COLOR PREFERENCES AND SELF-CONCEPT RELATED THROUGH COLOR MEANINGS

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ABSTRACT

Preferences of 60 college students for six colors were measured by the method of paired comparisons. The semantic differential was used to measure color meanings, self-concept, and meanings of three other concepts, chosen from areas of meaning other than person-concepts. The hypothesis was that there would be a positive correlation between the preferences for the colors and their closeness to the self-concept in semantic space. This correlation would be higher for closeness to the self-concept than for closeness to the other three concepts.

Little support for the hypothesis was found in comparisons of relative sizes of such correlations for each subject, comparisons of mean individual correlations, or in comparisons of correlations of group means. Although the hypothesis specific to the present method was not supported, the more general assumption underlying the diagnostic use of color preferences was not considered invalidated by the present results.

Secondary analyses of the data showed evidence for relationships between preferability of colors and their judged "potency" and "activity." There was an even stronger relationship between preference and positiveness of overall ratings for colors. Group ratings on the Evaluative Factor of the semantic differential were found to be unrelated to both group color preferences and to meanings of colors found by previous investigators. Finally, there was a striking consistency between the unusual order of color preference found in the present sample and those orders found for children in earlier investigations.

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INTRODUCTION

The present investigation is an attempt to provide support for a hypothesized relationship between color preferences and personality based on similarity of personality to the meanings of preferred colors. Previous findings for color preferences and sources of color preference variability will be reviewed. Since color preferences may rely on meanings associated with colors, investigations of color meanings will then be summarized. Indirect support for the relationship between color preference and personality will be drawn from studies of color use in artwork and color preferences of psychiatric groups. Finally, uses of color preference as a diagnostic technique will be described. The implicit assumption underlying these uses will be made explicit in the form of the present hypothesis.

Color preferences. Guilford and Smith (1959) have shown that group preferences for colors can be predicted with impressive accuracy if the physical qualities of the color stimuli and the sex composition of the sample are known. Correlations between predicted and observed preferences calculated separately for the male and female subjects in the study ranged from .77 to .97 (Guilford and Smith, 1959). Eysenck's (1941) factor analysis of color preference data for 10 subjects yielded a general factor contributing 30% to the variance, the result of a general order of preference. Furthermore, in reviewing color preference data for 21,060 subjects in 26 studies, Eysenck

(1941) found enough overall agreement to propose "a general factor of aesthetic appreciation (p. 394)." Blue was the most preferred color followed by red, green, violet, orange, and the least preferred, yellow (Eysenck, 1941).

This agreement across studies found by Eysenck (1941) is rather remarkable in view of the numerous sources of variability in color preferences. For example, either increasing brightness or increasing saturation will raise the affective value of colors. This effect of increasing brightness is reliable up to a maximum point after which affective value decreases rapidly (Guilford, 1934). The effect of saturation holds for the majority of subjects with a minority preferring desaturated colors. The area of the color sample and the mode of presentation can change the relative affective values of different colors (Optical Society of America, 1953). All these conditions varied widely in the 26 studies reviewed by Eysenck (1941). Finally, even studies with uniform stimulus conditions are subject to the unreliability of sensory and psychological adaptation (Optical Society of America, 1953).

Both sex and age affect color preference. Sex can affect the order of color preference; Eysenck (1941) found a reversal in the positions of orange and yellow for men and women, men preferring orange. Even within the overall order, the strengths of preferences vary by sex; for example, men preferred blue more strongly than women did (Eysenck, 1941). Age plays an even larger role in color preferences than does sex. As age increased in children from 5 to 15, the colors of short wavelength (green, blue, and violet) were relatively more preferred, and longer wavelength colors (red, orange, and yellow) declined in affective value (Katz and Breed, 1922). Garth (1924) found that the affective values of all colors except blue decline with increasing age and education; red's value fell most rapidly, followed by orange, yellow and violet, and green, in order of amount of decline. Staples (1931) found that the order of preference changed from red, yellow, green, blue for infants under two years old (tested by eye-fixation and reaching measures) to blue, green, red, yellow for college students.

Color meanings. Regardless of overall consistencies for sex and age groups, individual color preferences vary considerably (Optical Society of America, 1953). One way of approaching individual preferences is through an understanding of the meanings of the different colors. Chou and Chen (1935) have explained the differences between Chinese students' color preferences and preferences of other cultural groups in terms of associations due to usage of color-names in the Chinese language and to frequencies with which colors are related to specific objects. Kouwer (1949) has discussed at length the derivation of color-names in different languages in terms of associations. But he concluded that associations cannot fully account for the meanings of different colors; why, for example, is red "hotter" than yellow and orange when fire is predominantly yellow and orange (Kouwer, 1949)? Thus, Kouwer supplemented his discussion with two experimental investigations: frequencies of associations of color-names with 116 nouns and a cataloguing of spontaneous descriptions of colors (1949). Since, in the present investigation, existing color meanings are more relevant than their causes, findings of such experimental investigations would be more to the point than scholarly discussion.

Methods of investigating color meaning have varied widely in both kinds of color stimuli and form of subjects' responses. Hevner (1935) had subjects check listed adjectives in response to patterns of red and blue lines. The five other major investigations described below have included red, blue, and four other colors: orange, yellow, green, and purple. Lewinski's (1938) subjects rated colored lights on two five-choice continua from "hot" to "cold" and from "very stimulating" to "very depressing." Odbert, Karwoski, and Eckerson (1942) had subjects associate selections of music to both mood-names and color-names. Associations of colors to 11 mood-tones were tallied by Wexner (1954) and Murray and Deabler (1957) and scaled by Schaie (1961). Color meanings that are consistent across differing studies may be considered quite stable.

Purple has been rated "moderately depressing" (Lewinski, 1938). "Solemn" music has been labelled "purple" (Odbert, Karwoski, and Eckerson, 1942) while spontaneous descriptions of purple included adjectives like "sad" and "somber" (Kouwer, 1949). Purple has been found the most "dignified" color (Wexner, 1954; Murray and Deabler, 1957; Schaie, 1961).

"Serene," "sad," "dignified" (Hevner, 1935), and "cool" (Lewinski, 1938) have been among the strongest responses to blue. Spontaneous descriptions emphasized the "social" nature of blue with such adjectives as "cozy" and "friendly" (Kouwer, 1949). Nouns implying interpersonal relationships ("confidence," "cooperation," "harmony," and "devotion") were the most frequently associated with the word "blue" (Kouwer, 1949). Blue was related to "tender" (Odbert, Karwoski, and Eckerson, 1938), both "tender" and "secure" (Wexner, 1954; Murray and

Deabler, 1957).

Green is "cool" (Lewinski, 1938), "leisurely" (Odbert, Karwoski, and Eckerson, 1942), and "secure," "tender," and "calm" (Murray and Deabler, 1957). Green seems quite similar to blue in mood-tone, but associations with nonemotional meanings show differences. Green is most frequently described as "youthful" and "fresh" and most frequently associated with the nouns "nature" and "naturalness" (Kouwer, 1949).

Yellow was rated "warm," "moderately stimulating" (Lewinski, 1938), and "exciting" (Schaie, 1961). Many studies have attributed gay emotions to yellow: associations to "playful" music (Odbert, Karwoski, and Eckerson, 1942), assignments to a "cheerful" mood (Wexner, 1954; Murray and Deabler, 1957; Schaie, 1961), and descriptions as "merry" and "glad" (Kouwer, 1949). On the other hand, subjects have also described yellow as "aggressive" and "mean" and associate yellow with "jealousy" and "hatred" (Kouwer, 1949).

Like yellow, orange was rated "warm," "moderately stimulating" (Lewinski, 1938), and "exciting" (Schaie, 1961). Similarly it is "gay" (Odbert, Karwoski, and Eckerson, 1942), "merry," "glad," and frequently associated with "fun" (Kouwer, 1949). But the finding that orange was also "distressing" in mood (Wexner, 1954) poses a more direct contradiction in meaning than do the varied associations with yellow. It is interesting that the "gay" judgments occurred in two studies in which colors were only named or imagined, whereas a physical stimulus of orange elicited the pairings with "distressing."

Kouwer (1949) has called red "...the color par excellence...the liveliest, most colorful, most conspicuous color (p. 102)." Associations between red and various meanings are, in fact, more numerous and generally stronger than associations for other colors. "Red" moods have included "powerful" (Schaie, 1961), "powerful" and "defiant" (Wexner, 1954; Murray and Deabler, 1957), "protective" (Wexner, 1954; Schaie, 1961), and "cheerful" (Murray and Deabler, 1957). Red has been most frequently described as "active," "spontaneous," "intense," and "fiery" (Kouwer, 1949). Red has been rated "hot," "very stimulating" (Lewinski, 1938), and has rather consistently been called "exciting" (Hevner, 1935; Odbert Karwoski, and Eckerson, 1938; Wexner, 1954; Murray and Deabler, 1957).

Personality and color preference. If, in fact, color meanings do affect individual color preferences, then a person who likes intensely emotional and active colors should give highest preference to red whereas blue or green might be the first choice of a person liking calm and soothing colors. But what makes an individual prefer active or calm colors? An explanation might be found in the rationale behind projective techniques involving a "choice" task, such as the Szondi Test and the Make a Picture Story Test (Lindzey, 1959). The implied assumption behind these tests is that the individual will choose items which represent himself. When this assumption is applied to color preferences, an "active" individual is more likely to prefer red whereas a "calm" person should like blue or green best.

The usual emotional state of an individual can be considered a relevant aspect of his personality. Thus, indirect support for the effect of personality on color preference through color meaning can be found in the relationship between color use in artwork and the prevailing mood in children. Bricks (1944) found overuse of red and yellow occurring as an expression of "hostility" and "aggression" while use of dark colors indicated "anxiety" and "depression." This pattern of color use is consistent with red's intense emotionality, the unpleasant emotions often associated with yellow, and the "depressing" aspect of the dark colors, blue and especially purple. Alschuler and Hattiwick (1947) reported predominance of red occurring with impulsive behavior, love, and hate, and of orange with less strong emotions. Blue represented self-control while green was used when emotions were not strong. Again, these results can be understood in terms of orange's "gaiety" as a lesser form of red's emotionality, in terms of the "social" nature of blue and the "calm" and "natural" aspects of green.

Napoli (1951) has reviewed results of the use of finger painting as a projective technique for adults. His results are generally negative with respect to the idea that color use reflects the individual through the meanings of colors. Normal use of blue indicated "security" and "sincerity" but also "drive," while abnormal use indicated impulsive and violent behavior, foreign to the general idea of blue as "calm" and "soothing." Green represented good control of emotionality and "creative potential," consonant with its "calm" and "nature-like" qualities. Purple represented "deep depression, but with an optimistic outlook (p. 406)," good heterosexual relations, and leadership. Nothing in the previously mentioned meanings for purple seems to be related to this optimism, heterosexuality, or leadership. Overuse of yellow was related to immaturity in males and deceit in females whereas normal use was related to good social values. Again, no material on maturity, honesty, or social values related to yellow in the previous review.

Studies of color preference in psychiatric groups have, through an actuarial approach, found some support for a relationship between personality and preference. Shikiba (1927) found a much greater preference for red among manics than among depressives. Katz (1931) found red, orange, and yellow were preferred to blue, green, and violet more often in manic-depressives than in dementia praecox and other patients. These results provide some support for a meaning-preference relationship with "active" colors being preferred by active people. Warner (1949) found that green was more strongly preferred to yellow by anxiety neurotics than by catatonic schizophrenics, manics, or depressives. This result is opposite to the expected calmness of persons preferring green. Pasto and Kivisto (1956) found relatively greater rejection of red by psychotics than by normals. This could be because psychotics withdraw from the active emotionality represented by red.

Diagnostic use of color preferences. Two projective techniques make direct use of the assumption that color choice represents the personality of the individual: the Lowenfeld Mosaics Test and the Color Pyramid Test. In the Mosaics Test, diagnoses are drawn from the subject's choice and patterning of stimuli of six colors and five shapes (Morris, 1951). Although the subject's overall design is more relevant, use of color can play a role in the conclusions drawn from a design. Diamond and Schmale (1944) have found that overuse of bright colors indicates manic tendencies while Wertham and Golden (1941) found that manic patients tend to use red in masses. Again, "active" colors, yellow and especially red, are much preferred by overactive people.

Subjects taking the Color Pyramid Test (Schaie and Heiss, 1964) are required to construct three designs on a pyramidal background from squares of 24 colors. The test is scored in terms of overall design, change in performance on the three pyramids, and both absolute and relative use of different colors. Resulting trait scores are based on normative data for groups differing by age and sex.

Based on Heiss's conceptual model, the Color Pyramid Test assumes that each color has excitation potential, arousal value, and affective content (Schaie and Heiss, 1964). The similarity of this scheme to emotional qualities is a basic part of the rationale for testing personality by color choice. Red, orange, and yellow are colors with strong excitation and intense arousal value. The behavioral correlate for use of red was impulsivity, and for orange the correlates were externalization and extraversion. Yellow indicated goal-directedness (Schaie and Heiss, 1964). There seems to be some vague relation here to the activity and emotionality of red and to the activity and gaiety of orange. However, the behavior associated with use of yellow seems unrelated to the previously cited meanings for yellow. Low excitation, moderate arousal colors included green, blue, and purple. Green represented balanced emotional behavior. Blue indicated both tranquility and a "dampening" effect while purple showed anxiety and "internalization of affect" (Schaie and Heiss, 1964). These behaviors show some relation to the "calm" and "natural" qualities of green and the "soothing" and "depressing" aspects of blue. Purple is "solemn" and "depressing" but its relation to anxiety and internalized affect is unclear.

Kouwer (1949) used research on color-name usage in various languages and the two previously mentioned experimental investigations to synthesize a triangular model of colors. Red is unique, the most intense and passionate color. Yellow is self-centered, shallow, and glamorous, the opposite of blue which is altruistic, deep, and inconspicuous. Orange is a cross between red and yellow, sharing some of red's intensity and some of yellow's superficiality. Purple is an unstable combination of red and blue, representing conflict and ambivalence. Green is normal, natural, and self-evident, a balanced combination of blue's altruism and yellow's self-centeredness (Kouwer, 1949).

Kouwer used preferences and associations to colors as a diagnostic technique. Subjects ranked colors, described them, and grouped 116 nouns, each under one of the colors. The meanings of the colors for a given subject were assumed to be combinations of the subject's descriptions and the general meanings Kouwer had found. Kouwer deduced the meaning of a given noun for a given subject by noting both the color under which it was classified and the other nouns with which it was grouped. The more unusual the placement of a noun, the more noteworthy it was considered. Color preferences allowed Kouwer to judge the relevance of each color and the nouns grouped with it for the subject's personality. For example, if a woman's favorite color was yellow, it was considered very probable that she was self-centered, shallow, and superficial. Kouwer's (1949) evidence for the validity of his technique was unconvincing; it consisted of his own personal judgment of concurrence of two diagnoses with his previous knowledge of two subjects.

Altogether, there seems to be some support for the notion that color preferences are related to personality. Consistent color preferences by psychiatric groups and use of color in artwork and projective tests have provided support for the relevance of color-meanings in this preference-personality relationship. The purpose of the present study is a direct investigation of the assumption underlying the use of color preference as a diagnostic technique: that an individual's relative preference for different colors is determined by the similarity of the color meanings to his own personality. Highly preferred colors should be more similar and nonpreferred colors should be less similar to the personality of the individual.

METHOD

Apparatus. Almost all the investigations of color preference and/or meaning overlap on the six colors red, orange, yellow, green, blue, and violet (Eysenck, 1941). These colors represent maximum sampling of the spectral range while maintaining maximum subjective distinctiveness from each other. While they are not equisistant in physical terms of wavelength, multidimensional scaling indicates that they are, roughly speaking, subjectively equidistant (Indow and Uchizono, 1960).

Color stimuli were Rosco gelatin filters (purchased from the National Stage Lighting Company in Washington, D. C.). Rectangular color patches were projected onto a white screen through these filters taped between Kodak 2-inch glass squares. Two layers of "fire red" (Rosco #222), ten layers of "medium amber" (Rosco #214), ten layers of "medium lemon" (Rosco #206), two layers of "dark green" (Rosco #274), two layers of "medium blue" (Rosco #257), and two layers of "light purple" (Rosco #246) were used for red, orange, yellow, green, blue, and violet, respectively. The filters were chosen as representative of the color names by two judges; four judges agreed on the number of layers which yielded the truest colors. Two Schoolmaster slide projectors with 750-watt tungsten bulbs were used to project the colors onto a portable screen about 15 feet away. The brightness of the two projections was matched by eye and adjusted by replacing one of the bulbs whenever the difference became noticeable.

Materials. The method of paired comparisons was chosen to measure preferences for these six colors. The absolute number of times each item is preferred provides a sensitive measure of relative preference. The technique is useful with inexperienced subjects, requiring only one "bit" of information at a time (Gulliksen, 1960). Response sheets consisted of brief instructions and 30 pairs of letters standing for the color-names. The 15 possible pairings of the six colors and their position reversals were arranged in four different orders of presentation through the use of a restricted random series (Friedman, 1966). Appendix A shows these orders on the actual response sheets.

Self-concept, as measured by the semantic differential was the personality measure. Osgood, Suci, and Tannenbaum (1957) have strongly supported the use of the semantic differential in personality research through measuring self-concept in relation to other concepts. Talbot, Miller, and White (1961) have measured discrepancy between self-concept and seven other role-concepts for mental patients. Madden (1961) has found a strong relationship between nearness of MMPI items to self in semantic space and the probability of a "true" response to the items. Altogether, it seems that the semantic differential can be a valid personality measure.

Color meanings were also measured by the semantic differential. Colors have been rated on the semantic differential both without color stimuli (Jenkins, Russell, and Suci, 1958) and with color stimuli (Hofstatter and Lubbert, 1958; Wright and Rainwater, 1962). The advantage of using the semantic differential to investigate both self-concept and color meaning lies in the clear comparability of results, specifically, the convenience of measuring differences between colors and self in terms of distances in semantic space. Furthermore, if color preference is considered a diagnostic tool, then its investigation through the semantic differential follows recommendations for the use of this objective and quantitative technique in standardizing subjective tests (Osgood, Suci, and Tannenbaum, 1957). Investigations of the meaning of Rorschach cards, for example, have provided support for the traditional clinical meanings of the figures (Rabin, 1959; Zax and Loiselle, 1960).

Semantic differential adjective-pairs were chosen on the basis of data for 30 subjects reported by Jenkins, Russell, and Suci (1958). Two screening procedures insured that (1) different colors would be rated differently on the adjective pairs chosen and (2) the adjective-pairs would each load heavily on one of the three factors: I Evaluation, II Potency, and III Oriented Activity. For 12 of the 20 adjective-pairs, there was a difference exceeding 1.00 between any two ratings for the concepts "red," "green," and "blue." From these 12, 10 adjective-pairs were chosen for their loadings on the three factors: good-bad, wise-foolish, kind-cruel, beautiful-ugly (Evaluation), hard-soft, strong-weak, angular-rounded (Potency), active-passive, fast-slow, excitable-calm (Activity). Criterion loadings were set at points that were as high as possible while still including a sufficient number of adjective-pairs for each factor: .52 for the Evaluative Factor and .26 for the Potency and Activity Factors. Appendix B shows the actual factor loadings for each adjective-pair.

A positive result in this study would have little meaning unless it could be shown to have "discriminant validity" (Campbell and Fiske, 1959). That is, color-self differences should show a greater relationship to preferences than do differences between colors and concepts unrelated to self. Three concepts were chosen to represent categories different from the person-concept category. In a factor analysis of semantic differential ratings with adjective-pairs from Roget's Thesaurus, Osgood, Suci, and Tannenbaum (1957) used 20 concepts in five different categories: person-concepts, abstract concepts, event-concepts, physical objects, and institutions. Distances from the concept Me were calculated for concepts in the last three categories on the basis of ratings on the 10 chosen items in the Jenkins, Russell, and Suci article (1958). Appendix C shows the coordinates and distances for the concepts. A concept in each category was selected for being closest to the mean distance of all the concepts in the category. Symphony represented event-concepts, Boulder, physical objects, and Hospital, institutions.

Semantic differential adjective-pairs were arranged in 10 different random orders. Appendices D and E show the standard booklets of six and four pages for rating the six colors and the four concepts. Positively- and negatively-weighted adjectives were placed on the right or left according to a Gellerman-like series within each block of ten items (Gellerman, 1933). The series were arranged so that within each booklet each of the two possible positions for each adjective-pair occurred an equal number of times. To avoid a constant interaction effect between color or concept and order of items, colors and concepts were presented in four different orders on different occasions. No color or concept occupied the same position in order in any two of the four schedules. Concepts were presented in 2-inch block capitals in black ink on white posterboards (22" x 14"); these were hung by string from the top of the screen.

Subjects. Sixty students in the introductory psychology course at the College of William and Mary served as subjects. Some volunteered for the experiment after the announcement to the class shown in Appendix F. Only four sessions were planned, but so few subjects came to the scheduled sessions that these were supplemented by use of the students' scheduled laboratory sections. Here participation was voluntary but very much encouraged by the laboratory instructors. Another announcement reiterating the first was made in the next class meeting and an extra session was set up for that evening. Altogether, 14 subjects were run on three separate occasions under the Session I schedule, 12 subjects were run at once on the Session II schedule, 18 subjects were run under Session III in three different groups, and 16 subjects were run in one Session IV. Twenty-five of these students were tested in their laboratory sections and the remaining 35 came to the evening sessions.

Subjects were 38 females and 22 males. Age ranged from 18 to 26 with median age at 19. Forty-eight of the subjects were sophomores, though all college classes were represented. Complete data on the subject population is shown in Appendix G.

Procedure. Subjects first entered their research number, sex, age, and year in school in a subject roster. They were then instructed for the color preference task; instructions are shown in Appendix H. The color pairs were projected side by side onto a screen. Each pair was presented for 5 seconds and there was a fairly constant interval of about 10 seconds between presentations. The projectors were frequently adjusted so that the two projections were the same size and at the same level.

The order of the two semantic differential tasks was counterbalanced so that the colors were rated first in two sessions and the concepts were first in the other two. Appendix I shows the orders of tasks and of color- and concept-presentations. For the color ratings, one of the projections was centered on the screen at the same level and size as the projections for the color preference task. During both color tasks, lighting was indirect. For both the semantic differential tasks, each color or concept was presented until each subject had finished rating it. Instructions for the semantic differential tasks are shown in Appendix J.

RESULTS

According to the hypothesis under investigation an individual's relative preference for different colors is determined by the similarity of the color meanings to his own personality. Thus, relative preferability of the six colors should be positively correlated with their relative nearness to Me in semantic space. Also, this preference-nearness correlation for Me should be significantly higher than those correlations for relative nearness to Boulder, Hospital, and Symphony.

The data were analyzed in terms of correlations for each individual subject and for group means. The outcome of the analysis of individual data is theoretically more relevant to the hypothesis in that it better represents the relationship between an individual's preferences and his own personality. However, for practical purposes, the group data are more easily summarized and they yield correlations which are surely more reliable.

Individual data. Colors were ranked for preferability according to the number of times each one was chosen. Number of times judgment was reversed for the same pair of colors was tallied and entered in Table 1. Maximum possible inconsistency of judgments would be represented by 15 reversals since there were 15 pairings of colors, each presented twice. Reversals ranged from 0 to 10 with a mean of 3.57 and a standard deviation of 2.48.

Semantic differential ratings were scored -3 to +3 and weighted

TABLE 1

INDIVIDUAL DATA

Subject No.	Subject Sex	Preference reversals	Preference-factor rank correlations: Evaluation	Potency	Activity	Preference-distance rank correlations: Boulder	Hospital	Me	Symphony
1	M	0	+.60	+.03	-.90*	-.37	-.37	+.41	+.16
2	M	3	+.36	+.64	+.61	-.43	+.60	+.94*	+.31
3	F	5	+.67	-.29	-.30	-.47	-.21	+.21	+.21
4	F	6	+.23	-.43	-.43	-.51	-.43	+.46	-.04
5	M	2	-.01	+.64	+.53	+.43	+.07	+.37	+.03
6	F	6	-.14	+.53	+.37	-.09	+.14	+.14	-.01
7	F	8	+.64	+.10	+.30	-.10	+.07	+.31	+.67
8	M	2	+.31	+.11	+.24	+.09	+.50	-.49	+.14
9	F	9	+.07	+.13	+.21	+.07	+.21	+.84	+.93*
10	F	1	+.04	+.64	+.71	-.79	+.73	+.90*	+.36
11	F	3	-.71	-.04	+.70	-.61	+.13	+.44	-.27
12	F	8	+.64	+.24	-.04	+.10	+.09	+.19	+.21
13	F	3	+.67	+.67	+.27	+.39	+.39	+.56	+.61
14	F	5	+.14	+.80	+.17	+.20	+.54	-.06	-.23
15	F	2	+.87	-.91*	-.47	-.91*	-.46	+.29	-.10
16	M	8	+.49	+.17	-.39	-.04	-.13	-.13	-.06
17	M	0	+.84	+.13	-.09	-.54	+.17	+.09	+.53
18	F	5	+.59	+.27	+.27	-.63	+.24	+.27	+.04
19	F	0	+.57	-.24	+.30	-.71	+.26	+.71	+.31
20	F	3	+.90*	+.71	+.60	+.66	+.76	+.71	+.71
21	F	3	+.31	+.11	+.16	+.04	+.24	+.49	+.03
22	M	0	+.41	+.33	+.43	-.39	-.04	-.04	+.30
23	M	3	-.01	-.10	-.09	-.37	-.09	-.37	-.14
24	M	6	+.64	.00	.00	+.30	+.49	+.26	+.60
25	M	4	+.87	-.47	+.07	-.53	+.53	+.04	+.66
26	M	4	-.09	-.39	+.93*	-.90*	-.31	-.10	-.03
27	M	1	-.59	+.74	+.77	-.96**	-.73	+.81	-.73
28	F	4	+.20	+.04	+.23	-.06	-.49	-.57	-.57
29	F	0	-.13	+.91*	+.74	+.76	+.53	-.61	-.61
30	M	5	+.31	+.71	+.26	-.56	-.53	-.60	+.21
31	M	9	+.57	+.04	+.37	-.53	+.33	+.21	+.37
32	F	4	+.20	+.43	+.43	-.16	+.43	+.26	+.43
33	F	9	+.76	-.67	-.84	+.47	-.73	+.90*	-.21
34	F	1	+.33	+.04	+.61	-.09	-.13	+.53	+.49
35	F	4	+.03	+.76	+.81	+.41	+.54	+.94*	+.83
36	F	2	+.76	+.53	+.70	+.03	+.93*	+.93*	+.93*

Table 1, continued

37	M	2	-.06	-.60	+.14	-.26	-.61	-.44	-.54
38	F	1	+.73	-.13	-.06	-.39	+.33	-.04	+.79
39	F	3	-.06	-.30	-.40	-.30	-.40	-.57	-.57
40	F	5	-.14	+.56	+.46	-.33	+.76	+.36	+.61
41	F	7	+.24	+.36	+.73	+.01	+.73	+.50	+.53
42	F	2	+.94*	-.41	.00	-.74	+.54	+.46	+.03
43	F	2	+.33	-.21	+.07	+.09	+.09	+.26	+.14
44	F	2	+.46	+.06	+.41	-.53	+.07	-.01	+.43
45	F	2	+.63	-.56	-.39	+.04	+.44	+.64	+.40
46	F	1	+.76	+.24	-.03	+.19	+.66	+.77	+.77
47	F	4	+.83	+.10	-.14	-.31	+.24	+.09	+.07
48	M	4	-.74	+.93*	+.89*	+.47	+.21	-.07	-.24
49	M	3	+.26	+.89*	+.97**	-.90*	+.64	-.90*	-.90*
50	F	3	+.31	+.74	+.40	.00	+.23	-.40	+.37
51	F	3	+.86	+.20	+.61	-.47	+.41	+.33	-.24
52	M	2	+.89*	+.64	+.77	+.54	+.69	+.46	-.64
53	M	0	+.31	+.74	+.80	+.26	+.60	+.81	+.50
54	F	4	-.54	+.14	+.64	+.66	+.54	+.54	+.20
55	F	10	+.83	-.13	-.14	+.16	-.50	+.37	+.71
56	M	2	+.64	-.87	-.53	+.23	+.41	+.11	+.41
57	M	3	+.29	-.14	-.06	.00	+.19	-.23	+.23
58	F	4	-.39	+.81	+.70	+.26	-.29	-.03	-.07
59	M	3	+.47	-.26	-.03	-.07	-.36	+.33	-.31
60	F	4	+.57	+.19	+.26	-.23	+.26	+.69	+.57

* $p < .05$
** $p < .02$

equally into averages for the three factors. These averages were the coordinates in semantic space for the six colors and the four concepts for each subject. The 24 distances from each of the four concepts to each of the six colors were calculated by Osgood's geometric formula: $D = \sqrt{(I_1 - I_2)^2 + (II_1 - II_2)^2 + (III_1 - III_2)^2}$ where $\underline{I}_1$ is the Factor I coordinate for the concept, $\underline{I}_2$ is the Factor I coordinate for the color, and so on. These concept-color distances were ranked from lowest to highest for each concept and rank correlation coefficients were calculated between these ranks and the preference ranks associated with each color. These r' coefficients for each subject are shown in Table 1.

Summary data for these individual correlations between preferences and concept-color distances included an analysis of within-subject ranks. Each individual correlation received a rank from one to four depending on its size relative to correlations for other concepts for a given subject. For example, correlations for the second subject shown in Table 1 were ranked <u>Me</u> first, <u>Hospital</u> second, <u>Symphony</u> third, and <u>Boulder</u> fourth. The numbers of different ranks assigned to each concept were tallied and presented in Appendix K. $\underline{\chi}^2$ values were calculated among concepts within ranks to check for significant differences in rank assignments for the different concepts at any given rank. $\underline{\chi}^2$ values within concepts among ranks show amount of deviation from chance rank-assignment for each concept. A $\underline{\chi}^2$ of 3.93 for first ranks assigned to the different concepts shows that <u>Me</u> preference-distance correlations did not receive significantly more first ranks than the other concepts did. A $\underline{\chi}^2$ of 5.93 for ranks assigned to <u>Me</u> shows that the distribution did not deviate significantly from chance. All other χ^2 values for each rank and each concept have been calculated from numbers which are not independent of first ranks and ranks for Me. Since the relative values of the χ^2s are nonetheless informative, they are shown in Appendix K.

A second analysis of individual correlations between preferences and concept-color distances involved examining mean correlations for each concept. Mean correlations for Hospital (+.18), Me (+.31), and Symphony (+.21) were similar in value as opposed to the much lower mean for Boulder (-.20). This observation is upheld by t values for differences among means, shown in Table 2. The differences between the Boulder mean correlation and each of the other three mean correlations were significant to the .01 level in each case; t was 4.53, 4.92, and 4.63 for Hospital, Me, and Symphony, respectively (df = 59). Values of t for the other differences were much lower; t was 1.51 for Hospital and Me, .30 for Hospital and Symphony, and .87 for Me and Symphony (df = 59). Boulder individual preference-distance correlations were significantly lower than the correlations for the other three concepts.

Clearly there is very little support for the hypothesis in the individual data. Although the preference-distance correlations for Me received the highest number of first ranks (18), Symphony correlations ran a close second (16). Mean correlations were highest for Me (+.31), but Hospital and Symphony means (+.18 and +.21) were very close to the mean correlation for Me. Thus, the overall tendency for more preferred colors to be closer to Me in semantic space is unimpressive relative to such tendencies for other concepts.

A secondary analysis of individual data was performed to see if color preferences were related to meanings of the colors, represented

TABLE 2

SUMMARY DATA FOR INDIVIDUAL PREFERENCE-DISTANCE RANK CORRELATIONS

	Concepts			
	Boulder	Hospital	Me	Symphony
Mean correlations	-.20	+.18	+.31	+.21
t values for differences among means				
Hospital	4.53***	~	~	~
Me	4.92***	1.51	~	~
Symphony	4.63***	.30	.87	~

***$p < .01$

by their scores on the three factors. Colors were ranked from highest to lowest score within each factor for each subject. Rank correlations were then calculated between these factor ranks and the individual preference ranks. Table 1 shows the r' coefficients for each subject for the Evaluative, Potency, and Activity Factors.

These individual preference-factor correlations were summarized in the same forms as were the preference-distance correlations. In the analysis of within-subject ranks, shown in Appendix L, the within-rank $\underline{x}^2$ value was 17.10 ($\underline{p}$ < .01) for the first rank, due to the predominance of first-rank assignments for the Evaluative Factor correlations (34). The $\underline{x}^2$ value for the Evaluative Factor ranks (21.50, $\underline{p}$ < .01) shows a significant deviation from chance. This is partially due to the high number of first ranks received (34) but is also due to a very small number of second ranks (6). Thus, there seems to have been a tendency for a given subject to show either a relatively high or relatively low relationship between preference and scores on the Evaluative Factor. Again, the remaining $\underline{x}^2$ values for ranks and factors, shown in Appendix L, are not independent of first ranks or Evaluative ranks.

The mean for Evaluative Factor preference-factor correlations (+.42) was higher than those for Potency (+.22) and Activity (+.30) Factors. However, Table 3 shows none of the $\underline{t}$ values for differences among means to be significant; $\underline{t}$ was 1.80 for Evaluation and Potency, 1.10 for Evaluation and Activity, and 1.44 for Potency and Activity (df = 59).

One further analysis was performed on the individual data as a check on possible effects of inconsistency of performance as a general

TABLE 3

SUMMARY DATA FOR INDIVIDUAL PREFERENCE-FACTOR RANK CORRELATIONS

	Factors		
	Evaluation	Potency	Activity
Mean correlations	+.42	+.22	+.30
t values for differences among means			
Potency	1.80	~	~
Activity	1.10	1.44	~

trait in individual subjects. Individual preference-distance and preference-factor correlation coefficients were ranked from highest to lowest for each concept and each factor. These ranks were then correlated with ranks from most to least consistent derived from numbers of reversals in preference judgments. The resulting correlations between consistency and preference-distance coefficients were -.33 for Boulder ($p < .02$), +.16 for Hospital, +.08 for Me, and -.08 for Symphony. Correlations between consistency and preference-factor coefficients were +.08 for the Evaluative Factor, +.05 for the Potency Factor, and +.19 for the Activity Factor. The only significant correlation occurred between high preference consistency and low preference-distance correlations for Boulder. If inconsistency is a general trait, then greater overall consistency of performance would have tended to lower the preference-distance correlations for Boulder toward an even more negative relationship.

Group data. Mean color preferences were calculated separately for males and females, as shown in Table 4. Since there were more females than males in the present population, male and female means were weighted equally to find the hypothetical mean preferences balanced for male vs. female color preference tendencies. Actual overall mean preferences and standard deviations were calculated by weighting each subject's responses equally. Mean coordinates and their standard deviations, shown in Tables 5 and 6, were calculated for both colors and concepts. Table 5 also shows overall means across all coordinates and across all the coordinates' standard deviations for each color.

The 24 overall distances from each of the four concepts to each of the six colors, shown in Table 7, were calculated from mean

TABLE 4

MEAN NUMBER OF PREFERENCES FOR EACH COLOR

	Colors					
	Red	Orange	Yellow	Green	Blue	Violet
	Male mean preferences and ranks					
Mean	7.09	5.05	4.36	4.90	5.68	2.73
Rank	1	3	5	4	2	6
	Female mean preferences and ranks					
Mean	6.24	3.79	4.84	5.79	5.95	3.34
Rank	1	5	4	3	2	6
	Hypothetical mean preferences and ranks: average of male and female means					
Mean	6.67	4.42	4.60	5.35	5.82	3.04
Rank	1	5	4	3	2	6
	Obtained mean preferences, ranks, and standard deviations					
Mean	6.50	4.25	4.73	5.43	5.88	3.12
Rank	1	5	4	3	2	6
Standard Deviation	2.33	2.80	2.73	2.30	2.45	2.30

TABLE 5

MEAN COLOR COORDINATES AND STANDARD DEVIATIONS

	Factors			
	Evaluation	Potency	Activity	Overall mean
	Mean coordinates			
Red	-.37	+1.73	+2.50	+1.29
Orange	-.26	+.01	+.60	+.12
Yellow	+.48	-.16	+.76	+.36
Green	+1.12	+.03	+.10	+.42
Blue	+1.34	-.47	-.82	+.02
Violet	+.28	-.76	-.98	-.49
	Standard deviations			
Red	.94	1.02	.60	.85
Orange	1.10	1.13	1.43	1.22
Yellow	.97	1.49	1.70	1.39
Green	.95	1.14	1.46	1.38
Blue	.91	1.19	1.31	1.14
Violet	1.25	1.28	1.38	1.30

TABLE 6

MEAN CONCEPT COORDINATES AND STANDARD DEVIATIONS

Concepts	Factors		
	Evaluation	Potency	Activity
Mean coordinates			
Boulder	-.40	+1.37	-1.22
Hospital	+.76	+.64	+.67
Me	+.90	-.14	+.68
Symphony	+1.25	-.10	+.44
Standard deviations			
Boulder	.72	1.36	1.53
Hospital	2.23	1.36	1.19
Me	2.08	.72	1.21
Symphony	1.07	.88	1.26

TABLE 7

DISTANCES BETWEEN MEAN COLORS AND CONCEPTS

Colors	Concepts			
	Boulder	Hospital	Me	Symphony
Red	3.7	2.4	2.7	3.2
Orange	2.3	1.2	1.2	1.5
Yellow	2.7	.9	.4	.8
Green	2.4	.9	.6	.4
Blue	2.6	1.9	1.6	1.3
Violet	2.2	2.2	1.9	1.8
Mean	2.7	1.6	1.4	1.5

coordinates for concepts and colors. Distances were converted to "closeness" scores by assigning the negative of the distance to each concept-color combination. Product-moment correlations were calculated between mean number of preferences and these overall "closeness" scores for each concept. Table 8 shows that all correlations were negative, indicating negative relationships between preference and closeness in semantic space for every concept. The strongest such negative relationship occurred with Boulder (-.75, $p < .05$). Symphony and Me distances yielded similar correlations: -.26 and -.24, respectively. The weakest relationship occurred with Hospital (-.08). Table 8 shows t values for differences among correlations. None of these correlations was significantly different from ony other; t was 1.09, .89, and .86 for differences between Boulder and Hospital, Me, and Symphony, respectively, .20 for Hospital and Me, .23 for Hospital and Symphony, and .04 for Me and Symphony (df = 8).

Again, the hypothesis has not been substantiated. These group data yield results which give even less support for the hypothesis than do the individual data. Here, the overall relationship between preference and closeness to Me is, if anything, negative. In fact, it is even more negative than the relationship for Hospital.

The group analysis for preference-factor relationships consisted of product-moment correlations calculated between mean preferences and mean coordinates on each factor and between mean preferences and overall means for coordinates across factors. Table 9 shows that the Evaluation Factor coordinates yielded the lowest coefficient (+.16). There was a stronger relationship between preference and high Activity ratings (+.58). The correlation between high Potency ratings and

TABLE 8

RESULTS OF *t* TESTS FOR DIFFERENCES
AMONG GROUP PREFERENCE-DISTANCE CORRELATIONS

		Concepts			
		Boulder	Hospital	Me	Symphony
Concepts	Correlations	*r*=-.75*	*r*=-.08	*r*=-.24	*r*=-.26
Hospital	*r*=-.08	1.09	~	~	~
Me	*r*=-.24	.89	.20	~	~
Symphony	*r*=-.26	.86	.23	.04	~

*p < .05

TABLE 9

RESULTS OF *t* TESTS FOR DIFFERENCES
AMONG GROUP PREFERENCE-FACTOR CORRELATIONS

		Factors			
		Evaluation	Potency	Activity	Overall
Factors	Correlations	$r=+.16$	$r=+.68$*	$r=+.58$	$r=+.81$**
Potency	$r=+.68$*	.82	∿	∿	∿
Activity	$r=+.58$	.61	.21	∿	∿
Overall	$r=+.81$**	1.19	.37	.57	∿

* $p < .05$
** $p < .02$

preference (+.68) was significant at the .05 level. The highest correlation was found between preferences and overall high ratings (+.81), significant at the .02 level. As shown in Table 9, none of the _t_ values for differences among these correlations was significant; _t_ was .82, .61, and 1.19 for differences between Evaluation and Potency, Activity, and Overall, respectively, .21 for Potency and Activity, .37 for Potency and Overall, and .57 for Activity and Overall (df = 8).

DISCUSSION

The hypothesis under investigation was not supported. The χ^2 analysis of within-subject ranks for individual preference-distance correlations for Me did not show significant deviation from chance. The mean individual preference-distance correlation for Me was positive but low (+.31) and was significantly different from only the mean correlation for Boulder. The preference-distance correlation of group means for Me was negative (-.24) and was not significantly different from the correlations for the other three concepts. In no analysis was there any apparent difference between preference-distance relationships for Me and those for Hospital and Symphony.

Treatment of possible causes and implications of this lack of support for the hypothesis will be postponed until each aspect of the data has been examined in its own right. Then information relevant to the main hypothesis can hopefully be drawn from these minor findings.

Overall order of colors from most to least preferred was: red, blue, green, yellow, orange, violet (Table 4). A rank-order correlation between this preference order and overall preferences of 21,060 subjects in Eysenck's (1941) review showed moderately high consistency (+.71, $p < .05$). Discrepancies between the two orders were reversals in the positions of red and blue and of yellow and violet. Thus, both red and yellow were more strongly preferred in this study; they occupied the first and fourth positions in contrast to the second and sixth positions assigned by Eysenck. Conversely, blue and violet, which were first and fourth according to Eysenck, were second and sixth here; they were less preferred in the present study than in Eysenck's (1941) study.

Samples for red and yellow were relatively bright while blue and violet were the darkest colors in this investigation. Since affective values of colors vary positively with brightness (Guilford, 1934), these brightness differences may have contributed to preference for red and yellow and interfered with preference for blue and violet. This effect of brightness differences is especially likely in view of the qualities of the paired comparison preference task. The subjects were required to make only one judgment at a time; they were not as likely to keep in mind the relative preferability of the entire range of stimuli as subjects in ranking or rating studies. Thus, the paired comparisons may have enhanced the effect of brightness by increasing the tendency to choose the brightest of each pair of colors.

Apparently, the predominance of females in the present subject population did not contribute to the reversals in order of preferences from the order found by Eysenck (1941). The present female order of preference is identical to the overall order of preference, whereas the male order differs (Table 4). The overload of females might have contributed to the overpreference for yellow, but even the males place yellow in the fifth position and violet in the sixth rank. Neither is the blue-red reversal due to the sex bias of the present sample; both males and females place red first and blue second. In fact, the hypothetical order of preference (Table 4) resulting from giving male and female preferences equal weight is identical to the actual obtained overall order. With the exception of blue, male-female differences in strength of preferences for each color are in the directions predictable from Eysenck's (1941) data.

There is, however, an interesting consistency in unusual preference order in the present sample: red and yellow, the over-preferred colors, have longer wavelengths than do blue and violet, the under-preferred colors. In their study of over 2,500 children from ages 5 to 15, Katz and Breed (1922) have found a decline in affective values of long wavelength colors with increasing age. Further related evidence can be drawn from the data for 1,000 children in the first through the tenth grades presented by Garth (1924). Overall order of preference and positions of violet and yellow in this investigation were most similar to results for children in the third and fourth grades. Red was the most preferred color only in the first grade, and its rank dropped consistently as age increased. Staples (1932) has given relative color preferences for the four colors red, yellow, green, and blue for four major age groups. The order of preference for these four colors in the present data is most similar to those for children aged 2 to 5 and 7 to 12 years. The only age group with the first rank assigned to red consisted of infants under 2 years. The present order of preference is least similar to the blue, green, red, yellow order Staples (1942) has found for 100 college students.

Staples (1932) used the method of paired comparisons, as did the present investigator, although the task was administered individually in the earlier study. Neither the sex ratio nor the age of Staples college sample was specified. However, Staples used the results from these students as a sample of "adult" color preferences. Perhaps Staples' sample was generally older than the present sample. Or, perhaps the general conception of the maturity of college students has changed since the time of Staples' work (1932). In fact, the consistency between the results for the present sample and those found for children may indicate some variety of actual immaturity which may be specific to the present sample or may be generally indicative of today's college students. A final hypothesis concerning the present overpreference for red consists of red's associations with "force," "passion," "intensity" (Kouwer, 1949) and the relationship of these concepts to the current "revolutionary" feelings of college students.

Variability due to individual preferences was indicated by standard deviations for group preferences for each color (Table 4). The maximum number of times any color could be preferred was 10. Thus, these standard deviations are results of variability within a restricted range of possible preferences from 0 to 10. Preferences varied to the extent that every color received every possible rank from first to sixth from at least two subjects. Thus, in spite of the inter-subject agreement on color preferences emphasized by Eysenck (1941), Guilford (1934), and Guilford and Smith (1959), there seems to be enough individual color preference variability in the present data to provide an opportunity for expression of individual differences.

Violet, the least preferred color with 22 ranks of six, was also the least variable with respect to rankings for individual preferences and standard deviations for group preferences. Orange showed the highest preference variability; perhaps this is related to the previously-mentioned conflict between its "gay" qualities (Odbert, Karwoski, and Eckerson, 1942) and its "distressing" aspect (Wexner, 1954).

The meanings of the six colors investigated here can be described roughly in terms of "good" vs. "bad" (Evaluative Factor), "potent" vs.

"impotent" (Potency Factor), and "active" vs. "inactive" (Activity Factor). Standards for relative strengths of meanings can be drawn from instructions to the subjects (Appendix J). Within this framework, any coordinate within a range of -.49 to +.49 may be categorized as a "neutral" meaning with respect to the factor. Coordinates within the ranges +.50 to +1.49, +1.50 to +2.49, and +2.50 to +3.00 represent positive meanings of moderate, strong, and extreme intensity, respectively. Similarly, negative meanings of varying intensities may be represented by coordinates falling in the following ranges: -.50 to -1.49, -1.50 to -2.49, and -2.50 to -3.00. Exclusion of the "neutral" coordinates leaves the following meanings: red was "very potent" and extremely "active;" orange and yellow were "moderately active;" green was "moderately good;" blue was "moderately good" and "moderately inactive;" violet was "moderately impotent" and "moderately inactive" (Table 5).

A check on the generality of these color meanings will include the color-meaning investigations reviewed earlier (Hevner, 1935; Lewinski, 1938; Odbert, Karwoski, and Eckerson, 1942; Kouwer, 1949; Wexner, 1954; Murray and Deabler, 1957; Schaie, 1961).

Although the violet color sample in the present study might just as easily be called "purple," the differences between the present results and previous investigations may be due to differences in the name of the color. Kouwer's (1949) purple, for example, was described as "disagreeable" and "sad" and was associated with "deceit" in contrast to violet's "neutrality" on the Evaluative Factor. The dignity, stateliness, and solemnity of purple seems vaguely related to violet's "inactivity" but opposed to the "impotency" of violet in this study.

Blue's "goodness" is supported by the labels "agreeable" and "pleasant" (Lewinski, 1938; Odbert, Karwoski, and Eckerson, 1942; Schaie, 1961). The calm, cool, soothing, and serene qualities of blue are consonant with "inactivity." Although similar qualities, including "leisurely" (Odbert, Karwoski, and Eckerson, 1942), have generally been attributed to green, green was neither "active" nor "inactive" in the present study. Green too has been described as "agreeable" (Kouwer, 1949) and was "moderately good" here.

The "moderate activity" of orange and yellow is supported by their warm, exciting, and stimulating aspects. The striking consistency with which red has been described as hot, intense, exciting, stimulating, and active is borne up well by the "extreme activity" assigned to red in this study. Support for red's "potency" can be found in its association with "powerful" and "protective" mood-tones (Wexner, 1954; Schaie, 1961). Red, like orange and yellow, was here neither "good" nor "bad." However, conflicting meanings relevant to the Evaluative Factor have been attributed to all three colors; each is related to both cheerful moods and distressing emotions (Kouwer, 1949; Wexner, 1954; Murray and Deabler, 1957). Perhaps the evaluative neutrality of red, orange, and yellow is a sort of compromise.

Red and blue seem to be the colors for which the greatest number, strength, and consistency of color meanings have been found. In the present study, meanings for red and blue have shown the greatest agreement with previous investigations. The reliability of their meanings is also shown by the low variability of their coordinates in semantic space (Table 5). Color-meaning consistency across studies seems to have been highest for associations relevant to activity and lowest for evaluative meanings.

The dependence of color preference on color meaning could result in a direct relationship between preferences and relative positions of color coordinates on the three different factors. The most obvious expectation is that color preferences should be positively related to coordinates on the Evaluative Factor: highly preferred colors should have high positive coordinates while nonpreferred colors should have low coordinates in the negative direction. The mean for rank-order coefficients calculated from individual preferences and Evaluative coordinates indicated a moderate positive correlation (+.42). However, within-subject ranks for preference-distance correlations showed that although the first rank was in the majority, there were very few second ranks for the Evaluative Factor (Appendix K). In other words, a given subject was likely to have either a high preference-Evaluation relationship or a low one. Also, the product-moment correlation of group preferences and coordinates was very low (+.16). This was primarily the result of red's position as least highly evaluated but most preferred. The low relationship could be due to the previously mentioned unreliability of color meanings on the Evaluative Factor. A factor analysis of semantic differential ratings of colors on twenty items (Wright and Rainwater, 1962) yielded two new factors in place of the traditional Evaluative Factor: "happiness" and "showiness." Perhaps Osgood's Evaluative Factor is not useful in measuring color meanings. This inadequacy of the Evaluative Factor is particularly surprising in view of the support presented by Osgood, Suci, and Tannenbaum (1957) for the use of semantic differential in attitude measurement.

The Evaluative Factor proved unreliable for concept meanings also. Evaluative coordinates for concepts in the present data (Table 6) were not as expected (Appendix C) from data presented by Jenkins, Russell, and Suci (1958). Though the coordinates for Me were similar, Evaluative coordinates for Boulder, Hospital, and Symphony were lower in this experiment. The net result of these changes and small differences on the other two factors was that: the distance between Me and Boulder increased from the predicted 2.26 to 2.75, while distances of Me from Hospital and Symphony were .79 and .42 as opposed to 1.02 and 1.17. Thus, Hospital was close and Symphony even closer to Me, while Boulder was relatively removed from the cluster of the first three concepts. This "clustering" showed up in the similarity of relative distances of these three concepts from each color: yellow and green were always the two closest colors; orange and blue were mid-distance; violet was second from farthest; red was always farthest. Hence the similarity of the group correlations for preferences and distances from Hospital, Me, and Symphony. Basic differences between our college subject population and the college sample (15 males and 15 females) tested by Jenkins, Russell, and Suci (1958) cannot be assumed. However, these 30 subjects rated 360 words on 20 adjective-pairs. Perhaps differences in length and complexity at rating tasks affect Evaluative ratings more than Potency or Activity responses. But it also seems likely that the relevance of adjectives indicating high evaluation ("good," "kind," "wise," and "beautiful" in the present study) has decreased for college students since 1958.

The mean individual correlation of color preference with Potency was moderately low (+.22). In contrast, group preferences correlated +.68 ($p < .05$) with mean coordinates on the Potency Factor. Group data yielded another large but non-significant coefficient (+.58) for a preference-Activity relationship for colors. Again the mean coefficient for individual data was lower (+.30), but not as low as that obtained for Potency. Red was the most preferred, most potent, and most active color while violet was least preferred, least potent, and the least active color. These combinations of positions played an important role in the large size of group correlations of preference with Potency and Activity Factors.

The data in the present study seem to lend approximately equal support to the relationship between color preference and potency and to that between preference and activity. However, almost every color in every study reviewed was somehow related to activity. Activity-related meanings are the most consistent across these studies and between their results and the present results. Cross-study consistency for potency-related meanings was good, but they were not as often relevant to colors. It is indicative that excitation is a major dimension in both Kouwer's (1949) and Heiss's (1964) conceptual schemes of colors. The high negative relationship ($-.75$, $p < .05$) between group color preferences and overall closeness to <u>Boulder</u> in semantic space is better explained in terms of <u>Boulder</u>'s inactivity than in terms of its high potency (Table 6). If this negative relationship involves a color association to <u>Boulder</u>, then the "colorless, lifeless, dead" qualities of gray have higher predictive accuracy than associations to brown, "disagreeable" and "strong" (Kouwer, 1949).

Overall means of coordinates for each color showed an even higher correlation with preferences ($+.81$, $p < .02$) than did either mean Potency or Activity coordinates. This overall relationship seems to indicate group tendencies to respond with a consistent degree of positiveness or negativeness to the same color in both preference and rating tasks and with differential degrees of positive or negative responses to different colors.

Some inconsistencies between color meaning data in the present study and the results of earlier investigations may be due to narrowness of the range of meanings measured in the present study. Wright and Rainwater (1962) met the inadequacy of the Evaluation Factor for color meanings by substituting for it the factors "happiness" and "showiness." Their factor analysis of color meanings resulted in the retention of the traditional Potency and Activity Factors and the addition of "warmth" and "elegance." Their use of these new factors allowed them to give greater importance to adjectives more relevant to color meanings. Unfortunately, the use of the traditional factors in the present study prohibited the inclusion of adjectives that are highly representative of specific colors: "striking" for red, "festive" for orange and yellow (Kouwer, 1949), "young" for green, and "full" for blue and purple (Hofstatter and Lubbert, 1958).

One of the constant problems in the use of the semantic differential is subjects' interpretation of adjective-pairs in a literal, denotative sense rather than their connotative sense (Osgood, Suci, and Tannenbaum, 1957). For example, subjects in the present experiment could easily have rated themselves on the adjective-pairs "hard-soft" and "angular-rounded" in terms of the physical qualities of their own bodies. Talbot, Miller, and White (1961) have demonstrated the usefulness of certain semantic differential adjective-pairs (such as "masculine-feminine," "irresponsible-responsible," and "important-unimportant") in measuring person-concepts. Perhaps inclusion of more such person-related adjective-pairs would have ensured a more valid measure of self-concept. The validity of the self-concept measured by the semantic differential is also liable to the effects of misrepresentation, both intentional and unintentional. One subject in this study showed his defensiveness by marking extreme positive adjectives in every pair, perhaps attempting a humorous effect. The relation between self-concept and personality is a separate complicating issue. One possible view is that their relatedness depends on the subject's insight into his personality. A more skeptical view might propose that self-concept taps only the conscious level of personality and is, as often as not, a misrepresentation of the "real" person. At best, we can state only that the self-concept represents some portion of the personality.

There are some problems basic to making preference judgments for colors isolated from specific objects. "As a general rule, affective responses to single, detached colors can be considered at a low level of intensity. Ordinarily they are of the nature of esthetic judgments which are partly intellectual and involve a minimum of emotionality (Optical Society of America, 1953, p. 160)." Affective responses to colors, weak to begin with, are further weakened by prolonged or repeated exposures. Sensory adaptation and changes in associations contribute to within-subject variability of color preferences within single test sessions (Optical Society of America, 1953).

Sadacca (1962) has analyzed within-subject inconsistency in paired comparisons in terms of circular tetrads. He has concluded that inconsistency in paired comparisons is a general trait unrelated to the type of items being compared and indicating lack of motivation. Although Sadacca did not propose a generality of inconsistency beyond paired comparisons tasks, it seems likely that subjects performing inconsistently on the paired comparisons in the present study would also lack stable reference points for semantic differential ratings. Thus, inter-comparisons, specifically distance scores, could be unreliable for inconsistent subjects. Such intra-subject unreliability would affect individual data more than grouped data since individual fluctuations should tend to cancel each other.

Reversals of judgment in the present paired comparisons preferences averaged 3.57 out of a maximum of 15 possible. If general unreliability existed here in different degrees for different subjects, then subjects who performed more consistently on the preference task should show stronger relationships in cases where overall correlations have been large. More consistent subjects should show lower correlations for Boulder, for example, since Boulder was the one concept for which a significant negative overall preference-distance correlation was found. A rank correlation of -.33 (p < .02) between consistency and Boulder preference-distance correlations indirectly supports this idea of the role of overall inconsistency. Such rank correlations for Hospital, Me, and Symphony, the concepts for which little evidence for a preference-distance relationship has been shown, were correspondingly not significant (+.16, +.08, -.08). Thus, increased intra-subject consistency would probably not have improved the preference-distance relationships for these three concepts. Similarly, a low rank correlation between consistency and the preference-factor relationships for the Evaluative Factor (+.08) shows that intra-subject consistency would probably not have improved the overall preference-Evaluation relationship. On the other hand, such rank correlations for Potency and Activity Factors (+.05 and +.19) were not significant. Since evidence for overall preference-Potency and preference-Activity relationships has been shown, these low correlations indirectly weaken the notion that intra-subject inconsistency would reduce existing overall relationships found while not affecting overall relationships for which no strong evidence has been found.

Now some possible causes of the major results of this study can be examined. Relative preferability of the six colors was not positively correlated with their relative nearness to Me in semantic space. The overall preference-distance correlation for Me was not significantly higher than those for Hospital and Symphony but was significantly higher than that for Boulder in the individual data though not in the group data.

The similarity of preference-closeness correlations for Hospital, Me, and Symphony has been explained in terms of the unexpected "clustering" of these three concepts in semantic space as opposed to the more distant position and differing correlations for Boulder. This similarity of meaning for the three "clustered" concepts consists of similarly positive Evaluative and Activity coordinates. Although these three "clustered" concepts were not close enough to each other to consider their meanings identical, color meanings were distant enough for relative orders of distances to colors to be similar for the three concepts.

But why aren't more preferred colors closer to and less preferred colors farther from Me in semantic space? A check on the antecedents to this relationship is needed.

The inter-subject preference variability in these data seems adequately high for personality factors to play a role in color preference. However, intra-subject preference variability seems to point out the weakness and fragility of the color preferences. There is some evidence in the present study that preference inconsistency was related to unreliability of semantic defferential ratings. Color meanings in this study are generally rather consistent on the whole with those found by previous investigators. Inconsistencies were often the result of the irrelevance of meanings from other investigators to the narrow scope of meanings possible within the Evaluation, Potency, and Activity framework. This limitation on possible meanings of colors may have undermined preference-distance relationships by not allowing the most essential meanings of the colors to become apparent.

Consistent relationships between preferences and meanings would provide indirect support for the preference-self relationship hypothesized. Group correlations between preferences and factor coordinates were very low for the Evaluative Factor but substantial for Potency and Activity Factors. However, the very high correlation between preferences and overall coordinates for each color indicates that all responses to a given color may be affected by a general positive or negative set toward the color. If this factor was operative it must have inflated the preference-Potency and preference-Activity correlations so that they are not true estimates of meaning-preference relationships.

The validity of the self-concepts measured in this study is suspect. Misrepresentation of self could have occurred through faulty or vague interpretations of the items, defensiveness, or lack of insight. There are also limitations to the relevance of the self-concept to personality. The self-concept represents only a portion of the personality, at best.

It is clear that numerous factors could have undermined the preference-personality relationship. Thus, the present negative results are not considered grounds enough to reject the original hypothesis that an individual's preference for different colors is determined by the similarity of the color meanings to his own personality. This rationale behind the diagnostic use of color preferences remains unscathed.

However, some interesting implications have arisen from the minor data analyses conducted. The color preferences obtained for this sample of college students varies from established data on group color preferences in a pattern strikingly similar to preferences found for children. Perhaps predominant color preferences for different age groups have changed since the critical studies were conducted in the 1920's and 30's. Or the preferences of the population tested here may represent a current deficit in the maturity of college students, perhaps specific to the sample tested here or perhaps more general. The overpreference for red may be related to the current "revolutionary" atmosphere on campus.

Red, the color "par excellence" (Kouwer, 1949) played an active role (consistent with its meaning) in all the analyses by occupying the first rank for preference and extremes for all factors. Its meaning was least variable within this study and across different studies of color meaning. Violet, the color with the vaguest meaning, was the least preferred and least variable in preference. It occupied the lowest positions on Factors II and III and for overall coordinates. Through their extreme positions and their unusual positions in the preference order, red and violet "ran the show."

The semantic differential's Evaluative Factor was found generally inadequate for use with color meanings. In the present study the pleasant and unpleasant emotions so often associated with colors were related to the Evaluative coordinates of the colors; the net results were often conflicting and inconclusive. The very low group correlation between preferences and Evaluative coordinates further indicates that the Evaluation dimension is very poorly related to the pleasantness of colors. Discrepancies between Evaluation coordinates for concepts in the present study and those given by Jenkins, Russell, and Suci (1958) could indicate a lack of reliability in the Evaluative Factor across different methods.

An alternative explanation for these difficulties with the Evaluative Factor involves the possibility that adjectives related to "goodness" seem less and less relevant to college students as time passes. If this possibility is true, further investigation is needed to determine if the "list" of adjective-pairs commonly accepted as loading heavily on the Evaluative Factor needs revision or if the amount of variance due to the Evaluative Factor has actually decreased since Osgood's development of the semantic differential in the 1950's.

APPENDIX A

COLOR PREFERENCE RESPONSE SHEETS

Research Number _____

COLOR PREFERENCE SHEET

SESSION #1

As the color pairs are presented, circle the letter that stands for the color you prefer:

R = Red	O = Orange	Y = Yellow
G = Green	B = Blue	V = Violet

1. Y O	16. R G
2. V G	17. Y G
3. B G	18. G O
4. O Y	19. B O
5. G Y	20. G B
6. Y B	21. V O
7. B R	22. O G
8. O R	23. R Y
9. Y R	24. V Y
10. G R	25. O V
11. R O	26. Y V
12. V R	27. R B
13. G V	28. O B
14. V B	29. B Y
15. R V	30. B V

Research Number _____

COLOR PREFERENCE SHEET

SESSION #2

As the color pairs are presented, circle the letter that stands for the color you prefer:

R = Red	O = Orange	Y = Yellow
G = Green	B = Blue	V = Violet

1.	B	Y	16.	R	V
2.	Y	B	17.	O	Y
3.	G	B	18.	V	R
4.	V	Y	19.	G	V
5.	V	G	20.	R	O
6.	V	B	21.	R	Y
7.	R	G	22.	O	V
8.	Y	O	23.	O	B
9.	O	G	24.	Y	G
10.	B	R	25.	G	Y
11.	O	R	26.	B	V
12.	Y	V	27.	B	G
13.	Y	R	28.	G	O
14.	R	B	29.	G	R
15.	B	O	30.	V	O

Research Number _____

COLOR PREFERENCE SHEET

SESSION #3

As the color pairs are presented, circle the letter that stands for the color you prefer:

R = Red	O = Orange	Y = Yellow
G = Green	B = Blue	V = Violet

1. B V	16. O B
2. R O	17. G R
3. B Y	18. O V
4. O G	19. Y R
5. R G	20. V G
6. O Y	21. G B
7. R B	22. G O
8. V O	23. V R
9. B O	24. Y B
10. O R	25. V Y
11. B G	26. Y G
12. Y V	27. V B
13. R V	28. G Y
14. G V	29. R Y
15. B R	30. Y O

Research Number _____

COLOR PREFERENCE SHEET

SESSION #4

As the color pairs are presented, circle the letter that stands for the color you prefer:

R = Red	O = Orange	Y = Yellow
G = Green	B = Blue	V = Violet

1.	B	V	16.	O	R
2.	R	V	17.	Y	O
3.	V	B	18.	V	G
4.	V	O	19.	O	Y
5.	G	Y	20.	Y	B
6.	O	V	21.	Y	R
7.	G	V	22.	O	B
8.	O	G	23.	B	R
9.	G	R	24.	V	Y
10.	B	O	25.	B	G
11.	V	R	26.	R	O
12.	R	B	27.	Y	V
13.	G	O	28.	R	G
14.	Y	G	29.	G	B
15.	R	Y	30.	B	Y

APPENDIX B

FACTOR LOADINGS OF SEMANTIC DIFFERENTIAL ADJECTIVE-PAIRS

(from Jenkins, Russell, and Suci, 1958)

Adjective-pairs	Information about adjective-pairs	
	Factor loading	Rank among 20 adjective-pairs for factor
	Evaluative Factor criterion = .52	
good-bad	1.00	1
wise-foolish	.57	2
kind-cruel	.52	3.5
beautiful-ugly	.52	3.5
	Potency Factor criterion = .26	
hard-soft	.97	1
strong-weak	.40	3
angular-rounded	.26	6.5
	Activity Factor criterion = .26	
active-passive	.98	1
fast-slow	.35	2
excitable-calm	.26	5

APPENDIX C

COORDINATES AND DISTANCE FROM ME IN SEMANTIC SPACE FOR ELEVEN CONCEPTS

(from Osgood, Suci, and Tannenbaum, 1957, and Jenkins, Russell, and Suci, 1958)

Concepts	Coordinates on three factors			Distance from Me for concept	Mean Distance from Me for category
	Evaluation	Potency	Activity		
Person concepts					
Me	+.92	-.07	+.69	--	--
Physical objects					
Knife	-.66	+1.52	+1.30	2.32	2.23
Boulder	+.28	+1.27	-1.04	2.26	
Snow	+1.25	-1.20	-.80	1.90	
Engine	+.62	+1.91	+2.07	2.43	
Event concepts					
Debate	+.80	+1.12	+1.82	1.65	1.39
Birth	+.86	-.29	+1.19	1.02	
Dawn	+1.97	-.80	-.44	1.71	
Symphony	+2.04	-.22	+.98	1.17	
Institutions					
Hospital	+1.61	+.60	+.34	1.02	1.08
America	+1.90	+.59	+1.37	1.36	
United Nations	+1.58	+.50	+.63	.87	

APPENDIX D

SEMANTIC DIFFERENTIAL COLOR RESPONSE SHEETS

1 Research Number _____

foolish	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	wise
angular	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	rounded
slow	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	fast
passive	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	active
hard	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	soft
good	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	bad
ugly	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	beautiful
kind	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	cruel
weak	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	strong
excitable	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	calm

2 Research Number _____

passive _____ : _____ : _____ : _____ : _____ : _____ : _____ active

good _____ : _____ : _____ : _____ : _____ : _____ : _____ bad

weak _____ : _____ : _____ : _____ : _____ : _____ : _____ strong

hard _____ : _____ : _____ : _____ : _____ : _____ : _____ soft

ugly _____ : _____ : _____ : _____ : _____ : _____ : _____ beautiful

slow _____ : _____ : _____ : _____ : _____ : _____ : _____ fast

wise _____ : _____ : _____ : _____ : _____ : _____ : _____ foolish

angular _____ : _____ : _____ : _____ : _____ : _____ : _____ rounded

calm _____ : _____ : _____ : _____ : _____ : _____ : _____ excitable

kind _____ : _____ : _____ : _____ : _____ : _____ : _____ cruel

3 Research Number _____

strong	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	weak
soft	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	hard
slow	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	fast
kind	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	cruel
beautiful	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	ugly
angular	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	rounded
bad	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	good
foolish	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	wise
excitable	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	calm
passive	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	active

4 Research Number _____

excitable	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	calm
foolish	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	wise
fast	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	slow
active	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	passive
bad	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	good
hard	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	soft
weak	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	strong
rounded	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	angular
beautiful	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	ugly
cruel	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	kind

5 Research Number _____

rounded	_____	_____	_____	_____	_____	_____	_____	angular
beautiful	_____	_____	_____	_____	_____	_____	_____	ugly
fast	_____	_____	_____	_____	_____	_____	_____	slow
cruel	_____	_____	_____	_____	_____	_____	_____	kind
soft	_____	_____	_____	_____	_____	_____	_____	hard
calm	_____	_____	_____	_____	_____	_____	_____	excitable
strong	_____	_____	_____	_____	_____	_____	_____	weak
active	_____	_____	_____	_____	_____	_____	_____	passive
bad	_____	_____	_____	_____	_____	_____	_____	good
wise	_____	_____	_____	_____	_____	_____	_____	foolish

6 Research Number _____

fast	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	slow
rounded	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	angular
active	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	passive
cruel	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	kind
good	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	bad
strong	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	weak
wise	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	foolish
soft	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	hard
ugly	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	beautiful
calm	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	excitable

APPENDIX E

SEMANTIC DIFFERENTIAL CONCEPT RESPONSE SHEETS

1 Research Number _____

kind	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	cruel
rounded	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	angular
strong	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	weak
hard	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	soft
foolish	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	wise
fast	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	slow
ugly	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	beautiful
calm	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	excitable
passive	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	active
good	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	bad

2 Research Number _____

bad _____ : _____ : _____ : _____ : _____ : _____ : _____ good

kind _____ : _____ : _____ : _____ : _____ : _____ : _____ cruel

ugly _____ : _____ : _____ : _____ : _____ : _____ : _____ beautiful

hard _____ : _____ : _____ : _____ : _____ : _____ : _____ soft

rounded _____ : _____ : _____ : _____ : _____ : _____ : _____ angular

strong _____ : _____ : _____ : _____ : _____ : _____ : _____ weak

foolish _____ : _____ : _____ : _____ : _____ : _____ : _____ wise

active _____ : _____ : _____ : _____ : _____ : _____ : _____ passive

calm _____ : _____ : _____ : _____ : _____ : _____ : _____ excitable

fast _____ : _____ : _____ : _____ : _____ : _____ : _____ slow

3 Research Number _____

beautiful	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	ugly
weak	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	strong
active	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	passive
bad	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	good
cruel	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	kind
wise	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	foolish
slow	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	fast
soft	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	hard
excitable	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	calm
angular	_____ :	_____ :	_____ :	_____ :	_____ :	_____ :	_____	rounded

4 Research Number _____

wise _____ : _____ : _____ : _____ : _____ : _____ : _____ foolish

weak _____ : _____ : _____ : _____ : _____ : _____ : _____ strong

slow _____ : _____ : _____ : _____ : _____ : _____ : _____ fast

soft _____ : _____ : _____ : _____ : _____ : _____ : _____ hard

good _____ : _____ : _____ : _____ : _____ : _____ : _____ bad

passive _____ : _____ : _____ : _____ : _____ : _____ : _____ active

cruel _____ : _____ : _____ : _____ : _____ : _____ : _____ kind

angular _____ : _____ : _____ : _____ : _____ : _____ : _____ rounded

beautiful _____ : _____ : _____ : _____ : _____ : _____ : _____ ugly

excitable _____ : _____ : _____ : _____ : _____ : _____ : _____ calm

APPENDIX F

ANNOUNCEMENT TO POTENTIAL SUBJECTS

I'm a graduate student . . . my name is Maureen Landis . . . and I'm doing some research on reactions to colors. I'd like for as many of you as possible to be in my study. So that quite a few of you can come, I've scheduled it in four separate sessions: tonight, Friday night, and Monday and Tuesday nights. It will be at 8:00 each of these nights and shouldn't last more than an hour. It will be in Room 25 on the bottom floor of the psychology wing of this building.

This will be pencil-and-paper work but it will <u>not</u> be a test of any abilities. . . only of your own personal reactions. Please bring a pencil if you come. And please <u>don't</u> come if you are color-blind. Are there any questions?

APPENDIX G

CHARACTERISTICS OF SUBJECT POPULATION

	Age								
	18	19	20	21	22	23	24	25	26
No. of subjects	3	43	9	3	0	0	0	0	2

	Year in school			
	Freshman	Sophomore	Junior	Senior
No. of subjects	1	48	8	3

	Session			
	I	II	III	IV
No. of subjects in evening sessions	7	0	12	16
No. of subjects in laboratory sections	7	12	6	0

APPENDIX H

COLOR PREFERENCE INSTRUCTIONS

I am going to show six colors in thirty pairs on this screen. As I present each pair, I want you to circle the color you prefer on your sheets. Each pair will be presented for about five seconds. I'll show you all six colors before we start. Please put your research number at the top of the page. Are there any questions?

APPENDIX I

ORDERS OF TASKS AND PRESENTATIONS FOR SESSIONS I - IV

Order	Sessions			
	I	II	III	IV
	Semantic differential tasks			
1	colors	concepts	colors	concepts
2	concepts	colors	concepts	colors
	Concepts			
1	Boulder	Hospital	Me	Symphony
2	Hospital	Boulder	Symphony	Me
3	Me	Symphony	Boulder	Hospital
4	Symphony	Me	Hospital	Boulder
	Colors			
1	red	blue	green	violet
2	green	yellow	red	blue
3	blue	red	orange	green
4	violet	orange	yellow	red
5	yellow	green	violet	orange
6	orange	violet	blue	yellow

APPENDIX J

INSTRUCTIONS FOR SEMANTIC DIFFERENTIAL

(after Osgood, Suci, and Tannenbaum, 1957)

First task. Please do not look through these booklets as I hand them out. The purpose of this part is to measure the meanings of six colors (four concepts) to each of you by having you judge them against a series of descriptive scales. You will rate each color (concept) on one page of your booklet.

Here is how you are to use these scales: (A sample adjective-pair, masculine-feminine, on the blackboard was used to show the proper places for checkmarks if the color (concept) was extremely, quite, or slightly masculine or feminine. The neutral blank in the center was defined as a two-purpose category for concepts either equally related to both adjectives or for which the adjective-pair was consi-sidered irrelevant.)

It is important to place your checkmarks in the middle of the spaces, not on the boundaries, to be sure you check every scale for every color (concept), do not omit any, never to put more than one checkmark on a single scale.

Do not look back and forth through the booklet even if you feel you've had the same item before. Do not try to remember how you checked similar items earlier in the test. Make each item a separate and independent judgment. Work at a fairly high speed and do not worry or puzzle over individual items. It is your first impressions, the immediate feelings about the items that I want. On the other hand, please do not be careless, because I want your true impressions.

I will present each color (concept) on the screen until everyone is through with the ratings. Do not look at the other pages: just proceed to the next page as the next color (concept) is presented. Don't forget to put your research number at the top of each page as you come to it. Are there any questions?

Special instructions for colors:

So that you are sure you are rating the color and not just a vague memory of it, look back up at the color frequently.

Special instructions for concepts:

The names of these concepts are written on posterboards which I am going to hang from the top of the screen. Please react to the idea of the thing named, not to the sign itself.

Second task. Now we are going to use the same technique to measure the meanings of four concepts (six colors). Let me remind you not to look through the booklets and to put your research number at the top of each page as you come to it. Are there any questions?

APPENDIX K

WITHIN-SUBJECT RANKS FOR INDIVIDUAL PREFERENCE-DISTANCE CORRELATIONS

Ranks	Concepts: Boulder	Hospital	Me	Symphony	Totals across concepts	χ^2 for differences among concepts within ranks
	Number of within-subject ranks					
1	9	11	18	16	54	3.93
1.5	0	3	3	4	10	3.60
2	4	21	13	14	52	11.23**
2.5	0	3	3	2	8	3.00
3	11	11	12	15	49	.88
3.5	4	4	5	3	16	.50
4	32	7	6	6	51	38.80***
	χ^2 for differences among ranks within concepts					
	41.42***	8.70	5.93	5.87		

** $p < .02$
*** $p < .01$

APPENDIX L

WITHIN-SUBJECT RANKS FOR INDIVIDUAL PREFERENCE-FACTOR CORRELATIONS

Ranks	Factors: Evaluation	Factors: Potency	Factors: Activity	Totals across factors	χ^2 for differences among factors within ranks
	Number of within-subject ranks				
1	34	10	14	58	17.10***
1.5	1	2	1	4	.50
2	6	20	29	55	14.65***
2.5	0	3	3	6	3.00
3	19	25	13	57	3.78
	χ^2 for differences among ranks within factors				
	21.50***	7.38	10.15*		

* $p < .05$
*** $p < .01$

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