UNCONSCIOUS PROCESSING OF WEB ADVERTISING: EFFECTS ON IMPLICIT MEMORY, ATTITUDE TOWARD THE BRAND, AND CONSIDERATION SET

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Consumers have become increasingly savvy about technology in recent years, and many of them ignore Web ads during online activities. In this context, measuring advertising effects based on the traditional cognitive models of information processing may undervalue the effectiveness of Web ads. This study experimentally examined the effects of unconscious processing of Web ads by manipulating the level of attention paid to the ad (directed vs. non-directed attention). Online advertisers should be encouraged by the findings of this study. The results suggest that, upon exposure to Web ads, consumers experience priming caused by implicit memory and build a more favorable attitude toward the advertised brand regardless of the levels of attention they paid to the advertisements. Furthermore, those who unconsciously processed Web ads did not remember seeing the ad explicitly, but they were more likely to include the advertised brand in the consideration set than those who had no exposure.

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INTRODUCTION

Since the unveiling of Vance Packard's 1957 book, *The Hidden Persuader*, which exposed what it claimed was the use of subliminal advertising tactics by marketers, little interest has been paid to the unconscious processing of advertising. Analyses of advertising effects have been dominated by cognitive models of information processing, in which ad processing is equated mainly with conscious thought processes. Prior Web advertising research is no exception. Most researchers investigating the effectiveness of Web ads have assumed that ads are processed at a conscious level and have employed explicit measures (e.g., recall, recognition, click-throughs).

As the Web evolved as a mainstream commercial medium, ad revenues have increased continuously, reaching $16.9 billion in 2006, more than a 35% increase from 2005 revenues (PriceWaterhouseCooper, 2007). Accordingly, Web ads have received a substantial amount of scholarly attention. Early studies sought to identify the idiosyncratic properties of Web ads and attempted to profile online users and their behavioral responses (e.g., Eighmey, 1997; Hoffman & Novak, 1996). Later studies examined how ad characteristics (e.g., size, color, complexity, modality, and type) and consumers' online behavior (e.g., number of exposures, duration, and interactivity) affected consumers' responses toward Web ads (Briggs & Hollis, 1997; Cho, 2003; Yoo & Kim, 2005).

One distinctive advantage of Web ads is their potential to elicit direct behavioral responses from consumers, and the effectiveness of Web ads traditionally has been measured by direct response metrics such as click-through or conversion rates (Hoffman & Novak, 1996). From this point of view, Web ads are similar to direct mail that entices consumers to open the envelope, browse, and take action (Briggs & Hollis, 1997). Industry click-through rates, however, have declined continuously over the years and have been reported to be somewhere below 1%. In this context, some scholars have criticized focusing only on direct response metrics and have proposed using consumers' psychological responses (e.g., memory, attitude, and preference) as alternative measures (Schlosser, Shavitt, & Kanfer, 1999). In this study, consumers' memory, attitude, and consideration set (i.e., choice preference) were used as the measures for Web ad effectiveness, instead of mere click-through rates.

In the model of how online ads work, Shankar and Hollinger (2007) argued that only a small fraction of consumers who are exposed to a Web ad remember ad content, including the brand, and interact with the ad. More specifically, Drèze and Hussherr (2003) reported that more than half of online users may not pay attention to Web ads. Given that a number of consumers ignore or avoid Web ads during their online activities, traditional cognitive models of ad processing would not be appropriate to examine the effects of ignored or avoided Web ads. If consumers do not look at a Web ad, they cannot consciously process, remember, and click through it. Because of these unintended trends associated with Web ads, understanding the potential effects of Web ads that do not receive full attention from consumers is necessary. This study develops theoretical explanations of unconscious processing of Web ads led by non-directed attention and examines the effects of unconscious processing on memory, attitude, and consideration set formation.

UNCONSCIOUS PROCESSING OF WEB ADVERTISING

Although it might be surprising, the ability of the human cognitive system to acquire information unconsciously is a general assumption of almost all contemporary psychology (Lewicki, Hill, & Czyzewska, 1992). The term *unconsciousness* is generally regarded as "unawareness of stimuli or their effects during a task" (Krishnan & Trappey, 1999). Unconscious processing is thought to be "fast, involuntary, automatic, not subject to capacity limitations, and always triggered by response to a certain cognitive input" (Velmans, 1991). Research on unconscious processing, inspired by studies on implicit learning and implicit memory, demonstrated that visual stimuli, audio stimuli, or both can undergo unconscious processing (Treisman, 1980). Both visual and audio stimuli are included in many Web ads, and it is expected that Web ads also can be processed at an unconscious level.

Attention is closely related to unconscious processing. Consumers' attention is assumed to be selective, and selective attention is necessary due to the capacity limitations of the cognitive system (Johnston &

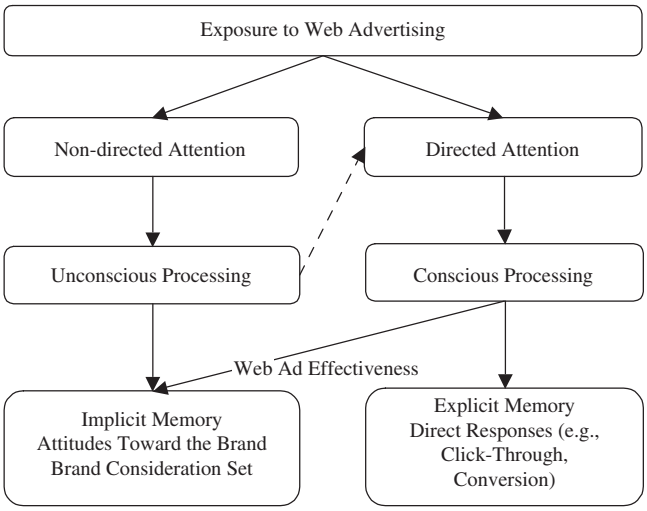

FIGURE 1
A Conceptual Framework

Dark, 1986). Compared to traditional media, the Web is believed to be a more goal- and task-oriented medium (Eighmey, 1997) that is used to satisfy consumers' needs and wants (e.g., information, entertainment, and socialization). Most consumers are preoccupied by their primary tasks (e.g., searching for information, watching video clips, and chatting with friends online) when visiting the Web, and their attention is focused on relevant stimuli on the Web page. Therefore, many, if not most, Web advertisements go unnoticed (Shankar & Hollinger, 2007). Nevertheless, as the characteristics of unconscious processing suggest, consumers initially experience unconscious processing of Web ads when they visit and scan the Web pages where advertisements are embedded. Web ads that draw attention enter the conscious processing stage, whereas ignored or avoided Web ads are processed only at an unconscious level. Figure 1 summarizes the conceptual framework. Accordingly, the level of attention paid to Web ads (directed vs. non-directed attention) was manipulated to engender different Web ad processing conditions (conscious vs. unconscious processing) in the study.

IMPLICIT MEMORY AND PRIMING EFFECT

Shapiro and MacInnis (1992) suggested that the existence of unconscious processing can be indicated by two measures: (1) no evidence for recognition of target stimuli, and (2) evidence of priming effect, which is regarded as an implicit memory process (Srinivas, 1993). They indicated that unconscious processing would result in priming effects induced by implicit memory without the consumer consciously recognizing the source from which it originated. To better understand the mechanism of unconscious processing, two major constructs—implicit memory and priming—were reviewed.

Implicit Memory

Advertising and marketing researchers have long realized the important role of memory, especially in brand consideration, and they have dedicated substantial effort toward measuring consumer memory. Various memory frameworks have been developed. Among them, the explicit-implicit memory framework is based on the nature of instruction and the task required of the respondent. Explicit memory is characterized by conscious recollection of the encoding episode (i.e., ad exposure) and intentional attempts to access the information that was presented, while implicit memory is defined as the non-intentional, unconscious retrieval of previous information (Duke & Carlson, 1994). In advertising studies, recall and recognition are typical examples of explicit memory tests because respondents are instructed to think back to past ad exposures and remember target information (Richardson-Klavehn & Bjork, 1988). On the other hand, other researchers (e.g., Krishnan & Chakravarti, 1999; Shapiro, 1999) also have used implicit memory tests. A typical example of implicit memory tests is a word completion test in which respondents are initially exposed to a set of target words (such as *FINESS*) and are later given a set of word stems or fragments (e.g., FIN_ _ _ _) to complete without reference to the prior exposure episode.

One of the key characteristics of implicit memory is that performance is not affected by variations in the level or type of processing. Jacoby & Dallas (1981), for example, assessed implicit and explicit memory performance following a study task that required elaborative or non-elaborative processing of 60 words. They found that yes/no recognition of those words (i.e., explicit memory) was higher following elaborative study tasks than non-elaborative tasks, whereas perceptual identification performance, the ability to identify a word presented for a very short time (i.e., implicit memory), was unaffected by task manipulation.

There are three alternative theoretical explanations of such disassociations among implicit and explicit memory performance. One explanation, the activation account, holds that implicit memory performance rests on concepts that are activated temporarily in memory due to the prior exposure. Activation is assumed to occur automatically, independent of the elaborative processing (Schacter, 1987). In contrast, the processing account focuses on the differential retrieval process demands of explicit and implicit memory tests. Disassociations occur because explicit memory tests draw primarily on respondent-initiated prior elaborations of the concepts in memory, while implicit memory tests mainly use information in the test materials (Roediger, 1990). The multiple memory system account attributes explicit and implicit memory differences to different memory systems. Explicit memory processes involve conscious recollection and are seen as stemming from a declarative or episodic system, while implicit memory processes are ascribed to a procedural or semantic system and can show learning facilitation or preference change without conscious awareness (Tulving, Schacter, & Stark, 1982).

Despite different theoretical explanations, prior studies have demonstrated consistently that implicit memory is unaffected by experimental variables (e.g., type of processing and level of attention), and that performance on implicit tests is often statistically independent of performance on explicit tests (Schacter, 1987). If implicit memory stays constant while explicit memory is affected by the different level of attention paid to Web ads (i.e., directed vs. non-directed attention), it would demonstrate that the effectiveness of implicit memory tests is not dependent on the level of attention. Thus, the importance of understanding implicit memory in the paradigm of unconscious processing would be underscored.

Priming

The majority of implicit memory research has been concerned with the phenomenon of priming, which is the facilitation in processing a stimulus as a function of a recent exposure to the stimulus. Priming is "an unconscious form of human memory" (Tulving & Schacter, 1990), which is conceived of as either the activation or the establishment of implicit memory by a primed stimulus (e.g., Web ads) that corresponds in some way to the test stimulus (e.g., word-completion tests). In principle, priming can occur at any level, ranging from low-level sensory analysis to high-level semantic analysis (Johnston & Dark, 1986). The typical priming experiment consists of two stages. First, the subject is presented with a stimulus object (target). Second, the subject is given reduced perceptual information about the object (e.g., word stems) and asked to name or categorize it (Tulving & Schacter, 1990). Priming is said to be demonstrated if the probability of identifying the previously encountered targets is increased in comparison with similar measures for distractor items. In the word completion paradigm, priming is shown by an increased tendency to complete the fragments with words exposed on a prior episode.

Although priming effects have been observed in a number of experiments, the question of whether such effects by implicit memory will be exhibited when consumers do not pay attention to Web ads still is unexamined. Consistent with previous studies, it is hypothesized that exposure to Web ads will prime the brand depicted within the ad as well as the semantic information and thus create an implicit memory for the brand and the words appearing in the ad, even though an individual's recognition (i.e., explicit memory) of the ad will be at levels no greater than had they not been exposed to the ad at all.

Based on the above discussion, the following hypotheses are suggested:

H1a: Implicit memory performance will be greater in the non-directed attention condition vs. the no-ad-exposure condition, whereas explicit memory performance will not differ between these two conditions.

H1b: Explicit memory performance will be greater in the directed vs. non-directed attention condition, whereas implicit memory performance will not differ between these two conditions.

Furthermore, it is necessary to demonstrate the extent to which conscious processing and unconscious processing generate the same pattern of results as that of memory measures. This is of great importance to support a claim that online users who pay attention to Web ads would be affected mainly by conscious processing of ad information, whereas those who pay no or minimal attention to Web ads would be affected by unconsciously or unintentionally

acquired ad information. Thus, the following hypotheses are suggested:

H2a: Subjects in the directed attention condition will show greater conscious processing than those in the non-directed attention condition.

H2b: Subjects in the non-directed attention condition will show greater unconscious processing than conscious processing.

MERE EXPOSURE AND AFFECTIVE RESPONSE

There is considerable evidence that unconscious processing results in the formation of affective responses (Kunst-Wilson & Zajonc, 1980; Lewicki, Hill, & Czyzewska, 1992). Mere exposure effects, which explain the increase in positive affect that results from the repeated presentation of previously unfamiliar stimuli, have been replicated and extended successfully in instances when subjects are not consciously aware of the stimuli to which they have been exposed. For example, Kunst-Wilson and Zajonc (1980) presented subjects with 10 irregular polygons five times each using a tachistoscope. In the forced-choice recognition test, subjects could not differentiate the shapes they had seen from a comparable set of distractors; on an affective preference test, the subjects preferred stimuli shown previously to those not seen before. These findings suggest that subjects can discriminate targets from distractors by affect without recognition, and that mere exposure to a stimulus builds familiarity and liking (affect) towards that stimulus at an unconscious level. Thus, mere exposure effects do not require conscious recognition of previously having seen the stimuli. This is important because it demonstrates that unconscious effects of mere exposure are distinct from the conscious inferences that consumers may make about the familiarity created by advertising exposure. This phenomenon was explained by "uncertainty reduction," which asserts that cognitive elaboration during encoding reduces uncertainty, resulting in greater familiarity with, and hence greater positive evaluation of, the stimulus.

A large body of research studies in mere exposure effect suggests that repetition plays a key role in the development of affect for stimuli (e.g., Baker, 1999; Kunst-Wilson & Zajonc, 1980). Some research studies, however, indicate that implicit learning without conscious attention can occur in a single exposure and is quite durable over time—even for novel stimuli (DeSchepper & Treisman, 1996). In the Web environment, Briggs and Hollis (1997) demonstrated that a single exposure to a banner ad enhanced brand attitude, but they failed to provide theoretical explanations for this important finding. If attitude toward the brand (A_b) is affected in the manner suggested by the mere exposure effect, consumers' unconscious processing of Web ads may be attributed mainly to the positive effect of ad exposure on A_b, especially when consumers do not pay attention to Web ads. Thus, it is expected that unconscious processing will lead to more favorable evaluations of the brand than no exposure to Web ads.

H3: Attitudes toward the brand will be more favorable in the non-directed attention condition vs. the no-ad-exposure condition.

BRAND CONSIDERATION SET

The concept of consideration set fits well with both theory and practice in consumer behavior. Consumers tend to employ a decision process that can be represented by "a phased decision rule" when involving many choice alternatives (Roberts & Lattin, 1991). For example, consumers may simplify the purchase decision-making process by filtering available alternatives and then performing detailed analysis of the reduced number of alternatives. In this phased decision-making process, the term *consideration set* refers to the subset of all available brands brought to a consumer's mind on a particular choice occasion (Shocker et al., 1991). Consideration set defines the pool of brands from which the eventual choice is made. Therefore, accurate identification of the consideration set is essential to the practical success of the decision-making model.

If Web advertising triggers the brand name after unconscious processing and the brand name is included in a consideration set, it is expected that consumers are more likely to respond to the same ad and to visit sponsored Web pages on a later occasion. Because inclusion of a brand name in a consideration set is a necessary condition for choice, the measure of subjects' consideration set would provide useful insight into how Web advertising plays a role in brand choice decisions.

Brand choice decisions may be made in a memory-based situation, in a stimulus-based situation, or both. In a memory-based situation, the consumer chooses a brand from a product category based on information retrieved from memory. A brand that is highly accessible in memory, and thus comes to mind easily, has a greater chance of being considered and selected than a less accessible brand. Nedungadi (1990) demonstrated that an increase in brand accessibility through exposures results in a greater probability of choice without changing brand preference. Thus, Web ad exposures that lead to greater explicit memory will enhance brand accessibility, and in turn they should benefit memory-based brand choice.

Unconscious processing led by non-directed attention, however, would produce limited or no explicit memories of the exposed ad information, and consumers may not be able to retrieve target brand names from explicit memories. Accordingly, unconscious processing of Web ads would not benefit memory-based brand choice; but in the absence of preferred brands that are accessible in memory or available in the environment, a salient brand name that is more readily recognizable among its competitors was more likely to be chosen. Under these circumstances, enhanced perceptual and/or conceptual fluency by unconscious processing of Web ads would benefit a stimulus-based brand choice.

Prior research (Janiszewski, 1993) suggests that incidental ad exposure allows ad information to be perceived more easily in a later choice situation due to a feature analysis (i.e., perceptual fluency), and consequently, such information is perceived to be more familiar and to be evaluated more favorably. Similarly, Shapiro (1999) found the likelihood that an advertised product would be included in the consideration set is greater in the preattentive processing condition than in the control group. Based on the discussion, the following hypothesis is suggested:

> **H4:** The likelihood of including the advertised brand in the consideration set will be greater in the non-directed attention condition than in the no-ad-exposure condition.

METHODS

An experiment was designed to test the hypotheses. The following sections describe experimental procedures and present results from the experiment. Prior to the main experiment, three Web banner ads and three Web pages were developed for the main study, and a word stem completion test was developed to assess implicit memory.

Stimuli Development

Based on a pretest administered to 28 undergraduate students (male = 11, female = 17), the product category of DVD movies was selected for developing this study's test ads. This product category successfully demonstrated a strong appearance in Web advertising and is appropriate for use as a stimulus for the population of available subjects.

One test banner ad and two filler banner ads (see Appendix) were developed by a professional graphic designer. Fictitious brand names for the target ad (*movie-paradise.com*) and for the filler ads were used to prevent any confounding effects of prior experience or knowledge with real brands. To avoid subjects' differential response to different content, three Web pages (one each for a computer buying guide, a movie review, and a travel guide Web page) were created as background in which the banner ads were embedded. All three product categories used for development of the Web pages are relevant to and frequently used by the sample population employed in the study. The rectangular-type test and filler banner ads (460 $\times$ 80 pixels) were placed at the top of each Web page (see Appendix).

Pretest—Implicit Memory Measurement

In another pretest to develop the word stem completion measure, student subjects (N = 27) were recruited and given a booklet containing a list of word stems (e.g., *FAV*_ _ _ _ _ for *FAVORITE*). They were asked to complete the words as best they could. To allow for adequate priming effects and to provide an appropriate, though limited, set of words for the test, selection was made from an initial pool of 37 words. A total of 25 of the pool of 37 possible words were retrieved from the banner ads that were created for the main experiment (these were the "target" words), while the other 12 words were selected from prior studies (Tulving, Schacter, & Stark, 1982; Weldon, 1991) (these were the "distractor" words). Words were chosen to avoid those stems that were too easy (producing extremely

high completion rates) or too hard[1] (producing extremely low completion rates) to complete. Based on the criteria used in prior studies (e.g., Tulving, Schacter, & Stark, 1982), words with no higher than 46% completion rates and no lower than 15% completion rates were selected.

Among the initial 37 words, pretest results provided 9 target and 9 distractor words that fell into the acceptable range of completion (see Appendix for the full list of word stems). The mean completion rate for the 9 target words was 32.2%, while that of the distractor words was 28.6%. Results of a paired t-test revealed that the two set of word stems would not generate significantly different completion rates [t (26) = 1.06, p = .29].

Experimental Procedures

Several marketing studies (Janiszewski, 1993; Shapiro & MacInnis, 1992) employed peripheral placement of advertisements when examining unconscious processing. With this method, subjects are instructed to attend to a primary task (e.g., reading a mock newspaper) in focal view, and target ads to be processed unconsciously are placed outside of focal view in the subjects' parafoveal or peripheral field of vision. Because the advertisements are in the subjects' periphery, and because the subjects are preoccupied with the primary task, it is assumed that the ads are not consciously processed. Consistent with these marketing studies, this study employed peripheral placement of Web ads with a verbal instruction to induce unconscious processing of Web advertising.

A total of 183 subjects (78 males and 105 females) were recruited from two introductory advertising classes at a major university in the southeastern United States. Subjects were randomly assigned to one of the three conditions. Experimental sessions ranged in size from 4 to 12 subjects per session and were conducted in a computer laboratory over a two-week period. Each experimental session lasted about a half hour. The age of subjects ranged from 18 to 44 (mean = 20.7).

An experimental instruction was given upon the subjects' arrival at the computer laboratory. Subjects in the control condition (N = 60) were exposed to all three Web pages but without any embedded banner ads present. Experimental subjects (N = 123) were assigned randomly to either the directed or non-directed attention conditions. Then, they followed the same procedure as the control subjects with respect to exposure to all three Web pages, each of which included either a test ad or a filler ad. The target ad was located in the second Web page (to remove primacy and recency effects); the first and third Web pages included a filler ad.

All subjects were exposed to each Web page for 45 seconds[2], and by a function of JavaScript, each Web page was redirected automatically to the next one after 45 seconds. Controlling the duration of each Web page visit by subjects provided equal opportunities for all subjects to process the advertising information. The order of the background Web pages was counterbalanced between subjects. Following the experimental task, subjects completed a distraction task (i.e., summary of Web page contents vs. summary of Web page evaluations) and measures for the variables of interest. Upon completion of experimental tasks, they were thanked and informed that they would get an e-mail with further instructions. A day after the experiment, each subject received an e-mail that asked him or her to select online movie retailers when considering renting a movie title. After submitting their choices, subjects were thanked and debriefed by e-mail. Some subjects did not respond to the follow-up e-mail survey, which left a total of 149 subjects for data analysis (control: N = 46; non-directed attention: N = 52; directed attention: N = 51).

Manipulation. Subjects in the directed attention condition were told that the purpose of the study was to find out their evaluation of the Web pages. Thus, they were instructed to evaluate three Web pages and banner ads during the experiment in terms of design, layout, content, and usability, and to summarize their evaluations in paragraphs. This instruction directed subjects' attention to banner ads and increase the elaboration of information presented in the Web ads.

Subjects in the non-directed attention condition were told that the purpose of the study was to evaluate

[1] Word stems with a high completion rate were eliminated because the incremental effects of priming from prior ad exposure might not be noticeable above an already high base level of completion without exposure (Duke & Carlson, 1994).

[2] The average duration of a Web page viewing as of June 2007. Retrieved from http://www.nielsen-netratings.com/press.jsp?section=pr_netv&nav=3.

students' verbal ability, which would be assessed by how well they understood the content of the Web pages for a given time. They were told that there would be a brief test on the degree of comprehension of the Web page contents. Then, they were asked to focus on the content of Web pages during the experiment and summarize the content in written paragraphs. These instructions should direct subjects' attention to the content of the Web page rather than the banner ad. Furthermore, this procedure replicated previous unconscious processing experiments, where subjects were asked to complete a main task (i.e., reading the articles in a magazine for Janiszewski's 1993 study) within an environment that contained target ads (hence, peripheral placement).

Measures. Implicit memory was assessed by the word stem completion tests. To avoid priming recognition of the stimulus, implicit memory was assessed first. One of the methodological limitations in using a word completion test is that both conscious and unconscious processing may contribute to subjects' overall performance on the test. Jacoby (1991) developed the Process Dissociation Procedure (PDP) to overcome this limitation. The PDP uses two different tasks: an exclusion task and an inclusion task. In an exclusion task, subjects are instructed to complete word stems with words that are not presented in the advertisement; in an inclusion task, subjects are asked to complete word stems with words presented in the advertisement, or if they could not do so, to complete word stems with the first word that came to mind. If subjects' explicit memories were perfect, subjects would always complete word stems with words that they were exposed to during the experiment for the inclusion task and never complete word stems with unexposed words. On the other hand, because unconscious processing is automatic by definition, such processing generated by a simple ad exposure should increase the likelihood of completing the word stems. Thus, in the exclusion task, an increased likelihood of completing word stems with exposed words would occur only if conscious memory retrieval failed $(1 - C)$ and if memory retrieval by unconscious processing led to a correct response (U). Translating this discussion into a simple equation that describes performance for exclusion tasks provides a way to estimate the separate contributions of conscious and unconscious processing. Stated formally:

$$\text{Exclusion Task Performance} = (1 - C)\,U \quad (1)$$

Similarly, for the inclusion task, the probability of responding with an exposed word is the probability of conscious processing (i.e., explicit memory) plus the probability of the word automatically coming to mind when there is a failure to retrieve an explicit memory. Formally:

$$\text{Inclusion Task Performance} = C + (1 - C)\,U \quad (2)$$

Using Equations 1 and 2, C and U can be obtained easily by simple algebra:

$$C = \text{Inclusion Task Performance} - \text{Exclusion Task Performance} \quad (3)$$

and

$$U = \text{Exclusion Task Performance}/(1 - C) \quad (4)$$

where performance is measured by the proportion of correctly completed words in the word completion test. For instance, if a subject correctly completed 4 of the 9 target words (44%) in the inclusion task and 3 of the 9 target words (33%) in the exclusion task, the extent of the conscious processing, as given in Equation 3, would be $0.44 - 0.33 = 0.11$, while the extent of unconscious processing would be $[0.33/(1 - 0.11)] = 0.37$, as given by Equation 4.

To implement the PDP measure, all subjects received a booklet in which they found 9 target word stems (words that had appeared in the ad) and 9 distractor stems (words that had not appeared in the ad). Subjects in the control condition were told that the test was a word game to assess their verbal ability and were asked to complete the stems with the first word that came to mind. Subjects in experimental conditions received a different instruction. Word stems were presented in three colors (i.e., black, blue, and red) and subjects were told that if the stem appeared in black, they were to use it as a cue to complete the stems with the first word that came to mind. This instruction was used for the distractors. They also were told that if the stem appeared in blue, they were to use it as a cue for remembering words appeared in the Web ads during the experiment and completing the word stems with the words in the Web ads (i.e., an inclusion task). If they could not think of a word in the Web ads, they were to complete the stem with the first word that came to mind. Additionally,

subjects were told to use red as a cue for completing the word stems with a word that did not appear in the Web ads (i.e., an exclusion task). Subjects were told that if they could not complete the words, they were to skip to the next word stems. No plurals were allowed as completions to the stems. Completion rates for the target words and distractor words were calculated, and the extent of conscious and unconscious processing was estimated based on the PDP equations.

Attitude toward the brand was measured by three 9-point semantic differential scales. The items were anchored by "positive/negative," "good/bad," and "favorable/unfavorable" (MacKenzie, Lutz, & Belch, 1986). The scores of the items were averaged to generate an index score of A_b ($\alpha = .94$).

A consideration set measure asked each subject, "Check the name(s) of online movie retailers that you would be interested in trying when considering renting a movie title. Please check as many or as few names as you wish" in the e-mail sent a day after the experiment. A list of 10 online movie retailers was presented in a random order, and no other information was provided. Fictitious brand names were used to remove potential confounding effects from prior knowledge or attitudes toward the existing brands. The number of brand names that subjects selected (i.e., consideration set size) and the presence or absence of the target brand name (i.e., consideration set composition) were recorded.

Ad recognition was measured by asking subjects to select the banner ad that they were exposed to during the experiment among the three ads (one target ad and two filler ads[3]). The ad recognition rate was used as an indicator of explicit memory and a measure of manipulation check.

RESULTS

Manipulation Check

To support the claim that subjects in the non-directed attention condition experienced unconscious processing of Web ads, two tests suggested by Shapiro and MacInnis (1992) were performed: (1) comparing ad recognition rates, and (2) examining the existence of priming effects. Subjects in both control and non-directed attention conditions followed the same instruction. Thus, the ad recognition rates for the control subjects can be used as a baseline performance level (i.e., false-positive rate); subjects in the control condition had neither motivation nor advertising to shift their attention. Thus, if statistically equivalent recognition rates were found, it would support the conclusion that the subjects in the non-directed attention condition allocated minimal attentional resources to the stimulus banner ads and may have experienced unconscious processing of the ad during the experiment.

Subjects in the directed attention condition, however, were supposed to allocate their attentional resources for a given time to both banner ads and the contents. Thus, if statistically greater ad recognition rates were found for the directed attention condition than for the non-directed attention condition, it would provide evidence that subjects in the directed attention condition paid attention to and experienced conscious processing of the stimulus banner ads.

A chi-square test, as shown in Table 1, found significantly different ad recognition rates across the three conditions ($\chi^2(2) = 19.52$, $p < 0.01$). Post hoc tests showed equivalent recognition rates between control ($M = 17\%$) and non-directed attention conditions ($M = 25\%$; $\chi^2(1) = .84$, $p = .36$), while recognition rates for subjects in the directed attention condition ($M = 57\%$; $\chi^2(1) = 10.82$, $p < 0.01$) were significantly greater than those for the non-directed attention condition.

Additionally, the evidence of priming effects was examined by the improvement in word completion rates for 9 target words above subjects' baseline verbal ability measured by word completion rates for 9 distractors. It was calculated by the following formula:

$$\text{Priming Effect} = \text{Target Word Completion Rate} - \text{Distractor Completion Rate}$$

A test of group means for the distractors was not significant [$F(2, 146) = 1.94$, $p > 0.10$], indicating no difference in subjects' verbal capabilities across three

[3] Those filler ads were different from the filler ads that subjects were exposed to during the experiment. For the purpose of ad recognition measures, two additional banner ads for fictitious dotcom brands (i.e., travel-paradise.com and laptop-paradise.com) were developed, and they were very similar to the target ad in terms of layout, color, and design.

TABLE 1 Descriptive Statistics

	CONTROL (*N* = 46)		NON-DIRECTED ATTENTION (*N* = 52)		DIRECTED ATTENTION (*N* = 51)		F/χ^2
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.	(df = 2)
Target Ad Recognition Rate	0.17[a]	0.38	0.25	0.44	0.57	0.50	19.52**
Target Word Completion Rate	0.36	0.13	0.55	0.17	0.57	0.14	27.45**
Distractor Completion Rate	0.26	0.22	0.30	0.14	0.33	0.13	1.94
Priming Effect	0.07[b]	0.08	0.14	0.08	0.14	0.09	10.97**
Attitude Toward the Brand	4.03	1.54	4.78	1.68	5.30	1.05	9.45**
Consideration Set Size	3.85	1.56	3.60	1.12	3.35	1.65	1.40
Brand Choice	0.22	0.42	0.42	0.49	0.51	0.40	9.08*

* $p < 0.05$, ** $p < 0.01$

[a] False positive rate

[b] Baseline priming effect

conditions. To examine the existence of priming effect, a baseline priming effect (M = .07, S.D. = 0.08) was calculated by the subjects who were not exposed to the stimulus ad (i.e., the control condition). The grand mean of baseline level was subtracted from the calculated priming effect for both directed and non-directed attention conditions. T-tests were employed to examine whether priming effects were greater than zero (i.e., to examine whether exposure to the Web ad led to an increased implicit memory performance). Results showed significant priming effects for both directed [$t(50) = 5.37$, $p < 0.01$] and non-directed attention conditions [$t(51) = 6.46$, $p < 0.01$]. In sum, the experimental manipulation to generate different ad processing conditions (conscious vs. unconscious processing) was successful.

Hypotheses Testing

To test the hypotheses relating to implicit memory performance, an ANOVA with three different levels of the factor (no exposure vs. non-directed attention vs. directed attention) on target word completion rates was performed. The results showed a significant main effect [$F(2, 146) = 27.45$, $p < .01$, $\eta^2 = 0.14$], and the subsequent planned contrasts revealed that subjects in the non-directed attention condition (M = .55, S.D. = 0.17) exhibited significantly greater implicit memory performances than those in the control condition [M = 0.36, S.D. = 0.13; $t(146) = 6.36$, $p < 0.01$], but equivalent implicit memory performances to those in the directed attention condition [M = 0.57, S.D. = 0.14; $t(146) = 0.22$, $p > 0.10$]. Combining the results of explicit memory (i.e., ad recognition) presented above, H1a and H1b were supported.

A repeated ANOVA was used to test H2a and H2b. The experimental manipulation (directed vs. non-directed attention) was treated as a between-subjects factor, while the estimated extent of conscious vs. unconscious processing associated with implicit memory performance was treated as a within-subjects factor. As shown in Table 2, a significant interaction effect was found [$F(1, 101) = 20.06$, $p < 0.01$, $\eta^2 = .17$]. Further examination showed that greater extent of conscious processing was found for the directed attention condition (M = 0.43, S.D. = 0.12) over the non-directed attention condition [M = 0.26, S.D. = 0.20; $F(1, 101) = 14.21$, $p < 0.01$, $\eta^2 = .12$], but no significant difference in the estimated extent of unconscious processing was found between these two conditions [$F(1, 101) = 3.56$, $p > 0.05$, $\eta^2 = 0.03$]. Subjects in the non-directed attention condition showed greater extents of unconscious (M = 0.32, S.D. = 0.12) over

TABLE 2

Results of a Repeated ANOVA: The Level of Attention and the Extent of Conscious vs. Unconscious Processing on Implicit Memory Performance

SOURCE		df	F	*p*-VALUE	η^2
Within-Subjects Factor	Extent of Conscious vs. Unconscious Processing	1	4.29	0.04	0.04
	Interaction	1	20.06	0.01	0.17
	Error	101			
Between-Subjects Factor	Directed vs. Non-directed Attention	1	6.06	0.02	0.06
	Error	101			

conscious processing [M = 0.26, S.D. = 0.20, t(51) = 2.08, $p <$ 0.05], while those in the directed attention condition showed greater extents of conscious (M = 0.43, S.D. = 0.12) over unconscious processing [M = 0.27, S.D. = 0.09, t(50) = 4.39, $p <$ 0.01]. Detailed results were plotted in Figure 2. Thus, both H2a and H2b were supported. The findings indicated that the estimated extent of conscious and unconscious processing generate the same pattern of results as that of recognition measures used in this study. In other words, subjects in the directed attention condition consciously acquired Web ad information and formed both implicit and explicit memory, while subjects in the non-directed attention condition mainly used unconsciously acquired information to form implicit memory. Thus, the results not only suggest the importance of employing implicit memory measure when examining the effectiveness of Web ads, but they also extend Web advertising research on methods used to separate the effects of unconscious and conscious processing on the formation of memory.

To test H3, an ANOVA test with A_b was conducted and the results found a significant main effect of three conditions [F(2, 146) = 9.45, $p < 0.01$, $\eta^2 = 0.12$]. In the subsequent planned contrasts, statistical significance was assessed by a Bonferroni corrected p-value (0.05/3 = 0.0167). The results showed that subjects in the non-directed attention condition (M = 4.78, S.D. = 1.68) had more favorable Ab than those in the control condition [M = 4.03, S.D. = 1.54; t(146) = 2.59, $p <$ 0.01], but equivalent Ab to those in the directed attention condition [M = 5.30, S.D. = 1.05; t(146) = 1.81, $p >$ 0.05]. Thus, H3 was supported.

H4 posited that the probability to include the advertised brand in the consideration set would be greater for subjects in the non-directed attention condition than those in the control condition. As shown in Table 1, ANOVA results on the consideration set size revealed no significant difference in terms of the number of the brand names that subjects selected [F(2, 146) = 1.40, $p >$ 0.10, η^2 = 0.02]. A chi-square test on the brand choice (i.e., the probability to include the target brand name in the consideration set) by three conditions was significant [$\chi^2(2) = 9.08$, $p < 0.01$]. Post hoc tests found a significant difference between non-directed attention (42% of 52 choice occasions) and control conditions [22% of 46 choice occasions, t(145) = 2.61, p = 0.01], and no significant difference between directed (51% of

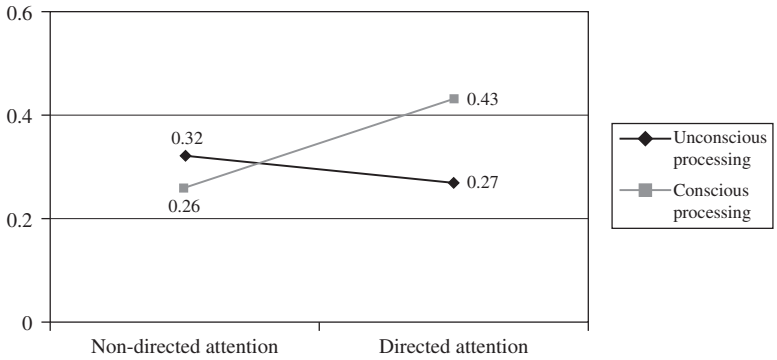

FIGURE 2

Effects of Attention and the Extent of Conscious vs. Unconscious Processing on Implicit Memory Performance

51 choice occasions) and non-directed attention conditions [$t(145) = 0.96$, $p > 0.10$]. Thus, support was found for H4, indicating that without altering the number of brands that subjects consider, those who experienced unconscious processing of Web ads are more likely to include the advertised brand name into the consideration set when making choices than those with no exposure.

Additional Analysis

Although hypotheses regarding the relationships between implicit memory and A_b or between implicit memory and consideration set were not stated explicitly, a series of correlation tests were conducted to examine the potential relationships. Among them, only one correlation between implicit memory performance and A_b ($r = 0.24$, $p < 0.05$) was significant for subjects in the non-directed attention condition, but no other correlation tests were significant. The results indicated that implicit memory performance is positively associated with A_b only when subjects experience unconscious processing of Web ads.

Following Baron & Kenny's approach (1986), additional regression analyses were conducted to confirm the mediating effects of unconscious processing on the dependent variables (i.e., A_b and consideration set). The binary variable (control vs. non-directed attention group) was created, and it had significant effects on both dependent variables (A_b: $B = 0.76$, $\beta = 0.23$, $t = 2.32$, $p < 0.05$; consideration sets: $B = 0.97$, Wald $\chi^2 = 4.56$, $p < 0.05$) and the mediator (i.e., estimated priming effect) ($B = 7.47$, $\beta = .41$, $t = 4.39$, $p < 0.01$). The mediator had an effect on A_b ($B = 0.03$, $\beta = 0.19$, $t = 1.88$, $p = 0.06$) and consideration sets ($B = 0.05$, Wald $\chi^2 = 3.92$, $p < 0.05$). When both variables were entered as independent variables, however, the binary variable (A_b: $B = .61$, $\beta = .18$, $t = 1.69$, $p = .09$; consideration sets: $B = .73$, Wald $\chi^2 = 2.17$, $p = .14$) and the mediator (A_b: $B = .02$, $\beta = .11$, $t = 1.04$, $p = .30$; consideration sets: $B = .04$, Wald $\chi^2 = 1.60$, $p = .21$) became insignificant. Overall, the full mediating effects of unconscious processing on A_b and consideration set were not found.

DISCUSSION

This study attempts (1) to provide theoretical explanations of unconscious processing of Web advertising; (2) to examine the magnitude of conscious vs. unconscious processing by using the PDP; and (3) to investigate the effect of unconscious processing of Web ads on memory, attitude toward the brand, and consideration set formation. Priming and mere exposure effects were proposed as the theoretical backgrounds of unconscious processing. The results of this study suggest that upon exposure to Web ads, consumers experience priming caused by implicit memory, and they build more favorable attitudes toward the advertised brand, regardless of the level of attention paid to Web ads. Furthermore, subjects who experience unconscious processing of Web ads have a greater likelihood to select the advertised brand name on a later stimulus-based brand choice situation than did those with no exposure to the ad.

This study demonstrated that the level of attention paid to Web ads affects explicit and implicit memory performance in a different manner. Specifically, if consumers pay greater attention to and subsequently experience conscious processing of Web ads, both explicit and implicit memory performance are enhanced. Conceptually, increased explicit memory performance at this level of processing is facilitated by elaborative semantic processes. Furthermore, as shown in the results of PDP (H2a and H2b), increased implicit memory performance are mainly attributable to consciously or intentionally acquired information. In contrast, if consumers pay minimal or no attention to Web ads and experience unconscious processing, only implicit memory performance would be enhanced due to the effects of unconscious components of memory. A positive correlation between implicit memory performance and brand attitude at this level of processing suggests that the mere exposure effects can be viewed as a demonstration of implicit memory, which is mainly affected by unconsciously or automatically acquired Web ad information.

Implications

There are several implications for advertising researchers and practitioners. First, this study shows that implicit memory measures can complement the limitations of the current measures of Web ad effectiveness based on explicit memory (e.g., recall and recognition) or direct response (e.g., click-throughs and conversion rate). Specifically, when Web ads are ignored or avoided, implicit memory measures based

on unconscious retrieval processes are more relevant for assessing a Web ad's effectiveness. For example, with low involvement or low-risk choices, where motivation and opportunity to retrieve information concerning many competing products is often low (MacInnis & Jaworski, 1989), prior ad exposure can have an effect on brand choice through unconscious means. In these situations, researchers should use implicit memory measures because consumers do not depend on intentional and effortful retrieval processes when making a judgment or choice. Thus, Web ad effectiveness measures based on explicit memory or direct response are valid only in situations in which consumers pay conscious attention to the Web advertisement. For example, for high involvement and high-risk choices, consumers are more likely to employ an explicit and effortful retrieval process because they are evaluating competing brands actively.

Second, traditional approaches to advertising effectiveness measures suggest that advertising objectives be developed, and that criteria be set, to indicate whether these objectives and criteria have been met. If an objective of a Web ad is to induce direct responses, more than 99% of Web ads are wasted. This disappointing fact may suggest that the practitioners need to rethink the objective of Web advertising. However, it is worth bearing in mind that the current experiment shows that a single exposure to an unfamiliar brand name (even unconsciously) is sufficient to bias attitude and brand choice without the subject being aware of the basis for that. Also, even if the roles of unconscious processing of Web advertising are limited to improving attitude and aiding transitions of brand names into online users' consideration set through priming, the importance of the brand building abilities of Web advertising should not be undervalued.

Generating favorable attitudes is one of the most frequently used communication objectives of advertising, and prior research showed that favorable attitudes toward the brand positively affect click-throughs (Cho, 2003) and purchase intention (MacKenzie, Lutz, & Belch, 1986). Furthermore, a number of researchers have underlined the importance of consideration sets (e.g., Nedungadi, 1990; Shocker et al., 1991). For example, Baker et al. (1986) pointed out, ". . . a brand that is not considered cannot be chosen." Also, it is possible that a first-choice brand may not be available (e.g., sold out, not in stock, etc.) on a particular online shopping occasion, and some choices still may involve very little prior consideration due to factors such as time pressure, impulse buying, etc. In such cases, prior exposure to Web advertising, even though consumers do not remember seeing it, might operate directly on attitude change and brand choice.

Additionally, critical to the success of unconscious processing is simple exposure to Web ads, and the effects of unconscious processing occur without consumers' recognizing their prior exposure to Web ads. Thus, the managerial implication for online advertisers is that emphasis should be placed on a Web ad's reach (or impression) rather than its direct response metrics (e.g., click-throughs and conversion rate) when considering Web advertising as part of a media mix. Consumers' direct responses certainly have value (especially if the objective of Web ads is to generate an immediate behavioral response), but direct response metrics alone are unlikely to be indicative of the overall value of Web ads. From a media seller's point of view, the findings of this study should be very useful to persuade potential clients to buy advertising spaces on the Web, especially when the clients doubt the effectiveness of Web ads and cite dismal click-through rates.

Third, the methodology used in this study, the PDP, is very useful in estimating the relative contributions of conscious vs. unconscious processing. Consumers use a mix of consciously and unconsciously acquired information to make a judgment, but only a few studies employed the PDP measure to separate the unconscious effects from the overall or conscious effects. Thus, to understand the effects of conscious and unconscious processing of ad information, future research should be conducted using the PDP measure to estimate the contribution of these processing mechanisms on various consumers' subsequent judgments, such as brand evaluation and brand choice.

Limitations

Although this study provided valuable insights into unconscious processing of Web ads, several limitations must be noted. The first concern relates to sampling issues. This study's investigation is limited to

undergraduate students, an appropriate audience to consider given that this age group is engaged actively in online activities and the Web is used primarily by younger people. This sample, however, may be more technology-savvy than the general population; thus replication of this study with a larger and more representative sample would offer additional insights.

Second, subjects' implicit memory was assessed by how many target word stems were completed. Those words were from the verbal or information cues in the Web ads. Non-verbal or perceptual cues, such as size, color, shape, and design, may affect subjects' perceptual fluency (Janiszewski, 1990), but this effect has not been assessed. Furthermore, the effects found in the study with respect to implicit memory performance, while significant, might appear small because the difference between scores on the word stem completion task for the unconscious processing condition (0.55) and for the control condition (0.36) are around 1 out of a possible 9 target words. It should be noted, however, that small changes in market share can generate billions of dollars in sales. Also, small changes in implicit memory performance found in the study may be attributed to the limited number of words (9 target words and 9 distractors) used in the word completion task. More importantly, the relationships between implicit memory performance and other advertising effectiveness measures (i.e., attitudes toward the ad, click-through rates, purchase intention, etc.) and the underlying mechanisms still are not clear. Thus, future research should examine independent influence of implicit memory on other advertising effectiveness measures.

Finally, key findings in support of the effects of unconscious processing on consideration set formation were based on fictitious brand names (i.e., brand familiarity was not a factor). Recently, Coates, Butler, & Berry (2006) found that exposure to familiar brands produced a significant priming effect that directly affected brand choice. Thus, future research should generalize the findings from the current study to competitive sets composed of brands with equal, but high, levels of familiarity.

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APPENDIX

1. Target Banner Ad

2. Filler Banner Ad

3. An Example of Background Web Page

4. Word-Completion Test

INSTRUCTIONS: Please complete the following words as shown in the example. Missing letters may be **vowels** or **consonants**. Do not use plurals to complete the word stems. Complete as many words as possible.

Example: S T R _ _ _
S T R I P E

- B A L _ _ _ _
- P I _ _ _
- T I _ _ _
- F A V _ _ _ _ _
- P R _ _ _
- M O _ _ _
- T U N _ _ _
- P A R _ _ _ _ _
- L I _ _
- F O _ _ _
- B L _ _ _
- K I _ _
- G R _ _ _
- F L O _ _ _
- P L A _ _ _ _
- O P _ _ _
- M A T _ _ _
- G A R _ _ _