Understanding the Effects of Color: How the Correspondence between Available and Required Resources Affects Attitudes

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The impact of presenting full-color, black-and-white, and color-highlighted ad photos is examined under different processing resource conditions. When viewers devote few resources to processing, ads with some color outperform black-and-white ads. However, when viewers engage in more effortful ad processing, attitudes are sensitive to the match between available and required resources. When the substantial resources devoted to ad processing are inadequate for thorough ad scrutiny, black-and-white ads or those that color highlight aspects highly relevant to ad claims are more persuasive. By contrast, when available resources better approximate those required for extensive ad scrutiny, full-color ads or ads that color highlight ad photo elements that are highly relevant to the ad claims are more persuasive than either black-and-white ads or ads that color highlight aspects of low relevance to ad claims. These outcomes are interpreted by extending notions offered by elaboration-likelihood and resource theories.

Color photographs are commonly used in ads because they are thought to have superior attention-getting properties. Although full-color ads seem to predominate, color highlighting has become increasingly popular (Larson 1988). Color-highlighted ads are primarily black-and-white ads that use color selectively to highlight certain elements such as the featured product or objects that convey the product image. For example, a print ad for Grass Roots clothing portrays three models wearing the Grass Roots brand. All objects in the ad appear in black-and-white except for the models' clothing, which is depicted in full color. Presumably, this technique is intended to increase consumers' overall attention to the ad and/or to draw attention selectively to the color-highlighted objects in the ad.

At the same time, ads containing color are more costly than black-and-white ads; full-color magazine ads typically cost one-third more (Nelson 1989). This raises the question of whether or under what conditions color may merit this extra expenditure by significantly enhancing consumers' product attitudes. More specifically, when are full-color, color-highlighted, or black-and-white ads likely to be more persuasive? We address this question by drawing on elaboration-likelihood notions (Petty, Cacioppo, and Schumann 1983) and general principles about how attitudes can be affected by the correspondence between the cognitive resources made available and those required for ad processing (Anand and Sternthal 1989).

To foreshadow the theorizing developed in this research, we suggest that when consumers' processing motivation is low, product attitudes will tend to be based on simple heuristics associated with superficial cues such as the physical attractiveness of the photo, the product, and/or the product user or spokesperson. Because color is likely to enhance the perceived attractiveness of these objects, consumers are likely to produce more favorable product attitudes when ads contain color rather than only black-and-white.

However, when consumers are motivated to process an ad critically and extensively with an eye toward substantiating the ad's assertions, it appears that color may have one of two effects. Color can consume resources by stimulating inferential processing that may benefit ad claim substantiation as colors and objects that are congenial with the message advocacy are processed. Alternatively, color may undermine ad claim substantiation by usurping resources that would otherwise have

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been devoted to processing substantiating information. Whether color enhances or undermines product attitudes depends on the correspondence between the level of resources made available for ad processing and that required to process the ad and its color with the goal of achieving ad claim substantiation. When processing motivation is high and ad processing and/or substantiation consumes relatively few resources, ad claims are likely to be not only substantiated but benefited by the use of color that reinforces the ad claim. The result is more favorable product attitudes when ads are in full color or when elements relevant to substantiating the ad claims are color highlighted. Yet, if such processing or ad claim substantiation is relatively taxing and usurps much of the resource pool, substantiation may be impeded. Thus, attitudes are likely to be more favorable when ads are more simple and use only black-and-white or when they color highlight only those elements in the ad that are relevant to substantiating the ad claims.[1]

THE USE OF COLOR IN ADVERTISING

Elaboration-likelihood notions (Petty et al. 1983) and general resource principles (Anand and Sternthal 1989) suggest that consumers' processing motivation may moderate the effect of color in advertising. When processing motivation is low, few cognitive resources are available for ad processing. Consumers seem to base their attitudes on heuristic cues such as the attractiveness of the ad photo or a product and/or a person shown with the product (Chaiken 1980; Petty et al. 1983). Because ads that contain color are likely to render such objects more pleasing (Bohle and Garcia 1986; Click and Stempel 1976), it follows that products are likely to be viewed more favorably when they appear in color rather than in black-and-white (Pallak 1983). Thus, under low processing motivation, consumers are likely to be more persuaded by ads that make use of color rather than only black-and-white.

When processing motivation is high, however, consumers are thought to engage in more effortful ad processing (Petty et al. 1983), allotting a sizable portion of their resource capacity to processing the ad. Like less motivated consumers, motivated viewers may initially attend to an ad's photo. Yet, they should go beyond this by processing the verbal ad claims extensively and examining specific objects in the ad photo that enable ad claim substantiation (Edell and Staelin 1983; Miniard et al. 1991; Unnava and Burnkrant 1991). Color may benefit this substantiation process by communicating information about the object that is relevant to the ad claim (Favre and November 1979) and by reinforcing "both the auditory and the visual images of words" presented in the ad claims (Lee and Barnes 1990, p. 25).

For example, motivated viewers of the aforementioned Grass Roots clothing ad might verify the ad's claims concerning the clothing's comfort by examining the portion of the ad photo that depicts the product, because it seems most relevant to this claim. To the extent that the clothing's cool, muted colors imply comfort and relaxation, they are likely to lend support for these ad claims and thereby enhance attitudes (Ball 1965; Wineman 1979). Along similar lines, a Brut deodorant ad depicting a beautiful woman in deep, sultry hues is likely to offer visual testimony to the claim that Brut unleashes sex appeal.

It also seems likely that in some situations, even motivated consumers may fail to realize the benefits of color. As will be explained, this outcome might be expected when the resources required for processing and/or substantiating the ad are sizable, while those available for such tasks are significantly reduced as the color itself may consume many resources (Anand and Sternthal 1989; Petty et al. 1983). Specifically, it appears that the attention-attracting properties of color can operate as visual noise that distracts attention to largely irrelevant sensory data at the expense of essential or more relevant information (Bohle and Garcia 1986; Brandt 1925; Dooley and Harkins 1970). Under such conditions, color ads are likely to undermine even highly motivated consumers' product attitudes by limiting ad claim processing and substantiation. As Szlichcinski (1979, p. 258) notes, because "colour has been found to increase the time spent looking at the irrelevant graphic stimuli . . . it may hinder comprehension by diverting attention from important [relevant] ones."

Hence, the question that emerges is, When will color influence motivated viewers' processing of objects that may or may not substantiate the ad claims and thereby influence product attitudes in a positive or negative manner? Some research sheds light on this question, suggesting that the impact of color depends on (1) the number of colors used in the display and (2) the extent to which the ad is cognitively demanding (Durrett and Stimmel 1982). It appears that as the first few colors or colored objects are added to an otherwise black-and-white display, processing of these items is facilitated. This occurs because color draws attention selectively to the color-highlighted objects at the expense of the others, thereby facilitating the processing of these objects (Brandt 1925; Cahill and Carter 1976). Thus, if

[1]Relating our findings to elaboration-likelihood theory also brings to light several assumptions on which our research relies. The validity of our predictions rests on the assumptions that (1) the colors employed in an ad are generally pleasant (providing positive peripheral cues under low motivation) and lead to inferences that are consistent with the ad claims and (2) the arguments expressed in the ad claims are relatively sound and strong. Indeed, as suggested by a reviewer of this article, if our ad claims were weak and the resource demands imposed by the ad were high, it might be that in some instances, ad persuasion among highly motivated consumers would be greater if the ad were color rather than black-and-white. The logic for this prediction is that by attracting attention, color might consume resources and thereby reduce consumers' likelihood of detecting the weakness of the claims.

the color-highlighted objects in the ad photo are highly relevant (of low or no relevance) to and facilitate (impede) ad claim substantiation, motivated processors would be expected to exhibit more (less) favorable attitudes toward the advertised product.

As more colors and/or colored objects are added (e.g., in a full-color ad), however, the colors can become distracting and effectively create a visual war by drawing attention to many diffuse and often irrelevant items. As such, the presence of color can lengthen search times by distracting and consuming resources that would otherwise be used to fully process ad claims and claim-relevant visual objects (Cahill and Carter 1976; Durrett and Stimmel 1982; Shontz, Trumm, and Williams 1971; van Nes, Juola, and Moonen 1987). Yet, it important to note that this negative, disruptive effect of color appears to occur primarily under more cognitively demanding conditions in which available resources are highly taxed and thus in short supply (Zentall and Kruczek 1988; Zentall, Zentall, and Booth 1978). Indeed, after reviewing the color literature, Christ (1975, p. 558) concluded that the addition of color to displays increasingly produced "a decrement in performance relative to the monochromatic display . . . as the overall display density [resource demands] increased." In comparison, it may be that under such resource-constrained conditions, a relatively nondistracting, simpler, black-and-white ad photo more readily allows ad processing and thus enhances attitudes relative to those elicited in response to a color ad photo (see Bohle and Garcia 1986; Brandt 1925; Christ 1975; Chute 1980).

A different outcome should occur, however, if the ad makes modest demands on motivated viewers' available resource pool. Given the abundant resources available for ad processing, a full-color photo is less likely to hamper the processing of items that may substantiate ad claims. Rather, the colors are more likely to help ad claim substantiation by communicating to viewers subjective or sensory information that reinforces the ad claims. Thus, in this case, ads that are in full color are more likely to enhance product attitudes than are ads in black-and-white.

Two experiments were designed to examine the effect of the use of color on ad processing and product attitudes. The first experiment focuses on the impact of cognitive demands on high-motivation viewers' processing of a full-color versus a black-and-white ad. The second experiment extends the first by examining not only high- but also low-motivation viewers' processing of ads that are full color, black-and-white, or color highlighted.

EXPERIMENT 1

The first experiment investigates whether under certain conditions black-and-white ads will enhance high-motivation viewers' product attitudes in comparison with full-color ads. As the preceding discussion indicates, the resource demands of the ad were expected to moderate the effect of color. Thus, this experiment employed a 2 (ad color) $\times$ 2 (resource demands of ad) factorial design. Subjects' processing motivation in all treatments was held constant at a high level. Further, all subjects received an ad containing the same ad photo accompanied by a common set of relatively strong, function-oriented ad claims, and the ad photo was presented either in full color or in black-and-white.

The level of resources required to process and substantiate the ad content was manipulated by varying the manner in which the ad claims were physically arranged in the ad. We reasoned that substantiating the diverse ad claims would require and consume a relatively high level of cognitive resources when the claims were massed in a single paragraph and placed in a unitary copy block superimposed on the ad photo. On the other hand, the claims should be easier to process and substantiate, thereby consuming fewer resources, when each ad claim was placed in a separate copy block that was superimposed on the ad photo. This is so because each copy block was connected by an arrow to the product feature discussed in the ad claim and thereby annotated the ad photo. Sample versions of the ads appear in Appendix A.

Both attitude and thought measures were administered to subjects. Because viewers' thoughts were believed to provide evidence of the process mediating attitudes, positive thoughts were expected to display the same pattern of outcomes as attitudes, while negative thoughts were predicted to display the opposite pattern. The content of viewers' thoughts—in particular, thoughts they produce that refer to specific visual elements in the ad photo that are relevant to the ad claims—should also mimic the pattern of the attitude measure, as more such thoughts should be stimulated when viewers have sufficient resources to substantiate the ad claims. Conversely, viewers' thoughts about visual elements in the ad photo that are of low or no relevance to the ad claims should not exhibit such effects.

Because all subjects were encouraged to evoke high processing motivation, an interaction of ad color by ad resource demands was expected to emerge on several measures. When processing the ad was relatively onerous and thus placed high demands on available resources, subjects were expected to produce more favorable product attitudes, more positive (and fewer negative) thoughts, and more thoughts about specific product-related (relevant) visual elements in the ad photo when they viewed a black-and-white rather than a full-color ad. But when processing of the ad was simpler and required fewer resources, subjects were expected to produce more favorable product attitudes,

more positive (and fewer negative) thoughts, and more thoughts about specific product-related (relevant) visual elements in the ad photo when they viewed a full-color ad rather than a black-and-white ad. Finally, given that the predictions imply that thoughts should mediate attitudes, we also examined the relationship between thoughts and attitudes.

Stimuli

A full-color photo from an existing ad was used in developing a new print ad for a bicycle. The photo depicted a bicyclist riding along a foliage-lined path. In addition, claims contained in various bicycle ads were used to create eight function-oriented ad claims. The claims discussed a variety of benefits provided by the bike's features, such as its all-climate, soft gel saddle; its quick-release seat post; its comfortable, thermoplastic grip handles; its strong, thermal-bonded joints; and its shortened, elevated chain stays for fast acceleration.

Four versions of the ad were created with computer software that permitted manipulation of the ad photo and ad claims. These versions displayed the photo either in full color or in black-and-white. In addition, they varied the ad's resource demands by altering the physical placement of the eight ad claims. In the more resource-demanding ad versions, each ad claim was preceded by a bullet and massed in a single copy block that was set against a white rectangle. This rectangle was then superimposed on background scenery in the ad photo. In the versions that required fewer resources, the same eight ad claims appeared, but they were displayed in a manner intended to make it easier for motivated viewers to verify the claims in relation to the ad photo. Specifically, the ad claims annotated the ad photo such that each claim was printed in a separate white rectangular copy block and was both positioned near and connected by an arrow to the bicycle feature the ad claim referenced.

Procedure

Forty-six students enrolled in marketing classes participated in the study. Subjects began by reading instructions intended to stimulate high processing motivation. These instructions were similar to those used by other researchers for this purpose (e.g., Gorn 1982; Petty, Harkins, and Williams 1980). Subjects were told that they were among a very small group of students at their university whose opinions about the products were being assessed. They were also told that because their views were of extreme importance to the manufacturers, they would be offered special discounts on the products.

Subjects viewed one of the four versions of the bicycle ad and then rated their attitudes and listed their thoughts about the bike. The order in which subjects performed these two tasks was varied. Subjects' attitudes were assessed on five seven-point scales that were anchored with poor/excellent value, a product I would not/might buy, extremely poorly/well made, boring/exciting, and not a worthwhile/worthwhile product. Responses to these attitude items were averaged to form a single attitude measure ($\alpha = .71$).

Subjects' recall of the ad claims was examined next. Subjects were asked to record as many of the claims contained in the ad as possible.

Next, subjects completed several manipulation checks and a measure that assessed whether, as intended, the two manipulated factors affected the ease with which subjects could substantiate the ad claims. Subjects rated their processing motivation by indicating on a seven-point scale how involved they were when reading the ad. Then, on two seven-point scales anchored by difficult/easy to comprehend and complicated/simple, subjects indicated how demanding ad claim processing was. To assess whether ad claim substantiation was helped or hindered by variations in the use of ad color and ad resource demands (i.e., ad claim placement), subjects rated on seven-point scales the extent to which they found it easy/hard to refer to the ad photo when thinking about the product features, they readily could/could not visually examine the product features discussed in the ad claims, and ad claim placement made it easy/difficult to examine related visual material. Items that assessed each of the preceding measures were averaged to form separate and reliable indices of the relevant concepts ($\alpha = .66$ or greater).

RESULTS

Preliminary analyses revealed that the order in which the attitude and thought measures were administered produced no significant treatment effects ($p > .22$). Thus, all data were analyzed as a 2 (ad color) $\times$ 2 (resource demands of ad) factorial design. This section reports the highest-order effects that were significant, and treatment means for all measures appear in Table 1.

Manipulation Checks

No treatment effects emerged on the processing motivation manipulation check ($F < 1$). As intended, all subjects appeared to be quite motivated or involved in the study ($\bar{X} = 5.09$).

As anticipated, the data also indicated that the ad claims varied in how demanding they were to process. Subjects' responses to the resource demands of the ad manipulation check exhibited only the expected main effect of ad resource demands ($F(1,42) = 5.29$, $p < .03$). Compared with the ad version in which the ad claims were massed ($\bar{X} = 3.89$), the annotated ad version ($\bar{X} = 4.78$) was perceived to be less demanding. Further evidence that the ad resource demands manipulation was successful was obtained on subjects' recall of the

TABLE 1

TREATMENT MEANS FOR ATTITUDES AND THOUGHTS ABOUT BICYCLE AD

	Ad with high resource demands		Ad with low resource demands	
	Color	Black-and-white	Color	Black-and-white
Processing motivation manipulation check	5.17	4.73	5.18	5.25
Ad complexity index	3.75	4.05	4.68	4.88
Ease of ad claim substantiation index	3.47	4.85	4.61	3.36
Recall of ad claims	3.58	5.00	5.73	5.25
Attitudes	4.50	5.15	5.31	4.47
Total thoughts	4.50	4.82	4.64	4.33
Percentage of positive thoughts	.16	.55	.43	.16
Percentage of negative thoughts	.42	.17	.15	.36
Percentage of thoughts about highly relevant visual elements	.07	.26	.17	.00
Percentage of thoughts about visual elements of low or no relevance	.02	.02	.01	.03

ad claims. A main effect of ad resource demands emerged on recall ($F(1,42) = 4.75$, $p < .04$). As might be expected, ad claim recall was greater in the less onerous, annotated ad claim version ($\bar{X} = 5.48$) than in the massed ad claim version ($\bar{X} = 4.26$).

Finally, analysis of the measure that examined how easy subjects felt it was to reference and thus verify the ad claims with items featured in the ad photo revealed an interaction of ad color and ad resource demands ($F(1,42) = 12.80$, $p < .001$). As expected, when the ad was relatively demanding because ad claims were massed in a single copy block, subjects found it easier to relate the ad claims with items in the ad photo when the photo was in black-and-white rather than in color ($F(1,42) = 6.97$, $p < .01$). Yet, when the ad's resource demands were reduced by displaying the ad claims so that they annotated the ad photo, subjects found it easier to relate the ad claims with ad photo items when the photo was in full color rather than in black-and-white ($F(1,42) = 5.84$, $p < .02$).

Attitudes

Analysis of subjects' attitudes toward the advertised bicycle revealed only an interaction of ad color by ad resource demands ($F(1,42) = 12.67$, $p < .001$). As anticipated, when the ad was highly demanding to process because the ad claims were massed in a unitary copy block, the bike was evaluated more favorably when the ad photo was in black-and-white rather than in full color ($F(1,42) = 4.80$, $p < .03$). But when ad claim substantiation was less demanding because the ad claims annotated the ad photo, product evaluations were more favorable when the ad photo was in full color rather than in black-and-white ($F(1,42) = 8.06$, $p < .01$).

Thoughts

Subjects' thoughts about the bicycle were categorized by two judges ($r = .89$). The four categories included the proportions of positive and negative thoughts, thoughts about specific visual elements in the ad photo that were product related and thus of high relevance to the ad claims (e.g., "The seat looks comfortable like they say it is"), and thoughts about elements that were not product related and thus of low or no relevance to the ad claims (e.g., "The picture looks like the bike is in motion"). The first two and the second two categories were not mutually exclusive, while the two pairs in each category were. Thoughts about visual items in the ad were classified as highly relevant to the ad claims only if it appeared that they were intended to substantiate an ad claim (i.e., adjectives or phrases that described the visual item in a way that corresponded with an ad claim).

An interaction of ad color by ad resource demands emerged on the proportion of positive thoughts that subjects generated ($F(1,42) = 29.57$, $p < .001$). Subjects who saw the more resource-demanding ad version, in which the ad claims were massed, produced a larger proportion of positive thoughts when the ad was in black-and-white rather than in color ($F(1,42) = 19.86$, $p < .001$). However, subjects who saw the less resource-demanding ad, in which the ad claims appeared to annotate the photo, produced a greater proportion of positive thoughts when the ad was in full color rather than in black-and-white ($F(1,42) = 10.43$, $p < .01$).

An interaction of ad color by ad resource demands also emerged on the proportion of negative thoughts that subjects generated ($F(1,42) = 17.77$, $p < .001$). Subjects who saw the relatively demanding ad version, in which the ad claims were massed, produced a larger

proportion of negative thoughts when the ad was in full color rather than in black-and-white ($F(1,42) = 9.53$, $p < .01$). However, subjects who saw the less demanding ad, in which the ad claims appeared to annotate the photo, produced a larger proportion of negative thoughts when the ad was in black-and-white rather than in full color ($F(1,42) = 8.24$, $p < .01$).

Analyses were performed on the proportion of subjects' thoughts that pertained to specific visual elements in the ad photos that were product related, and thus of high relevance to ad claims, or related to some other issue of low or no relevance to the ad claims. Examination of subjects' thoughts about visual elements that were of low or no relevance to the ad claims revealed no significant treatment effects ($p > .29$). However, an interaction of ad color and ad resource demands emerged on the proportion of subjects' thoughts about specific visual elements in the ad photo that were highly relevant to the ad claims (i.e., product-related; $F(1,42) = 11.14$, $p < .002$). As anticipated, when subjects received the more resource-demanding ad, in which the ad claims were massed, they elicited more such thoughts when the ad was in black-and-white rather than in full color ($F(1,42) = 5.78$, $p < .02$). But when subjects observed the less demanding ad, in which the ad claims appeared to annotate the photo, they generated more thoughts about highly relevant specific visual product-related elements when the ad was in full color rather than in black-and-white ($F(1,42) = 5.35$, $p < .03$).

A regression using attitudes as the dependent variable and thoughts characterized as positive, negative, and of high and low relevance to the ad claims as the predictors was conducted to provide support for the expectation that attitudes are derived from thoughts. Separate regressions were run under the high and low resource demands conditions. The results generally supported expectations. When the more demanding ad was viewed, positive thoughts ($t = 2.88$, $p < .009$, $\beta = .59$) and thoughts about visual ad photo elements of high relevance to the ad claims ($t = 2.17$, $p < .04$, $\beta = .44$) were significant predictors of attitudes. Yet, when the less demanding ad was viewed, no effects were significant.

Discussion

The results of this first study indicate that, for high-motivation viewers, the effectiveness of full-color versus black-and-white ads is moderated by the cognitive demands of the ad. When viewers are highly motivated and processing the ad consumes few resources, full color appears to assist the viewer in processing and substantiating the ad. This substantiation process appears to enhance attitudes toward a full-color ad relative to a black-and-white ad. However, when ad processing is highly resource demanding, even when viewers appear to be highly motivated, black-and-white ads appear to be less distracting and aid in ad claim substantiation relative to full-color ads. Thus, product attitudes were more favorable after viewing a black-and-white ad relative to a full-color ad when processing the ad was more resource demanding.

EXPERIMENT 2

Although the findings of experiment 1 nicely support the proposed theorizing, a second study was conducted to establish the robustness of the effects. Experiment 2 differs from the previous study in its use of an alternative means of varying an ad's resource demands. In this study, the level of resources needed to process the ad was manipulated by varying the nature of the verbal ad claims. The ad claims focused either on factual, fairly tangible product aspects that pertained to the product's quality or functional benefits that could be substantiated with relatively limited effort by examining material in the ad photo (i.e., low ad resource demands) or on relatively intangible, image-oriented product benefits that were more difficult to substantiate (i.e., high ad resource demands; Holbrook 1978; Snyder and DeBono 1985). We reasoned that if viewers were highly motivated to process and substantiate the ad, image-oriented ads, which concern intangible status or lifestyle benefits that supposedly accrue to the product user by virtue of using the product, would consume more resources to process than function-oriented ads for at least two reasons. First, their ad claims imply benefits that are likely to be more difficult to ascertain objectively. In addition, they contain image-oriented claims that are likely to elicit greater resource-consuming imagery or associations.[2]

Supporting this logic, researchers have posited that image-oriented ads tend to be "more complicated" (Muehling and Bozman 1990, p. 333), leaving viewers to "draw their own inferences about what the advertised brand has (i.e., its attributes) or what it will do for them (i.e., its benefits)" (Shimp 1978, p. 37). Hence, assuming that function-oriented ads avoid technical language and long, dense descriptions of many product benefits, processing and substantiating these ads should be less resource demanding than processing image-oriented ads.

A second way that experiment 2 deviated from the preceding study was the use of color-highlighted as well as full-color and black-and-white ads. As the theorizing developed earlier suggests, color-highlighted ads are thought to draw attention selectively to objects in an ad photo that are color highlighted at the expense of those that are not. Hence, when the color-highlighted items in the ad photo are informative about the image

[2]We do not mean to suggest that ads containing function-oriented ad claims always will be less resource demanding than those with image-oriented claims. Exceptions may occur, for example, if function-oriented ad claims are expressed in highly complex, technical, or arcane language.

associated with the product and thus are of high (low) relevance for substantiating the image- (function-) oriented ad claims, this ad's resource demands should be reduced (heightened). The same should be true for the function-oriented ad when the color-highlighted items are (are not) informative about the product's function or quality aspects. As a result, ads that color highlight objects of high versus low relevance to the ad claims should reduce the resources that highly motivated viewers require to substantiate the ad claims, thereby facilitating ad claim substantiation and leading motivated viewers to produce more favorable product attitudes.

A final change introduced in experiment 2 was the examination of low- as well as high-motivation viewers' processing of ads. The theorizing developed earlier suggests that relatively unmotivated viewers should be fairly immune to variations in the cognitive demands of ad claims, as they are unlikely to process carefully or use these claims as a basis for forming their product attitudes. Instead, under low motivation, viewers are likely to devote more attention to and base their attitudes on surface cues such as the overall attractiveness of the ad photo or elements in it. Because such material is likely to be viewed as more attractive when the ad photo appears in some color (full or color highlighted) as opposed to black-and-white, product attitudes should be more favorable in the former condition.

Integrating these expectations, we anticipated that three-way interactions involving processing motivation, ad resource demands, and ad color would emerge on product attitudes, positive and negative thoughts, and thoughts pertaining to elements in the ad photo that were of high relevance to the ad claims. No treatment effects were expected, however, on subjects' thoughts that pertained to elements in the ad photo that were of low or no relevance to the ad claims.

Specifically, when viewers' processing motivation was high such that they were likely to search ad photos for specific objects that were relevant to substantiating the ad claims, the following outcomes were anticipated. When ad claims were image oriented and thus consumed many resources, black-and-white ads and those that color highlighted image- or context-related objects of high relevance to the ad claims were expected to spawn more favorable attitudes, more positive and fewer negative thoughts, and more thoughts about visual items in the ad photo that were of high relevance to the ad claims than would occur when such ads were in full color or when they color highlighted objects of low relevance to ad claims. However, when ad claims were function oriented and thus consumed relatively few resources, full-color ads and ads that color highlighted objects related to function or product qualities of high relevance to these ad claims were expected to prompt more favorable attitudes, more positive and fewer negative thoughts, and more thoughts about items in the ad photo that were of high relevance to the ad claims than would occur when such ads were in black-and-white or color highlighted objects of low relevance to ad claims.

Different outcomes were anticipated when viewers' processing motivation was low. Here, attitudes were not expected to be based on the extent to which ad claims could be substantiated but on the use of simple decision rules related to readily perceived surface cues such as the attractiveness of the photo, product, or user. Thus, when processing motivation was low, viewers were expected to display more favorable product attitudes and more positive and fewer negative thoughts when ads contained some color—either full color or some form of color highlighting—rather than only black-and-white. Moreover, these effects were expected to hold regardless of the ad's resource demands and the relevance of the color-highlighted items to the ad claims. Finally, because viewers' attempts to substantiate the ad claims were expected to mediate attitudes under high-motivation conditions but not under low-motivation conditions, when processing motivation was low, we expected no treatment effects to emerge on viewers' thoughts about visual items in the ad photo that were highly relevant to the ad claims. Hence, such anticipation of different outcomes on this latter type of thought under high- versus low-motivation conditions should provide some evidence that substantiation of the ad claims mediated viewers' attitudes only under high-motivation conditions.

Subjects

One hundred sixty-six undergraduates enrolled in marketing classes participated in the study during class time. All subjects were randomly assigned to treatments.

Stimuli

Print ads for two products of interest to students, a bicycle and clothing, were developed for use in the study. The ad claims and the photo contained in the ads were adapted from existing ads. (The bicycle ad employed in this study differed from that used in experiment 1.) Two versions of the headline and ad claims were developed for the bicycle and clothing ads. One version was function oriented, stressing tangible factual information about the product's quality (e.g., "Its aluminum frame has been proven structurally superior in fatigue tests"). A second version was image oriented, focusing on evaluative, not easily verifiable characteristics of the product user's lifestyle that were presumably imbued by use of the product (e.g., "Whether you're riding across town or racing to meet an important date, you'll be noticed on your Exceed bike"). Both versions of the headlines and the ad claims were equivalent in length.

A pretest was conducted among 42 subjects to establish whether these two versions of the bicycle and clothing ad claims differed in the extent to which they consumed cognitive resources and conveyed verifiable benefits. The resources expended in processing the ad claims were assessed by having subjects rate on seven-point scales the extent to which the ad claims stimulated their imagination, brought memories to mind, related to things they knew about or could imagine, or made them think about other products or their own experience. As expected, the image-oriented ad claims appeared to occupy or consume more resources than did the function-oriented claims (for the bike, $\bar{X} = 5.42$ vs. 3.24, $F(1,39) = 62.45$, $p < .001$; for the clothing, $\bar{X} = 5.13$ vs. 2.88, $F(1,39) = 62.57$, $p < .001$).

The procedure of Edell and Staelin (1983) was used to assess the difference in how verifiable the benefits implied by the function- and image-oriented ad claims were. Twenty-six subjects were asked to classify one of the versions of the ad claims for each product with regard to whether it better fit Holbrook's (1978) definition of verifiable, factual ad claims or intangible, evaluative ad claims. As intended, all subjects classified the function-oriented ad claims as being verifiable and factual, while they classified the image-oriented ad claims as being intangible and evaluative.

The photos selected for each ad contained a shot of the fictitious featured product as well as contextual objects that were indicative of the lifestyle of the product user. Specifically, the bicycle ad displayed a picture of a young cyclist on a bike (the product) being waved at by five young people riding by in a car (the context). The clothing ad featured a picture of a young man clad in stylish clothing (the product) who was reclining on the seat and handlebars of a sleek motorcycle (the context). We reasoned that in each ad photo, the shot of the product was more likely to be relevant in substantiating the function-oriented ad claims (i.e., claims that stressed the tangible quality aspects of the product), whereas the portion of the ad photo featuring the context was more relevant for substantiating the image-oriented ad claims (i.e., claims that focused on the lifestyle of the product user).

Support for this notion was obtained in a pretest of 42 subjects, who rated on two seven-point scales the extent to which shots of these product and contextual objects in the ads helped substantiate and were relevant to the ad claims (not at all/very much). As expected, the shot of the product was rated as more relevant in substantiating the relatively easily processed function-oriented ad claims than the more cognitively demanding image-oriented claims (for the bike ad, $\bar{X} = 5.46$ vs. 4.54, $F(1,40) = 4.25$, $p < .05$; for the clothing ad, $\bar{X} = 5.61$ vs. 4.63, $F(1,40) = 8.55$, $p < .006$). Further, the shot of the contextual object(s) was viewed as more relevant in substantiating the image-oriented ad claims than the function-oriented claims (for the bike ad, $\bar{X} = 4.05$ vs. 2.55, $F(1,39) = 5.83$, $p < .02$; for the clothing ad, $\bar{X} = 3.29$ vs. 2.34, $F(1,39) = 4.32$, $p < .04$).

In total, for each product, four versions of the function-oriented ad that required relatively few resources and four versions of the more resource-demanding, image-oriented ad were created that were identical except for their use of color. One version featured all objects in the ad in full color, and another featured them all in black-and-white. Two additional versions of both the less (function-oriented) and the more (image-oriented) cognitively demanding ads were color highlighted. In these versions, either an object(s) that was highly relevant in substantiating the ad claims was color highlighted (i.e., the claims were function- [image-] oriented and the product [context] was color highlighted) or an object(s) that was of low relevance in substantiating the ad claims was color highlighted (i.e., the claims were function- [image-] oriented but the context [product] was color highlighted). Sample ads appear in Appendix B.

Procedure

Subjects received questionnaires that informed them that their views about some new products were being sought. Then, their motivation to process the ads was varied. In the high processing motivation condition, subjects received the same instructions that were used in experiment 1. In the low processing motivation condition, subjects were told that they were among a very large number of students at many universities whose opinions were being sought. Further, the identity and opinions of any single participant were of no interest to the manufacturers, as their opinions would be averaged with those of the many other participants.

Next, subjects viewed print copies of the ads for up to two minutes each. Every subject viewed a bike and a clothing ad that represented different treatments. The order of introducing the two ads was counterbalanced across subjects. After viewing each ad, subjects' attitudes about the advertised products were assessed on the same five scales used in the preceding study, and subjects listed their thoughts about the product. Because for each of the products the attitude items loaded on a single factor, they were averaged to form separate attitude scales ($\alpha = .91$ and .92 for bicycle and clothing attitudes, respectively).

Then subjects completed a second questionnaire, in which they were asked to recall as much as they could from the bicycle and clothing ads. This was followed by two processing motivation manipulation check measures in which subjects were asked how interesting and how involving they found the ad materials (1 = not at all, 7 = extremely). These highly correlated questions ($r = .87$) were averaged to form a motivation index.

Next, subjects rated on seven-point scales the extent to which each of the two ads they saw focused on the intangible image gained from using the product (an-

TABLE 2

TREATMENT MEANS FOR ATTITUDES AND THOUGHTS ABOUT BICYCLE AD

	Ad claims requiring high resources (image oriented)				Ad claims requiring low resources (image oriented)			
	Color	Product color highlighted	Context color highlighted	Black-and-white	Color	Product color highlighted	Context color highlighted	Black-and-white
Low processing motivation:								
Attitudes	5.16	5.18	3.91	3.26	4.80	5.35	4.38	4.27
Total thoughts	5.56	6.70	6.09	4.15	4.18	7.25	5.42	3.44
Percentage of positive thoughts	.28	.42	.01	.12	.51	.31	.16	.23
Percentage of negative thoughts	.61	.43	.70	.69	.44	.31	.69	.64
Percentage of thoughts about highly relevant visual elements	.00	.00	.03	.10	.01	.07	.04	.05
Percentage of thoughts about visual elements of low or no relevance	.20	.07	.08	.10	.07	.08	.16	.25
High processing motivation:								
Attitudes	3.80	3.82	4.62	4.66	4.89	4.89	3.44	3.89
Total thoughts	5.90	7.20	5.50	6.55	6.18	5.78	6.89	6.75
Percentage of positive thoughts	.11	.08	.49	.55	.66	.61	.13	.22
Percentage of negative thoughts	.62	.78	.27	.32	.25	.14	.72	.72
Percentage of thoughts about highly relevant visual elements	.00	.00	.12	.09	.18	.17	.02	.00
Percentage of thoughts about visual elements of low or no relevance	.05	.03	.08	.07	.06	.06	.12	.10

chored at 1) or on the verifiable functional or quality-related features of the product (anchored at 7). Then, two questions asked subjects to rate on seven-point scales whether they enjoyed biking/shopping for clothing and enjoyed reading and thinking about bikes/clothes. For each product, these two highly correlated items (r = .79 for bicycle; r = .79 for clothing) were averaged to form separate product interest measures. Finally, subjects were debriefed.

RESULTS

The data were analyzed as a 2 (processing motivation: high or low) × 2 (type of ad claim: low [function-oriented] or high [image-oriented] resource demands) × 4 (ad color: full color, color highlighting of product or object highly relevant to function-oriented ad claims, color highlighting of context or object highly relevant to image-oriented ad claims, or black-and-white) between-subjects factorial. Analyses revealed no treatment effects on the interest measures for bicycles and clothing ($p > .22$). Treatment means for the attitude and thought measures appear in Tables 2 and 3 for the bicycle and clothing ads. Tables 4 and 5 present the statistics for the highest-order significant effects observed on all measures and the relevant contrasts. In reporting the results, attention is limited to only the highest-order significant effects.

Manipulation Checks

Analysis performed on the motivation index revealed that only the main effect of processing motivation was significant. Subjects in the high processing motivation condition ($\bar{X}$ = 4.81) were more motivated when processing the ads than were those in the low processing motivation condition ($\bar{X}$ = 4.35; $F(1,147) = 6.07$, $p < .02$).

Subjects' recall provided additional evidence that the processing motivation instructions operated in the intended manner. A main effect of processing motivation emerged on recall of both the bicycle and the clothing ad claims; more ad claims were recalled when processing motivation was high rather than low (for the bike ad, $\bar{X}$ = 3.76 vs. 3.04, $F(1,147) = 9.79$, $p < .002$; for the clothing ad, $\bar{X}$ = 3.94 vs. 3.11, $F(1,147) = 12.00$, $p < .001$). No other effects were significant.

Finally, the manipulation check that assessed whether subjects felt that the ad claims focused more on veri-

TABLE 3

TREATMENT MEANS FOR ATTITUDES AND THOUGHTS ABOUT CLOTHING AD

	Ad claims requiring high resources (image oriented)				Ad claims requiring low resources (image oriented)			
	Color	Product color highlighted	Context color highlighted	Black-and-white	Color	Product color highlighted	Context color highlighted	Black-and-white
Low processing motivation:								
Attitudes	4.46	4.38	3.51	2.66	4.58	5.04	4.51	3.62
Total thoughts	5.80	4.78	4.92	4.09	6.00	4.55	4.67	4.50
Percentage of positive thoughts	.33	.62	.08	.27	.80	.59	.46	.43
Percentage of negative thoughts	.60	.21	.73	.67	.09	.36	.48	.38
Percentage of thoughts about highly relevant visual elements	.06	.00	.01	.08	.03	.04	.05	.03
Percentage of thoughts about visual elements of low or no relevance	.04	.34	.09	.10	.15	.11	.10	.30
High processing motivation:								
Attitudes	2.64	3.10	4.18	4.15	4.84	5.17	3.62	3.64
Total thoughts	6.30	5.90	5.09	4.83	5.56	5.64	7.38	5.78
Percentage of positive thoughts	.33	.10	.40	.57	.67	.70	.28	.20
Percentage of negative thoughts	.56	.80	.37	.35	.32	.21	.69	.78
Percentage of thoughts about highly relevant visual elements	.05	.01	.16	.15	.16	.15	.00	.02
Percentage of thoughts about visual elements of low or no relevance	.09	.06	.11	.16	.09	.06	.11	.16

fiable functional product features or intangible image benefits associated with the product user's lifestyle suggested that the two types of ad claims operated as intended. Specifically, only a main effect of type of ad claims emerged for the bike and clothing ads. Subjects felt that the ad claims in the function-oriented ad placed more emphasis on verifiable functional aspects of the product and that the ad claims in the image-oriented ad focused on relatively intangible, image-related product aspects (for the bike ad, $\bar{X} = 4.30$ vs. 1.64, $F(1,147) = 103.94$, $p < .001$; for the clothing ad, $\bar{X} = 4.38$ vs. 2.72, $F(1,147) = 53.68$, $p < .001$).

Attitudes

Analysis of subjects' attitudes toward each product revealed a three-way interaction of processing motivation by type of ad claims by ad color for the bicycle and the clothing ads. Figures 1 and 2 illustrate these effects for each ad, respectively.

Further examination of these interactions revealed support for the predictions. Under high processing motivation, subjects' attitudes for each product exhibited an interaction of type of ad claims and ad color. Specifically, subjects who received the more resource-demanding, image-oriented ad claims judged both the bicycle and the clothing more favorably when the ad was either in black-and-white or color highlighted the object that was highly relevant to the ad claims (the context) as opposed to when the ad was either in full color or color highlighted the object of low relevance to ad claims (the product; attitudes in these first two and last two ad color treatments did not differ significantly). However, a different pattern of effects was observed among subjects who viewed the function-oriented ad claims that required fewer resources to process or substantiate. Here, the bicycle and the clothing were judged more favorably when the ad was either in full color or color highlighted the object that was highly relevant to the ad claims (the product) rather than when the ad was either in black-and-white or color highlighted the object of low relevance to ad claims (the context; attitudes in these first two and last two ad color treatments did not differ significantly).

Finally, subjects in the low processing motivation condition were not inclined to assess the ad and its claims effortfully, so these subjects displayed only a main effect of ad color; their attitudes toward the bicycle

TABLE 4

SUMMARY OF *F*-VALUES OF THE HIGHEST-ORDER SIGNIFICANT EFFECTS FOR ATTITUDE AND THOUGHT MEASURES FOR BICYCLE AD

Source of effect	Attitudes	Total thoughts	Percentage of positive thoughts	Percentage of negative thoughts	Percentage of thoughts about highly relevant visual elements	Percentage of thoughts about visual elements of low or no relevance
Motivation × type of ad claims × ad color	6.11***	1.19	6.42***	3.88**	3.91*	1.12
Type of ad claims by ad color within high motivation	6.18***	.98	10.45***	10.39***	12.87***	.19
Within high motivation × image-oriented ad claims:						
Black-and-white or color-highlighted high-relevance object (context) vs. full-color or color-highlighted low-relevance object (product)	6.30**	.34	15.18***	12.20***	13.78*	.52
Black-and-white vs. color-highlighted high-relevance object (context)	.01	.87	.06	.09	.00	.05
Full-color vs. color-highlighted low-relevance object (product)	.00	1.26	.10	1.33	.00	.24
Within high motivation × function-oriented ad claims:						
Full-color or color-highlighted high-relevance object (product) vs. black-and-white or color-highlighted low relevance object (context)	12.04***	.76	17.67***	19.43***	27.16*	1.57
Full-color vs. color-highlighted high-relevance object (product)	.00	.20	.20	.55	.14	.02
Black-and-white vs. color-highlighted low-relevance object (context)	.74	.03	.22	.01	.33	.56
Ad color within low motivation	8.72***	5.40**	4.28**	4.06**	1.04	.72
Full color or color highlighted vs. black-and-white	16.57***	9.69**	2.46	2.77	2.10	.89

*$p < .05$.
**$p < .01$.
***$p < .001$.

and the clothing were more favorable when the ads were in full color or color highlighted either the product or the contextual object(s), regardless of these objects' relevance, as opposed to when the ads were in black-and-white.

Thoughts

Subjects' thoughts concerning the bicycle and clothing ads were classified into four categories by two judges who were blind to the treatments (interjudge reliability = .91). These included the proportions of positive and negative thoughts generated and the proportion of thoughts about specific visual elements in the ad photo that were of high relevance to the ad claims (e.g., "The words say something about bike's technology and quality aspects, and the biker is dressed like a semiprofessional or professional rider") and those that were of low or no relevance to the ad claims (e.g., "Those girls are lucky to have a Rolls"). Finally, the results of a mediational analysis are reported in which thoughts categorized as positive, negative, and of high and low relevance to the ad claims are used to predict attitudes.

Positive Thoughts. Investigation of the proportion of positive thoughts generated about the bike and the clothing ads revealed three-way interactions of processing motivation, type of ad claims, and ad color. Under high processing motivation, interactions of type of ad claims and ad color were significant for both the bicycle and the clothing ads, each showing a pattern consistent with predictions. Specifically, subjects who read the more resource-demanding, image-oriented ad claims generated more positive thoughts about the bike and the clothing when the ads were in black-and-white or color highlighted the object of high relevance to the ad claims (the context) than when the ads were in full color or color highlighted the object of low relevance

TABLE 5

SUMMARY OF *F*-VALUES OF THE HIGHEST-ORDER SIGNIFICANT EFFECTS FOR ATTITUDE AND THOUGHT MEASURES FOR CLOTHING AD

Source of effect	Attitudes	Total thoughts	Percentage of positive thoughts	Percentage of negative thoughts	Percentage of thoughts about highly relevant visual elements	Percentage of thoughts about visual elements of low or no relevance
Motivation × type of ad claims × ad color	7.64***	.64	5.90***	8.97***	4.73**	1.68
Type of ad claims by ad color within high motivation	10.14***	1.07	7.26***	8.85***	9.10***	.03
Within high motivation × image-oriented ad claims:						
Black-and-white or color-highlighted high-relevance object (context) vs. full-color or color-highlighted low relevance object (product)	14.53***	1.61	5.31*	7.59**	13.71***	.85
Black-and-white vs. color-highlighted high-relevance object (context)	.01	.04	.96	.02	.05	.14
Full-color vs. color-highlighted low-relevance object (product)	1.14	.10	2.77	2.90	.86	.17
Within high motivation × fun-oriented ad claims:						
Full-color or color-highlighted high-relevance object (product) vs. black-and-white or color-highlighted low-relevance object (context)	16.80***	.83	13.47***	15.28***	14.35***	.77
Full-color vs. color-highlighted high-relevance object (product)	.88	.03	.06	.38	.13	.13
Black-and-white vs. color-highlighted low-relevance object (context)	.00	1.17	.22	.37	.23	.00
Ad color within low motivation	8.82***	1.24	5.13**	4.14**	.38	1.78
Full color or color highlighted vs. black-and-white	20.82***	1.55	1.52	1.63	.23	1.13

*$p < .05$.
**$p < .01$.
***$p < .001$.

to the ad claims (the product; the proportion of such thoughts in these first two and last two ad color treatments did not differ significantly). However, subjects who received the less resource-demanding, function-oriented ad claims generated more positive thoughts about the bike and the clothing when the ads were in full color or color highlighted the object of high relevance to the ad claims (the product) than when they were in black-and-white or color highlighted the object of low relevance to the ad claims (the context; the proportion of such thoughts in these first two and last two ad color treatments did not significantly differ).

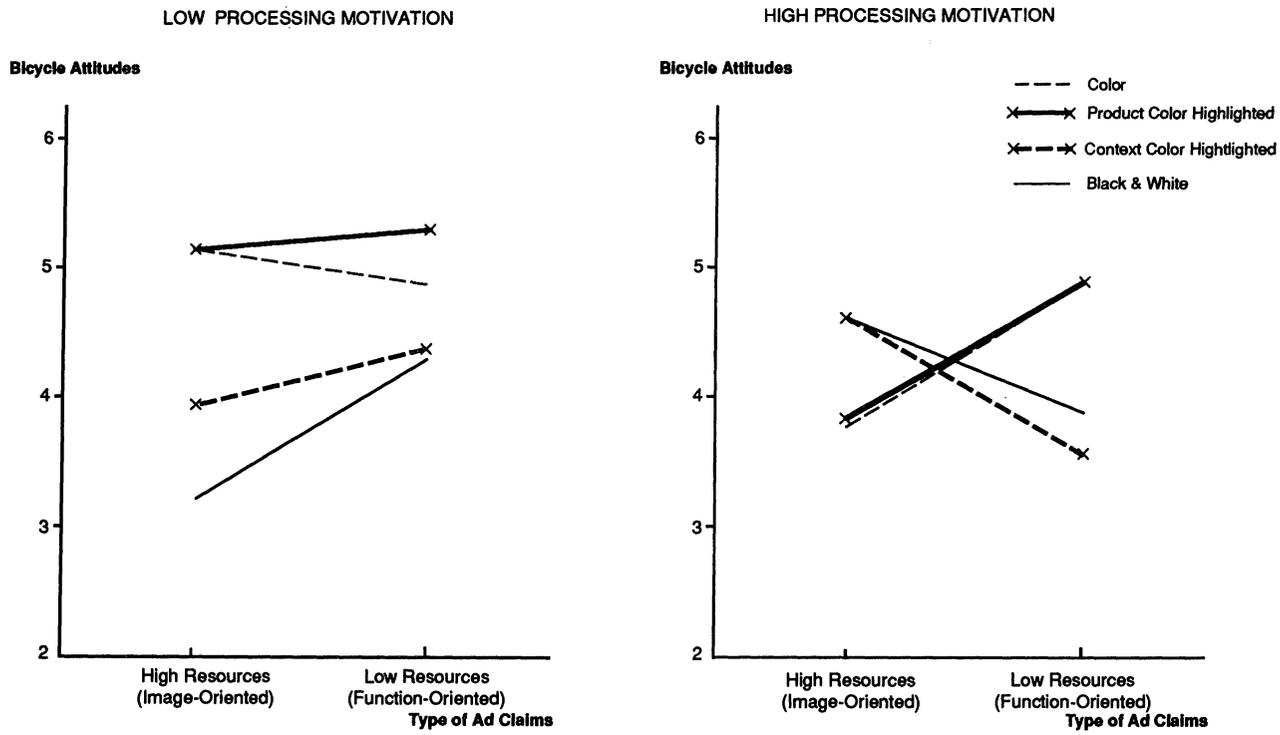
A different pattern of outcomes was obtained under low processing motivation. Here, as predicted, analysis of the proportion of positive thoughts revealed only the main effect of ad color for the bike and the clothing ads. Subjects showed a nonsignificant tendency to generate more positive thoughts when the ads contained full or some color than when they were entirely black-and-white.

Negative Thoughts. The proportion of negative thoughts that subjects produced about the bicycle and clothing ads revealed three-way interactions of processing motivation, type of ad claims, and ad color. The pattern of these effects was the reverse of that observed on positive thoughts, which offers further support for the predictions.

When processing motivation was high, interactions of type of ad claims and ad color were significant for both the bike and the clothing ads. The more resource-consuming, image-oriented ad claims prompted fewer negative thoughts about the bike and the clothing ads when the ads were in black-and-white or color highlighted the object of high relevance to the ad claims (the context) than when the ads were in full color or color highlighted the object of low relevance to the ad claims (the product; the proportion of such thoughts in these first two and last two ad color treatments did not differ significantly). For the less resource-consuming, function-oriented ad claims, fewer negative thoughts about

FIGURE 1

THREE-WAY INTERACTION OF PROCESSING MOTIVATION, TYPE OF AD, AND USE OF AD COLOR ON BICYCLE ATTITUDES



the bike and clothing ads were generated when the ads were in full color or color highlighted the object of high relevance to the ad claims (the product) than when they were in black-and-white or color highlighted the object of low relevance to the ad claims (the context; the proportion of such thoughts in these first two and last two ad color treatments did not differ significantly).

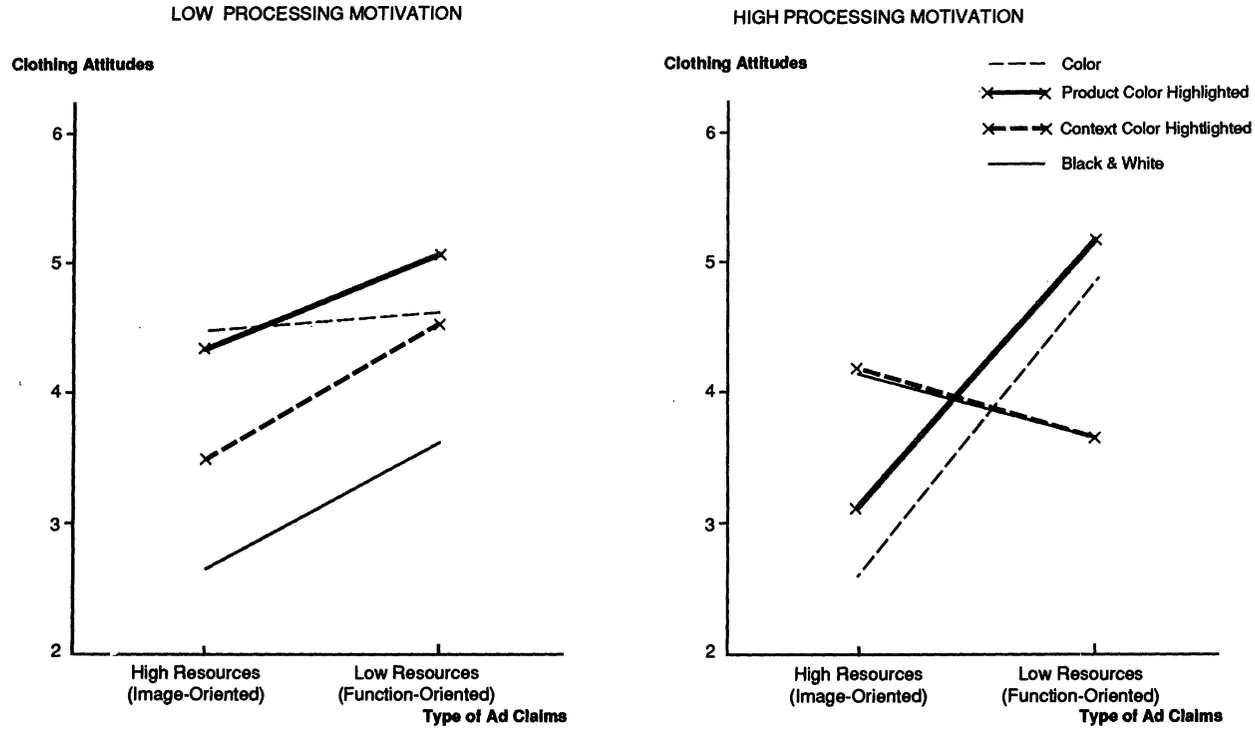
Under low processing motivation, however, a main effect of ad color emerged on the proportion of negative thoughts generated for the bicycle and the clothing ads. For the clothing ad, but not the bike ad, subjects showed a nonsignificant tendency to generate fewer negative thoughts when the ad contained full or partial color than when it was entirely black-and-white.

Thoughts about Visual Elements of High or Low/No Ad Claim Relevance. The proportions of thoughts about specific visual elements in the ad photos that were of high relevance to ad claims in the bike and clothing ads were examined next. This was done to explore whether the treatment effects observed on product attitudes under high processing motivation, but not those observed under low motivation, were mediated by subjects' processing of relevant visual elements that could substantiate the ad claims.

For both ads, a significant three-way interaction of processing motivation, type of ad claims, and ad color emerged on the proportion of thoughts about specific visual elements in the ad photo that were of high relevance to the ad claims. When processing motivation was high, the interaction of type of ad claims and ad color was significant for both the bicycle and clothing ads. As anticipated, subjects who received the image-oriented claims, which were relatively cognitively demanding to process, produced more such thoughts about specific visual objects and/or aspects relevant to the ad claims in the bike and the clothing ad photos when the ads were in black-and-white or color highlighted the object of high relevance to the ad claims (the context) than when the ads were in full color or color highlighted the object of low relevance to the ad claims (the product; the proportions of such thoughts in the first two and last two ad color treatments did not differ significantly). However, subjects who read the function-oriented ad claims, which required relatively few resources to process, engaged in more thoughts about specific visual elements of the photos that were highly relevant to the ad claims when the ads were in full color or color highlighted the object of high relevance to the ad claims (the product) than when they were in black-and-white or color highlighted the object of low relevance to the ad claims (the context; the proportions of such thoughts in these first two and last two ad color treatments did not differ significantly).

FIGURE 2

THREE-WAY INTERACTION OF PROCESSING MOTIVATION, TYPE OF AD, AND USE OF AD COLOR ON CLOTHING ATTITUDES



As was anticipated, when processing motivation was low, the proportions of thoughts about specific visual elements in the bike and clothing ad photos that were of high relevance to the ad claims were unaffected by any of the manipulated factors. This observation supports the view that under low processing motivation, subjects' more favorable product attitudes in response to ads containing some color rather than black-and-white ads are more likely to be based simply on a heuristic that relates to the enhanced attractiveness of surface cues in color ads over black-and-white ads than on subjects' critical processing of specific objects in the ad photos.

Finally, subjects' thoughts pertaining to visual elements in the ad photos that were of low or no relevance to the ad claims were examined. As expected, no significant effects emerged on this measure for either the bike or clothing ads.

Mediational Analysis. Regressions using attitudes as the dependent variable and thoughts classified as positive, negative, and of high and low relevance to the ad claims as the predictors were conducted to provide support for thoughts as predictors of attitudes. Separate regressions were run under low and high processing motivation conditions. The results generally supported expectations. For both products, when motivation was low, none of the predictors was significant, but when motivation was high, negative thoughts (for the bicycle ad, $\beta = .09$, $t = 1.79$, $p < .08$; for the clothing ad, $\beta = .28$, $t = 2.63$, $p < .01$) and thoughts about visual photo elements of high relevance to the ad claims (for the bicycle ad, $\beta = .28$, $t = 2.73$, $p < .008$; for the clothing ad, $p > .29$) significantly predicted attitudes. No other effects were significant.

Discussion

The data from this study are consistent with the view that whether color in ads enhances or undermines consumers' attitudes depends on whether (1) consumers are motivated to process and substantiate the ad effortfully, (2) ad processing and/or substantiation is highly resource consuming, and (3) the resources available for processing and/or substantiating the ad are sufficient to accommodate both the resources consumed by the presence of potentially distracting color and those required to draw sensory or subjective inferences from the color that may reinforce or substantiate the ad claims.

Specifically, when consumers lack motivation to process an ad effortfully, it appears that the use of full or partial color in the ad spawns more favorable product attitudes than when an exclusively black-and-white ad is employed. Presumably, the use of color enhances the attractiveness of surface cues (i.e., the overall photo and/or the product's or product user's appearance) that are

used to determine product attitudes heuristically. Thus, for consumers who lack motivation, color may be used as a heuristic cue to infer product quality or inherent goodness.

When consumers are highly motivated to process and substantiate an ad and its claims, whether color enhances or undermines attitudes seems to depend on the extent to which the resources made available for ad processing are commensurate with the demands of processing and verifying the ad content, overcoming the potentially distracting influence of color, and drawing the inferences implied by the photo's colors of objects relevant to the ad claims to assess the validity of the ad claims. These available resources are likely to be adequate if an ad is color highlighted such that only objects of high rather than low relevance to the ad claims appear in color. Assuming that the colors impart information that is relatively compatible with the claims, attitudes are likely to be enhanced by such color highlighting because it eliminates the distracting influence that color can have and reduces the effort required for identifying visual objects relevant to substantiating the ad claims.

The resources that motivated consumers make available for ad processing and substantiation are also likely to be adequate to benefit from the use of ad color as long as the ad claims are not highly resource demanding to substantiate (e.g., they are function oriented rather than image oriented). Yet, if the ad claims require many resources to substantiate (i.e., because they are image oriented and thus are difficult to verify), an ad photo that limits distraction by featuring all objects in black-and-white may reduce the level of resources consumed by other aspects of the ad and thereby enable the resource supply to better match the demands imposed by the ad and the consumers' goals.

As in experiment 1, the thoughts that subjects reported provide mediational support for this account. Under both high and low processing motivation conditions, subjects' positive and negative thoughts generally conformed to the pattern observed on product attitudes. Even more telling were subjects' thoughts about specific objects shown in the ad photo that were relevant to the ad claims and thus informative in substantiating the claims. Highly motivated subjects produced more thoughts about these objects—which provides evidence of superior ad claim substantiation—when the ad appeared in color (black-and-white) and the resources required by the function- (image-)oriented ad to process and substantiate the claims were relatively low (high). As expected, no differences in such thoughts were observed when subjects' processing motivation was low.

GENERAL DISCUSSION

The findings of the two studies are convergent and support the proposed theorizing. Together, the studies reveal that under high motivation, the use of ad color and the extent to which an ad and its claims are resource demanding to process and/or substantiate can jointly influence consumers' attitudes. Moreover, these effects appear to generalize despite variations in the manner in which ad processing and/or substantiation was made more or less resource demanding.

The results of these two studies contribute to the consumer behavior literature in several ways. From a practical perspective, they suggest that consumers may often respond to the use of color in ads in a manner that may run afoul of advertisers' intuitions. Specifically, it appears that under certain conditions, advertisers may realize double benefits by employing less costly black-and-white rather than color advertising and simultaneously achieve enhanced ad effectiveness. This seems to be the case when consumers are motivated to expend heavy resources processing an ad that is extremely resource demanding, and insufficient resources remain to engage adequately in ad claim substantiation. On the other hand, the extra cost of employing color in advertising is likely to be justified if (1) consumers devote few resources to ad processing (e.g., they simply are unmotivated or, because of more pressing concerns or a quickly paced television or radio ad presentation, time constraints are operative) or (2) the relatively high level of cognitive resources consumers allot to ad processing matches that needed both to process the ad and its colors extensively and to substantiate the ad claims.

The findings also make several theoretical contributions. First, the data contribute to consumer behavior theory by offering insight into how the use of full color, color highlighting, or exclusively black-and-white in advertising can influence consumers' product attitudes. Thus, they help us anticipate when each of these uses of color in advertising is likely to be more or less effective.

More generally, the findings may shed light not just on how color in ads can affect attitudes but also on how attitudes are influenced by other ad elements (e.g., motion, size, etc.) that, like color, appear to consume resources both by attracting attention and by potentially imparting information that can reinforce ad claims. If the conclusions derived from our findings apply to other such ad elements, whether the use of these elements enhances product attitudes should depend on the extent to which (1) consumers are motivated to process and substantiate the advertising, (2) processing and/or substantiation of the ad is highly resource consuming (e.g., possibly because of variations in the image- or function-oriented nature of the ad claims or in the claims' physical arrangement, which can facilitate or hinder ad claim substantiation), and (3) the resources available to process and substantiate the ad can accommodate those required by the use of the ad element (e.g., the resources consumed by motion's attracting of attention) to draw

relevant inferences that substantiate or reinforce an ad claim.

To illustrate these notions, consider a recent print ad for Nestle's morsels that displays a very oversized chocolate chip cookie that is pulled apart, revealing the gooey, melting chips. Suppose that the copy, which claims, "You can never be too rich or too creamy," is either superimposed around the strands of melting chocolate in the ad photo (as, in fact, it is in the ad) or placed below the photo in a separated copy block.

One might expect that the oversized morsels and cookie would be evaluated favorably if consumers' processing motivation were low (because the oversized cookie makes salient and heightens the product's appetite appeal) or if motivation were high and the ad claims were superimposed on the photo so that the claims, using few resources, could be readily interpreted and substantiated to imply that the morsels are rich and creamy. Yet, if processing motivation were high and the ad claims were separated from the oversized visual, it might be that consumers would evaluate the product less favorably in this ad than they would if the cookie photo were smaller. This might be so because the separation of the photo from the ad claims may make the intended interpretation of the claims less apparent (more resource demanding), such that consumers instead might link them to the highly available adage that a person cannot be too rich or too thin. Indeed, here, the presence of the rich, oversized cookie may undermine evaluations by fostering the interpretation that the cookies and morsels are rich and fattening. Future inquiry should assess such predictions.

Perhaps the most important contribution of the research is the theoretical insight it provides concerning elaboration-likelihood theory. Specifically, the findings show that a single cue—in this case, color—can be processed either as a substantive resource-consuming "central" cue or as a less resource-demanding "peripheral" cue, depending on a viewer's processing motivation. Thus, the implication is that the same cue can be either central or peripheral. Further, the findings suggest that resource demands versus availability is the true construct underlying elaboration-likelihood theory and central-peripheral processing notions. Whether a viewer is motivated, able, and has the opportunity to engage in detailed "central" processing in fact depends on both the resources available for processing and the resource demands imposed by the stimulus and context. Accordingly, we observed that when the resource demands imposed by difficult-to-substantiate ad claims, together with the presence of color, imposed very high resource demands, highly motivated viewers did not engage in central processing, which resulted in an undermining of their persuasion.

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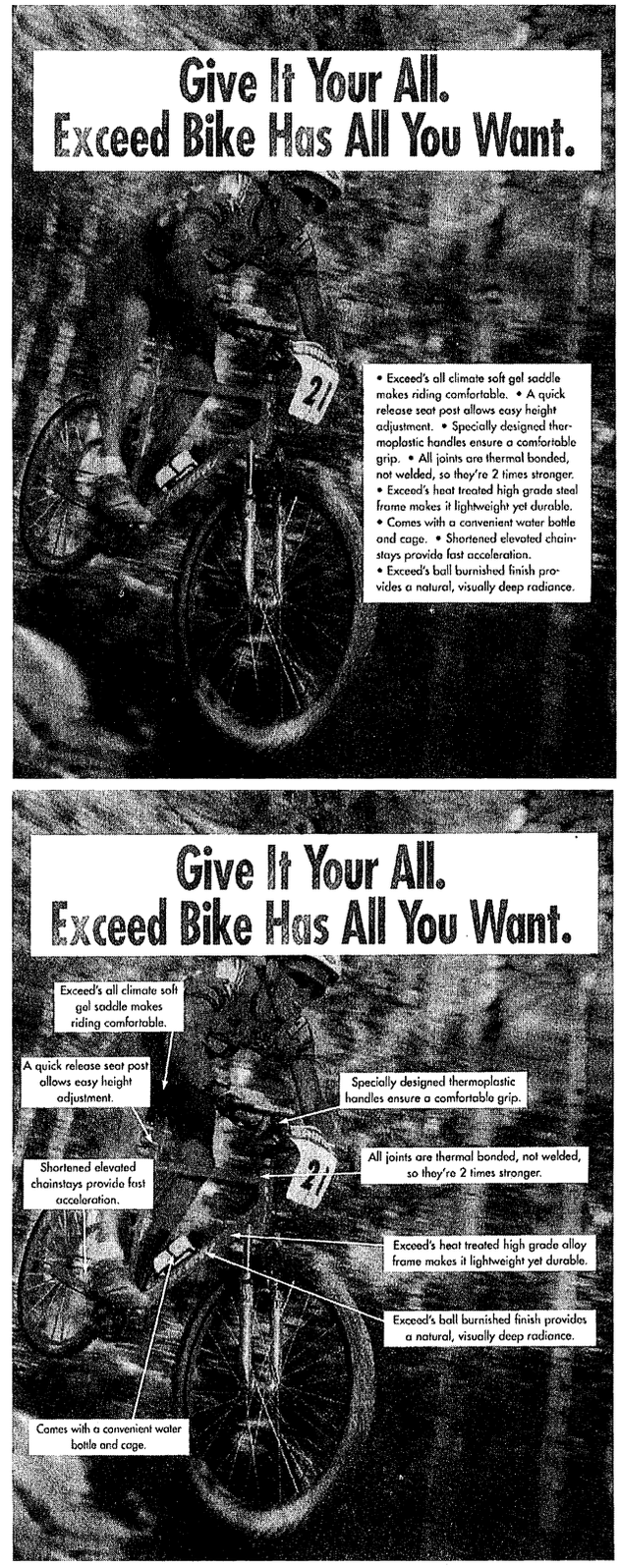
APPENDIX A

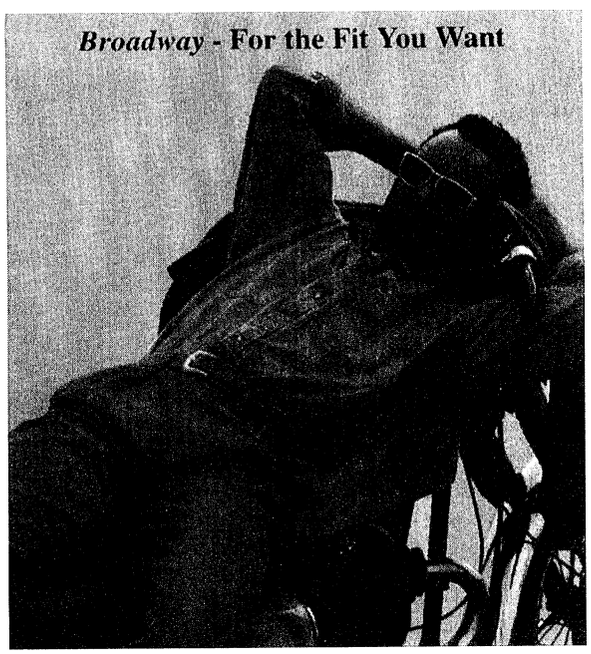
FIGURE A1

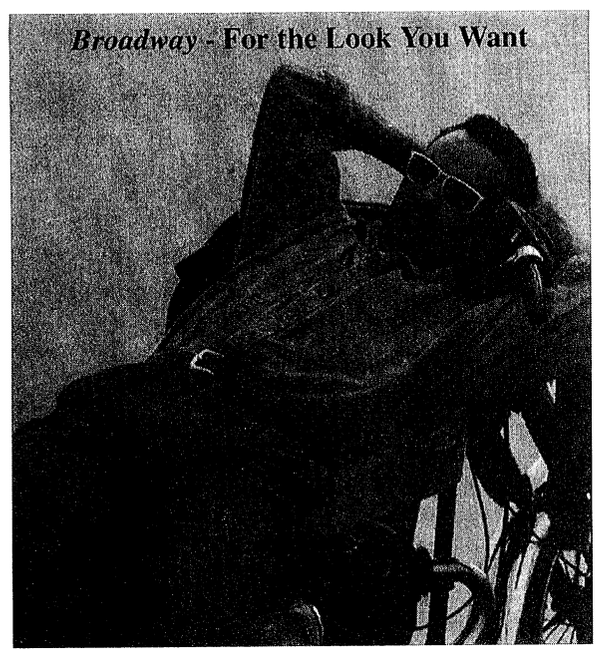


NOTE.—*Top,* ad with high resource demands; *bottom,* ad with low resource demands.

APPENDIX B

FIGURE B1





NOTE.—*Top left,* bicycle ad in which ad claims require low resources (function oriented) with full-color ad photo; *top right,* bicycle ad in which claims require high resources (image oriented) with context color highlighted in ad photo; *bottom left,* clothing ad in which ad claims require low resources (function oriented) with product color highlighted in ad photo; *bottom right,* clothing ad in which ad claims require high resources (image oriented) with full-color ad photo.

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