ARE UNCLICKED ADS WASTED? ENDURING EFFECTS OF BANNER AND POP-UP AD EXPOSURES ON BRAND MEMORY AND ATTITUDES

Patrali Chatterjee
Department of Marketing,
School of Business
Montclair State University,
Upper Montclair, New Jersey, 07043
chatterjeep@mail.montclair.edu

ABSTRACT

Do creative ad executions like large ad sizes and intrusive ad formats that enhance communication outcomes and clickthroughs immediately after ad exposure persist over time? In examining this question, we focus on the role of advertisement size (large vs. small) and ad exposure format (intrusive vs. voluntary) on immediate and delayed brand recall, ad recognition and brand attitude in web-based media. Voluntary exposure ad formats like banners and text ads are more likely to be cognitively avoided since it is an automatic, subconscious process that occurs in parallel with the browsing activity and does not require any behavioral action by the consumer. Intrusive ad formats like pop-ups that interrupt browsing activity and demand immediate response are more likely to be physically avoided by closing them. Prior research on preattentive processing and endurance of implicit/ explicit memory and memory for subgoals supports our findings that gains from using intrusive ads accrue when ad sizes are small and negative impact of intrusiveness decay over time.

Keywords: advertising effectiveness, ad avoidance, banner ads, memory, pop-up ads

1. Introduction

Research on effectiveness of ad exposure has largely focused on memory and behavioral (clickthrough) outcomes measured immediately after exposure to target ad(s). In such situations, the ad is very salient, memory traces of the ad are very accessible, and impact on communication outcomes and attitudinal measures are strong [Chattopadhyay & Nedungadi 1992]. In reality, there is generally a delay between ad exposure and product search, choice or purchase, hence ad-evoked memory outcomes and attitudes must endure over time if they are to influence behavior. The need to generate memorable ad exposures is especially acute in for websites and e-retailers due to low switching costs compared to their offline counterparts [Mu & Galletta 2007]. Prior research indicates that attitude persistence, memory for the ad, its context and communication outcomes persist when ads are elaborately and systematically processed under high message involvement. However, most ad processing is under low-involvement conditions [MacInnis et al.1991] and ad avoidance is the norm rather than an exception. Therefore, examining how ad-evoked attitudes and communication outcomes persist over time under low involvement and ad avoidance is an important research goal.

Published research in television advertising has extensively studied the impact of ad processing on memory and attitude persistence. While researchers have investigated persistence of communication outcomes under low involvement for television advertising, the impact of cognitive or physical (zipping or zapping) ad avoidance on long-term impact of ad exposure has been largely unexplored. This issue takes on additional importance in the web medium where ads differ in how they are delivered (co-exist with or interrupt browsing) and ad avoidance is the default action compared to television viewing where consumer need to take action in order to zap or zip ads. Little is known about the persistence of memory-based communication outcomes and attitudes generated by ads in the web medium. Specifically, advertisers want to know if consumers who don't click when exposed to their online ad will recognize or recall the ad or the advertised brand in future and visit the advertiser's web site directly when the product category need arises. Can these memory-based post-impression conversions (or view-throughs) be attributed to earlier ad exposures? This can provide an alternative justification for continued ad placements at the media vehicle despite low clickthrough rates observed immediately after ad exposure.

This research investigates immediate and delayed consequences of ad exposure in the web medium as a function of ad exposure format (voluntary vs. intrusive) and the size of ad stimulus (large or small). In the next section we discuss prior research on impact of cognitive and physical ad avoidance on communication outcomes.

Next we discuss consumer interactions with voluntary exposure ads that co-exist with media content and intrusive exposure ads that interrupt consumers' consumption of media content to demand immediate response and specify hypotheses. We test our hypotheses in an experiment and conclude by identifying ad execution features that induce implicit processing of advertising stimuli in busy media environments that advertisers can use to increase the value of their online advertising investments.

2. Ad Avoidance and Memory

Most consumers attend to media for the purposes of consuming content, hence conscious processing of ads is constrained in actual media consumption environments [MacInnis et al.1991]. The ubiquity and enormity of ad clutter leads to cognitive or physical avoidance of ad stimuli [Burke & Srull 1988]. Cognitive ad avoidance occurs subconsciously when consumers avoiding fixating on ads in their visual field. Physical ad avoidance occurs when consumers consciously use mechanical devices to avoid ads (zapping ads on TV, closing pop-up ads on Web or throwing away print advertising supplements). The impact of ad avoidance on communication outcomes of ad exposure vary based on whether an ad was cognitively or physically avoided.

Cognitive ad avoidance is an automatic process and involves visual screening out of ad stimuli embedded within content and does not need any conscious decision or behavioral action by the consumer. It is manifested through "memory without perception", i.e., the presence of implicit memory but absence of explicit memory. Prior research in preattentive processing suggests that cognitively avoided ads are incidentally processed. They can generate preference, induce consideration and choice behavior without any memory of the ad exposure [Janiszewski 1998]. The lack of explicit memory implies that memory-based communication outcomes are inferior to ads that are elaborately processed, but little is known about their persistence over time.

In contrast, physical ad avoidance is a result of a conscious decision by the consumer to avoid ads and leads to varying degrees of psychological reactance [Brehm & Brehm 1981]. Most research on ad avoidance has considered physical ad avoidance of TV ads (zapping) since it can be tracked, however findings differ. One theory suggests that the heightened attention to the ad in order to avoid it (e.g., zap ads on TV) results in explicit memory and better recall compared to non-zapped (and possibly cognitively avoided) ads [Greene 1988]. Zufryden et al. [1993] find that zapped commercials are more effective than non-zapped ads in their impact on purchase behavior. Others suggest zappers view the ad partially, if at all and find that non-zappers recall more of the brands advertised compared to zappers [Tse & Lee 2001]. Further cognitive resources during heightened attention are devoted to the ad avoidance task rather than the ad information and hence ad information may be preattentively processed leading to implicit memory traces.

Table 1: Research findings on ad avoidance and memory

Ad Avoidance	**Avoidance Decision Mechanism**	**Info Processing**	**Immediate (Tested) Memory & Attitude Outcomes**
Cognitive	Automatic/ Unconscious	Incidental/Preattentive	Implicit memory & neutral/+ve attitude for ad & brand
Physical	Deliberate/ Conscious	Psychological Reactance [Brehm & Brehm 1981] or loss of freedom leading to (i) or (ii) below	Negative ad and brand attitude
		(i.) Heightened attention to ad [Greene 1988; Zufryden et al. 1993]	Explicit memory for ad & brand
		(ii.) Heightened attention to avoidance task [Tse & Lee 2001]	Implicit memory & neutral/+ve attitude for ad & brand

Research suggests that consumers are more likely to engage in cognitive ad avoidance compared to physical ad avoidance since it is a subconscious process and does not require the consumer to deviate from original goals. Consumers will engage in physical ad avoidance when cognitive ad avoidance is not possible or when the consumer is actively trying to avoid ads. Research on the broadcast media, typically assumes that ads and program content typically do not share the same visual (tv) or aural (radio) field. In contrast, web ads may share the same visual field with content as in print media (e.g. voluntary exposure ads like banners, search-based text ads) or may not share the

visual field (based on size of the ad stimulus) by interrupting content consumption (e.g., intrusive exposure ads like pop-ups). Hence the consequences of ad avoidance for different ad exposure formats and size of ad stimuli warrant serious investigation.

3. Consumer Processing of Online Ads and Hypotheses

Ads displayed on web pages seek to divert consumers' attention from their browsing goals to process ad information. Consumer interaction with online ads comprises of a hierarchy of stages starting with preattention, attention and click decision [Chatterjee 2001]. Under conditions of high involvement or personal relevance in the advertised brand or category consumers will have higher motivation, ability and opportunity (MAO) to attend, centrally process and click on ads to elaborate on information in target ad pages [Cho 1999] leading to enduring memory and communication outcomes.

In natural browsing contexts, voluntary exposure ad formats like banner ads and text ads have to compete for consumers' attention with editorial content on web pages (and possibly with other embedded ads). Attention is singularly focused towards achieving navigational goals [Janiszewski 1998], most consumers avoid fixating on banner ads either because they lie in the periphery of the visual field or cognitively avoid them. Dreze and Hussherr [2003] suggest that eyes have been subconsciously trained to avoid banner ads, leading to "banner blindness" or non-perception of banner ads. If consumers perceive ads, in low involvement conditions peripheral cues like ad size may induce consumers to attend to and click on the ad [Cho 1999].

Advertisers are increasingly using intrusive ad formats like pop-up ads (see others at www.iab.net/standards/richmedia.asp) that cannot be cognitively avoided to ensure exposure to ad stimuli. Pop-up ads interrupt the consumers' current browsing task by opening in the foreground of the web page often blocking parts of the page that the consumer wishes to see. They compel the viewer to respond immediately either by clicking to visit advertiser site (process ad information) or physically avoid by clicking to close the pop-up ad in order to resume the original activity. Ad processing moves beyond preattention due to interruption in intrusive exposure formats, exposure and attention to pop-ups is guaranteed even when consumers want to physically avoid them since they have to look at the ads to click close.

Prior research suggests that popup ads yield a significantly higher level of ad perception, a significantly higher clickthrough rate, and higher purchase intention compared to banner ads [Cho et al.2001; Diao & Sundar 2004]. Given extensive prior research on immediate communication outcomes for pop-up vs. banner ads we do not specify any hypotheses but test them. Instead we discuss communication outcomes measured at a delay.

3.1. Impact on Delayed Recall and Recognition Measures

Prior research has demonstrated the immediately after exposure to an advertisement, both the ad and brand are fresh in the consumer's memory, hence explicit memory-based measures like recall and recognition are likely to be higher and there is direct transfer of affect from the ad to the brand. After a delay, memory for the ad declines faster than that of the brand [Moore & Hutchinson 1983], recall and recognition measures will be lower, with recall lower than that of recognition since memory of the ad is not needed for recognition to occur [Chattopadhyay & Nedungadi 1992]. Hence immediate processing has a bearing on delayed measures.

3.1.1. Ad Exposure Format (Focus of Attention)

Voluntary exposure ad stimuli (like banner ads) are preattentively processed. It involves a subconscious feature-based mental representation of the ad stimulus that makes subsequent perception of the stimulus easier (i.e., fluent) in a stimulus-based recognition task without recall of brand name. However in delayed conditions ad stimuli memory (and hence familiarity) will decay fast leading to significantly lower (delayed) recognition score. Since memory traces for ad information in preattentive processing are too weak to be retrievable during a direct search of memory, consumers may not recall being exposed to the advertised brand immediately after ad exposure, or at a delay.

The "heightened attention" hypotheses would suggest that higher cognitive resources available to pop-up ads to physically avoid or click on them will lead to superior immediate recall and recognition scores which are more likely to endure over time compared to preattentive processes. On the other hand, if attention is devoted to avoiding pop-up ads that have interrupted browsing tasks, brand information on pop-up ads will also be preattentively processed and hence not significantly different from banner ads. If both the effects co-exist, delayed recall and recognition will still be higher (if not significant) than that of banner ads.

H1: Pop-up ads will have significantly higher delayed (a.) recall and (b.) recognition measures than banner ads.

3.1.2. Size of Ad Stimulus (Amount of Attention)

Prior research has established the role of ad size in improving memorization in print media [Naccarato & Neuendorf 1998], however results have been mixed in the context of web banner ads. Dreze and Hussherr [2003]

and Chtourou and Chandon [2000] did not find any effects of size on memorization, but Cho [1999] and Chandon et al. [2003] found that banner size has a favorable impact on click intention. They did not test hypotheses for memory or clickthrough, hence we suggest hypotheses for both immediate and delayed measures.

Large banner and pop-up ads occupy more screen space and are more difficult to cognitively avoid compared to small ads. If preattentively processed they have a better chance of attracting attention, more feature-based memory traces of the ad stimuli, higher familiarity and recognition than small ads. Under low-involvement conditions ad size acts as a peripheral cue to induce increased attention to the ad. Large ad sizes facilitate increased message elaboration compared to small ads in high involvement conditions. In impoverished media environments, small pop-up ads can be as easily avoided as small banner ads and preattentively processed. Since they block a smaller portion of the underlying page, physically closing the small pop-up can be deferred and they are less likely to generate explicit memory of the advertised brand. We expect the immediate communication effects to decay over time for both large and small ads, but there is no documented research that indicates communication effects of large ads will decay faster or slower than that of small ads. Since large ads lead to stronger memory traces immediately after ad exposure and decay at the same rate as small ads,

H2: Large ad sizes will have significantly higher delayed (a.) recall and (b.) recognition compared to small ad sizes.

We do not expect immediate and delayed recognition scores to differ for large banner and pop-up ads since both will be difficult to avoid, so we do not propose any hypotheses. Visual scanning of large pop-up to close and resume browsing is more likely to lead to processing of ad information and higher immediate and delayed recall scores compared to banner ads that do not require interaction. Both it is easy to avoid small pop-up and banner ads, however visual scanning of small pop-up ads to close is more likely to lead to perception and higher immediate and delayed recognition measures compared to banner ads. The lack of explicit memory during preattentive processing for small pop-up and banner ads imply no differences in recall measures. Hence,

H3: Large pop-up ads will have higher (a.) immediate and (b.) delayed recall scores compared to large banner ads.

H4: Small pop-up ads will have higher (a.) immediate and (b.) delayed recognition scores compared to small banner ads.

3.2. Impact on Brand Attitude

3.2.1. Ad Exposure Format

Conventional wisdom holds that conscious processing of ads is necessary for ads to impact consumers' preferences. However, research in low involvement and unconscious processing [Shapiro et al. 1997] suggests that consumers may not recall having seen the preattentively processed banner ad stimulus before yet find it familiar. In the absence of explicit memory of the exposure context that could explain the familiarity the consumer will misattribute the familiarity as preference for the brand [Janiszewski 1998]. This can lead to changes in judgments or increased liking for the advertised brand as proposed by the mere exposure theory [Zajonc 1968]. In contrast, when consumers attend to ads immediate attitudinal measures depend on ad-induced feelings and cognitive thoughts generated by the ad copy. Stimuli that hinder satisfaction of immediate goals are labeled as displeasing [Chandon et al. 2003]. Hence interruption in browsing activity by pop-up ads can result in negative response such ad avoidance as feelings of irritation towards the ad stimulus [Li et al. 2002; Edwards et al. 2002] and lower brand attitudes compared to banner ads.

Chattopadhyay and Nedungadi [1992] found that under low-involvement conditions ad attitudes formed in response to peripheral characteristics (to attract attention) may favor immediate evaluations but may decay more quickly over time compared to brand attitudes that are relatively more stable and decay slowly. When there is a delay between ad exposure and measurement, the misattributed familiarity effect due to perceptual fluency of banner ad will decay as feature processed memory traces become weak, leading to lower brand attitudes in delayed condition.

Research on memory and attitude persistence in attentive and systematic processing encoding situations suggests that inferences based on the familiarity-based sleeper effect [Moore & Hutchinson 1985] can be used to explain the impact on advertisement recall, recognition, ad and brand attitudes. Hence the negative impact of exposure context due to intrusiveness will decay faster than brand attitude. Further the brand may seem familiar even though the context (the ad or source that caused familiarity) may not be recallable. Hence evaluation of a brand will be based on familiarity rather than consideration of the ad context. Over time, consumers will have more positive attitudes toward brands they remember, regardless of whether they initially liked the ads or not. Hence,

H5: Popup ads will be associated with (a.) lower brand attitude immediately after ad exposure and (b.) higher brand attitude after a delay compared to banner ads.

3.2.2. Size of Ad Stimulus

Mere exposure and perceptual fluency-misattribution theory suggests that increased perceptual fluency will be misattributed to increased familiarity associated with large banner ads and lead to more favorable brand attitudes compared to small banner ads [Janiszewski 1998]. However the same pattern does not hold true for pop-up ads, hence we do not specify a main effect for ad size on brand attitude.

Trafton et al.'s [2003] memory model suggests that when a consumer is unexpectedly interrupted it helps to have the primary-task display perceptually available, to allow retrieval cues to be quickly accessed and accurately encoded, i.e., have the opportunity to "prepare to resume." Large pop ads block out larger portions of underlying web page making it perceptually unavailable at least temporarily, thus preventing consumers from engaging in preparatory processing and encoding retrieval cues, especially since most pop-ups load suddenly without any warning. Edwards et al. [2002] did not find a significant effect for *duration length*, and point to failure of length manipulation. Smaller pop-up ad sizes also halt primary browsing activity, but still allow consumers to access and encode retrieval cues, since some portions of the screen and web page are still perceptually available. Hence we expect larger pop-up ads will be perceived to be more intrusive and irritating compared to small pop-up ads. Edwards et al. [2002] suggest that strategies that minimize the interruption of viewers' current activities like pop-unders and interstitials are less likely to meet with resistance and perceptions of intrusiveness. Smaller pop-ups may be better alternatives. Since feelings induced by ads moderate effect of brand-related thought on brand attitudes, we hypothesize,

H6: Brand attitude will be significantly more favorable for large banner ads compared to large pop-up ads in (a.) immediate and (b.) delayed conditions.

4. Experimental Design and Method

The experimental design for the lab study had two between-subjects factors (two ad intrusiveness conditions; banner ad vs. pop-up ad and two ad size conditions; large vs. small) and one within-subjects factor (time of measurement). One hundred sixty three undergraduate senior students at a major Northeastern university taking computer-lab classes completed all three stages in our study for $10 cafeteria coupon. 57% (94) were male students, 57% (98) had access to their own computer at home, 63% (104) lived in rental apartments and about 71% (118) used the Internet daily. Their ages ranged from 18-29, with a mean age of 23.

4.1. Context Manipulation

To simulate a natural website browsing experience, ads were embedded in a modified version of the online student newspaper that served as the experimental context. We used the home page and embedded web pages with experimental ads and apartment rental listings within a 15-mile radius of the university to create a relevant context for students. Links to external web sites were removed and the web site was launched from an internal server in a computer lab to ensure page download times were same. The content was the same in all treatment conditions and adjusted to fit on the screen to eliminate the need to scroll and collect page view durations. Questionnaires administered at the beginning of the experiment or at the end to collect dependent measures were integrated into the web site.

Filler ads for ten fictitious sponsors were used to mimic ad clutter and cognitive busyness. Relatively large number of content pages (forty-five, thirty-three content pages and twelve target ad pages) and goal-directed focus were used to create a realistic web browsing experience. We induced goal-directed focus on media consumption by instructing subjects that the student newspaper was planning a major redesign of their site based on their feedback on three occasions during the semester. Similar manipulations were used in prior research [Danaher & Mullarkey 2003; Janiszewski 1998].

4.2. Selection of Ad Stimuli

Prior to development of experimental stimuli, a different set of 41 undergraduate students answered a questionnaire to measure their involvement with fifteen product categories, and relevance and likelihood of the product category being advertised with apartment listings [Rodgers 2004]. Credit card and car rental were chosen as product categories for ad stimuli because they were associated with above average and below average involvement respectively, but both were equally rated as relevant to be advertised with apartment listings.

Ads for two sponsors were used to examine generalizability with action-oriented goal (i.e., Apply for Victory Mastercard, low APR, www.victorymastercard.com) and communication-oriented goal (Supervalue Rental Car Agency, same low rate all week, www.supervaluerental.com). Since prior familiarity with the advertised brands could potentially confound our results [Dahlen 2001], we used fictitious brands for focal and filler ads. Banner and pop-up ads had the same copy and creative execution in all treatment conditions. There was a hyperlink "click here" on the lower right corner, an image on left edge, URL and the sponsor name in words. The pop-up ads had a "click

to close" hyperlink on the top right corner. The copy consisted of the goal statement in light yellow font on a light green background. Only one banner or pop up ad was displayed on any web page accessed, except target ad pages.

Respondents could click on banner or pop-ads to view target ad pages to ensure replication of actual web browsing and tracking of clickthroughs. We did not want to introduce demand effects by asking subjects to click on ads, so we advised them to click on any content or ad hyperlink content if they wanted more information. The content on the target ad pages was modified, brand names, URLs, goal statements in the banner or pop-up ad and toll-free numbers to get more information were now displayed. Please note that no additional information except the toll-free number was provided in the target ad since it may have an impact on brand attitude measured at the end of the experiment (and target ad processing is not under investigation).

4.3. Procedure

Data was collected in three stages. Every student was provided with a numeric code that they used to access questionnaires and web site in all three stages and receive course credit. We used the numeric code to track responses in the three stages and allocate subjects to experimental conditions. In the first stage, subjects answered an online questionnaire to measure involvement with several product categories. Demographic, Internet use information, attitudes toward web advertising and use of popular technologies (which included pop-up blocker, anti-spyware, DVRs and digital photo album) were collected, as were awareness and frequency of use of the student newspaper site.

A week later, the second stage was conducted in several forty-five minute sessions. Subjects were told to carefully browse through the web site for 15 minutes, imagine that they needed to find an apartment for the next academic year (these were students taking Summer classes) and answer questions at the end of the session. Subjects were randomly assigned to one of the four conditions: ad format (banner vs. pop-up), and ad size (large vs. small) according to our experimental design. They were exposed to the experimental ad stimuli for one focal sponsor (counterbalanced) and filler ads at least three times during the session. After 15 minutes, subjects were taken to an online questionnaire to provide dependent and manipulation check measures. In the third stage, conducted seven days after the second stage, subjects reported delayed unaided recall, conditional post impression conversion intent, brand attitude and recognition measures in an online questionnaire. Participants were thanked, given $10 and debriefed before leaving.

4.4. Independent Measures

Ad exposure format: We manipulated ad exposure format conditions with the use of banner and pop-up ads for two fictitious sponsors (Supervalue Rental Car Agency and Victory Mastercard). Students in each condition were exposed to ad stimuli for only one focal sponsor and filler ads three times during the session. A questionnaire was used to assess perceived intrusiveness consisting of seven items: distracting, disturbing, forced, interfering, intrusive, and obtrusive [Li et al. 2001].

Size of ad: Size of banner and pop-up ads was manipulated as small (250×250 pixels) or large (550×480). The banner was placed on left center (top-bottom) of webpage and the pop-up ad opened at the same position. Measures of perceived size were collected for manipulation checks.

Measurement Delay: Immediate measures were collected at the end of the second stage. The seven-day delay following ad exposure for delayed measures is consistent with prior research [Chattopadhyay & Nedungadi 1992].

4.4.1. Covariates

Prior research has shown that product involvement can have an impact on information processing and perceived relevance of information in advertising [MacInnis et al. 1991]. We used a nine-item, nine-point Likert scale measure to measure product involvement [Zaichkowsky 1985]. The mean on the scale was 6.8 for apartments and 5.4 and 7.8 for car rentals and credit card respectively. This indicates subjects had above-average level of involvement with experimental context and credit card but below average level of involvement with car rentals. Cronbach's α for the scale was 0.89, 0.91 and 0.93 for apartment listings, credit card and car rentals.

Overall attitude (5 –item, 5-point Likert scale) toward Web advertising and actual usage of ad avoidance software in Internet use will impact ad processing. We used a weighted index of ad avoidance technology usage (e.g., DVR, pop-up blocker and anti-spyware) and self-reported subjective measure of ad avoidance behavior while reading newspapers, magazines, TV and Web. These measures were collected in the first stage of the experiment.

4.5. Dependent Measures

Unaided recall and recognition: Recall was measured followed by recognition immediate after ad exposure (second stage) and after a delay (third stage). These dependent measures were calculated by considering each advertisement to have four elements: a brand name, ad claim, image used and a web address (or URL). Subjects scored 0.25 for each element correctly recollected or recognized. In the recall measure, subjects were asked to list all ad information they remember seeing. We measured subjects' recognition memory by using sequential two-alternative forced choice tests of brand name, claim, image and URL.

Attitude toward the target brand: Brand attitude was assessed by 3 seven-point scales anchored by phrases "good-bad," "like-dislike," and "favorable-unfavorable." The α coefficient was 0.92 indicating a high degree of internal consistency. For the delayed condition, two scales were added to our original attitude measures to assure that attitude persistence was due to actual maintenance of attitude rather than memory for the earlier measure. In the session, prior to responding to the three "earlier" measures, subjects responded to two new statements on seven-point scales anchored by strongly agree and strongly disagree. The statements were "Victory (Supervalue) is a good credit card (rental car agency)" and "Victory (Supervalue) offers favorable interest (rental) rates."

Clickthroughs and Post Impression Conversions: Immediate clickthroughs were collected from server clickstream and specified as proportion of subjects clicking on the ad to look at target ad page. Subjects also reported intention to click at the end of the second stage of experiment. Unlike actual commercial settings, (delayed) post-impression conversion measures cannot be reliably collected in experiments. In stage three, binary responses to the conditional (assuming a product-category need) recall of focal sponsor URL were collected. If correct focal sponsor URL to the question "please write brand names or sites URLs to visit if you need to apply for a credit card (rent a car)" was mentioned, post-impression conversion intent was 1. It was collected after the recall measure but before recognition and attitude measures.

4.6. Manipulation Checks

To test if our context manipulation was successful and subjects were goal-oriented in their browsing orientation we used responses to a battery of questions (adapted from Novak, Hoffman & Duhachek 2003) provided by subjects in the survey at the end of the experiment. The t-test of differences between the number of goal- and experiential oriented statements (8.2 vs. 3.5, $p<0.01$) was significant overall and across each of the conditions.

Participants exposed to pop-up ads reported higher perceived intrusiveness (mean 5.1, s.d. 2.9) compared to those exposed to banner ads (2.6 vs. 1.2), hence manipulation of ad exposure format was successful (t=6.9, $p<0.05$). To assess if ad sizes were perceived to be different, participants were asked what proportion of computer screen was occupied by ads. The perceived proportion of screen space occupied by large ads was significantly higher then respective small ads (54% vs. 29%, t=7.13, $p<0.01$), hence our ad size manipulation was successful.

5. Results and Discussion

Chi-square tests revealed no significant differences in Internet use frequency, use of ad avoidance technologies and ownership of computer across cells. Preliminary analyses (*Table 2*) indicated mean recognition scores were significantly higher than recall scores in immediate {(0.691, s.d. 0.21) vs. (0.397, s.d. 0.29), $p<0.01$} and delayed conditions thus replicating earlier research [Moore & Hutchinson 1983]. Product involvement and web advertising attitude as covariates were insignificant ($p>0.05$) in initial analyses, and dropped from further analyses.

We conducted a series of mixed-model ANCOVAs, with time as within-subjects factor to test our hypotheses. Initial 2×2×2 ANOVA analyses revealed no significant main or interaction effects of product type for each of the dependent variables. Consequently, we pooled data for the two products for the reminder of our analyses. Test results of equality of regression slopes across the independent variables revealed that ad avoidance technology usage can be used as a covariate but the variance explained in the dependent variables was low (i.e., below 3 percent).

Table 2: Communication outcomes: lab experiment

Ad size	Ad Format	Initial Recall	Delayed Recall	Initial Recognition	Delayed Recognition	Initial Attitude	Delayed Attitude	N
Large	Banner	0.46 (0.13)	0.29 (0.11)	0.73 (0.28)	0.64 (0.21)	3.67 (1.36)	3.49 (0.79)	40
Large	Pop-up	0.51 (0.28)	0.27 (0.06)	0.77 (0.18)	0.69 (0.3)	1.94 (1.04)	3.52 (1.29)	43
Small	Banner	0.26 (0.11)	0.18 (0.13)	0.55 (0.21)	0.34 (0.19)	3.79 (1.03)	2.64 (1.9)	42
Small	Pop-up	0.32 (0.09)	0.24 (0.1)	0.64 (0.19)	0.51 (0.21)	2.56 (0.94)	2.59 (1.1)	41

Means and standard deviation by condition (N=166)

The main effect of ad exposure format was significant ($F(1, 164)= 21.87$, $p<0.05$). Planned contrasts indicated that recall for pop-up ad is significantly higher than banner ad in immediate and delayed measurement condition ($F(1, 81)=17.86$, $p<0.05$), thus *H1a* was supported. The main effect of ad size (*H2a* not supported) and other interactions (*H3a, b* not supported) were insignificant for recall.

Our analysis revealed a significant three-way interaction of ad size with time and ad format for recognition (F(1, 162)=31.53, p<0.001). It is critical to note that the two-way interaction of ad format and time achieved significance when ad size was small. This significant interaction indicates that, as predicted, that ad format had a significant impact on recognition endurance in small ad size condition (F(1, 81)= 37.13, p<0.01). Further, simple main effects indicated that in small ad size condition, recognition for pop-up ad did not decay significantly over time (F(1, 40)=1.09, p>0.1), whereas use of a banner ad lead to a significant decay in recognition over time (F(1, 41)=51.1, p<0.001). Planned contrasts revealed that delayed recognition was significantly higher for pop ad than for banner ad (F (1,81)=19.3, p<0.01), which provides additional evidence of the greater recognition endurance due to pop-up ad (*H1b* supported). None of the large ad size effects achieved significance. Thus ad format had no significant effect on recognition endurance under large ad size conditions (F(1,81)=1.12, p>0.05) (*H4 a, b* supported).

The three-way interaction of ad size with time and ad exposure format was significant for brand attitude (F(1,162)=28.91, p<0.05). The significant two-way interaction of ad format and time under large ad size condition (F(1, 81)=25.61, p<0.05) indicates that the negative impact of pop-ad use on brand attitude immediately after exposure (*H5a* supported) does not decay with time (F(1,41)=19.38, p<0.05), *H5b* is rejected. Simple main effects indicate that brand attitude with banner ad use was significantly higher than pop-up ad use when measured immediately after ad exposure and also after a delay (F(1,81)=18.17, p<0.05) in the large ad size condition (*H6 a, b* supported). In contrast, when ad sizes are small, immediate brand attitude for banner ad use was significantly higher than pop-up ad F (1, 81)=19.3, p<0.05, however it was not significant in the delayed condition F(1,81)=1.43, p>0.05. These results indicate that ad format has a significant impact on attitude persistence for large ad sizes but not when ad sizes are small. The data offer support for sleeper effects when pop-up ads are small but not when they are large.

We found a significant main effect of ad format for post impression conversion ($\chi^2(1)$ =3.95, p<0.05). Tests indicate that (delayed) post impression conversion intent was significantly higher for banner ads compared to pop-up ads (0.2 vs. 0.09, p<0.05). However there were no significant differences between large and small ads (p>0.05), observed differences were probably due to random variances. Hence higher delayed recall of pop-up ads (as support for *H1a* suggests) does not convert to higher (conditional) propensity to solicit information in delayed conditions. We found that immediate clickthrough rate for pop-up ads was insignificantly higher than banner ads (0.18 vs.0.13, $\chi^2(1)$=0.62, p>0.05) however clickthrough rate for large ads was significantly higher than small ads (0.22 vs. 0.08, $\chi^2(1)$=6.567, p<0.001), replicating earlier research [Chandon et al. 2003].

Table 3: Summary of hypotheses and results

Hypotheses	Supported	Rejected
H1: Pop-up ads will have significantly higher delayed (a.) recall and (b.) recognition measures than banner ads.	*H1a and H1b*	
H2: Large ad sizes will have significantly higher delayed (a.) recall and (b.) recognition compared to small ad sizes.	*H2b*	*H2a*
H3: Large pop-up ads will have higher (a.) immediate and (b.) delayed recall scores compared to large banner ads.		*H3a and H3b*
H4: Small pop-up ads will have higher (a.) immediate and (b.) delayed recognition scores compared to small banner ads.	*H4a and H4b*	
H5: Popup ads will be associated with (a.) lower brand attitude immediately after ad exposure and (b.) higher brand attitude after a delay compared to banner ads.	*H5a*	*H5b*
H6: Brand attitude will be significantly more favorable for large banner ads compared to large pop-up ads in (a.) immediate and (b.) delayed conditions.	*H6a and H6b*	

6. Managerial Implications and Future Research

We examine the effect of ad exposure format and ad size on immediate and delayed memory-based communication (recall, recognition, brand attitude) and behavioral (clickthrough and post impression conversion) outcomes. Our experimental findings motivate the following theoretical and practical implications.

6.1. Use of Attention-Grabbing Intrusive Ad Formats

Online advertisers face a formidable challenge in generating memory for their brand even when using intrusive ad formats. We found recall scores to be significantly lower than recognition scores immediately after ad exposure indicating that most ads were processed preattentively (banner ads) or peripherally (pop-up ads). While pop-up ads

are more successful in grabbing attention, generating recall and clickthroughs compared to banner ads even when ad sizes are small, their associated negative affect leads to lower brand attitudes and tendency to avoid ads over time. Our results suggest that advertisers desiring an optimal combination of attention-getting benefits, brand attitude and clickthroughs should consider small pop-up ads. Communication measures for small pop-up ads are high and enduring, the negative impact on brand attitude relatively small and forgotten after a delay.

However, as newer browsers with automatic pop-up blockers become popular, intrusive pop-up ads may not be an option. As Rajagopalan and Deshmukh [2005] note that with rapid developments in technology, factors that are perceived as being important by online customers today may not be as critical in the future as consumers' concerns shift over time. Yet, it is necessary to examine effects of intrusive exposure to establish boundary conditions and trade-offs to motivate development of innovative ad formats. Expandable banner ads, one such alternative, expand over the webpage when consumers move their mouse over them. The unanticipated expansion over the page (similar to pop-up) generates perception without the undesirable interruption of browsing activity to close, since it automatically collapses as the consumer (his eye gaze and mouse) resumes the browsing task. At the same time it increases the area covered on the screen (similar to large banner ads) At this time, use of expandables in controlled experiments is a challenge since it is difficult to ascertain if the banner expanded on the screen, otherwise its impact will be similar to regular banner ads for the original (unexpanded) size.

6.2. Implications for Print Ad Processing

The information processing perspective provides the research framework motivating research on consumer response to characteristics of print ads [Assael et al. 1967]. Both the hierarchical and divergent information processing models (similar to model of online ad processing adopted in this research) suggest that a consumer is exposed to an ad because of its size and location within a print vehicle. The effect of ad size in print medium has similar effects as we find in this research (*H2 a,b*) for voluntary Internet ads, i.e., a significant positive impact on delayed recognition but not recall measures immediately after ad exposure [Finn 1988]. Despite this similarity, there is an important point of difference between voluntary Internet-based ads and print ads. Internet ads integrate persuasion and purchase consideration whereas print ads do not allow their consumers to consummate purchase within the medium. Therefore, Internet ads may evoke more conative responses because they facilitates purchase without time delay or other constraints [Djikstra et al.2005]. Hence we expect the effects found for Internet ads will be stronger than that for print ads. The impact of ad size on brand attitudes has not been studied for print ads, however research on sleeper effects and this research (*H5b, H6b*) would suggest a weaker but positive impact of ad size on brand attitudes for print ads. Since there are no print media equivalents of pop-ups, we cannot propose any inferences based on our findings for intrusive ad formats (i.e., *H1, H3)*.

6.3. Use of Non-Intrusive Ad Formats

Gains in ad exposure outcomes due to non-intrusive ads arises primarily from large sizes. Large banner ads do not impact explicit memory or recall of advertised brand, yet large banner ads yield significantly superior and enduring brand attitude compared to small banners or pop-up ads and are better suited for long-term branding goals as results for post-impression conversions indicate. Sponsored content, text ads and advertainment as alternative ad formats should lead to more enduring communication outcomes because placement is contextual and ad information is elaborated extensively as part of media consumption [Rodgers 2004]. Use of multiple ad formats might also improve outcomes [Becker-Olsen 2003]. Consumer engagement with such advertising-centric content with added value and essentiality implies consumer willingness to process advertising information [Wang et al. 2005]. Contrasting effects might be found for some segments of consumers who suspect such attempts to be manipulations and unfair. It is however an important topic for future research.

This study has several limitations. In our lab experiment, we collected delay measures in the same computer lab a week after the second (immediate measure) stage. Examining delayed measures over time, and multiple intervals can yield a better understanding of nature of ad exposure decay. However subject attrition over multiple measurement episodes in a lab experiment is a challenge. The lab experiment allowed us to collect time duration between every click on web pages. We compared time taken to close a pop-up ad (and continue browsing) or click on it (to view advertiser target ad) after it launched on a page. The time taken to close or click on the small pop-up ad was significantly longer than that of large pop-up ad for both sponsors. We are not sure if the longer durations are because subjects could continue reading portions of the underlying page and did not need to close the pop-up immediately, or because they were concerned about skipping portions of the page since this was an experiment. Future efforts need to examine the impact of exposure duration under cognitive and physical avoidance since it has been shown to impact advertising processing outcomes [Danaher & Mullarkey 2003].

Acknowledgment

The author would like to thank the Special Issue Editor and three anonymous reviewers for their insights and helpful comments on this paper.

REFERENCES

Assael, Henry, John H. Kofron, and Walter Burgi, "Advertising Performance as a Function of Print Ad Characteristics," *Journal of Advertising Research*, Vol. 7: 20-6, June 1967.

Bagozzi, Rich and Alvin J. Silk, "Recall, Recognition, and the Measurement of Memory for Print Advertising," *Marketing Science*, Vol. 2: 95- 134, Spring 1983.

Becker-Olsen, Karen, "And Now, a Word from Our Sponsor: a Look at the Effects of Sponsored Content and Banner Advertising," *Journal of Advertising*, Vol. 3, No. 2:17-32, 2003.

Brehm, S. S. and Brehm, J. W., *Psychological Reactance: A Theory of Freedom and Control*. New York: Academic Press, 1981.

Burke, Raymond R. and Thomas K. Srull, "Competitive Interference and Consumer Memory for Advertising," *Journal of Consumer Research*, 15: 55-68, June 1988.

Chandon, Jean L., Mohamed S. Chtourou and David R. Fortin, "Effects of Configuration and Exposure Levels on Responses to Web Advertisements," *Journal of Advertising Research*, :217-229, June 2003.

Chatterjee, Patrali, "Beyond CPMs and Clickthroughs: Understanding Consumer Interaction with Web Advertising," *Internet Marketing Research: Theory and Practice*, PA: Idea Group Publishing, pp. 209-216, 2001.

Chattopadhyay, Amitava and Prakash Nedungadi, "Does Attitude toward the Ad Endure? The Moderating Effects of Attention and Delay," *Journal of Consumer Research*, Vol. 19, No. 1:26-33, 1992.

Cho, Chang-Hoan, "How Advertising Works on the WWW: Modified Elaboration Likelihood Model," *Journal of Current Issues and Research in Advertising*, Vol. 21, No. 1: 34-50, 1999.

Cho, Chang-Hoan, Jung-Gyo Lee and Marye Tharp, "Different Forced-Exposure Levels to Banner Advertisements," *Journal of Advertising Research*, Vol. 41:45-56, Jul/Aug 2001.

Dahlén, Micael, "Banner Advertisements through a New Lens," *Journal of Advertising Research*, Vol. 41, No. 4:23-30, 2001.

Danaher, Peter and Guy Mullarkey, "Factors Affecting Online Advertising Recall: A Study of Students," *Journal of Advertising Research*, Vol. 43, No. 3:252-267, September 2003.

Diao and Sundar, "Orienting Response and Memory for Web Advertisements: Exploring Effects of Pop-Up," *Communication Research*, Vol. 31:537-567, 2004.

Dijkstra, Majorie, Heidi E.J.J.M. Buijtels, W. Fred van Raaij, "Separate and Joint Effects of Medium Type on Consumer Responses: a Comparison of Television, Print, and the Internet," *Journal of Business Research*, Vol. 58: 377-386, 2005.

DoubleClick, *Ad Serving Trend Report DoubleClick Q3 2004*, November 2004. [http://www.doubleclick.com/us/knowledge_central/documents/trend_reports/dc_q304adservingtrends_0411.pdf]

Dreze, Xavier and Francois Hussherr, "Internet Advertising: Is Anybody Watching," *Journal of Interactive Marketing*, Vol. 17, No. 4:8-23, 2003.

Edwards S. M., Li H. and Lee J. H., "Forced Exposure and Psychological Reactance: Antecedents and Consequences of the Perceived Intrusiveness of Pop-up Ads," *Journal of Advertising*, Vol. 31, No. 3: 83-95, 2002.

Finn, Adam, "Print Ad Recognition Readership Scores: An Information Processing Perspective," *Journal of Marketing Research*, Vol. 25, No. 2:168-177, May 1988.

Enrique Mu and Dennis F. Galletta, "The Effects of the Meaningfulness of Salient Brand and Product-related Text and Graphics on Web Site Recognition," *Journal of Electronic Commerce Research*, Vol. 8, No. 2: 115-127, 2007.

Greene, William E., "Maybe the Valley of the Shadow Isn't So Dark After All," *Journal of Advertising Research*, Vol. 28, No. 5:11-15, 1988.

Janiszewski, C., "The Influence of Display Characteristics on Visual Exploratory Search Behaviour," *Journal of Consumer Research*, Vol. 25: 290-301, December 1998.

Li, Hairong, Steven M. Edwards, and Joo-Hyun Lee, "Measuring the Intrusiveness of Advertisements: Scale Development and Validation," *Journal of Advertising*, Vol. 31, No. 2: 37-47, 2002.

MacInnis, Deborah, Christine Moorman and Bernard J. Jaworski, "Enhancing and Measuring Consumer Motivation, Opportunity and Ability to Process Brand Information from Ads," *Journal of Marketing*, 55:32-53, October 1991.

Moore, D. L. and J. W. Hutchinson, "The Effects of Ad Affect on Advertising Effectiveness," *Advances in Consumer Research*, Vol. 10, Ann Arbor, MI: Association for Consumer Research, 1983.

Novak, Hoffman and Duhachek, "The Influence of Goal-directed and Experiential Activities on Online Flow Experiences," *Journal of Consumer Psychology, Vol.* 13, No. 1:3-16, 2003.

Shapiro, Stewart, Deborah J. MacInnis and Susan E. Heckler, "The Effects of Incidental Ad Exposure on the Formation of Consideration Sets," *Journal of Consumer Research*, 24:94-104, June 1997.

Rajagopalan, Balaji and Ashutosh Deshmukh, "Issues and Advances in B2C Research – An Introduction to the Issue," *Journal of Electronic Commerce Research*, Vol. 6, No. 2: 75 – 78, 2005.

Rodgers, Shelly, "The Effects of Sponsor Relevance on Consumer Reactions to Internet Sponsorships," *Journal of Advertising*, Vo. 32, No. 4: 67-76, 2004.

Trafton, J. G., E. M. Altmann, D. P. Brock, and F. E. Mintz, "Preparing to Resume an InterruptedTask: Effects of Prospective Goal Encoding and Retrospective Rehearsal," *International Journal of Human-Computer Studies*, Vol. 58:583-603, 2003.

Tse, Alan and Ruby Lee, "Zapping Behavior During Commercial Breaks," *Journal of Advertising Research*: 25-27, May-June 2001.

Wang, Cheng Lu, Li Richard Ye, Yue Zhang, and Dat-Dao Nguyen, "Subscription of Fee-Based Online Services: What Makes Consumer Pay for Online Content?" *Journal of Electronic Commerce Research*, Vol. 6, No. 4: 304 -311, 2005.

Zaichkowsky, Judith Lynne, "Measuring the Involvement Construct," *Journal of Consumer Research*, Vol. 12:341-352, December 1985.

Zajonc, R. B., "Attitudinal Effects of Mere Exposure," *Journal of Personality and Social Psychology*, Vol. 9 (2, part 2):1-28, 1968.

Zufryden, Fred S., James H. Pedrick, and Avu Sankaralingam, "Zapping and Its Impact on Brand Purchase Behavior," *Journal of Advertising Research*, Vol. 33:58-66, January/February 1993.