Meaningfulness of colors*

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Ten colors and 10 color words were scaled for meaningfulness by means of Noble's *m* and *a'* scale. The most frequent verbal responses to colors and color words were also collected.

Many scales of meaningfulness of verbal material exist within the psychological literature. The first scale to appear was an associative value scale devised by Glaze (1928) in which 15 Ss indicated whether or not a nonsense syllable meant something to them. Associative values were also obtained for CVCs by Hull (1933) and Krueger (1934), and Witmer (1935) determined associative values for CCCs.

Noble (1952), working within a Hullian framework, conceptualized meaningfulness of verbal elements in terms of the mean number of written responses a verbal element elicits within a given time interval. The scale he developed is called a production value (*m*). Another meaningfulness scale was introduced by Noble, Stockwell, & Pryer (1957), in which verbal items were rated by S on a 5-point scale. This meaningfulness scale, called *a'*, consisted of calculating the mean rating for the verbal item. Both words and paralogues were evaluated by *m* and *a'* scales.

In addition to the scaling of CVCs, CCCs, words, and paralogues, Vanderplas & Garvin (1959) have scaled nonsense shapes and Battig & Spera (1962) scaled numbers from 0 to 100. Cochran (1968) reported the associative values of 251 centroid colors.

Apparently the pervasiveness of meaningfulness as an important factor in human learning experiments has stimulated research of diverse stimuli. One stimulus dimension which has been currently employed is colors

(Underwood, Ham, & Ekstrand, 1962; Solso, 1968). The present standardization was designed to extend the empirical knowledge of colors as stimuli.

METHOD

Two sets of data were collected. Measurement 1 consisted of collecting responses of Ss to the names of 10 colors, and Measurement 2 consisted of collecting responses of Ss to actual colors.

Materials

In Measurement 1, a survey form was prepared, consisting of the names of 10 colors printed in a booklet. On each page, the name of one color was repeated, with a space for a response next to the name. The color words, selected on the basis of the 10 highest word-frequency counts of Thorndike & Lorge (1944), were: BLACK, BLUE, BROWN, GREEN, ORANGE, PINK, PURPLE, RED, WHITE, and YELLOW. This section was used to measure the first word associations, total word associations, and the total number of responses elicited by the words. A second part of the survey was prepared which consisted of a rating scale in which Ss were to evaluate their associations to the names of colors on a 5-point scale ranging from "none" to "very many." The name for the color appeared next to each scale. The presentation of pages containing the names of colors for the production section was randomized for each student. The presentation of colors on the rating scale was also randomly arranged and

two different random forms were prepared.

In Measurement 2, color cards and a response booklet were prepared. The colors were selected on the basis of the "best" blue, brown, green, orange, pink, purple, red, and yellow, as assessed by five judges who examined 240 colors from the entire series of Munsell colors, as reported by Brown & Lenneberg (1954). These colors, expressed in Munsell notations, were 5 PB 4/10, 5 YR 3/4, 2.5 G 5/8, 2.5 YR 6/14, 2.5 R 7/8, 10 P 3/10, 5 R 4/14, 5 Y 8/12. Replicates of these colors were carefully prepared by the Sherwin-Williams Paint Company to correspond to each of the Munsell colors reported in the Brown and Lenneberg study plus black and white. Each of these 10 different flat paints was then sprayed on 100 white 3 x 5 in. cards. The color cards were periodically checked against the Munsell colors for accuracy. The painted cards were stamped with an identifying number on the back, randomly collated, with the exception of white and black which never appeared first, and placed in a plain white envelope. The test booklet for Measurement 2 was similar to that used in Measurement 1; however, in the response section, the names of colors did not appear, only a sequence of lines for responses. A rating scale, similar to that used in Measurement 1, was prepared in which the possible ratings ranged from "none" to "very many." The rating scale did not include the names of the colors.

In Measurement 1, 155 students enrolled in undergraduate courses served as Ss and, in Measurement 2, 164 different students enrolled in undergraduate courses at Moorhead (Minnesota) State College served as Ss. Twelve different college classes were sampled, representing a diverse sample. The age range was 18 to 59, with about equal numbers of males and females.

In Measurement 1, the test booklet was distributed to those students who

Table 1
Meaningfulness (*m*) and Standard Deviations for
Color Words and Colors

Color Words (N = 146)			Colors (N = 146)		
Color (Word)	Mean	SD	Color	Mean	SD
White	6.62	2.65	White	5.81	2.27
Black	6.45	2.04	Black	5.39	2.44
Red	6.45	2.69	Red	5.31	2.27
Green	6.35	2.69	Yellow	5.28	2.41
Blue	6.25	2.30	Blue	4.92	2.34
Brown	5.73	2.63	Green	4.83	2.02
Yellow	5.73	2.46	Brown	4.55	2.00
Orange	4.95	2.39	Orange	4.09	2.10
Pink	4.95	2.39	Pink	4.07	2.09
Purple	4.55	2.39	Purple	3.86	2.08

Table 2
Meaningfulness (*a'*) in Terms of Ratings and Standard Deviations
for Color Words and Colors

Color Words (N = 146)			Colors (N = 146)		
Color (Word)	Mean	SD	Color	Mean	SD
White	3.21	.850	White	3.57	.913
Blue	3.32	1.186	Blue	3.42	1.016
Green	3.12	.859	Green	3.35	.828
Red	3.12	.950	Red	3.35	.825
Black	3.02	.802	Black	3.30	.996
Yellow	2.89	.869	Yellow	3.52	.952
Pink	2.86	.958	Pink	2.79	.943
Purple	2.58	.851	Purple	2.79	.938
Orange	2.57	.827	Orange	2.71	.877
Brown	2.64	.845	Brown	2.68	.605

volunteered to have their responses recorded. The instructions for all groups were read aloud, with Ss following printed instructions. The instructions were similar to those used by Noble (1952) and reminded Ss to refer back to the stimulus item after each response. After all data had been collected, Ss were asked to indicate if they had any known color vision deficiencies.

The procedure of Measurement 2 was identical to that of Measurement 1, with the exception of the printed instruction on the face of the test booklet, which was modified for the color stimuli. After completing the first part of the scale, the instructions for the rating scale were read. Following the completion of the rating scale, Ss were asked to go through the cards and write the name of the color in the lower right-hand corner of the page. Finally, Ss were asked to indicate if they had any known color vision deficiencies.

The responses were evaluated in terms of Noble's (1952) criteria for unacceptable responses. The scoring was liberal, and only obvious infractions were eliminated. In addition, four protocols were deleted because of known color deficiencies. In Measurement 1, nine protocols were eliminated, seven for persistent violations of the cited criteria and two on the basis of color deficiencies, and 10 were randomly deleted to balance the sample between Measurement 1 and Measurement 2.

RESULTS AND DISCUSSION

The means (M) and standard deviations of Ss' responses to color words and colors were computed and are presented in Table 1. Without exception, all color word M values were higher than color M values.

Table 2 contains the mean ratings of Ss to color words and colors. A rank-order correlation matrix is presented in Table 3.

The first five associative responses are presented in Table 4 with the percentage of Ss responding with each word. The complete normative data with all responses and a count of the first word responses have been deposited with ASIS National Auxiliary Publications Service, c/o CCM Information Sciences, Inc., 22 West 34th St., New York, N.Y. 10001.

Post hoc evaluation of the data suggests some tendency for responses to reflect unique cultural and environmental conditions.

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Table 3
Rank Order Correlations Between m, a' for Colors and m, a' for Names of Colors

	m Words	a' Words	m Colors	a' Colors
m Words		.826	.933	.666*
a' Words			.718*	.818
m Colors				.818
a' Colors				

*Significant at .05 level; all others significant at .01 level

Table 4
First Five Responses to Color Words and Colors

	Words	Percent of Ss	Colors	Percent of Ss
Black	Night	.39	Night	.54
	Shoes	.22	Death	.30
	Dark	.21	Dark	.20
	Cat	.19	Darkness	.12
	Hair	.19	Funeral	.08
Blue	Sky	.78	Sky	.62
	Eyes	.36	Water	.37
	Water	.36	Eyes	.16
	Sad	.22	Car	.10
	Car	.21	Cool	.08
Brown	Hair	.36	Dirt	.22
	Shoes	.32	Mud	.17
	Dog	.16	Shoes	.15
	Cow	.16	Hair	.14
	Dirt	.14	Wood	.14
Green	Grass	.90	Grass	.75
	Trees	.32	Trees	.34
	Envy	.22	Spring	.24
	House	.22	Leaves	.18
	Leaves	.19	Envy	.08
Orange	Fruit	.50	Halloween	.18
	Juice	.15	Orange	.18
	Sun	.14	Pumpkin(s)	.17
	Drink	.11	Fall	.11
	Orange	.10	Sunset	.11
Pink	Dress	.19	Dress	.12
	Panther	.16	Baby	.12
	Baby	.15	Baby Girl	.10
	Eye	.12	Flowers	.09
	Flower, Soft	.12	Skin	.08
Purple	Royalty	.16	Royalty	.15
	Grapes	.13	Grapes	.11
	Heart	.12	Easter	.07
	Cow	.11	Flowers	.07
	Dress	.09	Dark, Plums, Wine	.05
Red	Blood	.25	Blood	.43
	Car	.21	Fire	.21
	Hair	.19	Hot	.14
	Apple	.18	Car	.12
	Fire	.16	Bright	.10
White	Clean	.34	Snow	.42
	Paper	.34	Purity	.36
	Pure	.27	Clean	.28
	Snow	.26	Pure	.22
	Purity	.25	Paper	.21
Yellow	Sun	.38	Sun	.51
	Coward	.17	Bright	.23
	Dress	.17	Sunshine	.12
	Hair	.16	Happiness	.12
	Bright	.14	Happy	.10

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Paragraph complexity, arousal, and subjective evaluations of attractiveness*

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The purpose of this study was to test various postulates concerning the interrelationships between the arousal potential, the arousal level, and the attractiveness of a set of paragraphs differing in complexity. The effect of paragraph complexity on arousal level and ratings of attractiveness was significant. A significant U-shaped relationship between paragraph complexity and arousal level was observed. A significant negative linear relationship between paragraph arousal level and ratings of attractiveness was found. There was a significant inverted U-shaped relationship between paragraph complexity and ratings of attractiveness.

Berlyne (1963) has made the following postulates concerning the interrelationships between the arousal potential, arousal level, and attractiveness of a set of stimulus situations varying in arousal potential: (1) there is a U-shaped relationship between arousal level and arousal potential; (2) there is a negative linear relationship between attractiveness and arousal level; and (3) there is an inverted U-shaped relationship between attractiveness and arousal potential. The purpose of this investigation was to test Berlyne's (1963) postulates concerning the relationship between attractiveness and arousal level and between attractiveness and arousal potential. In a previous experiment, reported elsewhere (Evans, 1970a), a significant curvilinear relationship was found between arousal level and paragraph

complexity. Stimulation from sources other than paragraph complexity were assumed to vary at random among Ss; therefore, the only stimuli contributing to arousal potential systematically were the paragraphs. Thus, the observed U-shaped relationship between paragraph complexity and arousal level supports Berlyne's (1963) postulate concerning the relationship between arousal potential and arousal level. Berlyne's second postulate would suggest a negative linear relationship between paragraph arousal levels and indices of stimulus attractiveness. Finally, according to Berlyne's third postulate, there should be an inverted U-shaped relationship between paragraph complexity and stimulus attractiveness.

An attractive stimulus situation may be considered to be interesting, pleasing, and preferred. Therefore, on the basis of Berlyne's postulate, subjective evaluations of interestingness, pleasingness, and preference should decrease linearly over paragraph arousal level. Subjective evaluations of interestingness, pleasingness, and preference should also describe an inverted U-shaped function over paragraph complexity.

SUBJECTS

The Ss for this study were 30

students at Peterborough Teachers' College. There were 6 males and 24 females, and each sex group had a median age of 20 years.

MATERIAL

Six paragraphs between 95 and 105 words long were used to represent differing levels of complexity. The paragraphs and the procedure by which they were selected has been given previously (Evans, 1970b). Ss were assigned randomly to rate the paragraphs in one of six orders (Evans, 1970b) such that five Ss rated the paragraphs in each order. Five sets of the six paragraphs, typed with double spacing on 8½ x 11 in. white paper, were collated in each order. Semantic differential forms, including the semantic scales used by Day (1967), along with two additional dimensions, 'simple-complex' and 'likable-dislikable,' were mimeographed on 8½ x 11 in. white paper and collated in sets of six.

PROCEDURE

The 30 Ss were seated at separate desks in a classroom. Each S was given one of the sets of six paragraphs and a set of semantic differential forms. Ss were asked to write their name, age, sex, and the first word of the first paragraph in their set of paragraphs on the face sheet of the semantic differential forms. They were asked to read each paragraph and to rate each on the 21 semantic differential dimensions before proceeding to the next paragraph.

RESULTS

In a previous experiment (Evans, 1970a), the effect of paragraph complexity on arousal level was investigated. The relationship between median GSR amplitude and paragraph complexity is shown in Fig. 1. The effect of paragraph complexity on mean GSR amplitude was significant, and a nonparametric trend analysis indicated that only the curvilinear relationship was significant. Figure 1 shows that the relationship is U-shaped in form.

Fig. 1. Paragraph complexity and GSR amplitude (Evans, 1970a, p. 252).

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