Getting the User's Attention: The Effectiveness of Two Mediums of Online Advertising

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Abstract

While the Internet has become an increasingly popular medium for advertising, few studies have been performed to gauge Internet advertising's effectiveness in terms of increasing user attention to the advertisement and promoting memory for the content of the ads. The present study compared two types of banner advertisements in terms of capturing user attention, increasing recognition memory for the content of the advertisements, and in promoting positive attitudes toward the advertisements. Participants engaged in a search task on a simulated web page. An eye tracker was used to collect data on how effective the advertisements were in capturing user attention as indicated by the number of fixations participants' made on the body of the ads. A recognition task provided a measure of implicit memory for the content of the ads. Finally, an attitude survey assessed how participants felt about the advertisements' presence during the experiment. The results of the study indicate that neither type of banner can be preferred over the other in terms of increasing user attention to the ad, promoting recognition memory, and increasing positive attitudes toward the ad.

1 Background

Soon after the Internet was developed, companies sought to take advantage of the new interactive medium by advertising to promote their products. Banner ads appeared to be effective in creating brand awareness and positive consumer attitudes toward advertised products during early studies of Internet advertising [Goldsmith & Lafferty, 2002]. However, advertising on the Internet has since been attacked as, "uninformative, unfocused, forgettable, and generally ineffective" [Goldsmith & Lafferty, 2002]. Despite these criticisms, spending on Internet advertising among major companies is expected to total $6.3 billion at the close of 2003, with projected spending totals close to $8.1 billion by 2006 [Greenspan, 2003]. There is a substantial need to investigate how effective Internet advertising is toward promoting brand awareness and positive consumer attitudes toward the advertised product.

The goals of Internet advertising are, for the most part, identical to those of more traditional mediums of advertising. One of the goals of Internet advertising is for the consumer to "form positive attitudes toward the ad and the brand being advertised, thus increasing the likelihood of purchase" [Goldsmith & Lafferty, 2002]. A second goal of Internet advertising is to promote brand awareness. Brand awareness helps ensure that recalled brands will have a competitive advantage over those brands that are not easily recalled [Goldsmith & Lafferty, 2002]. Promoting brand awareness is not an easy task for Internet advertisers as there are thousands of sources of information competing for a user's attention as they browse the Web. As a result, companies must design advertisements that are likely to attract the user's attention.

Two of the most popular forms of advertising on the Internet are the banner advertisement and the pop-up advertisement. The present study compared the effectiveness of two types of banner advertisements in capturing the user's attention and promoting brand awareness for the advertised products. The study was conducted using a simulated web browsing task during which participants were exposed to either banner advertisements that display a continuous image (static banner advertisements) or banner advertisements that alternate images every two seconds (alternating banner advertisements). Data pertaining to the advertisements' effectiveness was collected using an eye tracker, a recognition task, and an attitude survey. Data pertaining to the advertisements' effect on the users' web browsing task was also collected. When users engage in a task such as searching for information on a web site they must operate under conditions of divided attention, with their attention allocated to many objects of interest. Research has provided significant evidence for a parallel preattentive process that continually organizes the world into objects and groups of objects [Wickens & Hollands, 2000]. Users then selectively attend to certain objects from these preattentive groupings. Problems with divided attention can occur when users fail to direct their attention to important items within these preattentive groupings.

Mack and Rock [1998] found empirical evidence for failures of parallel processing during their studies of a phenomenon they named inattentional blindness. Theories of inattentional blindness contradict the idea that perception of objects can occur without attention. Mack and Rock's research paradigm consisted of a cross presented briefly on a display either at a fixation point at the center of the display or parafovally. On each trial,

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participants were asked to name the longer arm of the cross after it was presented. On the third and fourth trials the critical stimulus, a small dot, was presented unexpectedly in one of the four quadrants of the cross at the same time that the cross was displayed. During the course of their research, Mack and Rock found that a significant number of participants in each test group failed to detect the critical stimulus during the experimental trials, even when it was presented at the fixation point. In fact, the amount of inattentional blindness exhibited by participants doubled for stimuli presented at the fixation point. Implicit divided attention trials revealed that the critical stimulus was perceptible when participants were aware an unexpected event might occur.

This finding may indicate that subjects actively inhibited input from objects at the fixation point in order to attend to objects presented away from the fixation point [Mack & Rock, 1998]. The research suggests that users may employ active cognitive processes to attend to certain stimuli and inhibit others [Mack & Rock, 1998].

Strayer, Drews and Johnson [2003] found additional evidence for failures of parallel processing in their research concerning the use of cellular phones while driving. In their experimental task, participants drove on a simulated highway while either engaged in a hands-free cell phone conversation or not engaged in a cell phone conversation. At the conclusion of the experiment, participants were tested for recognition of fifteen billboard advertisements that were present along the highway during the simulated driving task. The recognition test revealed that participants who drove the simulated highway while conversing on the cell phone showed impaired memory for the billboard advertisements. A later experiment by Strayer et al. [2003] measured eye fixations using an eye tracker while participants drove the same simulated highway as in the previous experiment. During the experiment, participants in both groups fixated on approximately two thirds of the billboards. However, recognition memory for the fixated billboards by those participants who engaged in the cell phone conversation while driving was still impaired. Conversing on the cell phone disrupted performance on the driving task by diverting attention from the driving task to the cell phone conversation, a failure of divided attention [Strayer et al., 2003].

Eye movement research conducted on searching behavior on the Internet has found that most users scan the environment for desired information rather than processing each available item independently. Short survey dwells are eye fixations used to establish those regions that are most likely to contain a target, while longer examination dwells are used to provide a detailed examination of a region [Wickens & Hollands, 2000]. Research by Most et al. [2001] provided evidence that users may guide their search for targets in a display by developing a perceptual set of required characteristics for the target. Detection of an object may then be dependent on whether the object possesses the required features [Most et al., 2001]. In Most's research paradigm, black and white L and T shapes moved across a display in a random pattern. On each trial, participants in the study fixated on a central point in the display and silently kept a tally of the total number of times either white or black shapes bounced off the edges of the display window. Five seconds into the third trial of the experiment, a cross entered the right side of the window, moved in a path horizontally across the screen behind the fixation point, and exited the left side of the display. The luminance of the cross varied among the experimental conditions as either black, dark gray, light gray, or white. When the unexpected cross had the same luminance as the attended items, almost all observers noticed it. When the cross had the same luminance as the ignored items, almost no participants noticed it. The more similar the cross was to the attended items and the more it differed from the ignored items, the more likely it was to be detected. This provides strong support for the idea that a perceptual set of expected features for a target can guide user attention to objects.

In a third experiment by Most et al., identical in procedure to the experiment outlined above, participants attended to either black or white circles and squares against a gray background. The cross was colored red and moved across the display in the same fashion as in the previously described experiment. In this experiment, however, the unexpected cross differed from the attended items in both shape and color. Only 72% of participants noticed the red cross on the critical trial. This research provided evidence that inattentional blindness can occur even for sustained and highly salient events in a display, provided that users are engaged in a selective attention task.

Research by Benway and Lane [1998] revealed one perceptual set users exhibit while viewing a web page that causes selective ignoring of banner advertisements and banner-type objects. In Benway and Lane's first experiment, participants searched for answers to twenty-four questions on a web site. In the control tasks, the answers to the questions could be found using text menus on the site. In the experimental tasks, the answers to the questions could only be found by viewing and clicking on red advertisement-style banners. Participants found the answers to the experimental task questions only 58% of the time, while the answers to the control tasks were found 94% of the time. Benway and Lane explained these results by noting that participants may have learned to ignore banners while searching for information, a form of inattentional blindness they dubbed "banner blindness" [Benway & Lane, 1998, p.2].

One possible reason that users may ignore banners is that they are perceptually grouped in a different category than text. Benway and Lane [1998] increased the perceptual grouping of the text on the web page and the banner-style link in a second experiment in an attempt to increase user attention to the banner objects. In the menu grouping condition, the banner was perceptually

grouped with the text menu on the web site by means of a similar background color, while in the title grouping condition the banner was perceptually separated from the text menu by means of a different background color. In a third condition, the banner contained the same text as in the other two conditions but resembled an advertisement banner in its graphic style. Only 17 of the 71 participants reported seeing the non-advertisement banners, while only twenty percent of the participants reported they saw any advertisements at all during the course of the experimental trials [Benway & Lane, 1998]. Benway and Lane's research provided evidence that user expectation and perceptual set may influence what areas of the screen they attend to while searching for information on the Internet. Mental models of web space, based on the probable locations of valuable information from prior experience, may guide user sampling of different areas of a web page [Wickens & Hollands, 2000].

Though users often employ top-down processes to guide their search of a web space, some have argued that a bottom-up, or stimulus driven, approach to advertising may succeed in capturing user attention. Findings from prior research have suggested that making a stimulus bright, large, colorful, or otherwise salient may succeed in capturing user attention [Wickens & Hollands, 2000]. Motion is one attribute that is often thought to capture attention. Yantis and Hillstrom [1994] conducted research using search arrays to determine whether motion can capture attention. During the course of their experiment, users were presented with a large global letter that was composed of smaller letters, for example, a large S composed of small T's. Participants were asked to name the identity of the global letter aloud. On some of the trials, one of the smaller letters exhibited motion after its appearance on the screen. Participants' response to the naming of the global letter was slower during the motion conditions [Yantis & Hillstrom, 1994].

Yantis and Hillstrom's findings support the new-object hypothesis, which states that motion captures attention when it requires the creation of a new object file (a visual representation of a perceptual object containing various attributes of the object such as its color, shape, or motion state). When a change in a scene occurs, the scene may be resegmented and an object file may be created for each new object, with new objects automatically receiving high attentional priority [Yantis & Hillstrom, 1994]. The new object hypothesis suggests that pop-up advertisements and banner ads that alternate between different images are more likely to capture attention since they produce changes in a visual scene.

The previous research has established that users view web pages with a perceptual set of what types of items are likely to be found in certain areas of a web page. Also, when users selectively attend to some items while engaged in a task, they are likely to miss other items that are dissimilar to the attended items. However, items that appear on a page with abrupt visual onsets may capture attention and thus overcome these limits of selective attention. In light of these findings, it is predicted that users in the present study will remember little about the content of the static banner advertisements and will remember more of the content of the alternating banner advertisements. Participants will remember less of the content from the static banner advertisement as they will be engaged in a selective attention task and are therefore likely to exhibit "banner blindness" similar to that found by Benway and Lane [1998] in their research. Participants are more likely to remember content from the alternating banner advertisements since the abrupt onset of a new image is more likely to capture users' attention, and therefore promote some processing of the information contained in the advertisement body, than the static banner advertisements.

It is predicted that participants will have their attention captured more quickly by the alternating banner advertisements. Since the alternating banner advertisement is likely to cause the generation of a new object file and new objects are automatically assigned high attentional priority, this high priority will be exhibited by more total fixations on the body of the alternating banner ad. Participants in the static banner condition will likely make fewer total fixations on the body of the ad due to "banner blindness". Participants will likely take longer to complete the search task in the alternating banner condition due to the attention capturing properties of the ad. This finding would be similar to those from Yantis and Hillstrom's research, which found the movement of a smaller letter delayed participant's response to naming the identity of a larger global letter [Yantis & Hillstrom, 1994]. The search task is less likely to be slowed by the static banner advertisement due to "banner blindness."

Finally, participants are expected to exhibit a negative attitude toward the alternating banner advertisements and a more neutral attitude toward the static banner advertisements. The attention capturing properties of the alternating banner advertisement and its likelihood of slowing the completion of the search task will cause participants to feel more negatively toward the alternating banner ads. The static banner advertisements are less likely to be noticed by participants and will have less of an effect on their completion of the search task. Therefore, participants will feel more positively about their presence.

The present study was conducted using an ISCAN eye tracker to measure how many times participants fixated on the body of the ads. This measure provided an indication as to how effective the advertisements were in capturing participants' attention. A recognition memory task indicated how effective the advertisements were in promoting implicit memory for content of the ads. Finally, an attitude questionnaire assessed how bothersome the advertisements were to the participants and their perception of how the ads' presence affected their performance on the search tasks.

2 Method

2.1 Participants

The study was conducted with 10 participants, 2 male and 8 female, with an age range of 18 to 21. A between-subjects design was used, with one group of five participants exposed to only static banner advertisements and a second group of five participants exposed to only alternating banner advertisements. Participants were randomly assigned to either the static banner group or the alternating banner group. Two participants' eye movement data was unable to be analyzed, and so was not included during data analysis.

2.2 Materials

The experiment was conducted using a series of images designed to replicate an Internet news site, the Herald Online (www.heraldonline.com). The images appeared similar to Internet web pages and included text areas and button areas that the user can click with their mouse. Clicking a button present on an image transported the participant to another image. In this fashion, the series of images served to replicate the Internet experience without the use of an Internet browser. Each user traversed the series of images while attempting to answer six questions. An example of a question that was asked is, "What recipes did Janet Oyler contribute to the cookbook about Carolina food?"

Figure 1. Experimental Website

The images used for the static banner condition and the alternating banner condition remained identical with the exception of the type of banner advertisement present. In both conditions the banner advertisement was presented in the top center of the image, which is the most common location for banner advertisements on the Internet.

There were six banners presented during the course of the experiment, each banner advertising a different product. To minimize the chance of previous exposure to the advertised products, the banner advertisements displayed information about events and businesses local to a place other than where the experiment takes place, rather than nationwide businesses or products. The order in which the advertisements were presented to participants was randomized using a Latin Square design.

The alternating banner advertisements consisted of two differently formatted advertisements for the same product. The content of the advertisements did not change between the two images, but the content's position on the body of the ad changed. The ads alternated images every two seconds and exhibited cut replacement, with the second ad instantly replacing the first ad to produce an abrupt onset of the second ad image. An example set of two images used to create an alternating banner advertisement can be viewed in Figure 2.

A 60 Hz ISCAN video-based pupil tracking system was used to monitor where the participant is looking on the screen. The eye tracker used was non-obtrusive and did not require the participant to wear any equipment during its use.

Figure 2. Alternating Banner Advertisement

A questionnaire was presented at the conclusion of the experiment. The questionnaire measured participants' attitudes toward the advertisements they encountered during the experiment. The survey assessed their attitudes using questions to determine to what extent they considered the ads distracting and if they felt that the presence of the advertisements slowed their work as they searched for the answers to the six experimental questions. Attitude survey questions were answered using a 5-point Likert type scale.

A recognition task for the advertisements that were presented during the course of the experiment was given immediately after the completion of the search task. The recognition task used was similar to that used by Strayer, Drews and Johnson to test recognition memory for billboard advertisements [Strayer et al., 2003]. During the recognition task, users were presented with twelve images of banner advertisements on a computer monitor. Six of these advertisements were present during the course of the experiment and six of these were not. The task prompted users to indicate if the advertisement presented was on the screen at any time during the experiment using "yes" and "no" buttons present on the screen. The recognition task was scored

as a ratio of the percentage of correct "no" responses to ads that were not present in the study (probability of false alarms) to the percentage of correct "yes" responses to ads that were present in the study (probability of hits). The average of these two percentages yielded a percentage of correct signal detection. The following formula was used in data analysis:

$$P(A) = \frac{P(Hits) - [1 - P(False\ Alarms)]}{2}$$

Participant signal detection scores were compared to a baseline of 50%, which represents the score for chance performance on the recognition task.

2.3 Procedure

When participants arrived at the laboratory they were given a consent form inviting them to participate in a study concerning how people read text on the Internet. They were then seated in front of a computer and performed a short calibration procedure for the eye tracker. Participants kept their chin in a headrest during the entire experiment in order to minimize head movement. Participants were then instructed as to how to complete the experiment. They were given six questions, one at a time, and asked to find the answer to the question using the website presented to them. Experimental questions were presented in the same order for all participants. Each question was read aloud to the participant, and questions were repeated if necessary. Participants began their search immediately after each question was read aloud and clicked a "Done" button present on the screen before verbally stating the answer they found. They were allowed unlimited time to answer each question, but they were asked to find each answer in a timely manner while remaining accurate. A question was considered completed when the participant clicked the "Done" button on the screen before they stated the answer to the question. Participants received no feedback as to the correctness of their response. They then returned to the home page of the website and was presented with another question. Participants who answered a question incorrectly were allowed to move on to the next question. The experiment proceeded in this fashion until all six questions had been answered. Participant search times for each question were determined using the difference between the start time, when the experimenter completed reading the question aloud, and the end time, when the participant clicked the "Done" button before answering the question verbally. All times were measured with a stopwatch.

During the course of the experiment, participants were presented with six advertisements, each advertising a different product. None of the answers to the experimental questions were able to be answered using the text present in the advertisements. The eye tracker was used to determine how many total fixations the participant performed on the advertisement body. A minimum of 150 milliseconds was used to qualify as a fixation. Each question had one of the six advertisements present in the top center of the screen during the entire time the participant searched for the answer to the question. The ad remained in the top center of the screen until the participant clicked the "Done" button indicating they had found the answer to the question. The advertisement present then changed to another of the six experimental banners when the participant returned to the home page to begin another question. This advertisement then remained on the screen until the participant completed the question by clicking the "Done" button. Each advertisement was used only once during the course of the experiment.

Following the completion of the last question, each participant first completed the recognition task on a computer, which asked them to indicate which banner advertisements of the twelve presented to them had been present on the screen at any time during the course of the experiment. Finally, participants completed an attitude survey. Following the attitude survey, participants were debriefed as to the purpose of the experiment.

3 Results

T-tests were used to measure the difference in the total number of fixations performed on the advertisements between the alternating banner group and the static banner group. Figure 3 below indicates the average number of fixations on the six banner advertisements during the entire course of the experiment by members of the static banner group and members of the alternating banner group. As can be seen in the figure, members of the static banner group made an average of 43 fixations on the banner advertisements (SD=54.19) and members on the alternating banner group made an average of 166 fixations on the banner advertisements (SD = 224.8). Members of the alternating banner group did not make significantly more fixations on the advertisements than members of the static banner group, $p = 0.27$. An example scanpath over an image by a member of the alternating banner group can be viewed in Figure 7.

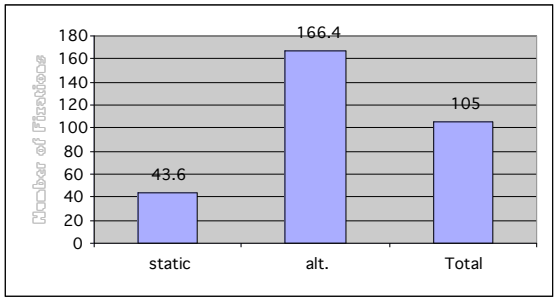

Figure 3. Average Number of Fixations for Each Type of Banner Advertisement

The recognition task was scored as a ratio of correct signal detection (hits) and a ratio of false alarms. A hit

was scored whenever a participant correctly indicated a banner advertisement that had been present during the experiment as being present. A false alarm was scored whenever a participant incorrectly indicated a banner that had not been present during the experiment as being present. The ratios for the hit detection and false alarm scores were compared to a baseline of 0.50, which represents chance performance. The static banner group exhibited better signal detection ratios in both probability of hits (0.19) and probability of false alarms (0.10). The alternating banner group exhibited signal detection ratios close to chance, with the probability of hits being 0.35 and the probability of false alarms being 0.44.

Figure 5 illustrates the mean search times for the six experimental questions for the alternating banner group and the static banner group. T-tests were used to determine if there was a significant ($p < 0.05$) difference in the mean search times between the groups. As can be seen in the figure, the alternating banner group had a significantly higher total mean search time for the six experimental questions compared to the static banner group, with the alternating banner group taking an average of 343 seconds for six experimental questions and the static banner group taking an average of 291 seconds to complete the six experimental questions, p=0.04. While the total mean search time for the questions was significantly different, individual comparisons for each of the question means between the groups were not significant. The mean search times (in seconds) for each of the six experimental questions by group can be viewed in Figure 5.

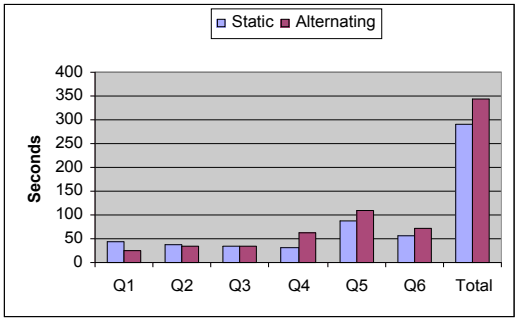

Figure 4. Average Search Time for Experimental Questions

The answers to each of the attitude survey questions were analyzed using t-tests to compare the answers between the alternating banner group and the static banner group. Participants answered each question on a 5 point Likert-type scale, with 1 meaning "strongly disagree", 2 meaning "disagree", 3 meaning "neither agree or disagree", 4 meaning "agree", and 5 meaning "strongly agree". Question 1 asked participants if they thought they noticed the advertisement banners during the experiment. The mean for this question did not differ significantly between the groups, with the alternating group indicating a mean of 1.8 (SD=0.8) and the static group indicating a mean of 2.2 (SD=1.3), p=0.257. Question 2 asked participants to indicate whether they found the advertisements to be distracting while they searched for answers to the experimental questions. The mean for this question did not differ significantly between the groups, with the alternating group indicating a mean of 1.8 (SD=0.8) and the static group indicating a mean of 1.8 (SD=1.3), p=0.428. Question 3 asked participants to indicate whether they thought the advertisements slowed their progress in completing the experimental questions. The mean for this question also did not differ significantly between the groups, with the alternating group indicating a mean of 1.6 (SD=0.8) and the static group indicating a mean of 1.8 (SD=1.1), p=0.264. The means for each of the attitude survey questions can be viewed in Figure 6.

	Static	Alternating	t-test significance
Q1	44.60 (SD=53.3)	26.00 (SD=8.9)	.062
Q2	37.40 (SD=11.5)	35.40 (SD=14.5)	.942
Q3	34.00 (SD=11.1	35.80 (SD=20.7)	.414
Q4	31.40 (SD=24.4)	63.80 (SD=41.7)	.363
Q5	87.80 (SD=51.8)	110.4 (SD=46.1)	.478
Q6	56.40 (SD=40.5)	71.60 (SD=50.5)	.412

Figure 5: Mean Search Times for Experimental Questions by Group

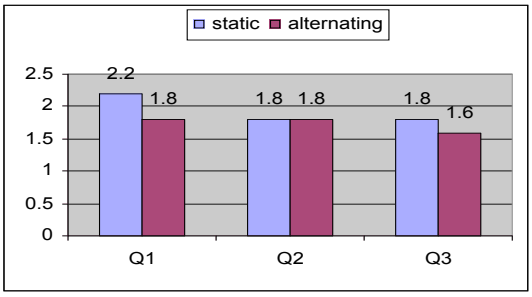

Figure 6. Attitude Survey Question Means

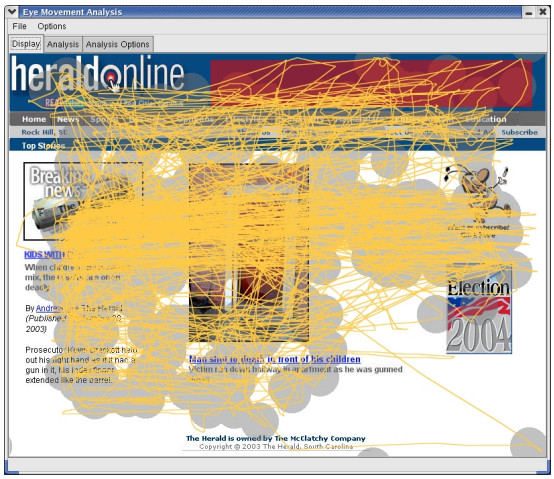

Figure 7: Example Scanpath over an Image

4 Discussion

In this study, an advertisement was considered to be more effective than another if it was more successful at capturing user attention, as exhibited by more fixations on the advertisement body, if it increased recognition memory for the ad's content, and if it increased positive attitudes toward the ad by participants. The results of the study did not provide support for the increased effectiveness of the alternating banner advertisement as compared to the static banner advertisement. The alternating banner advertisements were not significantly more effective at capturing user attention while they were engaged in a task than the static banner advertisements. As has been shown by previous research, the appearance of a new perceptual object is highly likely to capture the observer's attention [Yantis & Hillstrom, 1994]. However, the abrupt onset of the second ad image in the alternating banner condition did not appear to be effective at capturing user attention in the current experiment.

The results of the study indicate that participants' fixations on the advertisements did not promote recognition memory for the banner advertisements presented during the experiment. Both groups performed poorly on the recognition task, with the alternating banner group exhibiting performance closer to chance than the static banner group. This result is contrary to the hypothesis that members of the alternating banner group would exhibit better recognition memory for the advertisements than members of static banner group. Though the mean number of fixations performed on the advertisements did not differ significantly between the groups, members of the alternating group did make more total fixations on the banner advertisements than the static banner group. Therefore, it is highly unusual that members of the static banner group would exhibit better recognition memory for the advertisements given their lower number of total fixations. (Note: It is worth to note that, although not included in data analysis, both groups performed poorly on a measure of recall memory that was administered before the recognition task.)

The alternating banner advertisements were not sufficiently distracting so as to slow down the members of the alternating banner group in completing the experimental questions. Members in the static banner group and the alternating banner group both seemed to complete the questions in a timely manner. This finding may indicate that participants' attention was directed toward the experimental task itself, and that both types of advertisements were unsuccessful in capturing user attention.

Finally, contrary to the hypothesis, both groups exhibited a neutral attitude toward the banner advertisements present during the experiment. Neither the static banner group of the alternating banner group found the advertisements to be bothersome or distracting. Some participants even indicated a slightly positive attitude toward the advertisements. This finding is surprising, given that Internet advertising in general is often viewed as intrusive and bothersome. Participants may have felt more positively about the banner advertisements since they were engaged in a task and their attention was directed toward searching for the answers to the experimental questions. If this experiment were repeated without having the participants engaged in a task, participants may judge the advertisements as more bothersome.

While the study does not provide support for the effectiveness of the alternating banner advertisement over the static banner advertisement, it does provide support for the idea of "banner blindness." Overall, the measures in the study provide support for the idea that users pay little attention to banners and can remember little about their content. Participants did make fixations on the banners, but they exhibited poor memory for the content of the advertisements as their attention was directed toward the experimental task. Similar behavior can be expected from Internet users, as most have a specific goal in mind as they browse the Web.

Further research on the topic of Internet advertising should investigate other forms of advertising that have become increasingly popular, such as pop-up advertising or Flash advertising. The collection of eye tracking data is encouraged when pursuing these topics, since as it provides a valuable measure of user attention. Further research may also want to investigate user attention to Internet advertising as they freely browse the Internet, while not engaged in an experimental task.

On the Internet a user's attention is a valuable asset for advertisers. Ad designers must be aware of which types of advertisements are most effective at capturing user attention in a medium where they are bombarded with information from countless sources. While fighting for

the user's attention, advertisements must also be unobtrusive enough to not cause users to develop a negative attitude toward the ad and, in turn, to the product being advertised. Neither an alternating banner advertisement or a static banner advertisement appears to be effective in achieving this delicate balance.

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