

COLOR IN ADVERTISING*

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Abstract

A print ad was designed where the hue, chroma (saturation), and value (lightness) of the color in the ad were manipulated in a 2 x 2 x 2 between subjects design. The results revealed that differences in chroma and value had significant effects on feelings of arousal and relaxation, respectively. These feelings influenced ad attitude. Value also influenced consumers' brand attitude. Interestingly, the three dimensions of color had no effects on information processing. The implications of these findings are discussed.

Research on color vision is extensive, with contributions coming from fields as diverse as cognitive psychology, philosophy, and cellular biology (see Thompson, Palacios, and Varela 1992). The research addresses issues such as whether color perception is an objective phenomenon related solely to the properties of the object, a subjective perceptual phenomenon, or a combination of both (c.f., Behavioral and Brain Sciences, Vol. 15, 1992, a recent issue devoted to color.)

Relative to the attention that color vision has received, there is much less attention devoted to other psychological aspects of color, e.g., how color affects attitudes and behavior. Furthermore, the research that has been done has often produced inconsistent findings (McManus, Jones and Cottrell 1981; Sharpe 1974). In marketing, only a limited amount of research on color has been conducted. The advertising area, in particular, has seen very little published research on color, as compared to other potential executional cues in an ad, e.g., background music (c.f., Bruner 1990; Gorn 1982; MacInnis and Park 1991).

This paper represents a first attempt at exploring how the three dimensions of color (hue, chroma, and value) influence consumer responses to an advertisement. The paper begins with a presentation of the particular color framework and measurement system used in this research, and a brief review of the relevant research on the psychological effects of color, leading to the specific research questions and hypotheses of interest. This is followed by a description of the study which manipulates the hue, chroma, and value of the color used in an advertisement, and examines the effects on feelings, attitudes, and cognitions. The results are presented and the paper concludes with a discussion of our findings and directions for future research.

The Munsell System

It is widely accepted by color theorists that there are three basic and independent properties of color: hue, chroma (saturation) and value (lightness).¹ Hue is the pigment of the color. Chroma refers to saturation. It is the richness or deepness of the color. Highly saturated colors have a greater proportion of the pigment in them. Value is the degree of lightness or darkness of the color relative to a neutral scale which extends from pure white to pure black.² Colors of low (or high) value appear to have a black (or white) quality to them, as if the color black (or white) was mixed into the pigment. Color research across a number of disciplines (e.g., architecture, neuroscience, biology and psychology) has focused on the effects of the three dimensions of color on human responses (e.g., Guilford and Smith 1959; Nathans, Thomas and Hogness 1986; Porter and Mikelleides 1976; Thompson et al. 1992).

A key issue in this research has been the calibration of colors along the three independent dimensions of hue, chroma, and value. The most comprehensive and widely used calibration system is that advanced by Munsell (1929, 1966).³ This system is particularly suitable for psychological research on color effects. As Guilford and Smith (1959) note, "of all the various systems that attempt to represent the whole range of color variations, the Munsell Book of Color offers the best opportunities for quantitative specifications along the lines of the attributes familiar to psychologists..." (Guilford and Smith 1959, p. 488). This view is supported by many others (e.g., Helson and Landsford 1970; Judd and Wyszecki 1963; Lucy and Schweder 1979; McManus et al. 1981; Sharpe 1974; Thompson et al. 1992). The Munsell System is also used to color products such as computers (by MacIntosh), cheese (by Kraft), and soap (by Caress), and is the calibration system taught in North American art departments.

Based on the principle of just noticeable differences, Munsell classifies hue into 10 equally spaced major hues: red, yellow-red, yellow, green-yellow, green, blue-green, blue, purple-blue, purple, purple-red. Each of the 10 major hues is further subdivided into 10 equally spaced sub-hues, thus leading to 100 equally spaced sub-hues. The chroma scale extends from 0 up to as high as 14, depending on the strength of sample to be evaluated. The value scale extends from 0 to 10. A value of 0 is used to symbolize pure black and a value of 10 is used for pure white. Therefore, any specific color can be identified accurately by simply quoting the levels of hue, chroma, and value.

There is typically a different pattern of chromas and values for each hue. For example, for yellow, the range of chromas at low levels of value is very small. As you go higher in value, yellow's properties are such that the range of chroma increases. For yellow, the widest range of chromas exist at value level #9. Unlike yellow, blue and red have a wider range in their chromas at the mid-value level, with their widest range of chromas existing in the #4 to #6 value level range. Thus any comparison of blue or red, with yellow, controlling for value and chroma, could only be made within a very restricted range.

Color is inherently a visual stimulus. Verbally describing its dimensions will invariably result in some miscommunication. The Munsell System is invaluable under such circumstances since it enables a reader to unambiguously pinpoint the exact colors utilized, by simply referring to the three dimension levels of the Munsell System. This would seem important for interpreting the results of studies, as well as for further replication and extension.

Color and Advertising Effects

An examination of the empirical research on the effects of color in advertising reveals that the majority of the research on color effects is limited to examining the differential effectiveness of colored versus black and white ads (e.g., Diamond 1968; Valiente 1973). These investigations suggest that colored ads are more effective in gaining consumers' attention. In a different stream of research, Bellizzi, Crowley and Hasty (1983) and Bellizzi and Hite (1992) found that products presented against blue backgrounds seem to be received more favorably than products against red backgrounds, although the evidence is mixed (Middlestadt 1989). The research thus far has not systematically varied colors along the three dimensions of hue, chroma and value. It therefore does not shed any light on the questions of interest here -- how do differences between colors on these three dimensions influence consumers' ad and brand attitudes?

Fortunately, in disciplines such as architecture and psychology there have been investigations on the effects of the three dimensions of color on feelings and preferences. Below, we draw on these literatures to propose hypotheses about the effects of hue, chroma, and value on ad response variables.

Theoretical Framework for Hypotheses

Conceptualizations of how advertising influences consumers suggest that it influences consumers' feelings and thoughts toward an ad, which in turn influence attitude toward the ad. Advertising also influences thoughts about the brand, and both brand thoughts and ad attitude influence brand attitude directly. Feelings towards the ad and ad thoughts influence brand attitude indirectly through their effects on ad attitude (e.g., MacKenzie, Lutz and Belch 1986; Stayman and Aaker 1988). We adopt this conceptual framework in our investigation of the effects of color. Our major focus in the hypotheses below is on the feelings elicited by the hue, chroma, and value of a color and the influence of these feelings on ad and brand attitude.

Hypotheses. Research in architecture varying either the color of small patches, or of walls of buildings in photographs, suggests that different feelings are elicited by different colors. Specifically, higher chroma, more saturated colors are perceived to be more arousing than lower chroma, less saturated colors (Acking and Kellur 1976; Arnheim 1960; Mikellides 1990; Sivik 1976). This is consistent with findings from psychological research using Munsell color chips, where higher chromatic colors are seen as "warmer" than lower chromatic colors (Lakowski 1983; Lakowski and Pole 1963).⁴ A link between arousal and the level of chroma in a color would, therefore, be expected. Highly saturated colors would be considered strong (Sivik 1976) and perceptually rich in

that they have a large percentage of hue in them, whereas desaturated colors are comparatively closer to grey (Thompson et al. 1992). One would not expect as much arousal to be elicited by greyish colors than by chromatically strong colors. Thus, it is hypothesized that:

H1: Those exposed to an ad containing a higher chroma color are likely to be more aroused than those exposed to an ad containing a lower chroma color.

Research on the effects of color on likeability suggest that higher levels of chroma increase the favorability of response. Guilford and Smith (1959) found that colors higher in chroma were more liked. McManus et al. (1981) also found a general tendency for higher chromatic colors to be more liked (see also Sharpe 1974). These findings are also supported by much earlier research on saturation, where preference for more saturated colors was found (Bradford 1913; Guilford 1934; Guilford 1939; Jastrow 1897; Luckiesh 1916; Minor 1909; Walton, Guilford and Guilford 1933). As well, current models of consumer response to advertising suggest that feelings elicited by an ad directly influence ad attitude (e.g., Stayman and Aaker 1988). Thus we hypothesize:

H2: Those exposed to an ad containing a higher chroma color are likely to have a more favorable ad attitude than those exposed to an ad containing a lower chroma color.

Considering brand attitude, there is no research that has investigated the effects of the chromatic strength of a color on brand attitude. However, as noted above, ad attitude directly influences brand attitude (e.g., Homer 1990; MacKenzie et al. 1986) and, therefore, it is hypothesized that:

H3: Those exposed to an ad containing a higher chroma color are likely to have a more favorable brand attitude than those exposed to an ad containing a lower chroma color.

Turning to value, color research suggests that value is linked to feelings of relaxation.⁵ Given their pastel appearance, the higher value, lighter colors should be more relaxing than the lower value, darker colors. It would be consistent with psychological research suggesting that higher value colors are seen as "colder" than lower value colors (Lakowski 1983; Lakowski and Pole 1963). Similar to arousal and warmth, relaxation and coldness are also considered related (e.g., Sharpe 1974). For example, Bellizzi et al. (1983) suggest that cool colors are seen as calm, peaceful and relaxing, with psychophysiological research suggesting that white light produces the least amount of tension in the form of hand tremor (James and Domingos 1953). The architecture literature is mixed, however, with regard to the effect of value on relaxation (Sivik 1976). With small color patches, regardless of their level of value, low chromatic colors were found to be relaxing; however, when the color of walls was varied, in some cases higher value colors were seen as more relaxing than lower value colors (see

also Porter and Mikelledes' (1976) discussion of Sivik's (1976) research).

Furthermore, Guilford and others suggest that colors high in value tend to be more liked (Guilford 1934, 1939; Guilford and Smith 1959; McManus et al. 1981; Sharpe 1974). Thus, the following hypotheses are advanced:

- H4: Those exposed to an ad containing a higher value color are likely to feel more relaxed than those exposed to an ad containing a lower value color.
- H5: Those exposed to an ad containing a higher value color are likely to have a more favorable ad attitude than those exposed to an ad containing a lower value color.
- H6: Those exposed to an ad containing a higher value color are likely to have a more favorable brand attitude than those exposed to an ad containing a lower value color.

With regard to hue, it is generally believed that red is a warm color and more arousing than blue, which is a cool color and, therefore, relaxing (Argue 1991; Guilford and Smith 1959; Luckiesh 1923; Tom et. al. 1987; and Vahle 1978). As noted earlier, both feelings of arousal and relaxation are pleasant and likely to lead to favorable attitudes. Thus, we would not expect any differences in ad or brand attitude as a function of hue. Consistent with this reasoning, studies that have examined the effect of hue on likeability, with some exceptions (e.g., Granger 1955), have not found a consistent preference for any particular hue (Dorcus 1926; Eysenck 1941; Kreitler and Kreitler 1972; Kunishima and Yanase 1985; Norman and Scott 1952; Stimpson and Stimpson 1979; Von Allesch 1924). Thus, hue should affect feelings, but not ad or brand attitude.

- H7: Ads with a red hue are likely to elicit greater feelings of arousal than ads with a blue hue.
- H8: Ads with a blue hue are likely to elicit greater feelings of relaxation than ads with a red hue.
- H9: The hue of an ad does not affect either ad attitude or brand attitude.

Cognition. No research has been conducted on the effects of the three dimensions of color on measures related to information processing (e.g., recall, recognition, beliefs). Given the lack of these measures in the color literature, hypotheses related to information processing and learning are not formally structured in the present study. However, measures of information processing and learning are included and will be examined since they are commonly used in studies on the effects of advertising.

METHOD

Design

Subjects were exposed to an ad in which three independent variables were manipulated: 1) hue (red versus blue); 2) chroma (low versus high); and 3) value (low versus high). The dependent variables were feelings elicited by the ads, attitude toward the ad, attitude toward the brand, product recall, brand recall, claim recall, claim recognition, beliefs about the brand, and cognitive responses. Demographic measures were also collected.

Subjects

Subjects were 156 undergraduates enrolled in an introductory marketing course at a large eastern university. They were volunteers who received course credit for their participation. Subjects were randomly assigned to each of the eight experimental conditions. Cell sizes were 19 or 20.

Stimuli

Our goal was to use color as a critical executional element in a print ad. Since color is often used as an executional cue in paint ads (e.g., "Color Your World"), we created an ad for a fictitious paint company, Rainbow Paints (see Figure 1).⁶ As can be seen in Figure 1, a major feature of the ad is the "swoosh," designed to look like a semi-circle of paint. A circular shape was chosen for the swoosh since it seemed to best encapsulate the information contained within it. The information contained within the swoosh was developed in two stages. First, informal discussions with students and paint dealers yielded a set of potential benefits that could be used as claims in an ad for a paint. Second, a pilot study ($n=15$) was conducted in which subjects rated the desirability of the various benefits. The benefits identified as most desirable were chosen to be used as claims in the main study.

As will be described below, the color of the "swoosh" was manipulated, depending upon the experimental condition to which the subject was assigned. Except for the color of the swoosh, all other information in the ad was black on white. To ensure the professionalism of the ad, the executional features of the ad (shape of the swoosh and other graphics, type of print, etc.) were designed by an advertising agency.

Independent Variables: Hue, Chroma, and Value

As indicated earlier, in the Munsell System there are 10 major hues. The three main sub-levels within each of the 10 levels are numbered 2.5, 5, and 7.5. As the number departs from mid-level 5, the hue becomes closer to the next major hue in the Munsell Color Solid. For example, towards the lower end of the scale, the red hue gets closer to the adjacent hue, yellow-red, while at

the higher end of the red scale, the hue gets closer to the adjacent hue, purple-red.

The mid-range blue (#5 blue) and the mid-range red (#5 red) were selected for the manipulation of hue. In the print world, blue and red are considered primary colors; unlike green or purple, they cannot be produced from mixing any other colors together. Red and blue are also the hues investigated most often in color research. The third primary color, yellow, was not selected for testing because it has a completely different and more limited pattern of chromas and values. As stated earlier, it would have been possible to compare yellow with blue or red only within a very restricted range for chroma and value. While the pattern of values and chromas is not exactly the same for red and blue, (i.e., slightly higher levels of chroma are possible for red), there is sufficient overlap to allow for an orthogonal manipulation of hue, chroma and value.

Since the Munsell system is based on just noticeable perceptual differences for both chroma and value, we chose low and high levels that were as far apart as possible, but still available for both blue and red. The #2 chroma and #8 chroma were chosen, respectively, for the low and high levels of chroma. The #3 and #7 values were chosen, respectively, for the low and high levels of value. Thus, within each hue (#5 blue and #5 red), there were four shades possessing the chroma and value combinations of 2,3; 2,7; 8,3; and 8,7.

The Munsell color samples typically come in small rectangles (1/2" by 3/4" approximately). This probably accounts for the fact that the empirical research that has been done thus far has used these small rectangles or some likeness of them (e.g., Guilford and Smith 1959). A systematic manipulation of hue, chroma, and value in our ad required that a particular color be inserted in the swoosh of the ad. To create the colors in the swoosh, we engaged the services of a computer color expert who had considerable experience producing successful color matches for the Munsell Corporation.⁷ He used a computerized color matching program to duplicate each of the requisite Munsell colors, adapt them for print, and insert them into the swoosh.⁸ Then a silkscreening process was used to produce the actual ads used in the study. The silkscreening method is similar to the paint pouring method Munsell uses to produce its colors on sheets of paper.

The full page test ad was inserted into a dummy, four-color magazine especially prepared by a professional. The magazine consisted of a cover page, a table of contents page, three articles (one article each on sports, arts, and entertainment), three full page filler ads (ads in unrelated product categories), and the full page test ad. The latter was placed in the middle of the magazine on a right-hand page. It was the second ad in the magazine. This presentation format was chosen because we did not wish to force subjects' attention to the target ad, as it might attenuate any variability in the

attention getting ability of the various colors. A total of 40 stimulus magazines were prepared – five copies for each of the eight colors – thus allowing us to run up to five subjects at a time.

Procedure

Subjects were run in groups of five or less. Subjects were told that a new magazine was being proposed. The magazine was a blend of sports, arts, and entertainment. They were told that the publishers were interested in starting a magazine of this type and that they had engaged us to get opinions. As part of the cover story, subjects were informed that they would be given a couple of minutes to get an overview of the general layout of the magazine, including both the articles and the ads in it, so as to give them an idea of how long the magazine was. They were told that this would enable them to organize their reading time more effectively, when they would next be asked to examine the magazine more carefully. This procedure of encouraging subjects to skim through the magazine first was used to ensure that everyone would be exposed to all of the ads and articles and would not simply spend their time on the first page or two when they were asked to look through the magazine more carefully. After the initial couple of minutes flipping through the magazine, subjects were given 10 more minutes to examine the magazine and told that they would be asked some questions about it. This procedure was developed on the basis of pretesting as we wanted to ensure that all subjects had a reasonable opportunity to be exposed to the target ad without having to explicitly direct their attention to it. After 10 minutes, subjects were told to close the magazines before completing the questionnaire.

Experimental setting. On the advice of an executive from a lighting company (Phillips) and a Munsell executive, daylight (F40C50) fluorescent bulbs were used to light the room rather than cool white fluorescent bulbs. While more common, cool white bulbs have a tendency to distort colors, i.e., some colors look different under cool white fluorescent than in daylight (Danger 1968). Subjects were seated at tables in such a manner so that they were equidistant from the light overhead, but not directly under it. and so that they could not see what the others were doing. Having the light directly overhead tended to cause a reflection in pretesting. The room also had no windows, thus controlling for any other light source.

Dependent Variables

Since our major hypotheses focused on specific feelings, attitude towards the ad, and brand attitude, the questions related to these variables came early in the questionnaire. The following question order was used. First, subjects used the blank space provided to indicate their unaided recall of the product categories and brand names of the ads in the magazine. They then gave their attitude

toward the ad for Rainbow Paints on two nine-point bipolar scales: good (+4) -bad (-4) and pleasant (+4) -unpleasant (-4). Next, subjects were asked about the specific feelings elicited by the Rainbow Paints ad. The two feelings of theoretical interest (i.e., relaxation and arousal) were measured. Feelings of relaxation were measured using three items: 'relaxed', 'soothed', and 'calm'. Feelings of arousal were measured using two items: 'excited' and 'stimulated'. Additionally, although there was no theoretical basis in the color literature, unpleasant feelings of annoyance, irritation, and unhappiness were measured for the sake of comprehensiveness, as these feelings have been shown to be elicited by advertising. Unpleasant feelings were measured using three items: 'irritated', 'annoyed', and 'unhappy'.⁹ Following Madden, Allen and Twible (1988), subjects responded on a scale ranging from "not at all (1)" to "very much so (9)."

In a pretest of these scales, subjects (n=63) were shown samples (about one-third of a page in size) of the colors and asked to fill out the scales to describe the feelings each color elicited. A principal components analysis with varimax rotation and an eigenvalue cutoff of one confirmed the existence of three factors with: 1) 'excited' and 'stimulated' loading on one factor (loadings of .92 and .91 respectively); 2) 'relaxed', 'soothed' and 'calm' loading on a second factor (loadings of .93, .88, and .92 respectively); and 3) 'irritated', 'annoyed' and 'unhappy' loading on a third factor (loadings of .90, .91, and .66 respectively). Thus, pretesting confirmed the appropriateness of the proposed factor structure for the items.

In the questionnaire used in the main study, subjects next indicated their brand attitudes on two nine-point bipolar scales: good (+4)-bad (-4) and nice (+4)-not nice (-4).

Cognitive response data was then collected. Subjects were asked to list all of the thoughts and feelings they had while viewing the ad. They were instructed to write each thought/feeling on a separate line. They were given three minutes to complete this task. As described later in the section on coding of responses, these written protocols were coded to determine both the thoughts and feelings induced by the experimental ads. On the next page, subjects listed everything they could remember about what was said in the ad for Rainbow Paints, and specifically, the claims that were made. They were given three minutes for this task. Next, subjects were asked to write down the headline of the ad. The headline recall task was followed by a claim recognition task. Subjects were presented with a list of the seven claims made within the swoosh plus four others not made in the ad (to control for guessing), and were asked to place a tick next to the ones that appeared in the ad. A measure of beliefs regarding each of the seven claims made about Rainbow Paints followed the recognition measure. On a nine-point scale ranging from very likely (+4) to very unlikely (-4),

subjects indicated the likelihood that Rainbow Paints possessed each attribute.

Subjects then answered some questions related to the articles in the magazine, followed by an open ended question about what they thought was the purpose of the study. Demographic data was also collected on mother tongue, gender, and color blindness.

RESULTS

In this section, we first report preliminary analyses pertaining to experimental demand, color blindness, reliability and validity of rating scale measures, and coding of cognitive responses. Next, the tests of the hypotheses presented earlier are reported. This is followed by analyses of the measures of cognition for which no explicit hypotheses were offered. Finally, relationships among feelings, attitudes, and cognition are explored using tests of mediation.

Preliminary Analyses

Experimental Demand. Subjects' responses to the open-ended question, "What do you think was the purpose of this study?" were examined. No subjects guessed that the study had anything to do with color.

Color Blindness. Subjects' self report of color blindness was examined and 10 subjects were eliminated from the total sample of 156, thus leaving 146 usable responses. The number of subjects eliminated from each condition was no greater than two. Cell sizes based on the subset of 146 usable responses ranged between 18 and 20.

Rating Scale Measures of Feelings and Attitudes. As noted, feelings were measured using two methods. One measure was a rating scale measure. Three specific feelings were measured: arousal (two items), relaxation (three items), and unpleasant feelings (three items). As in the pretest, the eight items were subjected to a principal components analysis followed by varimax rotation. An eigenvalue of one was used as the cutoff point. The items 'relaxing', 'calming' and 'soothing' loaded on one factor (loadings = .93, .94, .74), which will henceforth be referred to as relaxing. The items 'exciting' and 'stimulating' loaded on a second factor (loadings = .90, .82), which will henceforth be referred to as arousing. The items 'unhappy,' 'irritating,' and 'annoying,' loaded on a third factor (loadings = .74, .92, .90) which will be referred to as unpleasant. The three factors accounted for 79% of the variance in the data. The mean scores of the items representing each of the factors were obtained for each subject and served as the dependent variables.

A principal components analysis with varimax rotation was performed on the four attitudinal items -- two items were used to measure attitude towards the ad and two items were used to measure

attitude towards the brand. As expected, the two measures of attitude towards the ad loaded on one factor (loadings = .89 and .91) and the two measures of brand attitude loaded on a second factor (loadings = .83 and .93), and together explained 88% of the variance in the data. The mean score on the two attitude toward the ad measures and the mean score on the two brand attitude measures served as the dependent variables in the analyses reported below.

Coding of Cognitive Responses. The cognitive response data were coded by two independent judges blind to the experimental conditions. The judges were in agreement in over 90% of the cases. Disagreements were resolved by discussion between the judges and one of the authors.

First, the verbal protocols were separated into responses reflecting thoughts and responses reflecting feelings. The thought responses were coded following previous research (e.g., MacKenzie et al. 1986) into the following categories: number of positive thoughts about the ad (source bolstering), number of positive thoughts about the brand (support arguments), number of negative thoughts about the ad (source derogation), and number of negative thoughts about the brand (counterarguments). The number of thoughts in each category served as the operational measure in the analyses reported below.

The feeling responses reported in the verbal protocols were coded into three categories. Two of the categories were of theoretical interest and drawn from Batra and Ray (1986): feelings of surgency, elation, vigor/activation (labelled arousing in this paper), and deactivation feelings (labelled relaxing). The third category was included to enable us to code all the feeling responses elicited in the verbal protocols, to span the range of feelings related to advertising reported in the literature (Burke and Edell 1989), and to parallel the rating scale measure. This category captured feelings of annoyance and irritation and was labelled unpleasant. The three categories were adequate to code all of the feeling responses.

For thoughts coded as arousing, the operational measure was constructed by giving each response reflecting surgency, elation, or activation a score of +1 and each response reflecting a feeling of boredom a score of -1, and then computing the sum score for all responses belonging to the category for each individual. Thus, the score for this category could take on both positive and negative values. For responses belonging to the category reflecting feelings of relaxation, the operational measure was constructed by giving each response in the category a score of +1 and computing the sum. Thus, the relaxation score could take on values of zero or greater. The third category, labelled unpleasant, included responses reflecting feelings of irritation and annoyance. Each response in this category was given a score of -1 and the sum score for each individual was computed

to serve as the operational measure. The unpleasant score could thus take on values of zero or less. In sum, the operational score for each category reflected not only a specific feeling but its intensity as well, paralleling the rating scale measures described above.

Test of Hypotheses

In this section, tests of the nine hypotheses offered earlier are presented. The data are analyzed using analysis of variance and the results pertaining to feelings are presented in Table 1, with those pertaining to ad and brand attitude presented in Table 2. Only the main effects are discussed since there were no interactions for any of the dependent measures (see Tables 1 and 2).

Effects of Chroma. Hypotheses 1, 2, and 3 propose that higher chroma colors in an ad are likely to lead to greater feelings of arousal, a more favorable ad attitude, and a more favorable brand attitude, respectively. An examination of the ANOVA results (Tables 1 and 2) reveals that, as expected, those exposed to an ad containing higher chroma colors report experiencing greater feelings of arousal (rating scale: $F(1,138)=4.31$, $p < .05$, $\omega^2 = .021$, means = 2.00 and 2.47; verbal protocol: $F(1,137)=5.96$, $p < .05$, $\omega^2 = .033$, means = .03 and .22). Similarly, liking for the ad increases as the chromatic strength of the color used in the ad increases ($F(1,135)=7.69$, $p < .01$, $\omega^2 = .042$, means = .10 and .85). Higher chromatic strength also appears to increase liking for the brand, but the effect does not attain statistical significance ($F(1,138)=1.44$, $p > .05$, means = .76 and 1.03). Thus, the results support hypotheses 1 and 2, but not hypothesis 3. Possibly, the effects on brand attitude failed to reach statistical significance because brand attitude is farther down the hierarchy of effects than ad attitude; brand attitude should be more difficult to influence than ad attitude, especially with only a single exposure to the ad.

Effects of Value. Hypotheses 4, 5, and 6 propose that higher value colors in an ad are likely to lead to enhanced feelings of relaxation, a more favorable ad attitude, and a more favorable brand attitude, respectively. As expected, those exposed to ads containing higher value colors report experiencing greater feelings of relaxation. This is true for both measures of relaxation (rating scale: $F(1,138)=9.22$, $p < .01$, $\omega^2 = .054$, means = 3.70 and 4.67; verbal protocol: $F(1,137)=5.62$, $p < .05$, $\omega^2 = .03$, means = .10 and .42). Colors of higher value in the ad also produce greater liking for both the ad and the brand (ad attitude: $F(1,135)=7.39$, $p < .01$, $\omega^2 = .04$, means = .08 and .85; brand attitude: $F(1,138)=7.69$, $p < .01$, $\omega^2 = .044$, means = .56 and 1.21). Thus, the results support hypotheses 4, 5, and 6.

Effects of Hue. Hypothesis 7 proposes that those exposed to ads with a red hue are more likely to be aroused than those exposed to ads with a blue hue. An examination of the results reveals

that those exposed to ads with the red hue report stronger feelings of arousal. However, only the results for the rating scale measure are statistically significant ($F(1,138)=4.98$, $p < .05$, $\omega^2 = .026$, means = 1.97 and 2.53; verbal protocol: $F(1,137)=3.10$, $p > .05$). While the results therefore only partially support hypothesis 7, it should be noted that the results were significant for the rating scale measure which is typically more reliable and robust than measures based on viewers' verbal protocols.

Hypothesis 8 proposes that those exposed to ads with a blue hue are more likely to report feeling more relaxed than those exposed to ads with a red hue. The results reveal that although those exposed to the blue hue report experiencing greater feelings of relaxation (rating scale means = 4.31 vs. 4.04), the effect of hue on feelings of relaxation fails to reach statistical significance (rating scale: $F(1,138) < 1$; verbal protocol: $F(1,137)=1.59$, $p > .05$). Thus, hypothesis 8 is not supported. The lack of support for hypotheses 7 and 8 would be consistent with research suggesting that hue does not affect feelings when saturation and lightness are controlled (Acking and Kuller 1976; Mikellides 1990; Porter and Mikellides 1976; and Sivik 1976). As proposed in hypothesis 9, hue does not affect either ad attitude or brand attitude ($F_s < 1$).

Though unpleasant feelings were measured, no hypotheses with respect to them had been advanced. Analyses of the measures of unpleasant feelings, using both rating scales and verbal protocols, revealed that none of the dimensions of color had any effects on them (all $p_s > .05$; see Table 1).

Effects of Hue, Chroma, and Value on Cognitions

As noted earlier, aside from our hypotheses related to verbal protocols for feelings, we had no other specific hypotheses about the effects on cognitive responses, of the hue, chroma, or value of a color in an ad. However, since cognitive activity induced by an ad influences both ad and brand attitudes and since brand awareness, message registration, and consumer elaboration of the message can be important advertising objectives, we considered it worthwhile to include measures of category recall, brand name recall, headline recall, claim recall, claim recognition, beliefs about the claims, and cognitive responses to examine whether hue, chroma, or value have any effects.

Sixteen ANOVAs were conducted with hue, chroma, and value as the independent factors and each of product category recall, brand name recall, headline recall, claim recall, claim recognition, belief strength for each of the seven claims made, number of support arguments, number of counterarguments, number of source bolstering statements, and the number of source derogations as the dependent variables. The analyses revealed only four significant effects at the .05 level of

significance, with no discernible pattern. The four effects that attained statistical significance probably did so by chance. It would not be unexpected for four effects out of the total of 112 (sixteen ANOVAs with seven effects each) tested at the .05 level of significance, to attain significance by chance alone. The results therefore suggest that the effects of the three dimensions of color in an advertisement do not influence cognitive processes.

Relationships Among Feelings and Attitudes

In this section we look at the relationships among feelings, ad attitude, and brand attitude in an effort to integrate the results for the individual dependent measures discussed thus far. Note that we exclude measures of cognition from these analyses as the hue, chroma, and value of the color in an ad seemed not to influence cognitive processing in any systematic way.

As noted earlier, current models of advertising effects (e.g., MacKenzie, et al. 1986; Stayman and Aaker 1988) propose that the effects of an ad on brand attitude are mediated by ad attitude and, furthermore, the effects on ad attitude are mediated by the feelings elicited by the ad. Considering the mediating role of ad induced feelings on ad attitude first; if feelings mediate the effects of the ad on ad attitude, then the independent variables should have parallel and significant effects on both the dependent variable, ad attitude, and the mediating feelings. As reported earlier, there were statistically significant effects of value and chroma on ad attitude. As well, there was a significant effect of chroma on feelings of arousal and a significant effect of value on feelings of relaxation. Thus, it is possible that the effects of chroma on ad attitude are mediated by feelings of arousal and the effects of value on ad attitude are mediated by feelings of relaxation.

If, in fact, these specific feelings mediate the effects of chroma and value on ad attitude, then the observed significant effect of chroma and value on ad attitude should disappear or be reduced once the effects of the specific feelings are partialled out. To test whether arousal mediates the effect of chroma on ad attitude, a regression equation was estimated with ad attitude as the dependent variable, and the design factors (hue, chroma, and value) and feelings of arousal as the independent variables (Baron and Kenny 1986).¹⁰ The regression analysis revealed that once the effect of arousal is partialled out, the previously significant effect of chroma on ad attitude disappears ($F(1,134)=3.19$, $p > .05$). Thus, the effects of chroma on ad attitude would appear to be mediated by feelings of arousal.

A second regression equation was estimated using ad attitude as the dependent variable and the design factors and feelings of relaxation as the independent variables, in order to examine whether feelings of relaxation mediated the effects of value on ad attitude. The results show that when the

effects of feeling relaxed on ad attitude are partialled out, the effect of value on ad attitude disappears ($F(1,134)=3.87, p > .05$). Thus, the effect of value on ad attitude would appear to be mediated by feelings of relaxation.

Considering brand attitude next, there is a significant effect of value on both ad and brand attitude. But does the effect of value on brand attitude disappear once the effects of ad attitude are partialled out? A regression equation was estimated with brand attitude as the dependent variable and the design factors and ad attitude as the independent variables. The analysis revealed that once the effect of ad attitude is partialled out, the previously significant effect of value on brand attitude disappears ($F(1,134)=2.53, p > .05$). Thus, the effect of value on brand attitude would appear to be mediated by ad attitude.

DISCUSSION

The results of the present study confirmed the hypotheses that higher levels of chroma (saturation) and value (lightness) influence feelings of arousal and relaxation, respectively. These in turn influence ad attitude, and at least in the case of value, the greater feelings of relaxation appear to favorably influence brand attitude, a variable further down the hierarchy of advertising effects. The effects of hue (red vs. blue) were limited, with no effects on either ad or brand attitude, and a significant effect on only one of the feelings measures.

Our finding that value affected feelings of relaxation, whereas chroma seemed to primarily affect arousal, makes intuitive sense. Higher value colors have a soft, pastel look to them so it should not be surprising that they would elicit some feelings of relaxation. On the other hand, higher chroma colors should attract attention and elicit arousal since they are more saturated than lower chroma colors (i.e. they contain more of the color pigment). Arousal has been the subject of much research (e.g., Berlyne 1970). However, comparatively less attention has been given to feelings of relaxation, particularly in consumer behavior. The covariance analyses in the present study suggested that feelings of relaxation are important in that they seem to mediate the effect of the value of the color in an ad on attitude towards the ad.

Our results also suggest that the hue, chroma, and value of a color in an ad have no effects on cognitive processing of the ad, except for the verbal protocols related to the respondents reflecting on the feelings the ad elicited. Effects on cognitive processing were absent, even though the ad was designed with the claims physically framed within the colored swoosh to afford maximal opportunity for the effects of the color of the swoosh to influence cognitive processing of the message. Thus, it

appears that the effects of color on ad response are predominantly feeling-based, suggesting a peripheral route to persuasion (Petty, Cacioppo, and Schumann 1983).

This study investigated the use of color in an ad for a paint. Color is commonly used as an executional cue in paint ads. To reinforce the notion that the actual paint came in many colors, the ad contained the claim that the paint came "in all colors imaginable". This was reinforced further by the name given to the paint company, Rainbow Paints. There was no indication from subjects' cognitive responses that they viewed the particular color they saw in the swoosh in terms of an attribute of the product rather than the ad. They did not make comments related to whether they should paint things, like the walls of their house, in that color. In fact, among the colors selected, even the light (high value) and less saturated (low chroma) colors would be too dark to be used to paint something like the walls of a house. Furthermore, the fact that the ads with more saturated colors were reacted to more favorably than ads with less saturated colors, provides further evidence that subjects were not looking at the ad in terms of how appropriate the color in the swoosh was for paint. Very saturated colors of paint would not typically be considered appropriate for painting surfaces other than trims, and do not account for much of the sales by paint dealers. It should also be noted that subjects did not make comments relating the particular color used in the ad to the quality of colors offered by Rainbow Paints.

Future Research

This study represents an initial attempt to investigate the effects of the various dimensions of color on consumer responses to an ad. As such, we had to make several important decisions as to the independent and dependent variables to consider, the background factors to hold constant, the stimuli to use, etc. It remains for future research to explore color effects in the context of ads for other products, in other contexts where color is important (for example, in-store environments and package design), for different ranges of hue, chroma, and value, for various color combinations, and for other dependent variables of interest (e.g., behavioral intention or behavior). It may also be interesting to explore the degree to which color operates like other peripheral cues in an ad (e.g., other graphics, background music in commercials, background humor in commercials or print ads, and so on). The interactive effects of color and other peripheral cues also awaits future research (e.g., the color and music used in TV commercials).

This study also represents a first attempt at testing the effects of color in advertising using the Munsell System of color. This system enabled controlled testing of the three dimensions of color (hue, chroma, and value) in an advertising context. As mentioned earlier, the Munsell system is the

preferred system for most of the theoretical and empirical research on color in psychology. Since it both enables the controlled testing of the three dimensions of color and allows for replicability, the Munsell System would seem to hold much promise for research in marketing as well, in areas such as advertising, packaging, and product color research.

FOOTNOTES

1. Chroma and value are terms used in the Munsell System, the system of color used in this research and described below.
2. Researchers often refer to the value dimension as brightness, but brightness is not a term used in the Munsell System itself.
3. The Munsell System was used in this research since it is the dominant calibration system for color in psychological research. The authors are in no way connected to the Munsell Corporation.
4. Warmth and arousal are treated as related constructs in the color literature (e.g., Sharpe 1974). For example, warm colors are evaluated as physically stimulating (Bellizzi et al. 1983).
5. As will be seen later, arousal and relaxation were measured using separate scales and turned out to be independent factors in this research on color. More generally, see Smith and Apter (1975) for a view of arousal and relaxation as independent dimensions, but see Berlyne (1960) and Russell (1978) for a view of arousal and relaxation as opposite poles of a single continuum.
6. Data will later be presented consistent with the notion that subjects did in fact regard the particular color they were exposed to in the ad as an executional element rather than as an attribute of the product itself (e.g., in terms of whether or not it was attractive enough to use to paint their house or other objects, or whether the color in the ad implied the quality of colors offered by Rainbow Paints).
7. As yet, Munsell can only produce their colors on large sheets of paper or smaller sample chips.
8. The details of our computer program are available from the authors.
9. These specific emotions were the ones that turned out to be the most discriminating in pretesting.
10. For the sake of readability, we only report the mediation results using the rating scale measure for both arousal and relaxation. The results are the same using the verbal protocol based measures. We report the rating scale measure as both ad and brand attitude are measured using rating scales.

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TABLE 1
F-STATISTICS FOR FEELINGS ELICITED BY THE ADS

Source	Arousal		Relaxation		Unpleasant	
	Rating	Protocol	Rating	Protocol	Rating	Protocol
Hue	4.98*	3.10	0.59	1.59	1.96	2.60
Chroma	4.31*	5.96*	0.01	3.45	0.20	0.87
Hue x Chroma	0.11	1.16	0.21	0.02	0.08	0.02
Value	2.95	0.08	9.22**	5.62*	1.07	1.08
Hue x Value	0.56	0.08	0.02	3.11	0.08	0.81
Chroma x Value	2.51	0.16	2.09	0.69	1.53	2.50
Hue x Chroma x Value	0.53	0.16	0.30	0.06	1.16	0.13

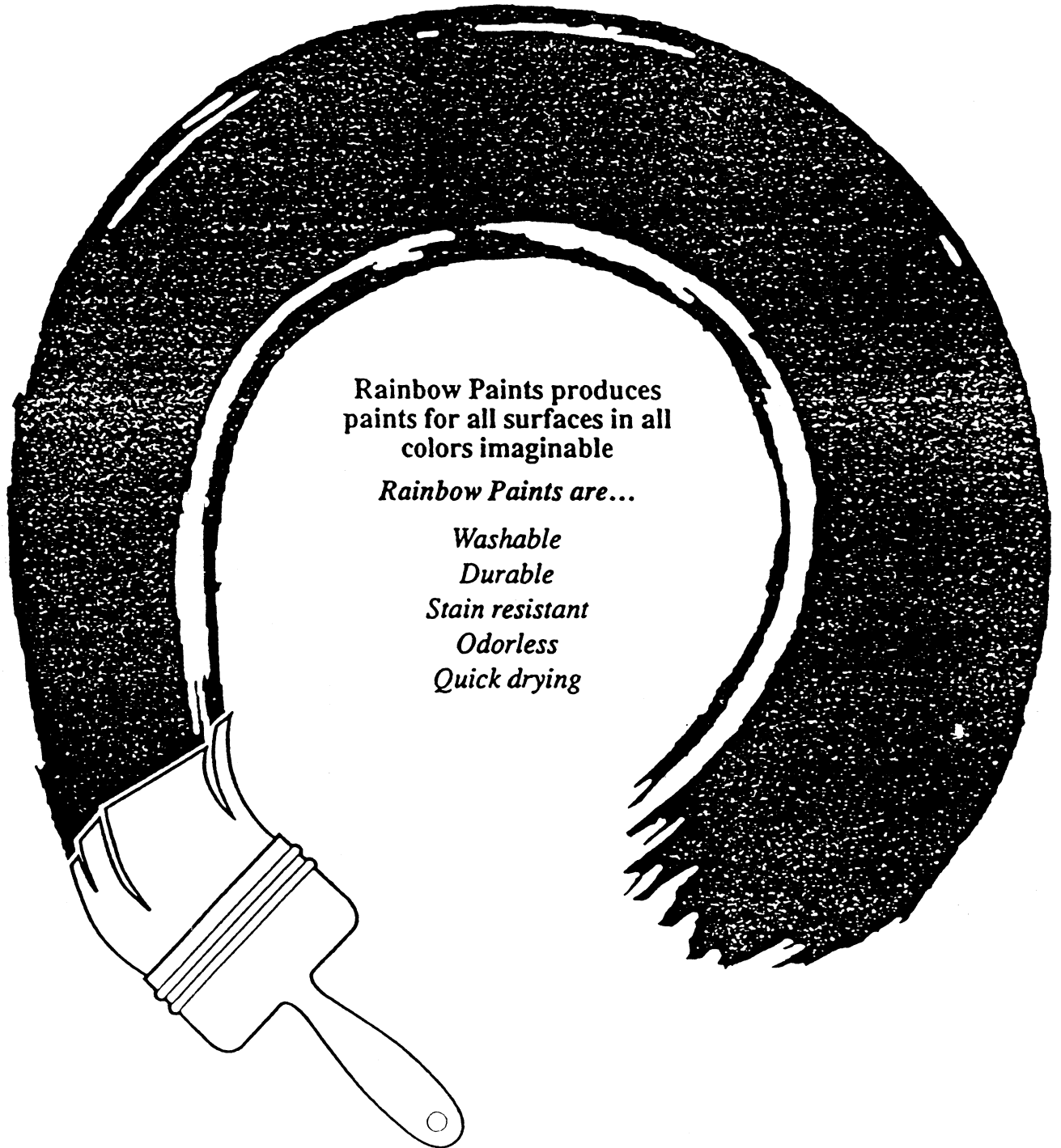
* p < .05
** p < .01

TABLE 2
F-STATISTICS FOR AD ATTITUDE AND BRAND ATTITUDE

Source	Ad Attitude	Brand Attitude
Hue	0.63	0.38
Chroma	7.69**	1.44
Hue x Chroma	0.24	0.04
Value	7.39**	7.69**
Hue x Value	0.01	0.02
Chroma x Value	3.88	1.57
Hue x Chroma x Value	3.36	2.99
•	p < .05	
**	p < .01	

FIGURE 1

Whenever you think of paint, think of us...



Rainbow Paints produces
paints for all surfaces in all
colors imaginable

Rainbow Paints are...

Washable

Durable

Stain resistant

Odorless

Quick drying

RainbowPaints