10 level of confidence.

Results of Further Statistical Analyses. Table 15 gives the frequencies and proportions of blue or red preference among high and low n Ach Ss. Preference for blue was defined as the assignment of a higher rank (greater numerical rank value) to blue than to red; Preference for red was defined as the assignment of a higher rank to red than to blue. The table shows that, for both men and women, a greater proportion of high n Ach Ss than low n Ach Ss preferred blue to red.

Using the frequencies of Table 15, chi square tests were performed of the following null hypothesis:

Table 15

Frequencies and Proportions of Preference for Blue vs. Red Among High and Low n Achievement Groups of Male and Female Subjects

n Achievement Group	Men			
	Blue Preference		Red Preference	
	Freq.	Prop.	Freq.	Prop.
High n Ach	12	.632	7	.368
Low n Ach	6	.461	7	.539
	Women			
	Blue Preference		Red Preference	
	Freq.	Prop.	Freq.	Prop.
High n Ach	20	.833	4	.167
Low n Ach	14	.737	5	.263

> The proportion of high n Ach Ss preferring blue to red is the same as the proportion of low n Ach Ss preferring blue to red.

The obtained values of chi square (.35 for men and .15 for women) were not so large that the null hypothesis could be rejected at the .10 level of confidence.

Table 16 gives the frequencies and proportions of high and low n Ach Ss ranking blue "high" (rank of 1, 2, 3, 4 or 5) and "low" (rank of 6, 7, 8, 9, 10, 11 or 12). The table shows that, for both men and women, a greater proportion of high than low n Ach Ss ranked blue high.

Using the frequencies of Table 16, chi square tests were performed of the following null hypothesis:

> The proportion of high n Ach Ss ranking blue high is the same as the proportion of low n Ach Ss ranking blue high.

For women, the obtained value of chi square was 2.96, significant beyond the .10 level of confidence. The chi square value for men (.33) did not reach statistical significance at that level.

Table 17 gives the frequencies and proportions of high and low n Ach Ss ranking red "high" (rank of 1, 2, 3, 4 or 5) and "low" (rank of 6, 7, 8, 9, 10, 11 or 12). The table shows that, for women, the proportions of high and low n Ach Ss who ranked red high were nearly identical. For men, a greater proportion of low than of high n Ach Ss ranked red high. The frequencies for men in Table 17 were used in a chi square test

Table 16

Frequencies and Proportions of High and Low n Achievement Groups Ranking Blue High and Low -- Male and Female Subjects

n Achievement Group	Men			
	Blue Ranked High		Blue Ranked Low	
	Freq.	Prop.	Freq.	Prop.
High n Ach	16	.842	3	.158
Low n Ach	9	.692	4	.308
	Women			
	Blue Ranked High		Blue Ranked Low	
	Freq.	Prop.	Freq.	Prop.
High n Ach	17	.708	7	.292
Low n Ach	7	.368	12	.632

Table 17

Frequencies and Proportions of High and Low n Achievement Groups Ranking Red High and Low -- Male and Female Subjects

n Achievement Group	Men			
	Red Ranked High		Red Ranked Low	
	Freq.	Prop.	Freq.	Prop.
High n Ach	11	.579	8	.421
Low n Ach	10	.769	3	.231
	Women			
	Red Ranked High		Red Ranked Low	
	Freq.	Prop.	Freq.	Prop.
High n Ach	5	.208	19	.792
Low n Ach	4	.210	15	.632

of the following null hypothesis:

> The proportion of high n Ach Ss ranking red high is the same as the proportion of low n Ach Ss ranking red high.

The resulting chi square value of .49 did not reach significance at the .10 level of confidence.

CHAPTER IV

Summary of Findings and Discussion

n Intraception

It was hypothesized that Ss with high n Int would prefer tints over saturated colors, whereas Ss with low n Int would prefer saturated colors over tints.

Basic findings were as follows:

1. In accordance with the hypothesis, low n Int men preferred saturated colors to tints by an average of 1.24 scale points (significant beyond the .01 level of confidence). High n Int men also preferred saturated colors to tints, but to a lesser degree than low n Int men -- a average of .70 scale points (not statistically significant).

For low n Int men, four saturated hues were significantly greater in scale value than their respective tints (Red and Green: $P < .01$; Blue and Orange: $P < .10$). For high n Int men, only saturated red was significantly greater in scale value than its tint ($P < .05$).

2. In accordance with the hypothesis, women of high n Int preferred tints to saturated colors by an average of .92 scale points (significant beyond the .01 level of confidence). Low n Int women preferred saturated colors to tints, also in accordance with the hypothesis, but by an average of only .05 scale points (not statistically significant).

For high n Int women, four tints were significantly greater in scale value than their respective saturated hues (Violet: $P < .01$; Red: $P < .02$; Green: $P < .05$; Orange: $P < .10$). For low n Int women, the only significant difference for individual hues was a greater scale value for violet tint than for saturated violet ($P < .10$).

3. For both men and women, the mean tint score was greater for high than for low n Int Ss. In the case of women, a t-test showed that the difference was statistically significant beyond the .01 level of confidence.

4. The proportion preferring tint to saturated color was greater for high than for low n Int men for five of the six hues -- blue, red, green, violet and orange.

5. The proportion preferring tint to saturated color was greater for high than for low n Int women for three of the six hues -- red, green and orange. Chi square tests indicated that the difference in proportion was statistically significant for red ($P < .01$) and orange ($P < .10$). Corresponding phi coefficients, indicating the degree of association between n Int and tint preference were .47 and .34 respectively. The degree of association between n Int and preference for tints of both red and orange was indicated by a phi coefficient of .55.

The data of the present investigation indicate that women of high and low n Int may be differentiated by ascertaining their preferences for tints vs. saturated colors. In

particular, the data indicate that a preference for tints over saturated colors of red and orange is associated with high n Int. While both high and low n Int men tended to prefer saturated colors to tints, there is some indication that these groups may be differentiated through a greater degree of preference for saturated colors by low n Int Ss.

It is interesting to note that several studies have indicated a type factor with respect to preference for tints vs. saturated colors. Evidence for such a factor was first provided in the early work of Major (1895) and Cohn (1900). Major (1895) concluded that individuals differ in terms of their preferences for saturated vs. less saturated colors and in terms of preference regarding lighter vs. darker colors. Cohn (1900) found that while the majority of his observers preferred saturated colors, a few (three out of sixteen) preferred the less saturated ones. Titchener (1901) also maintained that there are two different types of observers in the population, one type preferring the saturated colors, the other the unsaturated ones, with the former group constituting the majority.

Further experimental evidence for a type factor such as was first suggested in the work of Major and Cohn has been provided by Eysenck (1941). In addition to a general factor extracted from a factor analysis of the intercorrelations of 12 Ss' color preference rankings, Eysenck found a second, bi-polar factor which accounted for 4% of the variance. This

factor was not significant, but when the colors preferred by the Ss with the highest positive and negative saturations were examined, it was found that the factor divided those who preferred pure, saturated colors from those who preferred tints. Eysenck noted that this finding was supported by the results of an investigation carried out by Parry (1940) in which 15 Ss ranked 24 colors -- eight pure colors, eight tints, and eight shades. After elimination of a general factor, a bi-polar factor appeared accounting for 13% of the variance and dividing Ss into those who preferred saturated colors and those who preferred tints or shades.

Still further evidence is provided in the work of Stephenson (1935) who had 20 Ss (twelve women and eight men) rate 60 different colors in terms of affective value. When the scores given to the colors by the different Ss were intercorrelated, it was found that twelve Ss correlated positively among themselves with a mean of .36 and the rest correlated a mean amount of -.15 with these twelve Ss and an average of .20 among themselves. Thus Stephenson states that two distinct factors emerged, one among the twelve individuals and the other among the remaining eight. The first factor represented preference for the "pure, bright" colors, the second for the "subtle tones and hues, the subdued colors."

The present investigation, as well as evidence presented in Chapter I, indicates that the division of individuals into types preferring either pure, saturated colors or

less saturated colors may be partly accounted for in terms of the personality characteristics of the individuals.

n Achievement

It was hypothesized that Ss with high n Ach would prefer blue to red, whereas Ss with low n Ach would prefer red to blue.

Basic findings were as follows:

1. In accordance with the hypothesis, high n Ach men preferred blue to red by an average of .74 scale points, and low n Ach men preferred red to blue by an average of .30 scale points. Neither of these differences, however, was statistically significant.

2. In accordance with the hypothesis, high n Ach women preferred blue to red by an average of 2.99 scale points. Low n Ach women also preferred blue to red, but to a lesser degree than high n Ach women -- an average of 1.00 scale points. The difference was statistically significant for high n Ach women beyond the .01 level of confidence and for low n Ach women beyond the .10 level.

3. For both men and women, a greater proportion of high n Ach Ss than low n Ach Ss preferred blue to red.

4. For both men and women, a greater proportion of high than low n Ach Ss assigned blue a high rank. A chi square test showed that, for women, the difference in proportion was statistically significant beyond the .10 level of confidence.

5. For women, the proportions of high and low n Ach Ss assigning red a high rank were nearly equal. For men, however, a greater proportion of low than high n Ach Ss assigned red a high rank.

The data of the present investigation offer some indication that Ss with high and low n Ach tend to be differentiated on the basis of their relative preference for blue and red. In the case of men, the evidence indicates that this differentiation may be in terms of a tendency to prefer blue over red on the part of high n Ach Ss and a tendency to prefer red over blue on the part of low n Ach Ss. In the case of women, the differentiation may be in terms of a tendency toward a greater degree of preference for blue over red on the part of high n Ach Ss.

In connection with his own findings, consistent with the findings for men of the present investigation, Knapp (1958) has offered some interesting hypotheses to account for a greater preference for blue than for red on the part of high n Ach individuals. He presents a definition of n Ach in terms of "ego-strategy" in which the individual pursues well-being through adopting an active, manipulatory role towards the environment. While the individual with low n Ach wishes to have his environment "do unto" him, the person with high n Ach wishes to "do unto" his environment. In relating preference for subdued, bluish tartans and dislike of bright red tartans to a desire to "do unto" the environment, Kanpp notes that "it is an

established psychophysical fact that red is inherently brighter than blue, more rarely found in nature, more commanding of attention generally." (1958, p. 369) Furthermore, he notes the Gestalt observation that blue is a "soft" color which holds form poorly, is malleable, and is a preferred "ground" color. Red, on the other hand, is a "hard" color which resists perceptual distortion and imposes itself as a "figure" in the perceptual field. Knapp reasons that individuals with high n Ach require that their environment be "soft" or "passive," while they are "hard," so that they may manipulate rather than be manipulated. Knapp hypothesizes further that individuals and cultures fostering high achievement motivation will tend to dislike strong and assertive stimuli in their fashions, dress and ornament and prefer a subdued and even monotonous decor. As further speculative evidence he notes:

1. A somberness in use of color and in general decor of achievement oriented Northern European Protestant cultures, i.e., German, Dutch and British, as contrasted with less achievement oriented peoples of Catholic Mediterranean cultures.

2. The extreme austerity in dress and decor of the highly achievement motivated Puritans in contrast to the Cavaliers and their taste for colorful dress and indulgent living.

3. The subdued taste of middle-class Americans as contrasted with the more colorful taste of their lower socio-economic counterparts who are typically less achievement oriented.

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APPENDIX

Table 18

Percentiles for College Students on n Intraception and n Achievement Variables of the EPPS

	n Intraception Percentile		n Achievement Percentile	
Score	Men	Women	Men	Women
28				
27				
26	99	99		
25	97	97		
24	95	94	99	
23	93	90	98	99
22	89	85	95	98
21	84	80	91	97
20	78	73	86	96
19	72	66	83	93
18	64	58	74	90
17	57	49	66	84
16	51	43	58	79
15	45	35	50	72
14	39	28	40	64
13	32	22	30	58
12	25	16	22	47
11	19	12	16	36
10	17	9	10	27
9	13	5	7	19
8	9	3	4	13
7	5	1	2	8
6	4		1	5
5	1			3
4				2
3				1
2				
1				
0				

Table 19

Color Sequence, n Intraception Percentile, Tint Score

Preference Rankings for Individual Colors -- Male Subjects

Color Sequence	Percentile n Intraception	Tint[1] Score	Rankings for Individual Colors											
			B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT
3	99	49	1	8	11	10	12	7	3	5	2	6	9	4
3	93	37	5	9	1	3	12	7	8	11	4	2	10	6
4	89	38	1	2	6	12	8	9	4	7	3	10	11	5
1	84	37	4	11	2	12	3	5	1	7	8	10	6	9
2	78	21	5	3	1	2	6	4	8	10	11	7	12	9
2	78	37	2	1	10	12	9	3	8	5	4	11	6	7
2	78	33	1	2	5	12	6	7	3	10	8	11	9	4
2	78	33	2	6	5	3	7	10	1	12	8	4	9	11
1	72	21	3	2	1	4	5	6	7	9	12	8	11	10
4	64	43	12	3	6	10	11	1	5	9	8	7	4	2
3	57	42	7	6	5	12	8	4	3	9	10	1	11	2
2	57	45	8	9	1	11	4	12	2	5	10	7	6	3
3	57	32	6	1	5	3	9	8	2	11	12	4	10	7
4	51	25	1	7	4	2	6	5	9	11	10	8	3	12
1	51	21	3	4	1	2	6	5	11	8	10	7	12	9
1	51	21	2	4	3	1	6	5	10	12	8	11	9	7
4	51	29	1	7	4	2	9	6	3	12	10	11	8	5
3	45	31	2	1	3	4	9	12	8	5	6	7	10	11
4	45	23	1	8	2	3	4	5	7	12	11	6	10	9
1	45	39	7	6	2	11	9	4	1	8	3	10	12	5
1	45	38	12	3	2	11	6	4	10	7	8	9	5	1
2	39	22	3	2	4	1	5	7	9	11	10	12	8	6
2	25	35	5	1	6	9	3	11	12	8	4	2	7	10
2	17	28	1	6	4	5	10	2	3	9	8	11	12	7
2	17	28	1	5	9	2	8	3	7	12	10	6	11	4
4	17	29	3	4	2	12	1	7	11	9	6	8	5	10
3	13	49	11	4	3	12	9	10	1	6	5	2	8	7
3	13	34	4	1	6	3	9	11	5	12	7	2	10	8
1	13	30	5	2	1	4	10	8	7	12	3	9	11	6
4	9	37	1	2	3	12	8	11	4	10	5	6	7	9
1	9	30	1	3	2	9	11	4	10	7	6	12	8	5
1	5	29	1	3	4	7	8	6	2	10	12	5	11	9

[1]Sum of Rank Values for tints

Table 20

Color Sequence, n Intraception Percentile, Tint Score, Preference Rankings for Individual Colors -- Female Subjects

Color Sequence	Percentile n Intraception	Tint[1] Score	Rankings for Individual Colors											
			B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT
1	99	43	11	12	10	2	5	3	6	8	4	1	9	7
2	99	46	10	12	4	5	9	6	11	8	3	7	1	2
2	97	45	9	8	10	5	12	1	7	4	2	6	11	3
3	94	51	6	12	11	3	9	10	2	8	5	1	4	7
4	94	57	7	9	11	12	8	10	3	6	1	4	5	2
2	85	42	4	12	2	8	11	5	3	9	1	7	10	6
3	80	39	10	3	2	12	11	1	8	9	4	6	7	5
1	80	40	3	12	1	7	11	6	4	9	2	8	10	5
3	80	41	1	8	4	6	12	10	2	7	3	5	11	9
4	80	48	10	12	2	7	8	9	11	3	5	6	4	1
4	80	40	6	7	2	12	9	4	5	10	1	11	8	3
2	73	57	7	10	9	11	8	12	1	3	2	6	4	5
3	73	44	7	9	4	12	11	1	6	2	5	10	8	3
1	66	45	5	4	6	12	11	7	3	8	2	10	9	1
3	66	45	2	9	4	12	8	10	1	5	3	11	7	6
3	66	28	1	10	4	2	6	5	9	12	7	3	11	8
1	66	45	10	11	3	12	4	5	1	7	2	6	8	9
3	66	36	1	12	5	2	10	6	9	4	7	3	11	8
1	58	41	7	8	2	11	12	1	6	10	3	4	9	5
3	58	41	3	11	9	4	6	8	2	12	7	5	1	10
1	58	21	4	3	5	2	1	6	7	10	11	12	8	9
2	49	44	4	9	1	7	11	12	3	5	2	6	10	8
2	49	39	2	11	9	12	4	1	3	7	8	10	6	5
2	49	45	2	8	5	9	10	11	1	3	6	4	12	7
3	49	31	4	6	2	8	10	1	3	12	5	7	9	11
4	49	32	3	12	1	2	5	9	6	7	11	10	4	8
2	43	54	9	8	11	12	10	4	1	6	2	5	7	3
3	43	42	3	12	7	6	9	5	1	11	8	2	10	4
2	43	31	3	9	1	12	2	4	8	10	6	11	7	5
4	43	27	1	5	4	3	12	2	11	9	7	6	10	8

Table 20 (Continued)

Color Sequence	Percentile n Intraception	Tint[1] Score	Rankings for Individual Colors											
			B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT
4	35	52	7	12	10	8	6	9	2	1	5	3	4	11
4	35	35	1	6	2	12	9	5	3	8	4	10	11	7
4	35	38	1	9	6	3	8	11	2	5	10	4	12	7
3	35	42	6	8	1	5	10	12	9	11	2	4	3	7
1	28	37	11	2	3	12	5	4	10	7	8	9	6	1
1	22	38	11	12	1	3	6	5	10	9	2	4	8	7
2	22	49	2	11	9	12	8	7	1	6	4	10	5	3
3	22	39	6	3	4	7	11	8	5	12	2	10	9	1
1	22	39	2	8	3	6	11	9	7	12	1	5	10	4
1	16	31	8	2	7	9	4	1	5	3	11	6	12	10
1	16	41	3	6	5	7	11	9	2	10	4	1	12	8
4	12	39	3	5	7	11	9	4	1	6	8	10	12	2
2	9	29	5	3	6	4	2	9	7	12	8	1	11	10

[1] Sum of Rank Values for tints

Table 21

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 10 Male Subjects Showing High n Intraception

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	3	1	3	-	-	1	2	-	-	-	-	-	8
2	11	2	3	1	1	-	-	-	-	1	1	-	1	7
3	10	1	2	-	2	1	1	2	-	1	-	-	-	7
4	9	1	-	-	1	-	1	1	-	2	1	1	2	6
5	8	2	-	2	-	1	1	1	2	-	-	-	1	6
6	7	-	1	2	-	2	1	-	-	-	1	2	1	5
7	6	-	-	-	-	1	3	1	2	-	2	-	1	5
8	5	-	1	-	-	1	-	3	-	4	1	-	-	4
9	4	-	1	-	-	1	1	-	2	-	-	3	2	4
10	3	-	-	1	2	-	1	-	2	-	2	1	1	3
11	2	-	1	1	-	1	-	-	1	1	2	2	1	3
12	1	1	-	-	4	2	-	-	1	1	-	1	-	2
$\sum f_{ji}$		10	10	10	10	10	10	10	10	10	10	10	10	
$\sum f_{ji}C$		65	59	59	41	43	54	59	41	47	44	39	49	

Table 22

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 11 Male Subjects Showing Low n Intraception

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	5	2	1	1	1	-	1	-	-	-	-	-	8
2	11	-	3	2	1	-	1	1	-	-	3	-	-	7
3	10	2	2	2	1	1	1	1	-	1	-	-	-	7
4	9	1	2	3	1	-	1	1	-	1	-	-	1	6
5	8	2	1	-	1	1	-	1	-	2	1	1	1	6
6	7	-	1	2	-	-	1	-	1	2	2	-	2	5
7	6	-	-	-	1	-	2	2	1	1	-	2	2	5
8	5	-	-	-	-	3	1	-	1	1	1	3	1	4
9	4	-	-	1	2	2	-	1	2	-	1	-	2	4
10	3	-	-	-	-	2	1	1	2	2	-	1	2	3
11	2	1	-	-	-	1	3	1	1	-	1	3	-	3
12	1	-	-	-	3	-	-	1	3	1	2	1	-	2
$\sum f_{ji}$		11	11	11	11	11	11	11	11	11	11	11	11	
$\sum f_{ji}C$		75	74	68	53	50	51	56	37	52	52	42	50	

Table 23

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 18 Female Subjects Showing High n Intraception

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	3	-	1	-	-	3	3	-	3	2	1	2	8
2	11	1	-	4	3	-	-	2	1	5	-	-	2	7
3	10	1	1	1	1	-	1	3	2	3	2	-	3	7
4	9	1	1	5	-	1	1	1	2	2	1	3	-	6
5	8	1	-	1	2	1	3	1	1	3	1	1	3	6
6	7	2	-	1	1	1	3	2	1	-	5	-	2	5
7	6	3	1	-	2	-	1	1	2	2	2	2	2	5
8	5	-	2	-	1	4	-	1	4	-	1	3	2	4
9	4	1	3	1	-	3	1	2	3	-	-	2	2	4
10	3	4	2	2	-	1	4	-	1	-	2	2	-	3
11	2	1	1	2	1	5	-	2	-	-	2	4	-	3
12	1	-	7	-	7	2	1	-	1	-	-	-	-	2
$\sum f_{ji}$		18	18	18	18	18	18	18	18	18	18	18	18	
$\sum f_{ji}C$		94	61	100	76	67	93	104	87	120	93	80	105	

Table 24

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 13 Female Subjects Showing Low n Intraception

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	2	-	2	-	-	1	2	1	1	2	-	2	8
2	11	2	2	1	-	1	-	3	-	3	-	-	1	7
3	10	2	2	2	2	-	-	1	1	-	1	1	1	7
4	9	-	-	1	1	1	2	-	-	3	3	1	1	6
5	8	1	1	1	1	1	2	2	1	1	1	1	-	6
6	7	2	2	2	1	2	-	-	2	-	1	1	-	5
7	6	1	-	2	2	-	1	2	1	-	-	-	4	5
8	5	1	2	-	1	2	1	-	1	3	-	1	1	4
9	4	-	1	1	1	2	4	1	1	-	1	1	-	4
10	3	-	-	1	-	1	-	2	1	1	4	1	2	3
11	2	2	1	-	1	3	1	-	1	1	-	2	1	3
12	1	-	2	-	3	-	1	-	3	-	-	4	-	2
$\sum f_{ji}$		13	13	13	13	13	13	13	13	13	13	13	13	
$\sum f_{ji}C$		75	63	76	58	57	62	76	56	71	68	49	69	

Table 25

Color Sequence, n Achievement Percentile, and Ranks Assigned to Saturated Blue and Red -- Male Subjects

Color Sequence	Percentile n Achievement	Rank Saturated Blue	Rank Saturated Red
2	95	3	2
1	91	5	2
2	91	5	1
3	86	5	9
1	86	1	3
3	83	6	1
1	83	4	11
3	74	4	1
3	74	2	1
2	74	8	9
1	66	1	3
2	66	1	5
4	66	1	8
4	66	1	7
1	58	3	4
3	58	7	6
2	50	2	6
2	50	1	6
4	50	3	4
1	40	3	2
4	40	1	2
3	40	1	8
4	30	1	2
4	30	1	7
3	30	11	4
2	30	5	3
1	30	12	3
1	22	7	6
2	22	2	1
1	16	2	4
4	10	12	3
2	1	1	2

Table 26

Color Sequence, n Achievement Percentile, and Ranks Assigned to Saturated Blue and Red -- Female Subjects

Color Sequence	Percentile n Achievement	Rank Saturated Blue	Rank Saturated Red
4	99	7	12
1	99	8	2
2	98	3	9
2	98	2	8
4	97	1	5
2	96	5	3
3	96	1	8
4	93	3	12
3	93	1	12
3	93	1	10
4	93	7	9
4	90	1	6
3	90	4	6
3	84	7	9
3	84	3	12
3	72	5	4
4	72	6	7
1	64	2	9
1	64	3	12
1	64	11	12
2	58	2	11
4	58	1	9
1	58	4	3
1	58	11	12
2	47	9	8
3	47	3	11
2	47	9	8
1	36	11	2
3	36	6	8
2	36	2	11

Table 26 (Continued)

Color Sequence	Percentile n Achievement	Rank Saturated Blue	Rank Saturated Red
1	27	2	8
3	27	6	3
2	27	4	12
1	27	3	6
4	19	3	5
3	8	6	12
1	8	7	8
2	5	7	10
4	5	10	12
2	3	10	12
3	3	10	3
1	3	10	11
2	3	4	9

Table 27

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 19 Male Subjects Showing High n Achievement

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	6	4	4	1	1	-	2	-	-	1	-	-	8
2	11	2	2	4	3	-	1	3	-	-	3	-	1	7
3	10	3	2	1	5	2	1	3	-	1	-	-	1	7
4	9	2	2	4	2	2	2	-	-	2	2	-	1	6
5	8	3	1	3	1	1	3	1	2	-	1	1	2	6
6	7	1	3	2	-	1	2	-	-	3	2	2	3	5
7	6	1	1	-	1	1	3	3	2	1	3	1	2	5
8	5	1	1	-	-	3	2	2	2	3	1	3	1	4
9	4	-	2	1	2	4	-	1	3	-	1	1	4	4
10	3	-	-	-	-	2	1	1	1	6	1	5	2	3
11	2	-	1	-	1	1	2	2	3	1	2	4	2	3
12	1	-	-	-	3	1	2	1	6	2	2	2	-	2
$\sum f_{ji}$		19	19	19	19	19	19	19	19	19	19	19	19	
$\sum f_{ji}C$		127	113	123	104	89	90	102	66	76	93	68	89	

Table 28

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 13 Male Subjects Showing Low n Achievement

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	5	1	2	1	-	1	2	-	-	-	-	1	8
2	11	2	4	2	2	-	-	-	-	1	1	-	1	7
3	10	1	3	3	-	-	1	2	-	2	-	1	-	7
4	9	-	2	1	1	-	3	2	-	1	-	1	2	6
5	8	1	-	1	-	1	2	1	2	2	-	1	2	6
6	7	-	1	2	-	5	1	-	1	-	2	1	-	5
7	6	1	1	-	-	-	2	1	2	-	2	1	3	5
8	5	-	1	-	-	2	-	2	1	4	2	1	-	4
9	4	-	-	-	-	3	1	1	2	-	1	3	2	4
10	3	-	-	1	2	-	1	2	3	1	2	-	1	3
11	2	1	-	1	2	1	1	-	1	1	3	2	-	3
12	1	2	-	-	5	1	-	-	1	1	-	2	1	2
$\sum f_{ji}$		13	13	13	13	13	13	13	13	13	13	13	13	
$\sum f_{ji}C$		79	83	79	50	56	70	71	53	63	54	55	67	

Table 29

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 24 Female Subjects Showing High n Achievement

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	6	-	4	-	1	3	4	1	2	2	-	1	8
2	11	3	1	3	5	2	1	3	1	3	1	-	1	7
3	10	4	2	-	3	-	1	4	2	2	3	-	3	7
4	9	2	1	5	1	1	2	1	1	3	4	2	1	6
5	8	2	1	3	-	2	4	2	2	3	1	2	2	6
6	7	1	2	3	2	3	3	3	2	2	2	-	1	5
7	6	3	1	2	1	-	2	2	2	3	1	2	5	5
8	5	1	2	-	2	4	-	1	3	2	1	4	4	4
9	4	-	5	1	2	3	3	2	3	-	-	3	2	4
10	3	-	1	2	-	3	3	1	3	1	5	3	2	3
11	2	2	1	1	-	3	2	1	1	3	3	5	2	3
12	1	-	7	-	8	2	-	-	3	-	1	3	-	2
$\sum f_{ji}$		24	24	24	24	24	24	24	24	24	24	24	24	
$\sum f_{ji}C$		151	96	139	109	105	126	142	109	132	119	92	120	

Table 30

Matrix of Frequencies With Which Each of Twelve Colors Was Ranked in Each of Twelve Positions by 19 Female Subjects Showing Low n Achievement

r_i	R_i	B	R	G	V	O	Y	BT	RT	GT	VT	OT	YT	C
1	12	-	-	2	-	-	4	4	-	2	2	2	3	8
2	11	2	1	4	-	-	-	3	-	7	-	-	2	7
3	10	3	2	3	1	-	-	3	2	2	-	1	2	7
4	9	2	-	2	1	2	3	-	1	2	2	3	1	6
5	8	-	1	1	3	1	2	1	1	2	3	-	4	6
6	7	3	1	-	1	1	1	1	2	-	6	2	1	5
7	6	2	-	1	4	-	-	2	3	1	2	2	2	5
8	5	-	5	-	1	2	2	1	2	3	-	1	2	4
9	4	2	1	3	-	3	3	1	2	-	1	2	1	4
10	3	4	1	1	-	2	1	1	2	-	3	3	1	3
11	2	1	3	2	3	6	-	2	1	-	-	1	-	3
12	1	-	4	-	5	2	3	-	3	-	-	2	-	2
$\sum f_{ji}$		19	19	19	19	19	19	19	19	19	19	19	19	
$\sum f_{ji}{}^{C}$		95	76	109	79	71	96	112	82	120	99	89	112	

APPROVAL SHEET

The dissertation submitted by Mary Anne Safely Kelbley has been read and approved by members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Date Signature of Adviser