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ROLE OF COLOR IN PERCEPTION OF ATTRACTIVENESS

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Summary.—In this color study females reported a favorite color significantly more often than males. Males preferred bright colors significantly more than females, with a converse finding for preference for soft colors. The 276 subjects, when asked to evaluate the attractiveness of stimulus models in photographs, gave as the reason color significantly more often than style of clothing or facial expressions. Subjects significantly concurred with expert choices of recommended and nonrecommended colors in five of the six sets of photographs. This study lends credence that wearing recommended colors makes a difference in judgments of what looks best by subjects over the age of 12.

Photographs have been used to study physical attractiveness for many years. When comparing prejudged photographs of highly attractive individuals over those considered unattractive, consistent patterns emerge. Highly attractive persons in photographs are judged significantly more positively than those judged less attractive (Miller, 1970; Dion, Berscheid, & Walster, 1973; Landy & Sigall, 1974).

One means through which physical attractiveness may be enhanced is by wearing colors of clothing which complement one's personal skin coloration (Jackson, 1980). Personal color analysis is a tool to help consumers decide what their clothing color choices should be (Abramov, 1985). There are many systems of color analysis, and these are inconsistent in their recommendations (Collin, 1986). This inconsistency has resulted in skepticism regarding the value of wearing prescribed colors (Abramov, 1985).

However, there is some evidence of a relation between clothing color and personal coloring. Mahannah (1968) found a relationship between hair color and costume color and concluded these were important determinants of first impressions. More recently, Francis and Evans (1987) manipulated personal coloring, hue, value, and garment style in an investigation of color and person perception. An experimental design which included four independent variables, personal coloring (blonde, brunette), hue (red, green), value (high, low), and garment style (tailored, feminine), was used. Questionnaires which contained 27 adjective pairs with attached photographs of the stimulus person were completed by 301 female students in one of 16 treatments. Six factors were generated from a factor analysis: emotional, sociable, adaptable, scientific, typical, and excitable. Emotional accounted for 40% of the total

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variance. Personal coloring of the stimulus person had the largest effect on assessments of six personality trait factors, followed by value and garment style. Both stimulus persons were perceived more positively when wearing experimental garments of high value (tints) than when wearing garments of low value (shades). However, the stimulus persons were generally perceived more positively on the sociable factor when not wearing garment colors recommended for their personal coloring than when wearing the recommended colors.

In another study on personal coloring and garment hue and value in relation to college recruiters' assessments of employment potential, Francis and Evans (1988) found that value had a greater influence on assessments of employment than did hue. Only one of the two reds recommended for the model used in the study was associated with positive assessments of employment potential, so only partial support for recommendations based on a commercial color analysis system was found.

The major purpose of the present study was to investigate whether attractiveness is perceived on the basis of color, facial expression, or style of garment and whether stimulus models photographed in a prejudged recommended or nonrecommended color polo shirt are perceived as more attractive in their recommended color. Attractiveness was defined by judging in which photograph a person looked better. A secondary purpose was to ascertain subjects' color, value, and chroma preferences. Moderating variables were age and sex.

Method

Stimulus Items

Six stimulus models' personal coloring were classified based on Caygill's (1980) seasonal color system as being winter, summer, autumn, or spring. Four trained color consultants validated the classifications. Two polo shirts were selected for each of the models. One was considered to be a recommended color and the other a nonrecommended color. These judgments were based on comparing the color of the polo shirts to colors suggested by Jackson (1980). Each model was photographed with a polaroid camera in each of the polo shirts. In all photographs, but set 5, the background was beige. Photographs were taken at a 5-ft. distance and displayed the model from the waist to the top of the head.

For reliability, the Munsell system of color notation was used to describe and analyze the color of the polo shirts in the photographs. The standard used was the glossy edition of the Munsell Book of Color (1966). Color ratings were taken of each 3- x 3-in. photograph, 1½ in. from each side and 1 in. from the bottom of the photograph.

A uniform gray matte background material provided by the Munsell

Company was used in viewing the colors of the photographs. Openings were cut to expose only the color area being identified. The color area examined was a 1½-cm square. The researcher who made the color identifications had normal vision as determined by an ophthalmologist and had normal color vision as determined by testing with the Farnsworth-Munsell 100 Hue Color Test. A daylight photography incandescent flood bulb of 250 watts rated at 4,800 Kelvins that gives 99% fidelity of color was used for the analysis. The photographs and standard were viewed from a distance of 16 in.

A panel of 10 experts confirmed the six sets of stimuli. These sets are described below and in Table 1.

Set 1.—Stimulus model 1 in the recommended color wore a scarlet red of middle value with strong chroma. In the nonrecommended color she wore a plum polo of middle to light value with a weak to moderate chroma. The model was a brunette female 40 yr. of age categorized as of winter coloring. In both photographs the model had a closed smile without exposure of teeth.

Set 2.—Stimulus model 2 in the recommended color wore a green color polo shirt of dark to medium value with moderate chroma. The nonrecommended color shirt worn was a green of dark to medium value with weak chroma. The model was a brownette male 18 yr. of age categorized as winter. The smile in the recommended color shirt was more open than the smile in the nonrecommended color shirt.

Set 3.—Stimulus model 3 in the recommended color wore a striped shirt of red-orange and tan, the red-orange of moderate value and strong chroma. In the nonrecommended color shirt the model wore a lavender color of weak value and low invensity. This shirt had six miniature embroidered lavender flowers across the front. The model was a golden haired woman of 31 yr. of age categorized as having spring coloring. Her smile was similar in both photographs.

Set 4.—Stimulus model 4 in the recommended color wore a warm green shirt of middle value with a moderate chroma. The nonrecommended color shirt was a blue-green of moderate value and moderate chroma. The model was a 30-yr.-old female with red hair categorized as having autumn coloration. Her smile was similar in both photographs.

Set 5.—Stimulus model 5 in the recommended color wore a plum polo of middle to light value with weak to moderate chroma. In the nonrecommended color shirt the model wore a scarlet red polo of mid-value with strong chroma. The model was a 40-yr.-old female with ash blonde hair categorized as having summer coloring. The model had similar facial expressions in both photographs.

Set 6.—Stimulus model 6 in the recommended color wore a navy blue polo of dark value and weak to moderate chroma; the model in the nonrecommended color wore a baby blue polo of light value and weak to

moderate chroma. This model was a 35-yr.-old female with brown hair classified as a winter. The model had similar facial expressions in both photographs.

TABLE 1
DESCRIPTION OF STIMULUS MODELS

Model	Recommended Color Polo Shirt[a]	Nonrecommended Color Polo Shirt[a]	Color Variation	Seasonal Color Category[b]	Subject Description
1	5 R 4/12	10 P 7/8	Warm/cool hue Chroma	Winter	F/40[c] Brunette[d] Closed smile
2	2.5 BG 4/6	7.5 G 4/4	Chroma	Winter	M/18 Brownette Open smile
3	7.5 R 4/10 5 Y 7/2	5 PB 7/2	Warm/cool hue Chroma	Spring	F/30 Golden blonde Open smile
4	2.5 G 4/6	2.5 BG 6/4	Warm/cool hue	Autumn	F/30 Red Open smile
5	10 P 7/8	5 R 4/12	Warm/cool hue Chroma	Summer	F/40 Ash blonde Open smile
6	10 BG 2/2	10 BG 7/2	Value	Winter	F/35 Brownette Open smile

[a]Munsell notation for polo shirt colors.
[b]Cayghill Color Categories.
[c]Sex and age.
[d]Hair color.

Subjects

Two hundred seventy-six subjects attending a state fair participated in the study. By sex there were 167 females and 83 males. Six age categories were established. The three most representative age categories were 18—45 yr. (30%), 6—12 yr. (27%), and <6 yr. (22%); see Table 2.

Procedure

The procedure consisted of two parts. First, subjects were asked to check on a 5- x 8-in. white notecard if they had a favorite color and, if so, to list their favorite color, preferred light or dark colors, and preferred bright or soft colors. Next the subjects were given a photograph album that contained these six sets of stimulus models in recommended and nonrecommended color polo shirts. Subjects were directed to check, "Whether the person looks best in the photo marked A or the photo marked B." For each set of photographs the person was to check the reason for choosing a respective photograph. Reasons listed in order were (1) the smile, or facial expression,

(2) the style of shirt, or (3) the color of shirt, and "other reasons" category was also provided.

The photograph album was placed on a table with the same flood bulb used in the analysis of the colors of the photographed shirts. The light was placed over the left shoulder of the participant at a 45° angle, 24 in. from the top of the table. The order of the photographs within the album was randomly selected for each subject.

TABLE 2
SUBJECTS BY SEX AND AGE

Sex	Under 6 yr.		6—12 yr.		13—18 yr.		18—45 yr.	
	n	%	*n*	%	*n*	%	*n*	%
Male	30	18.0	35	22.5	4	5 7	9	24.9
Female	30	42.0	40	52.5	15	13.3	74	58.1
Total	60	21.7	75	27.1	19	6.9	83	30.0
	46—65yr.		Over 65 yr.		Total			
	n	%	*n*	%	*n*	%		
Male	1	3.9	4	8.1	83	30.0		
Female	12	9.1	23	18.9	194	70.0		
Total	13	4.7	27	9.8	277	100.0		

RESULTS

Two hundred thirty-two respondents said they had a favorite color. Blue was the favorite color of 77% of the respondents followed by red (75%). For both colors, males' and females' responses were evenly divided. The color purple was favored by 31% of the respondents, however, only 8% of these were males. Green was favored by 17% of the respondents; in this case, 11% were males. Females were more likely than males to report having a favorite color ($\chi_1^2 = 17.51$, $p = .04$).

There was no significant difference between males and females in their expressed preference for light versus dark colors. However, in relation to expressed preference for bright versus soft colors, there was a significant difference ($\chi_2^2 = 8.20$, $p = .02$). Males preferred bright colors over soft colors more than females, while females expressed preference for soft colors over bright colors.

To assess the significance of the average number of photographs in each of the prejudged sets the typical respondent agreed with as compared to the experts' choices of models in their recommended and nonrecommended colors, a z test was computed. A significant difference was found between those who selected stimuli in the recommended colors versus those who selected stimuli in the nonrecommended colors ($z = 17.83$, $p < .05$).

Forty-four persons (17%) out of 264 selected all six of the prejudged stimulus models as best in their recommended colors. Ninety-one persons

(35%) selected five of the stimulus models as best, 61 (23%) selected four, 44 (17%) selected three, 23 (9%) selected two, and one (.4%) selected one stimulus model. Over one-third of the participants selected five of the six prejudged sets as did the experts.

For all the photographs prejudged as distinguishing the stimulus model looking best, color was significantly selected over facial expression and style of shirt according to the chi-squared test; see Table 3.

TABLE 3
PERCENTAGE OF REASONS FOR SELECTION OF PHOTOGRAPH STIMULUS SETS

Photograph Set	Smile		Style		Color		χ^2*
	n	%	*n*	%	*n*	%	
1	25	9.6	28	10.7	254	77.0	238.9
2	88	33.6	58	22.1	108	41.2	14.9
3	29	11.2	73	28.1	147	56.5	85.6
4	38	14.6	35	13.4	179	68.9	161.2
5	32	12.5	40	15.6	181	70.4	165.2
6	34	13.1	27	10.4	196	75.4	212.6

*$p < .05$.

There was a significant relationship between age of subject and choice of stimulus models in recommended colors for all sets except set 5. Subjects in the middle-age group selected persons more often in their recommended colors more than all other groups. The youngest subjects selected persons in recommended colors the least; see Table 4.

TABLE 4
PERCENTAGES OF CORRECT AND INCORRECT RESPONSES TO STIMULI AND RECOMMENDED COLORS BY AGE GROUPS FOR EACH PHOTOGRAPH SET

Photograph Set	Age, yr.	*n*	% Correct	% Incorrect	χ^2*
1	<6	47	49	51	27.81
	6—12	72	68	32	
	13—18	17	82	18	
	19—45	75	89	11	
	46—65	14	64	36	
	>65	25	84	16	
2	<6	47	60	40	31.30
	6—12	72	89	11	
	13—18	17	100	0	
	19—45	75	89	11	
	46—65	14	79	21	
	>65	25	60	40	
3	<6	47	60	40	36.39
	6—12	72	81	19	

(continued on next page)

TABLE 4 (CONT'D)
PERCENTAGES OF CORRECT AND INCORRECT RESPONSES TO STIMULI AND RECOMMENDED COLORS BY AGE GROUPS FOR EACH PHOTOGRAPH SET

Photograph Set	Age, yr.	*n*	% Correct	% Incorrect	χ^2*
	13—18	17	94	6	
	19—45	75	97	3	
	46—65	14	100	0	
	>65	25	88	12	
4	<6	47	47	53	23.03
	6—12	72	64	36	
	13—18	17	71	29	
	19—45	75	83	17	
	46—65	14	86	14	
	>65	25	84	16	
5	<6	47	49	51	6.61
	6—12	72	44	56	
	13—18	17	47	53	
	19—45	75	64	36	
	46—65	14	57	43	
	>65	25	48	52	
6	<6	47	64	36	26.10
	6—12	72	54	46	
	13—18	17	76	24	
	19—45	75	87	13	
	46—65	14	93	7	
	>65	25	84	16	

*p = .0001, except Set 5.

Analysis of variance was computed for the number of times color was given as the reason as selecting the person in the recommended color. Age was not a factor in use of color in subjects' selected person looking best ($p = .46$). However, there was a significant difference in times among the age groups ($p < .05$) and also significant difference between the two groups ($p < .05$).

Duncan's multiple comparison was used to analyze the six age groups and the groups of inaccurate and accurate responders. The two younger age groups (<6 yr., 6—12 yr.) had significantly lower means than the two oldest age groups (46—65 yr., >65 yr.) for the number of times they used color as their reason for selecting the recommended photograph; see Table 5.

Subjects ($n = 186$) who indicated color was a reason for selecting the most attractive person significantly judged more than half of the photograph sets accurately as compared to the subjects ($n = 64$) who did not use color as the reason for choosing the person who looks best. The means were 3.17 for noncolor choosers contrasted to 4.13 for color chooses according to Duncan's multiple comparison.

TABLE 5
MEANS FOR NUMBER OF TIMES COLOR WAS USED FOR STIMULI SELECTION BY AGE

Age, yr.	*n*	*M*	*SD*
<6	47	3.34[a]	.49
6—12	72	3.33[a]	.39
13—18	17	4.18[b]	1.04
19—45	75	4.17[b]	.48
46—65	14	4.86[b]	1.35
>65	25	4.88[b]	.99

Note.—[a] is significantly different from [b].

DISCUSSION

The findings that blue and red were the two most favored colors of the respondents supports the research literature on color preference (Guilford & Smith, 1959; McInnis & Shearer, 1964; Mather, 1971; Birren, 1978). Plater (1967) also found that males tend to prefer stronger chromas than females. With respect to age, the youngest age group (<6 yr.) was least reliable in selecting the stimulus models in the recommended colors. Color perception in children is not fully developed; Munsell (1946) indicated they had difficulty seeing more than 20 or 35 hues, five steps of chroma, and 10 steps of value. Therefore, these results are not surprising. Another conjecture is that color perception is learned as individuals have more experiences working with color.

In this study, color was the influential factor in perception of what looks best which was equated to attractiveness. The findings support recommendations based on a commercial color analysis. In only one instance (Set 5) was the stimulus model in the recommended color not significantly more often chosen than the one in the nonrecommended color. Reasons could include that this was the oldest model by age and the background was different in this photograph set than all other sets. The generalizability of this present study is limited because the stimulus persons were not controlled for sex and age and they were not viewed in different colors and rated independently. With respect to color analysis, control of color stimuli using Munsell notations such as done in this study provide the means for standardizing and validation research on analysis systems of color.

Most color analysis systems rely on the concept that people have either warm or cool skin tones and those with warm skin tones (yellow-based) wear clothing of warm colors while cool skin-toned persons (blue-based) wear clothing of cool colors (Jackson, 1980; Kentner, 1983). However, skin color is attributable to five prevailing pigments, namely, melanin, melanoid, hemaglobin, oxyhemaglobin, and carotene. Each of these pigments also absorbs specific spectral regions and reflects characteristic colorations (Lontz, *et*

al., 1976). Some color analysis systems have recognized the greater variation of skin tones and offered a wider array of color palettes (Litthauer & Litthauer, 1982; Eiseman, 1983; Radeloff, 1983). To understand better the relationship between human skin tones and color, colorimeter values of skin tones should be recorded and reported in research.

Other recommendations include using a broader array of colors with a variation of models. It would also be interesting to manipulate somatic types to evaluate mediating effects. Would stimulus models wearing predetermined recommended colors judged as physically attractive or physically unattractive affect raters' perceptions? Would a person's name attached to a stimulus model wearing a right and/or wrong prejudged color make a difference? Previous research on physical attractiveness suggests these factors potentially mediate perceptions (Wiggins, *et al.*, 1968; Garwood, *et al.*, 1980).

Finally, parsimonious and clearly interpretable methods for representing color in evaluative judgments need to be developed.

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