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Attention Capture and Transfer in Advertising: Brand, Pictorial, and Text-Size Effects

The three key ad elements (brand, pictorial, and text) each have unique superiority effects on attention to advertisements, which are on par with many commonly held ideas in marketing practice. This is the main conclusion of an analysis of 1363 print advertisements tested with infrared eye-tracking methodology on more than 3600 consumers. The pictorial is superior in capturing attention, independent of its size. The text element best captures attention in direct proportion to its surface size. The brand element most effectively transfers attention to the other elements. Only increments in the text element's surface size produce a net gain in attention to the advertisement as a whole. The authors discuss how their findings can be used to render more effective decisions in advertising.

Magazines are an important advertising medium, as illustrated by their projected 13% share of ad spending in 2003 in the United States and the even greater shares in countries such as France (32%), Germany (24%), Italy (15%), the Netherlands (27%), and the United Kingdom (16%) (International Federation of the Periodical Press 2003). To reach consumers effectively and to communicate with them, print advertisements need to cut through the clutter of competing advertisements and editorial messages. Because the typical magazine contains more than 50% advertising, consumers cannot fully absorb all the advertising and editorial content. Failures to capture consumers' attention (i.e., to attract and retain it) reduce the effective reach of print advertising, thereby increasing the cost-per-thousand and jeopardizing the attainment of long-term communication and marketing goals. Because competitive clutter is on the rise, some industry experts argue that "the power of marketing is eroding … from lack of attention" (Sacharin 2001, p. 3). Attention has been referred to as the scarcest resource in today's business (Adler and Firestone 1997; Davenport and Beck 2001). This makes the capture of consumers' attention an increasingly important aim for print advertising.

The general belief underlying print advertising tactics is that size matters: larger advertisements attract and retain more attention, and the larger an advertisement's brand, pictorial, and text elements, the more attention they should capture. However, the precise attention effects of brand, pictorial, and text sizes have been vigorously debated (Aitchinson 1999; Maloney 1994; Moriarty 1986; Rossiter and Percy 1997) but rarely empirically studied. Much is known about the influence of the size of the entire advertisement on consumers' memory (Diamond 1968; Finn 1988; Hanssens and Weitz 1980; Twedt 1952), but attention to advertisements cannot be directly inferred from consumers' memory for them, because different psychological processes are involved with distinct antecedents. There is no research on the simultaneous effects of the size of the brand, pictorial, and text elements on consumers' attention patterns. We believe that this is surprising, because the element sizes are key variables that are manipulated jointly in advertising design, and changes in each of them may affect attention to the others and to the entire advertisement. Moreover, we are not aware of research that has systematically examined the influence of the brand-element size in advertising, despite the element's central role in the communication process and the surge of interest in branding and visual brand-identity issues.

Our research aims to enhance knowledge about attention to advertising as follows: First, we examine the contribution of the surface size of the brand, pictorial, and text elements of advertisements in capturing consumers' attention to the entire advertisement. Second, we identify the extent to which consumers' attention to the brand, pictorial, and text elements of advertisements increases with the surface size devoted to them. Third, we assess potential carryover effects of attention to ad elements. Specifically, because consumers' attentional resources are limited, their increasing attention to one ad element may be at the expense of other ad elements, which reveals attention competition. In contrast, attention to a particular ad element may also spill over to other ad elements. The possibility of such positive and negative attention effects *among* ad elements has been suggested in the advertising literature (e.g., Poffenberger 1925; Wells, Burnett, and Moriarty 2000) but has not yet been examined empirically. Finally, we examine the extent to which the surface size effects of ad elements are homogeneous across three important marketing variables: product involvement, product motivation, and brand familiarity.

To accomplish this, we propose a conceptual model of attention capture and transfer by elements of advertisements

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(AC-TEA), and we estimate its statistical formalization on eye-tracking data for more than 1300 print advertisements and 3600 regular consumers. In the next section, we begin to summarize the debate in the advertising literature about the role of the brand, text, and pictorial in capturing consumers' attention to advertising. Then, we present the AC-TEA model and hypotheses about the influence of the brand, pictorial, and text elements of print advertising. We then describe the methodology, data, and results. The findings document the unique effects that the space devoted to the three ad elements has in capturing and transferring attention, and they demonstrate the superiority of each ad element for a specific attention function.

The Debate About Brand, Pictorial, and Text Effects

Most print advertisements contain a brand, pictorial, and text element. The brand element covers the visual brand-identity cues in print advertisements, such as the brand name, trademark, and logo of the source (Keller 2003). The text element comprises all textual information of the advertisement, excluding all incidences of the brand name. The pictorial element comprises all nontextual information of the advertisement, excluding all incidences of the brand trademark and logo. There is a long-standing debate in advertising about the attention effects of these three ad elements and their surface size and about the management of the elements to maximize attention capture.

Influence of the Brand Element

Some scholars have recommended maximization and others minimization of the brand element's size in advertising. Proponents of the first position argue that the brand should be prominently featured in print advertising, as one step in the brand value chain (see Burton and Purvis 1987; Higgins 1986; Kapferer 1992; Keller 2003; Moran 1990). As a case in point, Moriarty (1986, p. 291) argues, "the most important thing to remember in national advertising is to focus on identification of the brand.… It sounds simple; it isn't. Play the brand front and center." Likewise, Smith (1973, p. 66) recommends to advertisers: "In any case, be sure that your product or company name appears clearly and loud." The reasoning is that a prominent brand element, reflected among others in its size, captures more attention to the brand, which is a necessary condition for obtaining the desired brand-communication effects. The weight that industry places on the size of the brand element is illustrated by the detailed corporate identity guidelines of firms such as AT&T, J.D. Edwards, Dow Chemical, and Sun Microsystems. For example, AT&T (2003) specifies that its "globe" brand logo should never be reproduced smaller than ⅜ inch and the brand name never smaller than ¼ inch to ensure sufficient attention to them.

In contrast, some advertising practitioners claim that brand presence should be curtailed in advertising because the brand element signals that the message is an advertisement in which consumers purportedly are not interested. Taking an extreme position, Aitchinson (1999, p. 61) argues that the advertisement should be so good that consumers know what the brand is without it being present in the advertisement: "Because consumers hate advertising, once they see a page with a logo in the corner, it doesn't look like editorial[;] it doesn't look like the reasons why they bought the magazine in the first place. It's a trigger that makes them turn the page faster." The International Newspapers Limited (2003) media company expresses this more moderately as follows: "A logo is not a benefit. It serves the ego of the client, not the customer. It also flags to the reader, Warning: this is an advertisement." Such viewpoints may fuel tendencies to minimize brand presence in advertising (Kover 1995).

Influence of Pictorial and Text Elements

The debate about the pictorial and text element centers on which of the two commands the most attention and what the influence of their size is in the process. The pictorial illustration is commonly supposed to be the chief element in capturing consumers' attention (Assael, Kofron, and Burgi 1967; Poffenberger 1925; Rossiter 1981; Singh, Lessig, and Kim 2000). For example, Rossiter and Percy (1997, p. 295) assert that "the picture is the most important structural element in magazine advertising, for both consumer and business audiences," and they recommend that "the straightforward rule for magazine ads, therefore is: the bigger the picture, the better." Likewise, Wells, Burnett, and Moriarty (2000, p. 295) affirm that "the bigger the illustration, the higher [is] the attention-getting power of the advertisement." Similar beliefs are held in advertising practice, as is illustrated by Canada's magazine association (Magazines Canada 2001): "A strong visual is perhaps the single most important weapon a magazine has in gaining and capturing reader attention. In this case, it appears that picture size does matter. Ads using visuals that are ⅔ of a page perform best."

The text element is also believed to be key in capturing consumers' attention. For example, Ogilvy (1963, p. 104) argues that the headline, the largest text, is the vital part of print advertisements and that "[t]he wickedest of all sins is to run an advertisement without a headline." Belch and Belch (2001, p. 290) mention that most advertisers consider the headline the most important ad element.

This ongoing debate about the influence of ad elements and their size is further complicated if attention to the ad elements is interdependent. Then, attention devoted to a particular ad element promotes attention to or detracts attention from the other ad elements. In the first case, there is attention cooperation; in the second case, there is attention competition, which is reflected in positive and negative covariance, respectively, of the attention to the relevant elements. Such cases are examples of positive or negative attention transfer.

Ideas about attention transfer have been postulated since the early days of magazine advertising. Most often, positive attention transfer from the pictorial to the other ad elements is expected. For example, Nixon (1924, p. 18) believes that pictures in print advertisements may serve to direct attention to the text. Others note that attention may be relocated from the pictorial to the brand in advertisements, because the former evokes interest in the latter (Poffenberger 1925, pp.

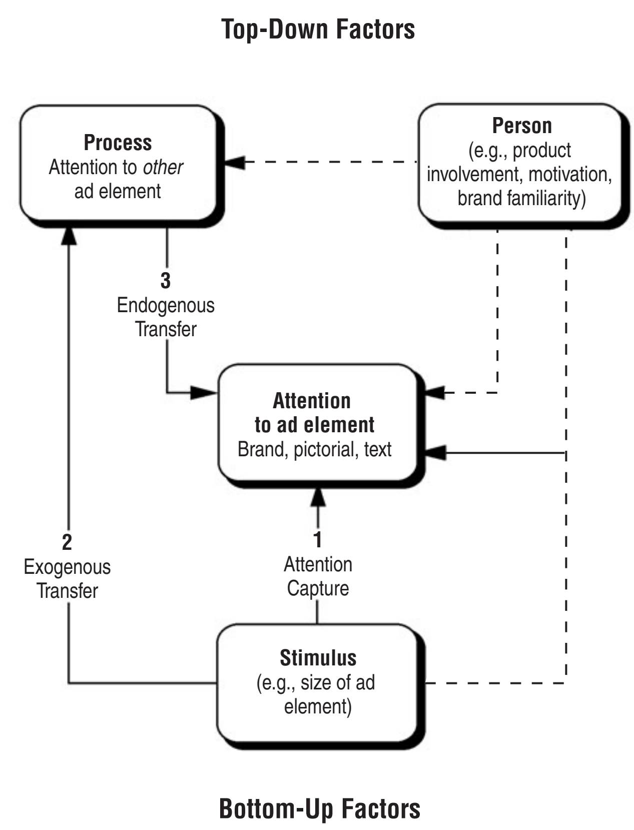
156–61). Such attention transfer has even been formulated as a goal of advertising. Wells, Moriarty, and Burnett (2000, p. 331) point out that print advertisements try to "guide the eye" over their surface to induce attention carryover.

Notably, although there are advocates for each of the ad elements being of key importance to capture and transfer consumers' attention to advertising, these ideas have remained largely untested. Rayner and colleagues (2001, p. 220) emphasize that "remarkably little is known about the extent to which viewers look at the picture versus the text" of advertisements. This study aims to contribute to such knowledge.

A Model of Attention Capture and Transfer

Advertisements that capture attention attract consumers so that they select the advertisement from its environment, and they retain consumers so that they pay more attention to the advertisement and its elements than to other advertisements. Attention capture enables higher-order cognitive functions to operate on more parsimonious and salient input (LaBerge 1995). This function of attention is central in our AC-TEA model. Its background is summarized in Figure 1, and we describe it in the next sections. In short, the AC-TEA model describes bottom-up (stimulus) and top-down (person and process) mechanisms of visual attention to advertising. It differentiates two forms of attention capture by ad elements, one being independent (baseline) and the other being dependent (incremental) on its size, and it distinguishes two forms of attention transfer from one ad element to the others, one being independent (endogenous) and the other being dependent (exogenous) on its size.

FIGURE 1
Determinants of Attention Capture and Transfer to Elements of Print Advertisements



Determinants of Visual Attention to Advertising: Bottom-Up and Top-Down

There are two broad determinants of selective visual attention (indicated in Figure 1): bottom-up factors in the stimulus and top-down factors in the person and in the attentional process itself (Chun and Wolfe 2001; Posner 1980; Theeuwes 1994; Yantis 2000). The attentional processes driven by the bottom-up and top-down determinants reside in distinct but connected areas of the brain (Itti and Koch 2001).

Bottom-up factors are features of advertisements that determine their perceptual salience (Janiszewski 1998), such as size and shape. These features capture attention to ad elements rapidly and almost automatically, even when the consumer is not actively searching for them (Wolfe 1998; Yantis and Jonides 1984). Arrows 1 and 2 in Figure 1 represent these effects. Top-down factors reside in the person and in his or her attentional process. Person factors, such as involvement with products or familiarity with brands (Rayner et al. 2001; Rosbergen, Pieters, and Wedel 1997), encourage subjects to voluntarily pay more or less attention to advertisements and their elements. The dotted arrows in Figure 1 signify these effects.

Part of this study focuses on process effects on visual attention. Process-related factors manifest themselves when attention to a particular ad element, regardless of its surface size, is observed to depend on the amount of attention paid to one or more *other* ad elements. We conjecture that such dependence is caused by voluntary (top-down) shifts of visual attention. Because advertisements are composed of complex scenes and texts, the visual system and knowledge operate jointly to guide attention. This occurs because memory and expectations are required to locate and recognize elements with particular visual features in the scene. Semantic representations of previously attended elements are stored in memory and provide cues that allow for voluntary redirection of attention based on what was already attended to (Yantis 2000; Yarbus 1967). Arrow 3 in Figure 1 indicates these effects.

Attention Capture: Baseline and Incremental

It is useful to distinguish two forms of attention capture, baseline and incremental, as in theories of visual attention in search tasks (Bundesen 1990; Folk, Remington, and Johnston 1992; Logan 1996) and reading (Reichle et al. 1998).

Baseline attention is the attention devoted to an ad element, independent of its surface size and other factors, and is at least partially caused by the visual pop-out of the element. The higher the baseline attention, the higher is the information-mode priority of consumers for that specific ad element. Thus, if consumers in general paid more attention to the pictorial than to the text, independent of the size of these two ad elements, the baseline attention of the former would be higher.

Incremental attention is the extra amount of attention that an ad element captures beyond baseline attention because of increases in its surface size. The higher the incremental attention, the higher is the surface-size elasticity of attention for that specific ad element. Some early work based on observational data found that attention increased with the square root of surface size, which implies an elasticity of .5 (Nixon 1924; Poffenberger 1925).

Attention Transfer: Exogenous and Endogenous

Attention transfer occurs when attention to a particular ad element depends on other ad elements, which can occur through exogenous and endogenous processes (Posner 1980).

Exogenous attention transfer occurs when the surface size of an ad element affects attention to one or more other ad elements. This takes place when, for example, an increase in the size of the pictorial element directly increases or decreases attention to the text or brand element (see Arrow 2 in Figure 1). Endogenous attention transfer occurs when attention to an ad element depends on attention to another ad element, independent of their surface sizes. Such attention transfer is endogenous, because the attentional process itself provides the cue for redirection of attention instead of it being directly driven by stimulus or person factors. Endogenous attention transfer manifests itself when, for example, attention to the pictorial element promotes attention to the text or brand elements in the advertisement, independent of the factors that stimulated attention to the pictorial element in the first place (see Arrow 3 in Figure 1). Not much is known about endogenous attention transfer in complex scenes (Henderson and Hollingworth 1998, 1999) such as advertisements.

Hypotheses

What is the influence of ad elements and their size on capturing consumers' attention? We expect that the pictorial captures most baseline attention, independent of its size, and that the text captures most incremental attention because of its size. We base these predictions on the reasoning that follows.

Scene (picture) perception is genotypically much older than text perception. It relies more on peripheral and preattentive processes that are automatic, parallel, fast, and less effortful (Loftus 1983; Öhman, Flykt, and Esteves 2001; Stolk, Boon, and Smulders 1993), and this may have established an attentional priority for it. In addition, pictures are often perceptually more distinct than words (Childers and Houston 1984), which draws bottom-up attention. We expect that this jointly contributes to a picture superiority effect on baseline attention, independent of the size of the pictorial.

Text perception is genotypically more recent. It relies more on focal attentive processes, which are voluntary, serial, slow, and effortful (Loftus 1983; Rayner 1998; Reichle et al. 1998). Thus, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth 1998, 1999), text requires more eye fixations to be comprehended. In addition, text is usually heavily packed in the visual field. Thus, more attention per unit surface is required for text than for scene perception, and an increase in the ad size devoted to text further increases its attentional demand. We expect that this jointly contributes to a text superiority effect on incremental attention.

Specific predictions about effects of the brand-element size on attention would be conjectural given the current lack of knowledge, so we chose to explore these effects. We test the following:

H_1: Pictorial superiority effect on baseline attention: Independent of the surface sizes, more attention is devoted to the pictorial than to the other elements in print advertisements.

H_2: Text superiority effect on incremental attention: Increases in the surface size of the text element have a greater effect on attention to this element than do increases in the surface size of the other ad elements on attention to them.

Which predictions can be made about the transfer of attention between the elements of print advertisements? There is reason to expect substantial competition for attention between ad elements based on their surface size. An increase in the surface size of an ad element increases its perceptual salience and its attentional demand, which is likely to detract attention from other ad elements (Janiszewski 1998), because salience is a relative phenomenon (Itti and Koch 2001; Wolfe 1998). Such competition for attention is likely when attentional resources are limited but heavily taxed, such as with advertisements in cluttered magazines. Thus, we predict a negative exogenous attention transfer effect (i.e., competition for attention between ad elements because of their surface sizes).

Conversely, we predict positive endogenous attention transfer effects (i.e., cooperation for attention between ad elements after we control for their surface sizes). To the extent that advertisers succeed in integrating the three ad elements to convey a joint message, attention for one of the ad elements is likely to covary positively with that for other ad elements (Rayner et al. 2001). Attention to one element will raise the level of interest in the others, eliciting voluntary redirection of attention, similar to what has been shown in target search tasks (Yantis 2000). At the current level of knowledge, we cannot offer more specific predictions about attention-transfer effects. Therefore, we test the following hypotheses:

H_3: Negative exogenous attention transfer: Increases in the surface size of a particular ad element decrease attention to the other ad elements.

H_4: Positive endogenous attention transfer: Attention to a particular ad element, independent of its size, is positively associated with attention to other ad elements.

Finally, the question is, What is the net effect of ad-element capture and transfer on attention to the advertisement as a whole? That is, will enlargement of the brand size eventually increase or decrease attention to the entire advertisement, and what will the overall effects of the size of the pictorial and text element be? Because of the lack of theory, we abstain from formulating hypotheses, but if advertising practioners' previously reported recommendations hold, larger pictorial sizes should result in a net positive effect on attention to the entire advertisement. If the fears of some advertising practitioners are confirmed, larger brand sizes should results in a net negative effect on attention to the entire advertisement. The data will reveal whether this is the case.

Eye-Tracking Data on Print Advertisements

Tests of Print Advertisements

Verify International, a company that specializes in eye-tracking market research, made available data from 33 independent eye-tracking tests of print advertisements conducted in 1998. Tests were conducted for the present research, to fill the company's database of tested advertisements, and for use in communication to prospective clients. On average, 110 randomly selected adult consumers (male/female, ages 18 to 55) from across the Netherlands participated in each test (the sample selection procedure was the same in all tests). Thus, the current data are based on a subject sample of slightly more than 3600 consumers.

The 33 tests contained 1363 full-page advertisements (1/1), with an average of 41 advertisements per test. Advertisements came from 65 consumer magazines published in the Dutch market, including popular national magazines, such as *Libelle*, *Panorama*, and *Tip Culinair*, and national versions of popular international magazines, such as *Cosmopolitan*, *Elle*, and *Esquire*. Magazine page sizes were homogeneous, and there were no nonstandard-sized magazines, such as *Reader's Digest* or *National Geographic*. Verify selected the magazines, which covered a wide range of consumer advertisements, brands, and product categories in the Dutch market. For each test, advertisements from the most recent issues of the magazines were sampled. There were advertisements for 812 national and international brands in 71 product categories, such as airlines, alcoholic and nonalcoholic beverages, cars, cleansing products, clothing, financial products, fragrances, home entertainment, personal care, pet foods, photo equipment, real estate, restaurants, and retail stores.

Ad Exposure and Eye Tracking

On entering the market research firm, participants provided sociodemographic information and engaged in a visual exploration task of print advertisements (Janiszewski 1998; Wedel and Pieters 2000); the protocol was the same for each test. Participants were instructed as follows: "Page through several magazines that are presented on the monitor. You can do this at your own pace, as you would do at home or in a waiting room." Next, the advertisements were shown each with the editorial counter page (i.e., the page that contains regular magazine content and is opposite an advertising page), preceded by the front cover and trailed by the back cover of the relevant magazine, and in the sequence in which they appeared in the magazines. Instructions and stimuli were presented on NEC 21-inch LCD monitors in full-color bitmaps with a 1280×1024 pixel resolution. Participants continued to the subsequent page by touching the lower right-hand corner of the (touch-sensitive) screen, as when paging. After completion, participants engaged in other unrelated studies. We believe that the visual exploration task that we used mimics real-life situations closely and allows for maximal bottom-up effects of the ad layout itself.

Eye tracking was done by means of infrared corneal reflection methodology (Duchovski 2003; Ober 1994): The cornea is a clear, dome-shaped surface that covers the front of the eye. It is the first lens in the eye's optical system. In corneal reflection, an infrared light is pointed at the cornea and reflected off it. When the eye moves across a spatial stimulus, the difference between the incoming and outgoing angle of the infrared light beam changes. After calibration, this is related to the specific position on the stimulus to which the eye moves and at which the fovea in the retina is directed. Infrared light is applied because it is "invisible" to the eye and does not distract participants. The specific eye-tracking equipment used leaves participants free to move their heads in a virtual box of approximately 30 centimeters. Cameras track the position of the eye and head and allow for continuous correction of position shifts. Measurement precision of the eye-tracking equipment is better than .5 degree of visual angle. The eye-tracking procedure is summarized in Figure 2.

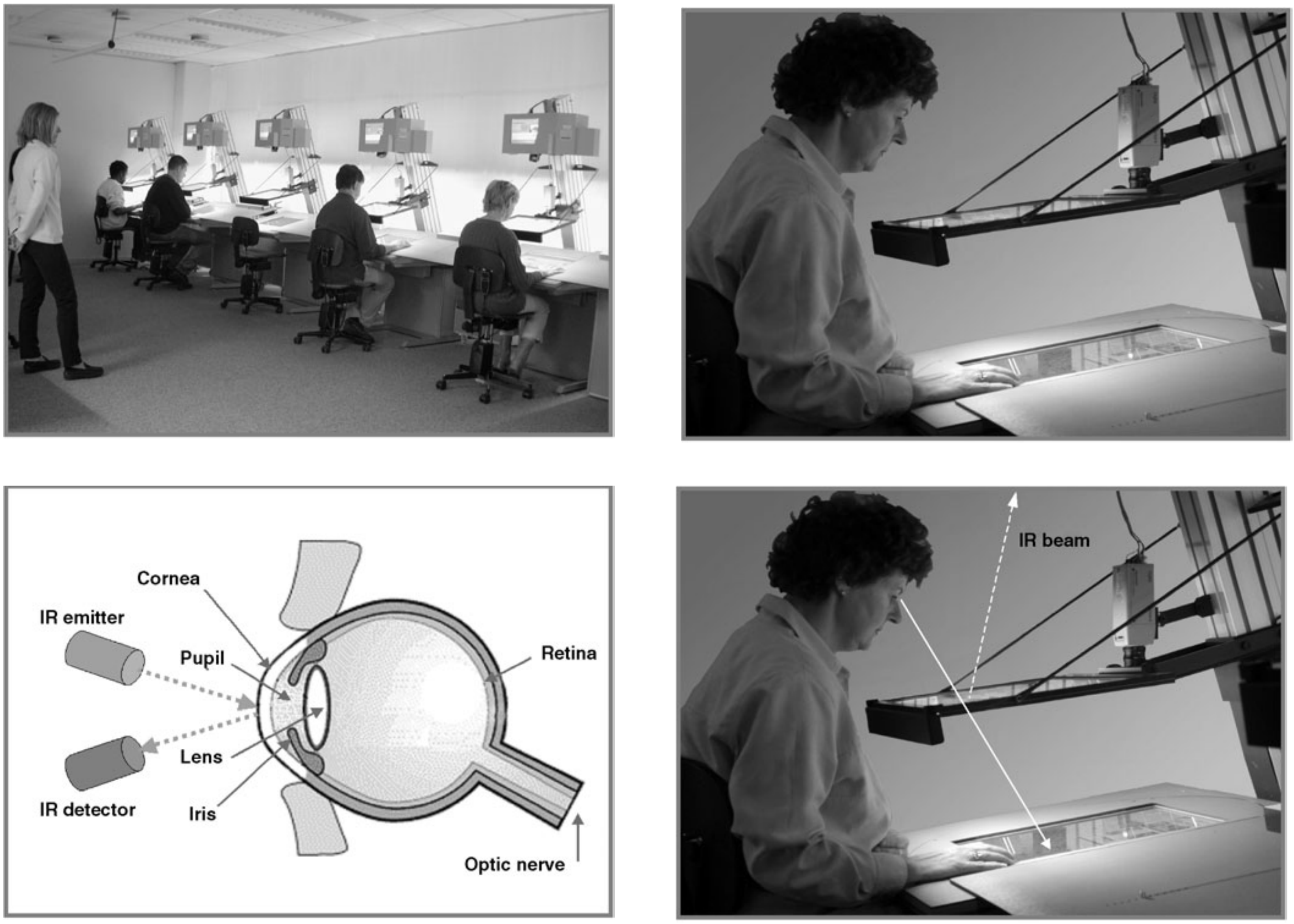
The top-left part of Figure 2 shows the room in which data collection took place; participants at the eye trackers are on the right-hand side, and the operator is on the left-hand side. The top-right part of Figure 2 shows a closer view of a participant at an eye tracker. The bottom-right part of Figure 2 illustrates how a glass sheet between the participant and monitor reflects the infrared beam from the top (where the light beam comes from) to the eye and back and is transparent for all other light. The bottom-left part of Figure 2 illustrates infrared corneal reflection.

Three indicators of visual attention employed in previous research (Chandon 2002; Fox et al. 1998; Krugman et al. 1994; Lohse 1997; Rayner et al. 2001; Rosbergen, Pieters, and Wedel 1997) were used: ad selection, ad gaze duration, and ad-element gaze duration. *Ad selection* is the percentage of participants who fixated on a target advertisement at least once. It measures how many consumers an advertisement can attract in its editorial environment. *Ad gaze duration* is the total time that consumers who selected the advertisement, on average, spent on it. It measures how well an advertisement can retain consumers in its editorial environment. *Ad-element gaze duration* measures the time spent on each of the ad elements. Because of the demands on data storage and analysis, individual-level fixations could not be retained, so their sequence is unknown, and we analyzed the data as a cross-section.

Surface Size of Ad Elements and Covariates

We established surface sizes of ad elements with specialized software by drawing the appropriate boxes and polygons around them, which enabled us to isolate cases of one element being embedded in another (e.g., brand logo in a pictorial). We defined ad elements as we described previously. Table 1 presents summary information about the surface size of the three ad elements, the entire advertisement, and attention to them.

FIGURE 2
The Eye-Tracking Procedure



We added the following (stimulus and person) covariates as control variables: overall ad size, serial position of test advertisements, magazine type in which the advertisements were placed, product involvement and motivation, and brand familiarity. We assessed the variables in a content analysis of the 1363 advertisements and 65 magazines. We included overall ad size because of its influence on attention to advertising (e.g., Lohse 1997). Although all the advertisements are full-page, their surface sizes vary because of differences in magazine formats and the use of bleed or trim. The addition of overall ad size as a covariate ensures proper estimation of the effects of ad-element surface sizes across advertisements. We included information about the serial-position of advertisements (from 1 to n: first to last) in the 33 tests, because advertisements seen earlier on typically capture more attention than later ones (Lohse 1997). Magazine type may influence visual attention to advertising through technical reproduction quality and editorial context, particularly glossy magazines, which provide significantly better reproduction quality. To control for this potential effect, two judges categorized each of the 65 magazines into leisure/glossy versus other magazines (92% agreement). Of the advertisements, 62% appeared in leisure/glossy magazines (n = 843), such as *Cosmopolitan* and *Elle*, and 38% (n = 520) appeared in other magazines, such as *Margriet* and *Top Sante*.

In addition, we included product involvement, motivation, and brand familiarity because of prior evidence that these factors may influence attention to print advertising (Hanssens and Weitz 1980; Pratkanis and Greenwald 1993; Ratchford 1987; Rayner et al. 2001; Rosbergen, Pieters, and Wedel 1997; Vaughn 1980). An independent sample of ten trained judges categorized product involvement and brand familiarity of the advertised products and brands, and another independent sample of ten trained judges (MBA students, five males and five females, in both cases) categorized product motivation to minimize possible learning across tasks. To assess product involvement, judges individually sorted the advertised products (names typed on cards) into two categories: (1) involved, an important decision ("I'm very motivated when I buy a product from this category, a decision about this is [very] important") and (0) uninvolved, not an important decision ("I'm not [at all] motivated when I buy a product from this category, a decision about this is [very] unimportant"). Cronbach's alpha across the ten judges was .916, and each product was

TABLE 1
Summary Information of Surface Sizes and Attention

Variables	Mean	S.D.	Minimum	Maximum
Surface Size (dm²)				
Advertisement	4.72	.177	4.14	5.43
Brand	.53	.384	.05	3.53
Pictorial	2.74	1.279	.04	5.02
Text	1.33	.863	.03	4.27
Attention				
Selection (percentage)	95.70	4.78	61	100
Duration (gaze in .1 seconds)				
Advertisement	17.26	5.68	3.71	52.96
Brand	4.31	1.80	.84	14.03
Pictorial	5.75	2.80	.05	22.85
Text	7.21	4.88	.05	30.50
Tests (n)	33			
Advertisements (n)	1363			

Notes: Selection is the percentage of participants in a test who fixated at least once on an advertisement. We calculated duration across participants who selected an advertisement.

assigned its modal involvement. Of the advertisements, 46% were for low-involvement products (n = 624), and 54% were for high-involvement products (n = 739).

To assess product motivation, judges individually sorted the advertised products (names typed on cards) into the following two categories: (1) think, functional ("I buy this product because it solves or prevents a problem and/or because I need it") and (2) feel, hedonic ("I buy this product because it makes me feel good and/or because it helps my personal growth"). Cronbach's alpha across the ten judges was .866, and each product was assigned the modal motivation category. Of the advertisements, 47% were for think products (n = 643), and 53% were for feel products (n = 720).

To assess brand familiarity, judges sorted the advertised brands (names typed on cards) in the following three categories: (1) "unknown brand, I do not know this brand name," (2) "known brand, I know this brand name, but know little more," and (3) "well-known brand, this brand is familiar to me; I know more than just the brand name." Cronbach's alpha across the ten judges was .951, and the modal brand familiarity was assigned to each brand name. Of the advertisements, 30% were for unknown brands (n = 407), 25% were for known brands (n = 347), and 45% were for well-known brands (n = 609).

Model Formulation

The AC-TEA model can be expressed as a multilevel multivariate regression model (Goldstein 1995; Zellner 1972). We begin by describing ad-element gazes. Suppose that i = 1, …, I indicates the 1363 advertisements, j = 1, ..., J (and k = 1, ..., K) indicates the three ad elements, and t = 1,…, T indicates the 33 tests. The vector $q_{i,t} = [q_{i,t,j}]$ denotes gaze duration on the J elements of advertisement i in test t, and the vector $s_{i,t} = [s_{i,t,j}]$ denotes the surface sizes of the J elements of advertisement i in test t. In addition, we have a vector, $x_{i,t} = [x_{i,t}]$, of covariates:

$$(1)\quad \underbrace{\ln(q_{i,t})}_{\text{Gaze duration}} = \underbrace{\mu}_{\substack{\text{Baseline attention:}\\ \text{information mode}\\ \text{priority}}} + \underbrace{\Gamma \ln(s_{i,t})}_{\substack{\text{Incremental attention:}\\ \text{surface size elasticities}}} + \underbrace{A \ln(q_{i,t,-j})}_{\text{Endogenous attention}} + \underbrace{B x_{i,t}}_{\substack{\text{Covariates:}\\ \text{stimulus and}\\ \text{person factors}}} + \underbrace{E \ln(s_{i,t})x_{i,t}}_{\substack{\text{Heterogeneity}\\ \text{of incremental}\\ \text{attention}}} + \underbrace{\phi_t}_{\substack{\text{Test-level}\\ \text{variability}}} + \underbrace{\omega_{i,t}}_{\substack{\text{Residual}\\ \text{variability}}}.$$

The model has a double log specification to accommodate the nonnegativity and right skewness of gaze durations and ad-element sizes. The log–log formulation accounts for nonlinear and multiplicative effects, which is desirable (Bundesen 1990; Reichle et al. 1998), and it renders interpretation easier, because coefficients are scale free and can be interpreted as elasticities (i.e., percentage change in attention for a 1% change in a variable).

Baseline attention effects are represented by $\mu = [\mu_j]$, a vector of ad element–specific constants. Incremental attention effects due to the size of the ad elements are represented by the diagonal of $\Gamma = [\gamma_{j,k}]$, a matrix of ad element–specific coefficients. This diagonal taps the influence of the surface size of ad-element j on attention to element j itself. Arrow 1 in Figure 1 indicates this. Exogenous attention transfer is represented by the off-diagonal part of Γ. It taps the influence of the surface size of ad-element j on attention to other ad elements k ≠ j. Arrow 2 in Figure 1 indicates these effects. Endogenous attention transfer is represented by the matrix $A = [\alpha_{j,k}]$. Because Equation 1 controls for all other effects, Matrix A represents influences that are endogenous to the attentional process itself. The vector $[q_{r,i,t,-j}]$ contains J – 1 elements, but the jth element itself is missing because attention to element j cannot affect itself. Arrow 3 in Figure 1 indicates these effects. Attention-transfer effects can be asymmetrical (e.g., attention to the pictorial and text may transfer [endogenously or exogenously] more to the brand than the other way around).

Matrices B and E in Equation 1 represent the effects of covariates on attention to the ad elements. The covariate vector $x_{r,i,t} = [x_{r,i,t,p}]$ contains stimulus and person factors that may directly influence attention to the ad elements. Matrix E represents the influence on attention that product involvement, motivation, and brand familiarity have in interaction with ad-element sizes. Dotted arrows in Figure 1 represent the effects of these covariates. We specify two ($J \times J$) vectors of random effects to assess differences between tests and between advertisements within tests, with $\phi_t \sim N(0, V_\phi)$, and $\omega_{it} \sim N(0, V_\omega)$, where V_ϕ and V_ω are ($J \times J$) diagonal matrices to be estimated.

To examine the effect of ad-element sizes on attention capture to the entire advertisement, we estimated the model in Equation 1 simultaneously for the ad selection and ad gaze duration measures (i.e., $j = 1,2$ indicates these two measures in this case). This reduced version of the AC-TEA model does not include endogenous attention transfer effects (i.e., $A = 0$). We used a logit specification of ad selection to accommodate this measure being a proportion and to facilitate comparison with the log gaze durations.

Model Estimation and Evaluation

Because the model is a multivariate multilevel regression model, we employed Markov chain Monte Carlo methods to estimate it, which facilitates the evaluation of the multiple integrals occurring in the likelihood function (Gelman et al. 1995). In each Markov chain Monte Carlo iteration, we draw from the full conditional distribution of parameters, conditional on the values of the other parameters obtained from the last draw. All prior distributions are standard non-informative distributions, for a fixed generic parameter θ, $p(\theta) \propto 1$, and for a generic scalar variance σ^2, $p(1/\sigma^2) \sim$ gamma(.001, .001). We use 10,000 draws, with a burn-in of 2000, and we retain every target draw. We start the algorithm from iterative generalized least squares estimates and monitor convergence through plots of key parameters against iterations, which indicate convergence well before the end of the burn-in. We present the posterior mean and posterior standard deviation (S.D.) of coefficients. A parameter is considered significant if the posterior mean is at least twice as great as the posterior S.D. To assess incremental model fit, we use the deviance, deviance information criterion (DIC; Spiegelhalter et al. 2002), and pseudo R^2 statistics.

Results

Table 1 presents descriptive statistics of the ad elements and visual attention. The pictorial is the largest ad element (2.74 dm^2 = 42.47 $inch^2$), followed by the text (1.33 dm^2 = 20.62 $inch^2$) and the brand (.53 dm^2 = 8.22 $inch^2$). On average, advertisements were selected by 95.7% of the participants (who fixated at least once), and the lowest-scoring advertisement was skipped by 39% of the participants. Participants who selected the advertisements, on average, attended 1.73 seconds to the advertisement as a whole (text .7 seconds, pictorial .6 seconds, and brand .4 seconds), which is typical when consumers explore regular magazines at their own pace (e.g., Rosbergen, Pieters, and Wedel 1997) but lower than when advertisements are tested in laboratory conditions (e.g., Fox et al. 1998).[1]

Attention to the Entire Advertisement

We examine what the net effect of brand, pictorial, and text size is on attention to the entire advertisement. Table 2 presents the results of the analysis. For parsimony, we omit the interactive effects of the covariates with size, because none of these was significant and the overall fit of the model with all effects did not improve (deviance = 1683; DIC = 1778).

Neither the surface size of the brand nor the pictorial affects attention to the entire advertisement for attention selection and duration. However, a 1% increase in the text surface size increases attention significantly: Selection improves by .05% (coefficient = .048) and duration by approximately .16% (coefficient = .156). In particular, the text-size effect on duration of attention to the advertisement is noteworthy; it accounts for approximately 17% of the variation. The patterns of the results for attention selection and duration are similar, indicating that during visual exploration, bottom-up factors that influence attention selection also influence attention duration.

The observed positive text surface-size effect is not caused by differences in the overall size of advertisements from different magazines or by (unobserved) features of the magazines in which the advertisements were placed. In a follow-up analysis, we added dummy variables to the model, representing each of the magazines that contributed 20 or more advertisements to the sample. Estimates of the surface-size effects remained virtually unchanged: The brand and pictorial surface-size effects were insignificant, and the text surface-size effect was positive and significant. Several covariates influence attention to the entire advertisement systematically, notably serial position (advertisements that are placed later in the page sequence are less attended), product involvement (advertisements for high-involvement products are more attended), and brand familiarity (advertisements for familiar brands are less attended).

Thus, an increase in the size of the pictorial does not increase attention to the entire advertisement, but an increase in the surface size devoted to the text does. We obtained these effects while controlling for relevant stimulus and person factors that could potentially bias the findings. Next, we examine how these net effects on attention to the entire advertisement came about from attention to the three ad elements, and we test the hypotheses.

Attention to the Elements of Advertisements

We estimated the AC-TEA model in Equation 1 for gaze duration to the three ad elements. The overall fit of this model is $R^2 = 32.2\%$, accounting for considerable portions of variance in attention to the brand (46.4%), pictorial (15.3%), and particularly the text (69.8%) in advertisements.

[1]Average gaze duration on editorial pages was 2.79 seconds, which is significantly higher than on the advertisements.

TABLE 2
Attention to Print Advertisements: Size Effects

	Advertisement Attention			
	Selection		Duration	
Parameter	**Coefficient**	**S.D.**	**Coefficient**	**S.D.**
Constant	–.786	.575	**1.671**	.350
Covariates				
Ad size (log dm^2)	**2.086**	.374	**.808**	.227
Ad serial position: first to last (1 – x)	**–.003**	.001	**–.003**	.000
Magazine type: leisure/glossy–other (1 – 0)	–.021	.033	–.029	.020
Product involvement: high–low (1 – 0)	**.117**	.027	**.071**	.016
Product motivation: think–feel (1 – 0)	–.033	.027	.005	.015
Brand familiarity: high–low (2 – 0)	**–.030**	.014	**–.029**	.009
Size Effects of Ad Elements				
Brand (log dm^2)	.001	.019	–.011	.011
Pictorial (log dm^2)	.021	.020	–.008	.012
Text (log dm^2)	**.048**	.017	**.156**	.010
Variance at test level	.021	.007	.022	.006
Variance at ad level	.188	.007	.063	.002
Deviance	1682			
DIC	1759			
Pseudo R^2	22.2%			

Notes: Selection = logit (proportion of participants fixating at least once on an advertisement). Duration = log (average time spent on advertisement, if fixated). We report posterior mean coefficients and standard deviations. Posterior means twice as great as the posterior standard deviations are boldface; the 95% credible interval of boldface coefficients does not cover zero.

Attention capture: baseline and incremental. In support of H_1, a notable pictorial superiority effect on baseline attention emerges. Table 3 reveals that the constant for pictorial attention is high and significant (coefficient = 3.395) and that the constants for brand attention and text attention both are small and insignificant. This indicates that the pictorial has an intrinsic tendency to capture a substantial amount of attention, independent of its surface size and of all other factors in the model, whereas the other two ad elements lack this tendency.

In support of H_2, a strong text superiority effect on incremental attention is evident: The mean surface-size elasticity for the text element is .85, which is more than two times greater than the mean coefficients for the brand (.32) and pictorial surface-size effects (.32). Thus, a 1% increase in the surface size of the text leads to a .85% increase in gaze duration, which is substantial. The text size effect is significantly larger than the brand and pictorial size effects.

Table 3 also demonstrates the extent to which the effects of the surface-size element are stable across product involvement, product motivation, and brand familiarity. In particular, the surface size of the text element interacts with the three covariates; that is, advertisements for high-involvement products gain more from increasing the surface size of their text element than do advertisements for low-involvement products. Advertisements for think products gain less from increasing the surface size of their text element. Finally, at smaller surface sizes, advertisements for well-known brands capture more text attention that do advertisements for unknown brands, though the effect is fairly small.[2]

The findings support our hypotheses that the pictorial in advertisements captures superior baseline attention independent of its size and that the text in advertisements captures superior incremental attention because of its size, when we control for the effects of relevant covariates.

Attention transfer: exogenous and endogenous. In support of H_3, the effects of an ad element's surface size on attention to *other* ad elements all have a negative sign, and three of them are significant (in Table 3, under "Size Effects of Ad Elements"). The most notable case of this exogenous attention competition between ad elements due to their surface size occurs for the brand and text. An increase in the surface size of the brand (by 1%) detracts a large amount of attention from the text (.41%), and an increase in the surface size of the text (by 1%) detracts attention from the brand element (.23%). Finally, an increase in the pictorial surface size (by 1%) withdraws attention from the brand (.11%).

[2]The observed superiority effect of text surface size on incremental attention is not due to these interaction effects. In a model without the interaction effects, the coefficient of text surface size was .927 (S.D. = .022), which again was more than two times greater than the effects of brand (.376, S.D. = .013) and pictorial (.411, S.D. = .038) surface size on attention to those ad elements.

TABLE 3
Attention to the Brand, Pictorial, and Text of Print Advertisements: Size Effects

	Brand Attention		Pictorial Attention		Text Attention	
Parameter	**Coefficient**	**S.D.**	**Coefficient**	**S.D.**	**Coefficient**	**S.D.**
Constant	–.014	.392	**3.395**	1.030	.687	.669
Covariates						
Total ad size (log dm^2)	**1.060**	.253	**–1.542**	.676	.031	.435
Ad serial position: first to last (1 – x)	**–.003**	.000	–.001	.001	**–.003**	.001
Magazine type: leisure/glossy–other (1 – 0)	**–.054**	.022	.103	.058	.026	.038
Product involvement: high–low (1 – 0)	.019	.028	–.039	.077	.002	.031
Product motivation: think–feel (1 – 0)	**.057**	.027	–.125	.075	**.059**	.032
Brand familiarity: high–low (2 – 0)	**–.045**	.013	–.032	.038	**.039**	.017
Size Effects of Ad Elements						
Brand (log dm^2)	**.322**	.026	–.061	.046	**–.409**	.026
Pictorial (log dm^2)	**–.111**	.014	**.315**	.080	–.028	.025
Text (log dm^2)	**–.230**	.017	–.087	.051	**.852**	.044
Heterogeneity of Size Effects						
Ad element$_j$ × product involvement	–.018	.024	.070	.067	**.273**	.039
Ad element$_j$ × product motivation	.046	.024	.071	.068	**–.205**	.040
Ad element$_j$ × brand familiarity	**.050**	.023	.032	.066	**–.131**	.034
Endogenous Transfer						
Brand attention (log .1 second)	—	—	**.217**	.075	**.512**	.047
Pictorial attention (log .1 second)	**.026**	.010	—	—	–.012	.017
Text attention (log .1 second)	**.159**	.015	–.027	.042	—	—
Variance at test level	.014	.004	.026	.012	.012	.005
Variance at ad level	.084	.003	.629	.024	.258	.010
Deviance	5712					
DIC	5828					
Pseudo R^2	32.2%					

Notes: We report posterior mean coefficients and standard deviations. Posterior means twice as great as the posterior standard deviations are boldface; coefficients for surface-size effects are boldface and underlined; the 95% credible interval of boldface coefficients does not cover zero.

Figure 3 summarizes the surface-size effects. For each ad element, the estimated effect of an increase in its surface size on attention to itself and to the other ad elements is shown for when all other variables are held constant (estimated attention on the y-axis, observed surface sizes of the elements on the x-axis). Figure 3 illustrates the strong incremental attention effect of text surface size and the attention competition between brand and text surface size.

H_4 predicts positive endogenous attention transfer between the three ad elements, when we account for attention effects due to the surface sizes. In support of this, four of the six effects are positive and substantial; the other two are not different from zero. Notably, brand attention plays a major role. That is, increased attention to the brand (1%) is associated with more attention to the pictorial (.22%) and to the text (.51%). Although increased attention to the pictorial or text in advertisements (1%) is associated with more attention to the brand (.03% and .16%, respectively), the latter effects are quite small; they are smaller than the positive attention-transfer effects of the brand.

These findings suggest the presence of an unexpected brand-superiority effect in endogenous attention transfer. They suggest that when attention has been drawn to the brand, the attention is linked more strongly to the pictorial and text elements than it is when it has been drawn to the pictorial and text elements.

Figure 4 summarizes the influence that ad elements have in endogenous transfer of attention and illustrates the potential superiority effect for the brand. A cautionary note on the interpretation of these effects is important. Because we used cross-sectional data and no sequential information is available, strictly speaking we cannot draw conclusions on causality; we can only conclude that attention to ad elements covaries. However, note that the endogenous transfer effects are unlikely to be caused, for example, by a mere total attention effect. If overall attention to the advertisement were to confound the effects of attention paid to a particular element, it would bias all attention transfer effects homogeneously. However, correcting for ad-element surface sizes, we find quite different effects across the elements.

Benchmark model comparisons. To gain more insight into the relative magnitudes of the attention effects under study, we estimated a sequence of benchmark models. Table 4 gives the analysis of deviance as well as the DIC and pseudo R^2 statistics of the models. First, we estimated the

FIGURE 3
Surface-Size Effects of Brand, Pictorial, and Text on Attention: Capture and Exogenous Transfer

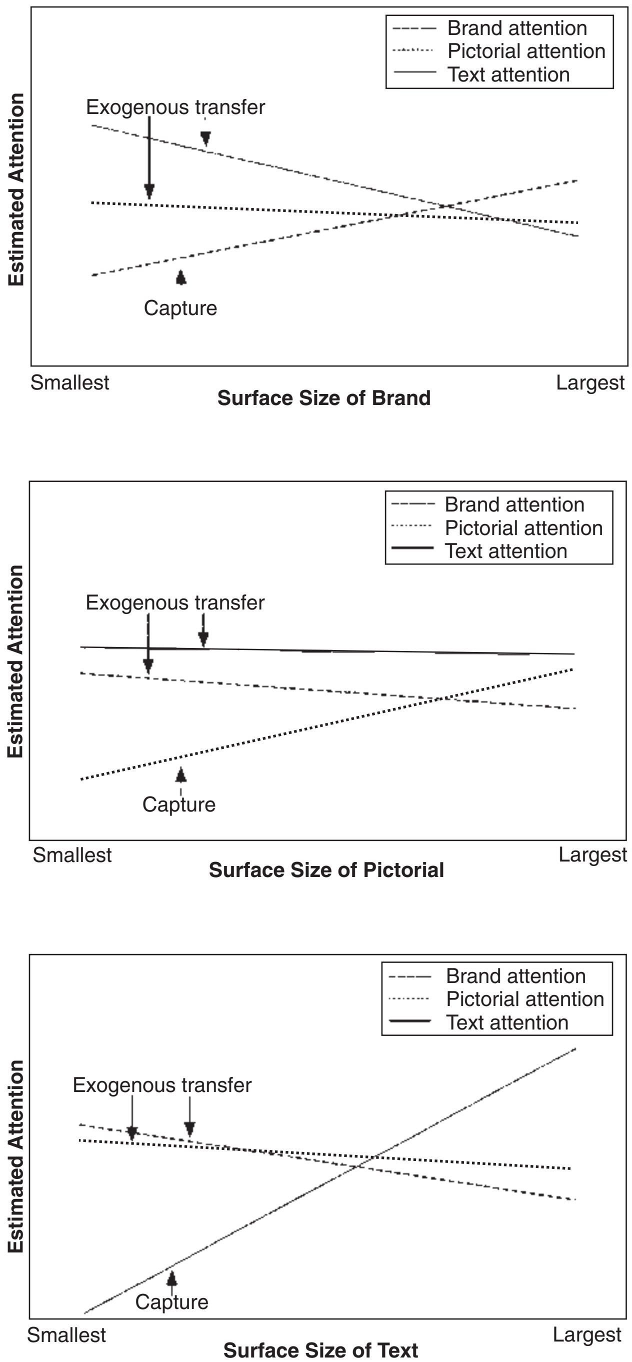
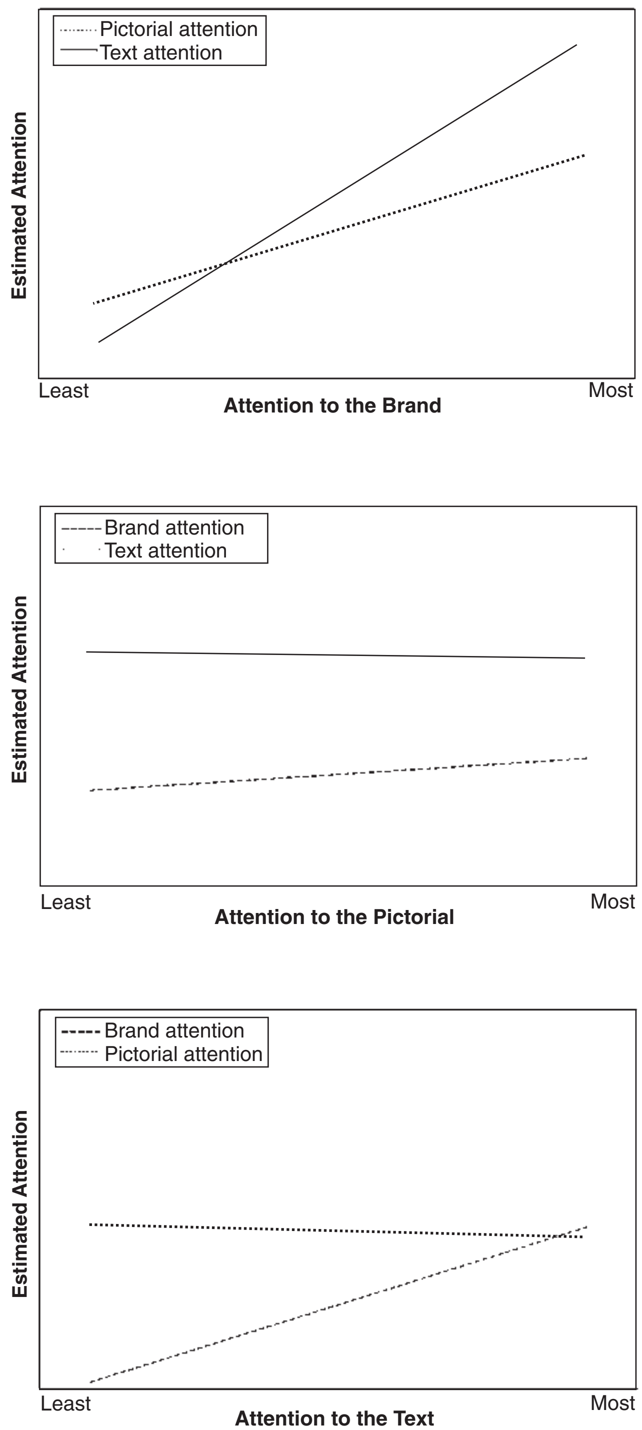


FIGURE 4
Effects of Attention to Brand, Pictorial, and Text on Attention to the Other Ad Elements: Endogenous Transfer



null model (Model 0), which contained constants only. Second, we added the following effects at each subsequent stage: covariate effects on attention (Model 1), attention capture (own effects of element surface sizes; Model 2), exogenous attention transfer (cross-effects of element sizes; Model 3), interaction effects of element sizes with covariates (Model 4), and endogenous transfer effects (Model 5). A comparison of this sequence of models reveals the notable finding that the three attention-capture effects present 21.5% of the total attention process, whereas exogenous and endogenous transfer jointly account for only 6.4%. This finding points to the importance of bottom-up processes in visual exploration of print advertisements.

TABLE 4
Analysis of Deviation and Model Comparisons

Model	Predictors	Deviance	DIC	R^2
0	Constant	8425	8507	—
1	+Covariates	8063	8161	4.3
2	+Size effects: capture	6253	6355	25.8
3	+Size effects: exogenous transfer	6020	6128	28.5
4	+Heterogeneity of size effects	5915	6032	29.8
5	+Endogenous transfer	5712	5828	32.2

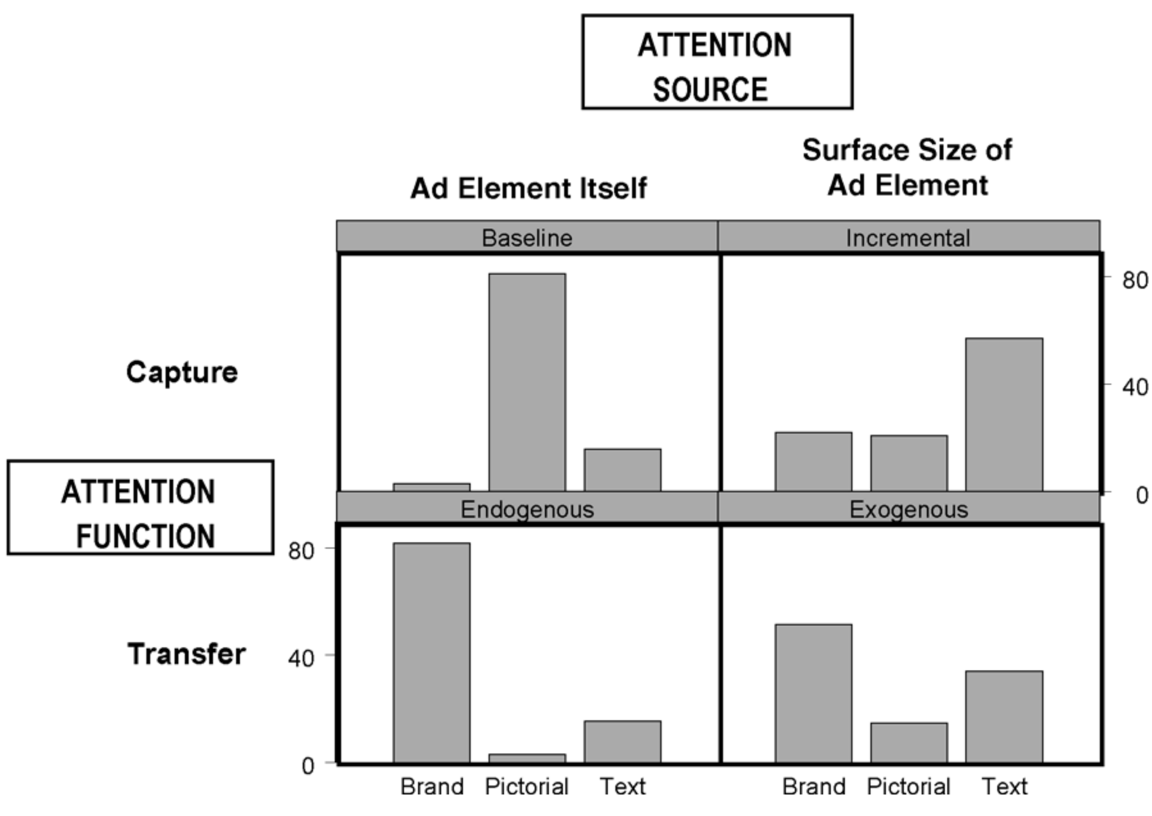
Discussion and Implications

The brand, pictorial, and text elements of print advertisements have significant effects on attention capture and transfer that are on par with common ideas in advertising practice and literature. Figure 5 summarizes the relative magnitudes of effects by combining the attention source (ad element versus surface size) and attention function (capture versus transfer), which we believe has important implications for advertising management and for theory.

Managerial Implications

The surface size of the pictorial element has no demonstrable effect on attention to print advertisements as a whole. Moreover, it has only a small effect on attention to the pictorial itself. However, the pictorial draws significant amounts of baseline attention during ad exploration, regardless of its size. This picture superiority in baseline attention is important in view of recommendations such as "make the illustration relatively large" (Armstrong 2000, p. 6), make it at least larger than half the size of the advertisement (Assael, Kofron, and Burgi 1967), make it two-thirds of the advertisement, or "the bigger the picture, the better" (Rossiter and Percy 1997, p. 295). On the basis of the current findings, advertisers and agencies would be ill advised to maximize the surface size of the pictorial, regardless of its content, in an effort to maximize attention to the entire advertisement.

FIGURE 5
Relative Magnitudes (%) of Brand, Pictorial, and Text Superiority Effects on Attention to Print Advertisements



However, there is evidence for text superiority in incremental attention, with the surface size devoted to the text having a substantial positive effect on attention to the entire advertisement. This is because an increase in text surface size raises attention to this element much more than it simultaneously reduces attention to the brand and pictorial elements. We obtained these results while controlling for product involvement and motivation, brand familiarity, media context, and other possible confounders, which points to their generality. From our study, we cannot conclude the extent to which the surface-size effect is caused by text layout (e.g., increases in font type or size, such as in the headline), text amount (e.g., number of words), or increases in the amount of information provided by it. However, in view of our findings and the large amount of variability explained in attention to the text element (70%) by the surface size alone across the large sample of advertisements, advertisers aiming to maximize attention to the entire advertisement should seriously consider devoting more space to text. Follow-up research is needed to examine the effects of increased text attention on downstream communication effects such as brand awareness and attitude.

Increases in the surface size of the brand element do not have a net negative effect on attention to the entire advertisement. This finding should relieve advertisers and agencies that fear that a prominent brand would trigger consumers to turn the page faster. Increases in an advertisement's surface size promote more attention to the brand element, but this is offset to some extent by reduced attention to the text. Thus, strong branding practices that involve more prominent placement of the brand's visual identity symbols in print advertisements favor rather than harm attention to the brand; in addition, they have only small negative effects on attention to the other ad elements and no negative net effect. Attention to the brand and pictorial increases with an increase in surface size at the same rate; that is, with somewhat less (surface$^{.32}$) than the square root of the surface size, as has been suggested (Nixon 1924; Poffenberger 1925).

Unexpectedly, we find sizable brand superiority in endogenous attention transfer. That is, our results suggest that attention captured by the brand element transfers more readily to the pictorial and text than to the brand. This has not been previously described and runs counter to common beliefs in advertising practice. Instead of attention carrying over easily from the pictorial, attention captured by the brand appears to play a key role in routing attention through advertisements. Although the net effect of (exogenous and endogenous) attention transfer is small compared with attention capture, and we should be cautious in interpreting the effects as causal, the findings point to a possible crucial role of the brand in the integration of the information contained in the advertisement. Advertisements that succeed in capturing attention to their source (i.e., the brand) may thus also succeed in relocating attention to the message of the advertisements, as contained in the pictorial and text elements; the size of the brand element helps achieve this, as our results indicate.

We showed that brand familiarity reduces attention to the brand element but simultaneously increases attention to the text element, rather than having a global attention reduction effect across all ad elements. Because the decrease in brand attention surpassed the increase in text attention, the net effect on attention to the entire advertisement was a reduction. Advertisements for well-known brands may invite consumers to inspect the text more, which presumably contains further information about the brand. Even for small surface sizes, we observed the text-pull effect by brand familiarity. This suggests that particularly familiar brands gain attention from increasing the text surface in their advertisements, which may also be desirable in view of the demonstrated text–brand attention transfer effects. Although it becomes more difficult to attract consumers' attention in clustered advertising media, the good news from this study is that advertisements' bottom-up influences account for more than three times the variance than top-down influences, which may inhibit the intrinsic attention-capture effects caused by advertising design with respect to its elements.

Limitations and Directions for Further Research

Limitations of this study offer opportunities for further research. First, this research has focused on how the attention of consumers is captured and transferred by elements of print advertisements, leaving the following question unanswered: How much attention is required for communication effects such as brand awareness and attitude? There is increasing evidence that even small attentional effects of advertisements and other commercial stimuli, such as catalogs and packaging designs, can have substantial effects on brand memory, attitudes, and sales (e.g., Chandon 2002; Janiszewski 1998; Pieters and Warlop 1999; Wedel and Pieters 2000), but further research into the link between attention and its downstream effects is desirable.

A second limitation is that our data were cross-sectional. The danger of inferring causality from cross-sectional data is well known, and our approach is no exception. Although the time order is of no concern for attention capture or exogenous transfer, endogeneity caused by ad content may hinder causal interpretations of endogenous transfer effects.[3] We have attempted to include as controls the effects of several important covariates related to the content and context of the advertisements. Currently, we have no indication that this potential biasing effect of other content-related variables is present and systematic across the large number of advertisements under study. We investigated the effect of the size variables across a large representative sample of advertisements and consumers, accounting for random differences between the advertisements. The revealed effects were motivated from prior theory in visual perception, which provides additional support for a causal interpretation. Still, only moment-to-moment analyses of attention scanpaths and detailed content analyses of advertisements can provide more definite answers.

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[3]We thank David Schmittlein and an anonymous reviewer for pointing this out.

Conclusion

Advertising-attention research has come a long way since Nixon (1924) hid behind a curtain and painstakingly observed eye movements of consumers who were paging through a magazine with print advertisements. Eye-movement data of large samples of consumers attending to large samples of advertisements gathered using infrared eye tracking are currently being produced on an industrial scale and used by companies to optimize decisions on the design of advertisements, packages, Web pages, and other carriers of their visual brand-equity symbols. The application of theories and models of visual attention, such as the AC-TEA model presented in this study, is likely to render such research and the decisions based on it more effective. The availability of direct measures and detailed models of attention enables tests of long-standing beliefs in the advertising industry and substantial improvements in the validity of findings and recommendations. The first and foremost finding derived from this study is that size clearly matters in capturing attention to advertising, but it matters in ways that are quite different from what was commonly assumed.

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