# An Experimental Method for Studying Unconscious Perception in a Marketing Context

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## ABSTRACT

**This article provides in-depth discussion of a recently developed method designed to foster the elicitation and detection of unconscious perception. Prior findings coupled with additional studies and analyses support the value of this method as a tool for studying unconscious perception in a marketing context. The method can both divert subjects' conscious attention away from experimental stimuli and provide a separate indicator of where subjects' attentive resources are being allocated during exposure. Moreover, it is easy to use and flexibly applied in an experimental setting. © 1999 John Wiley & Sons, Inc.**

Considerable research in psychology has examined individuals' acquisition and use of knowledge through unconscious and automatic processes (cf. Erdelyi, 1992; Greenwald, 1992; Hasher & Zacks, 1979, 1984; Kihlstrom, 1984, 1987; Marcel, 1983a, 1983b; Reber, 1989; Zajonc, 1980,

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1984; Zajonc & Markus, 1982). One interesting issue in this line of inquiry is the impact of unconsciously processed advertisements. Such processing might occur when consumers are engaged in a primary task (e.g., reading a magazine article) and advertisements are present in consumers' peripheral field of vision (e.g., advertisements placed to the left or right of the article). Given the enormity of advertising clutter (Ha & Litman, 1997), and the fact that consumers are often involved in tasks that occupy attention and limit ad processing (MacInnis, Moorman, & Jaworski, 1991), understanding the potential impact of ads that do not receive full attentional resources is important.

Emerging research in marketing suggests that information from unconsciously processed ads can be encoded and can affect responses of interest to marketers. For example, in a set of studies, Janiszewski (1988) identified conditions that affect unconscious processing of ads and showed that information processed unconsciously affected consumers' attitudes toward an ad. Subsequent marketing studies have investigated other conditions that facilitate unconscious processing (Janiszewski, 1993), the impact of unconsciously processed information on comprehension of attended material (Janiszewski, 1990), the mechanism by which unconscious processing affects ad attitudes (Shapiro & MacInnis, 1992), and the effect of such processing on the formation of consideration sets (Shapiro, MacInnis, & Heckler, 1997). These findings are important because they suggest that ads not explicitly recalled or recognized can influence consumers, and that measures of advertising effectiveness relying on recall and recognition may underestimate an ad's effectiveness.

The study of unconscious processing is difficult, however. Researchers examining this phenomenon face the task of showing that consumers do not devote attentional resources to the stimulus presumed to be processed unconsciously. In part, such difficulty can be traced to the fact that revealing unconscious processing requires a method that will both (1) *foster* unconscious perception and (2) *monitor* the location of attentive resources during exposure. Unfortunately, methods that enable both are limited, particularly in a marketing context.

In prior work in the marketing literature the processing of peripheral stimuli such as ads was considered to have been unconscious if subjects showed poor memory for these stimuli in a recognition task (e.g., Janiszewski, 1988; Shapiro & MacInnis, 1992). Reliance on recognition measures alone, however, does not provide adequate evidence of unconscious perception, as we often forget stimuli to which we consciously attend (Lazarus, 1984). Attempts to provide additional measures to monitor the location of attentional resources during peripheral ad exposure have used eye-tracking data (Janiszewski, 1993). Here evidence that stimuli are not consciously processed is presumably indicated by data that show that subjects do not look directly at the target information when they complete a processing task. Although this methodology is clearly an

important step in detecting unconscious processing, some limitations can be noted. First, subjects can direct attentional resources to information not in focal view (Posner, 1980; Sperling & Melchner, 1978). Thus, lack of focal attention need not indicate lack of conscious ad processing. Second, eye-tracking equipment is cumbersome and may create atypical viewing behavior. Its use is also time-consuming. Because subjects must be run one at a time, it minimizes efficiency in the conduct of experiments. Hence, identifying a method that both provides evidence of unconscious (versus conscious) perception, and is applicable in a marketing context would foster the research efforts and findings in this interesting and managerially relevant line of inquiry.

The purpose of this article is to articulate a novel method, termed attentional resource tracking (ART), that is designed to both *foster* unconscious perception and *indicate* the nature of such processing. The purpose is also to argue that the method is *easy to use,* and *flexibly applied* in a *marketing context.* This article describes the ART method and articulates the criteria used to evaluate it. Evidence that the method meets each criterion is found by reporting on analyses involving the method in previous work (Shapiro, Heckler, & MacInnis, 1997; Shapiro, MacInnis, & Heckler, 1997). Both previously reported and novel analyses are described. Also reported are the results of several new data collection efforts designed to provide additional evidence for the method's effectiveness. Nowhere is such a complete cataloguing of the criteria met by this method reported. Combined, the package of results reported here readily communicates the method's potential value to those interested in studying unconscious processing. Although the method was designed to facilitate the study of unconscious perception in a marketing context, its application extends to other psychology and marketing relevant domains.

To understand how the proposed method compares to existing methods, the article first briefly reviews the three commonly used methods to assess unconscious perception: visual masking, dichotic listening, and parafoveal/peripheral placement. The characteristics of each method, as well as those of the proposed ART method, are summarized in Table 1. Then the ART method is described and data are presented to support its effectiveness.

## Predominantly Used Methods

***Visual Masking.*** Visual masking involves presenting a stimulus for a very brief duration (for a matter of milliseconds) followed by a mask (e.g., a string of symbols), which inhibits further stimulus processing. During exposure subjects are asked to fixate on the area where the stimulus is to be presented. Although subjects are attending to the location where the stimulus is displayed, the subliminal exposure inhibits conscious processing. Holender (1986) argues that of the three methods,

**Table 1. Alternative Methods for Inducing Unconscious Perception**

| Methods | Stimulus Modality | Who Ultimately Controls Whether Stimulus Reaches Awareness? | Focus of Attention | Mechanism Inhibiting Conscious Awareness | Ability to Track Attentional Resources? |
|---|---|---|---|---|---|
| Masking | Visual | Experimenter | Target stimulus | Subliminal exposure duration followed by visual noise | No—assumed by method of exposure |
| Dichotic listening | Auditory | Subject | Oral information in attended ear and a shadowing task | Task instructions—allowing exposure to information in the unattended ear | Yes—performance on a shadowing task |
| Parafoveal/peripheral placement | Visual | Subject | Visual information in focal view | Task instructions—allowing exposure to information outside of focal view | No—prior studies relied upon memory tests assessed after exposure |
| Proposed method: Attentional resource tracking | Visual | Subject | Visual information in focal view and cursor moving task | Task instructions—allowing exposure to information outside of focal view | Yes—performance on the cursor moving task |

visual masking is most valid. However, rarely, if ever, are consumers exposed to marketing communications in a manner similar to visual masking. In fact, it is more likely that unconscious perception of marketing communications occurs because consumers' attention is devoted to tasks other than processing the marketing communication (e.g., Janiszewski, 1988, 1993; Shapiro & MacInnis, 1992; Shapiro, Heckler, & MacInnis, 1997). Hence, although masking may be readily incorporated into experimental contexts in psychology, its applicability to a marketing context is more problematic.

***Dichotic Listening.*** Dichotic listening is a method used to study unconscious perception of auditory information. Subjects are exposed to two different verbal messages, one in each ear, and are instructed to attend to one of the messages (e.g., the information heard in the right ear) and ignore the other. Subjects are also given a shadowing task in which they repeat aloud as it is heard (shadow) the verbal message sent to the attended ear.

In contrast to visual masking, whether information is indeed processed unconsciously is ultimately under the control of subjects, not the experimenter. If subjects' attention wanders from the attended ear, or if they choose to not follow instructions, information in the unattended ear may be processed on a conscious level. To monitor whether this occurs, the shadowing task can provide an online measure of where attentional resources are allocated. The extent to which attention is placed on the attended ear can be determined by performance on the shadowing task. Although it is more applicable to a consumer context than visual masking, this method is limited to the study of auditory information. Although it may be appropriate to the study of radio advertising, the powerful and pervasive effects of pictorial information in print and broadcast media (Edell & Staelin, 1983; Mitchell, 1986, Rossiter & Percy, 1983) make it highly relevant to marketers to identify a methodology that detects the unconscious processing of information presented in a *visual* modality (e.g., pictures or printed words).

***Parafoveal/Peripheral Placement.*** Consistent with dichotic listening, positioning stimuli outside of focal view also places control over conscious processing in the hands of subjects. With parafoveal/peripheral placement subjects are instructed to attend to a primary task in focal view. Visual information to be processed unconsciously is placed outside of focal view in subjects' parafoveal (1.5–5 degrees from fixation) or peripheral (greater than 5 degrees from fixation) field of vision. Marketing studies employing this method (e.g, Janiszewski, 1998; 1993; Shapiro & MacInnis, 1992) typically ask subjects to read a mock newspaper and focus their attention on a set of marked articles. Target ads are placed in side columns next to the articles. Because the advertisements are in subjects' periphery, and because subjects are preoccupied

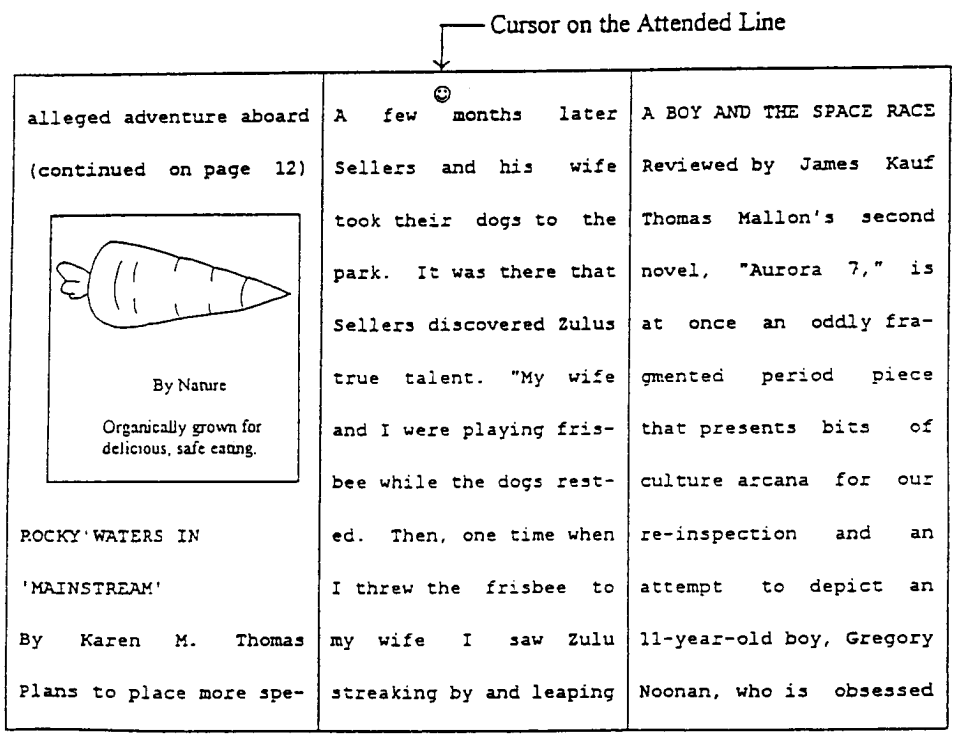


**Figure 1.** Computer-controlled magazine.

with the reading task, it is assumed that the ads are not consciously processed.

Although this method is similar to dichotic listening, it does not involve a tracking component that monitors whether subjects shift attention to the target advertisements *at the time* of ad exposure. Evidence of whether subjects processed ads on a conscious or unconscious level has typically been assessed *after* ad exposure by measures of ad recognition (e.g., Janiszewski, 1988; 1993; Shapiro & MacInnis, 1992). Measuring the allocation of attentional resources concurrent with ad exposure would provide greater evidence that ad exposure effects are due to unconscious versus conscious influences.

## Attentional Resource Tracking

The new method that is advocated involves a computer-controlled magazine, a depiction of which is shown in Figure 1. The computer screen is divided into three columns by two vertical lines. The middle column contains an article that is subsequently called the focal attention task. Target ads, designed to be unconsciously processed, are embedded within the magazine's left- or right-hand column between blocks of text. The ads occupy a visual field ranging from approximately 2.5 degrees

to 11 degrees when subjects' view the margin of the middle column closest to the ad and from 12.5 degrees to 21.0 degrees when viewing the margin of the middle column furthest from the ad. To make the computer-controlled magazine similar to an actual magazine, articles are placed above and below the target ads.

The information in the magazine's three columns scrolls up the computer screen line by line at a rate predetermined by the experimenter. All three columns scroll at the same rate. During the scrolling process, the target ad first appears in the left or right column at the bottom of the computer screen and then scrolls up past the top of the screen. Because ads are on the screen for only a limited period of time, consumers' opportunities to consciously process them are limited. However, because the ads are in peripheral vision, consumers do have the opportunity to process ads at an unconscious level.

The new method is designed to foster unconscious ad processing and provides an "online" measure that tracks the direction of attentional resources in a marketing context. In so doing, it was designed to meet six criteria noted below. Specifically, to foster unconscious ad processing, the ART method is designed to (a) hold subjects' attention on the focal attention task while placing the stimulus presumed to be unconsciously processed in subjects' peripheral vision.

To measure the direction of attentional resources and demonstrate unconscious perception, the ART method is designed to (b) track attentional resources, showing that subjects' attention is focused on and occupied by the task in focal attention (versus the peripherally placed ads); (c) monitor whether and when subjects shift their attention to the stimulus in peripheral vision; (d) show that subjects who do allocate attentional resources to the peripherally placed stimulus can recognize that stimulus in a subsequent recognition task, while those that do not shift their attention cannot; and (e) demonstrate that peripherally placed stimuli can indeed be processed (without being recognized).

To demonstrate the method's applicability to marketing, the method was designed in such a way that could (f) demonstrate its flexibility and ease of use in a marketing context.

The method's ability to meet criteria (a)–(d) is summarized in Table 2 and discussed in more detail below. Discussion also focuses on the method's ability to meet criteria (e) and (f).

***Holding Attention on the Focal Attention Task.*** Consistent with the first criterion, the computer-controlled magazine is designed to foster unconscious perception by controlling the focus of subjects' attention. Specifically, the task is designed to hold attentional resources on the focal attention task (i.e., the magazine article) while minimizing attentional focus on the peripherally placed ad. Subjects are told that the study's purpose is to determine the degree to which doing an activity interferes with reading an article. They are told that they will read an

**Table 2. Results Supporting the ART Method's Ability to Meet Criteria (a)–(d)**

| Criterion | Evidence Supporting the Criteria | Significant Effects? | Implications |
|---|---|---|---|
| (a) Hold attention on focal task | Control-group error rates with the cursor-moving task: 29%[a], 24%[b] | – | Focal task is challenging, yet not too difficult. |
| (b, c) Method's ability to track attentional resources and monitor shifts in attention | Error rate with the cursor-moving task where subjects in the ad instruction group self-reported a shift in attention (when the ad was 4–6 lines below the attended line)<br>Control Group: 28%[a]; No Ad Instruction Group: 25%[a]; Ad Instruction Group: 49%[a] | Yes | The method can detect quick shifts in attention away from the focal task and to the ads. |
| | Error rates with the cursor moving task on the 10 lines when ads were visible<br>Control Group: 24%[a]; Experimental Group: 25%[b] | No | Subjects exposed to ads are no more likely to shift their attention away from the focal task than control group subjects not exposed to ads. |
| | Error rates with the cursor-moving task comparing new control group with side columns of processing task removed<br>No Side Column Control Group: 22%[c]; Side Column Control Group: 24%[b]; Exp. Group: 25%[b]; Over 10 lines<br>20%[c]; 28%[e]; 24%[e]; Lines 4–6 | No | Control-group subjects and experimental subjects do not shift their attention away from the cursor moving task. |

| | | | | | |
|---|---|---|---|---|---|
| (d) Those allocating attentional resources to the ads perform well on ad recognition tests. | Recognition rates across conditions | | | | |
| | Control Group | No Ad Instruction Group | Ad Instruction Group | | |
| | 25%[a] | 25%[a] | 100%[a] | Yes | Only those subjects instructed to look at the ads claim to recognize the ads. |
| | Control Group | Experimental Group | Change | | |
| | 26%[b] | 31%[b] | 25%[b] | No | |
| | Comparing recognition rates taken immediately after completion of the processing task. | | | | |
| | Exp. Group Immediate Recognition | | Exp. Group Recognition after Short Delay | | Lack of ad recognition is due to unconscious perception and not memory failure. |
| | 35%[c] | | 31%[b] | No | |
| | Relationship between recognition and error rates over 10 lines. | | | | Subjects confident in their recognition may have shifted their attention to the ads and the error rate data could detect this attentional shift. |
| | High Confidence Recognition | | Low Confidence Recognition | | |
| | Ad 1 error rate = 55%[e]<br>Ad 2 error rate = 50%[e] | | Ad 1 error rate = 19%[e]<br>Ad 2 error rate = 16%[e] | Yes | |

[a] Results from Shapiro, Heckler, and MacInnis (1997).
[b] Results from Shapiro, MacInnis, and Heckler (1997).
[c] New data collection.
[d] Reanalysis of Shapiro, Heckler, and MacInnis (1997).
[e] Reanalysis of Shapiro, MacInnis, and Heckler (1997).

article in the middle column of the computer screen, and that they will be later tested for their memory and comprehension of that article.

Attentional focus is controlled by asking subjects to perform two tasks. One is to comprehend as much of the article displayed in the middle column (the focal attention task) as possible while the article scrolls line by line up the computer screen. At the same time, subjects are asked to perform a cursor-moving task. As the figure shows, a happyface cursor is depicted on the top line of the middle column (hereafter called the attended line). By pressing marked computer keys, subjects can move the cursor left or right on the attended line within the boundaries of the middle column. Their task is to move the cursor in such a way that it does not hit a word when the next line scrolls up. In other words, when the line of text immediately below the attended line is about to scroll past the cursor, subjects need to position the cursor so that it fits in the space between any two words in the line of text. If the cursor does hit a word, an error is detected and a beep is sounded. The program allows for a short practice trial so that each subject can practice the cursor-moving task. Although this cursor-moving task does not represent an actual viewing situation, it does simulate situations where attention is focused on material other than a peripherally placed ad (e.g., driving a car, having a conversation, or quickly reading a magazine article). It thus provides a representative context for fostering unconscious (vs. conscious) processing of peripherally placed ads.

The program stores the error data in a separate file for each subject. Each error file contains information on a subject's performance with the cursor-moving task on every line of text. Such data allow for the detection of the total number of errors made by a particular subject and the exact line on which the error(s) occurred. The separate subject files can be subsequently aggregated into a single file.

Findings reported elsewhere (Shapiro, Heckler, & MacInnis, 1997; Shapiro, MacInnis, & Heckler, 1997) suggest that when the scrolling speed is set at 1 line per second, the error rate is approximately 27%. The error rate among control-group subjects not exposed to peripherally placed ads in the computer-controlled magazine was 29% in Shapiro, Heckler, & MacInnis, 1997, and 24% in Shapiro, MacInnis, and Heckler, 1997. In other words, subjects allow the cursor to hit a word about every fourth line.[1] This percentage indicates that the task is sufficiently difficult that subjects have to pay attention to the middle column of the computer screen to perform the task, but not so difficult that they give up. Thus, the requirement of holding subjects' attention on the focal attention task (criterion 1) is met.

The number of errors with the cursor-moving task is also used to provide a measure of the allocation of attentional resources. Specifically,

[1]This percentage may differ depending upon the population and scrolling speed; in the past undergraduate marketing students have been used.

a shift in attention from the middle column of the computer-controlled magazine toward a target ad should reduce consumers' performance in the cursor-moving task (i.e., the attentional shift would leave fewer resources available for performing the cursor-moving task). It thus provides useful insight (along with additional measures) into the extent to which the method meets criteria (b)–(d).

***Tracking Attentional Resources and Monitoring Shifts in Attention.*** The fact that this method is capable of both tracking attentional resources [criterion (b)] and monitoring whether and when attentional resources shift to the ad in peripheral vision [criterion (c)] is supported by analyses reported in prior research (Shapiro, Heckler, & MacInnis, 1997; Shapiro, MacInnis, & Heckler, 1997) and an additional study reported here.

The study by Shapiro, Heckler, and MacInnis (1997) involved three groups of subjects—(a) an ad instruction group, (b) a no ad instruction group, and (c) a control group. All subjects were given the reading and cursor moving task instructions described previously. Each was also told that memory and comprehension of the article in the middle column of the magazine would be tested. Those in the ad instruction group were also told that they would be questioned about the pictures in the advertisements. Those in the no ad instruction and control groups were not told about the presence or absence of advertisements. The computer-controlled magazine for the ad instruction and no ad instruction groups contained two target advertisements in the left-hand column of the computer-controlled magazine. The computer-controlled magazine for the control group did not contain any advertisements, and text replaced the space where the ads were removed.

Consistent with criteria (b) and (c), the results revealed that performance on the cursor-moving task decreased if a subject quickly glanced at the target advertisements while proceeding through the computerized magazine. Specifically, subjects in the ad instruction group made significantly more errors with the cursor-moving task than those in the no ad instruction and control groups. Additionally, the increased error rate was only found in that portion of the processing task where ad instruction group subjects claimed, in a self-report measure, to have made a single rapid glance at the target ads (when the ads were 4–6 lines below the attended line). No differences in error rates were found between the control group and no ad instruction group in this section of the processing task (see Table 2).

This latter finding was replicated by Shapiro, MacInnis, and Heckler (1997). They showed equivalent error rates between an experimental group whose version of the computer-controlled magazine contained target advertisements and a control group whose version of the computer-controlled magazine did not (see Table 2). Neither experimental nor control-group subjects were told anything about the presence or absence

of advertisements. These results suggest that the new method is sufficiently sensitive to detect quick shifts in attention to the target ads. Furthermore, when not instructed to do so, subjects in the experimental groups tend not to shift their attention to the peripherally placed target ads.

Although these results are consistent with criteria (b) and (c), statistically equivalent levels of error rates across both experimental and control groups may only imply that experimental subjects shift their attention *equally as often* as control subjects, not that they do not shift their attention. Although it is unclear why control-group subjects would be motivated to shift their attention from the middle column to adjacent columns that contained the same sized and font text, additional data were collected (not reported elsewhere) to examine this issue. The reasoning is that although curiosity or interest in adjacent text could potentially cause a shift in attention, subjects should have little or no motivation to shift their attention if they saw that the columns adjacent to the middle column were blank. A new version of the processing task that left the side columns blank was therefore developed. Thus, this version of the computer-controlled simply contained the middle column of the magazine. The 26 subjects who participated in this task were given the same instructions as subjects in the Shapiro, MacInnis, and Heckler (1997) study. They also completed the processing task in the same manner.

To examine whether information in the side columns caused control-group subjects to shift their attention away from the focal task, a repeated-measures ANOVA analysis was conducted between this new control group and the control and experimental subjects in Shapiro, MacInnis, and Heckler (1997). The dependent variable was the error rate across the 10 lines of data when each ad was visible on the computer screen in the experimental group. Results indicate that neither the main effect of group ($x$ = 22% in the new control group with no side columns, $x$ = 24% in the old control group with side columns, $x$ = 25% in the experimental group; $F(2,174) = 0.32$, $p = .73$) nor the interaction between group and section of processing task (where the first ad and where the second ad were visible in the experimental group) ($F(2,174) = 0.61$, $p = .55$) were significant.

Similar findings were found when a repeated-measures ANOVA was run with the use of the error rate in those lines where subjects in the ad instruction group in Shapiro, Heckler, and MacInnis (1997) claimed to shift their attention to the target ads (i.e., 4–6 lines below the attended line) (see Table 2). The main effect of group was not significant ($x$ = 20% in the new control group with no side columns; $x$ = 28% in the old control group with side columns; $x$ = 24% in the experimental group; $F(2,174) = 1.29$, $p = .28$). Nor was the interaction between group and section of processing task significant ($F(2,174) = 1.59$, $p = .21$). Together, these findings provide stronger evidence that subjects in the

experimental group did not shift their attention to the target ads while completing the processing task. Thus, they support the method's ability to meet criteria (b) and (c).

***Demonstrating a Correspondence between Shifts in Attentional Resources and Ad Recognition.*** The error-rate data can provide evidence relevant to criterion (d) when coupled with the ad recognition data. Specifically, they demonstrate a correspondence between shifts in attention to the peripherally placed ads and ad recognition. Once again, the method's ability to detect such a correspondence is found in both our previously reported work and additional studies.

Shapiro, Heckler, and MacInnis (1997) provided evidence of the method's ability to show a correspondence between allocation of attentional resources and ad recognition. The reasoning is that there would be greater confidence that a peripherally placed ad was unconsciously processed if subjects in the no ad instruction group had forced-choice recognition scores (a) no greater than what was expected by chance, (b) equivalent to subjects in the control group (who were not exposed to the ads), and (c) lower than subjects in the ad instruction group who presumably shifted their attention. Also, if high levels of ad recognition are present only when the number of errors is high (as would be expected in the ad instruction condition), and if chance levels of ad recognition are present only when the number of errors is low (as would be expected in the no ad instruction condition), the method would appear to be sufficiently sensitive to detect shifts in attentional resources.

The results supported these predictions. Four-alternative forced-choice recognition levels in the ad instruction group (100%) were significantly greater than chance (25%), whereas recognition levels in the no ad instruction group (25%) were at chance levels. Similar confirmation of the method's ability to meet the requirements of criterion (d) was found in Shapiro, MacInnis, and Heckler (1997) with a four-alternative, forced-choice recognition measure (see Table 2).

Although these results provide fairly compelling albeit preliminary evidence consistent with criterion (d), it might be argued that experimental subjects' poor recognition may be due to forgetting, not to a lack of conscious ad processing, because recognition measures in both studies were administered several minutes after exposure to the processing task. To test this forgetting explanation, a new study was conducted. Twenty-two undergraduate marketing students from the same population were given the same instructions, completed the same processing task, and completed the same measures as experimental subjects in Shapiro, MacInnis, and Heckler (1997). In this latter condition, however, the recognition measures were completed *immediately* after the processing task. A comparison of four-alternative forced-choice recognition scores for subjects in this condition (35%) with those of subjects in Shapiro, MacInnis, and Heckler (1997) (31%) revealed that the rec-

ognition scores of the two groups did not differ ($\chi^2 < 1.0, p > .30$). Additionally, the recognition rates were no greater than what would be expected by chance ($p > .10$). Further, ad order had no effect on recognition scores for either ad (Fisher's exact $p$'s $> .60$ for recognition). Together, the findings provide strong evidence that poor recognition performance by experimental subjects in Shapiro, MacInnis, and Heckler (1997) was not due to forgetting.

Additional analyses not reported in Shapiro, MacInnis, and Heckler (1997) were also conducted. These analyses compared recognition rates with error rates. In Shapiro, MacInnis, and Heckler (1997) forced-choice recognition measures were supplemented with a confidence measure that asked subjects to indicate how confident they were that they recognized the appropriate ad (1 = not at all confident; 9 = very confident). Weighted recognition scores were constructed by giving a code of 0 if subjects did not correctly identify the target ad and a code of 1 if they did. This value was then multiplied by the confidence rating response. Thus, weighted recognition scores ranged from 0 to 9.

To investigate the relationship between experimental subjects' error rate and recognition data, correlations between the two were examined for both target ads. The only error segment found to be significantly correlated with the weighted recognition score was the segment where the target ad was 4-6 lines below the attended line ($r = 0.26, p < .05$). The positive correlation implies that subjects with high error rates for this particular section of the reading task were also fairly confident that they recognized the target ad as being in the computer-controlled magazine. Previously, Shapiro, Heckler, and MacInnis (1997) provided support for the computer-controlled method's ability to detect shifts in attention when subjects are directed to attend to the target ads while completing the processing task (the ad instruction group). These new results support the method's ability to detect relatively subtle shifts in attention away from the middle column and toward the target ads as they scroll by in the periphery when subjects are not directed to shift their attention to the target ads.

Further support for criterion (d) would be found if subjects in the experimental group who shifted their attention away from the cursor-moving task (as identified by the recognition data) had more errors than subjects in the control group. Recall that the underlying assumption of this method is that a shift in attentional resources away from the middle column leads to more errors in the cursor-moving task. To investigate this assumption a dichotomous variable was created—taking a median split of the weighted recognition score for subjects in the experimental group who claimed to recognize a target ad. This variable divided the experimental-group subjects who claimed to recognize a target ad into two groups: those who had relatively low weighted recognition scores (scores lower than 3 for ad 1 and lower than 4 for ad 2), and thus were uncertain as to the correctness of their recognition response, and those

who had relatively high weighted recognition scores, and thus were fairly confident as to the correctness of their recognition response. Then a comparison was made on the number of errors made by subjects in the experimental group with relatively high weighted recognition scores, those with relatively low recognition scores, and the entire control group.

The results provide further support for criterion (d). Significantly more errors were made by experimental subjects with relatively high weighted recognition scores (error rate = 55% and 50% for the two target ads) than by those with relatively low weighted recognition scores (error rate = 18.5%; $F = 9.22$, $p = .01$ for one target ad; error rate = 15.5%; $F = 14.57$, $p = .01$ for the other target ad) and by control-group subjects (error rate = 29%; $F = 4.90$, $p < .04$ for one target ad; error rate = 20%; $F = 8.56$, $p < .02$ for the other target ad). These results suggest that experimental group subjects with relatively high weighted recognition scores may have shifted their attention to the target ads while completing the reading task. These results support criterion (d) by demonstrating the method's ability to detect attentional shifts.

***Demonstrating That the Peripherally Placed Ad Is Processed.*** Because the purpose of this method is to foster unconscious processing, it is imperative to not only demonstrate that conscious processing is minimized, but also that unconscious processing can occur. Thus the possibility must be ruled out that the processing task is so demanding, or that the method places the ads so far in the periphery that the advertisements cannot be processed at any level, consciously or unconsciously.

Evidence that the method does allow the ads to be processed, albeit on a less-than-conscious level, would be provided by a change in task performance due to ad exposure in the computer-controlled magazine. Preliminary evidence for this fact was shown in Shapiro, Heckler, and MacInnis (1997). There it was demonstrated that experimental subjects completing the processing task evaluated the ad and brand more highly than did control-group subjects. Shapiro, MacInnis, and Heckler (1997) showed that, compared to control-group subjects, experimental subjects were more likely to include products depicted in the target advertisements in their consideration sets.

Additional analyses conducted here (and not reported elsewhere) indicate the same effects are observed under very stringent conditions. From the data set subjects were eliminated who (1) claimed to recognize *either* target ad, (2) had above-average error rates when each ad was visible on the computer screen *or* (3) made *any* errors in the two critical lines of the processing task (when the ads are 4–6 lines below the attended line). With this reduced data set ($N = 29$ in the experimental group, $N = 78$ in the control group), Fisher exact tests indicate that there is a greater likelihood of including advertised products in a

stimulus-based consideration set among experimental-group subjects exposed to nonfocal ads (34.5% for ad 1 and 46.4% for ad 2) compared to control-group subjects not exposed to the nonfocal ads (16.7% for ad 1, $p < 04$; 24.4% for ad 2, $p < .03$). The ability to still observe predicted effects under these highly stringent conditions strongly suggests that the method allows for unconscious processing of the ad information.

In sum, the preceding findings provide fairly strong support for the first five criteria noted earlier.

***Demonstrating Flexibility and Ease of Use in a Marketing Context.*** A significant advantage of the ART method is its use in studying a variety of factors relevant to unconscious perception. For example, previous research indicates that the effects of unconscious ad processing are affected by whether the ad is placed in the left or right visual field and whether the ad information is verbal or pictorial (Janiszewski, 1988, 1993). The program used to develop the computer-controlled magazine can readily accommodate such manipulations. Any pictorial or verbal ad can be easily scanned and incorporated into the magazine in the left-hand or right-hand column, thus appearing in subjects' left or right visual field.

The extent to which a processing task uses resources predominantly from the left versus right hemisphere of the brain has also been found to influence unconscious ad processing (Janiszewski, 1990; Shapiro, Heckler, & MacInnis, 1997). According to matching activation theory, the use of left hemispheric resources is thought to facilitate unconscious processing of pictorial information, whereas use of right hemispheric resources is thought to facilitate unconscious processing of verbal information. This method can easily be used to manipulate the extent to which resources from either the left or right hemisphere are used during processing. Recall that the method requires subjects to complete two tasks: a reading task and a cursor-moving task. The reading task predominantly uses left-hemispheric resources, and the cursor-moving task predominantly uses right-hemispheric resources. Consistent with matching activation theory, Shapiro, Heckler, and MacInnis (1997) found that subjects who emphasized the reading task (evidenced by greater recall of facts from the article in the middle column of the magazine), also evaluated the pictorial ad and brand more highly. An experimenter can easily manipulate this factor by emphasizing the importance of one of these tasks (reading versus cursor moving) over the other when giving subjects instructions.

The method can also be used to vary the level of processing resources used while proceeding though the computer-controlled magazine task. By allowing the experimenter to select the scrolling speed, the reading and cursor-moving task can be made to be more or less difficult.

The method also allows for easy and rapid administration. Multiple subjects can be run at one time, which decreases the required number

of experimental sessions. Different versions of the magazine can easily be loaded on each machine, allowing multiple conditions to be run simultaneously. The tasks are not difficult for subjects to understand and complete. In fact, subjects seem to enjoy the process and appear to be highly motivated while proceeding through the task.

Because this method is computer based, it also allows for easy collection of dependent measures typically used in the psychology literature. For example, reaction-time measures can easily be incorporated into a study to immediately follow completion of the computer-controlled magazine task, as these measures are often collected via computer.

### Limitations of the ART Method

Operationally, one major limitation of this method is that experimental advertisements used in the computer-controlled magazine need to be fairly simple in design. Because peripheral vision is degraded, conscious or unconscious processing of information in the periphery requires that the information be fairly predominant. Hence, ads that contain significant small detail may not lend themselves to this method.

Another note of caution must be made. Holender (1986) notes that the use of peripheral placement alone does not ensure unconscious versus conscious attention. This point is not debated, nor does it imply that the use of this method is alone sufficient to make claims of unconscious versus conscious perception. However the computer-controlled magazine is a very valuable methodological tool for studying the effects of unconscious processing in a marketing context. Using this method in conjunction with other measurement techniques, such as the process dissociation procedure (Jacoby, 1991) provides greater evidence that subjects processed target information in an unconscious versus a conscious manner.

Jacoby's (1991) process dissociation procedure allows for separate estimates of both conscious and unconscious perception regardless of the method used to foster unconscious processing. This procedure is a measurement technique applied *after* subjects have processed the experimental stimuli. The procedure puts conscious and unconscious influences in opposition with one another by instructing subjects to complete a task (e.g., a stem completion task) while attempting *not* to respond (e.g., not to complete the word stem) with a previously presented stimulus (e.g., a previously flashed word). If the experimental stimulus was processed consciously during the previous exposure episode, then one would predict a decreased likelihood (compared to baseline) of completing the task to form the target word. The opposite effect would be predicted if the stimulus was processed unconsciously.[2]

Although this procedure allows experimenters to be more confident

[2]See Jacoby (1991) for a more detailed description of the process dissociation procedure.

as to whether *effects* that emerge from exposure are due to conscious or unconscious perception, it does not ensure that subjects *process* experimental stimuli in an unconscious manner. This procedure is a measurement technique that is independent of the method used to foster unconscious perception during exposure to experimental stimuli. Hence, the development of this measurement procedure does not decrease the need to find alternative methods that elicit unconscious processing applicable in a marketing context. In fact, significant evidence that effects due to marketing exposure are attributable to unconscious versus conscious perception may be found with the use of the current method to *foster* unconscious perception and Jacoby's process dissociation procedure to *measure* the influence of such processing.

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