

The Long-Term Effects of E-Advertising: The Influence of Internet Pop-ups Viewed at a Low Level of Attention in Implicit Memory

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Faced with an abundance of advertising messages, Internet users allocate only minimal cognitive resources to advertising. What are the effects of pop-up ads for a new brand viewed at low-level attention, and then measured when the Internet users have forgotten having seen them? In the theoretical context of processing fluency and implicit memory, the experiment ($n = 398$) studied the effects of repeated brief exposure to different types of content (words/image) in pop-up ads 7 days and 3 months after exposure. The results show the overall positive effects of the pop-ups, the superiority of the image over words for effects on attitude toward the brand and the purchase intentions; but the words produce more semantic effects than the image.

Key words: E-advertising, persuasion, influence, mere exposure, implicit memory, word, image

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Faced with an abundance of advertising messages, Internet users occupied with their current task activate selective perception and processing strategies that lead them to allocate only minimal cognitive resources to advertising, which generally interests them very little. While in everyday life there is always a delay between the phase of exposure to an Internet ad about a brand and the moment when the individual finds himself in front of the product in a store, the vast majority of marketing communication studies do not take this into account, since they record people's judgments just minutes after exposure. This delay is too short and unrealistic. But, we do not know much about longer-term effects of advertising on judgments about the brand, particularly when consumers do not have any memory of ad content or even of having previously seen any ads for the brand. Despite the ubiquity of the Internet pop-ups, we know little about their psychological effects. The current experiment fills in this gap by studying the influences of pop-ups in a more "ecological" context of reception: While users are concentrating on a

task to accomplish on a website, a pop-up for a fictitious brand appears briefly, with several repetitions. Seven days and 3 months later, the subjects are asked to make judgments on the brand, even though they have forgotten that they have already briefly seen advertisements for it and wrongly think they have never seen the brand before. Thus, their judgments drew on implicit memory, the subjects are “not conscious” that their judgments were formed as a result of the advertising exposure.

The implicit memory is manifested when the accomplishment of a task (here, judging the brand) is facilitated or influenced by a previous event that the subject has forgotten (exposure to the advertising; Roediger, 1990). In the present research, we are interested in cognitive, affective, and conative effects in implicit memory, that is why, in the remainder of this article, we will refer to the experimental context as the “implicit-effects context” (Courbet, 2000). In an implicit-effects context similar to conditions of everyday life, the first objective of the present research was to study and compare the effects of three types of pop-ups for a brand containing either (a) the brand logo by itself, (b) the logo with the product category represented in words, and (c) the logo with the product category represented with an image. Can subjects make semantic associations between the brand and the product in implicit memory? What psychological processes are involved? Another objective of the study was to examine changes in the judgments over time, and extend the time delay traditionally used in advertising research. We wanted to study and compare the effects of three types of pop-ups, seven days and three months after exposure, in the implicit-effects context.

After explaining the theoretical framework, we will present the hypotheses and the methodology. Then, we will detail the results and discuss them. Finally, we will discuss the limitations of the experiment, and possible avenues for further research.

Theoretical framework

Implicit-Effects Context and Effects of Exposure to the Logo

Studies dealing with the mere exposure effect (Zajonc, 1968) use an experimental procedure similar to the one utilized in an implicit-effects context. Several studies have shown that repeated exposure to a message containing a brand logo, viewed at a low attention level, leads to better ratings of the brand (Grimes & Kitchen, 2007). Mere exposure effects are mainly rooted in implicit memory (Lee, 2001). When exposure generates conscious perception of the stimulus, the experimental procedure must be designed so that, at judgment time, the subjects cannot explicitly recall or remember the stimulus presented. When the message consists of only a brand logo, what cognitive processes are at work? The more a person is exposed to the brand logo, the stronger the fluency of mental networks linked to the perceptual representation of the brand will be. When consumers in a store are faced with a product of this brand – and without their being aware of it – perceptual fluency leads them to process the general form of the logo more quickly and easily. This ease of processing leads to a positive attitude toward the brand. The Perceptual Fluency/Misattribution Model (PF/M) explains that through a metacognition-based mechanism that is implemented very rapidly, the cognitive system makes a perceptual-fluency “misattribution” (Mandler, Nakamura, & Van Zandt, 1987), falsely attributing beneficial characteristics to the brand. At the time of judging the brand or making a purchase decision, when the consumer is not aware of the prior exposure resulting in enhanced perceptual fluency, he or she may misattribute it to attitude toward the brand (Lee & Labroo, 2004) or to other relevant judgments regarding the brand such as quality, interest in trying it, narrow-broad product distribution, or purchase intention (Nordhielm, 2002). In an Internet advertising context, Fang, Singh, and Ahluwalia (2007) found that as the number of exposures increased, perceptual fluency was stronger and evaluations of the brand were more positive. In a study comparing effects in implicit and explicit memory, Shapiro and Krishnan (2001) showed that brand advertisements can favorably influence intent to purchase brands a week

after exposure, even when subjects are incapable of identifying the brands to which they were exposed. We would like to go one step further, firstly, by testing a more true-to-life context where the brands integrated into pop-ups on a website in which they do not attract attention, and secondly, without asking the experimental subjects to make the connection between the exposure phase and the later phase of brand judgment. More broadly, no studies have looked into whether it is possible to favorably influence other types of judgments about brands, such as affective, cognitive, and conative judgments, following low-attention exposure to Internet pop-ups in the implicit-effects context.

Effects of Associating the Brand With the Product Represented in Words or Images

As the number of low-attention exposures to advertising where the brand is associated with semantic stimuli (e.g. attributes) increases, the semantic association network between brand representations and attributes is better encoded in memory and the network's conceptual fluency is reinforced (Lee & Labroo, 2004). There is a difference between conceptual and perceptual fluency. Perceptual fluency is related to the shallowest level of memory: sensory memory (Tulving, 1995). It concerns only the "structure" of stimuli such as the shape and color of the logo. Conceptual fluency is related to a deeper level of memory: semantic memory. It pertains to the meaning of stimuli, such as the product category. The stronger the conceptual fluency becomes, the more the vision of the brand logo automatically activates the attributes and semantic representations linked to the brand in memory. As with the effects of perceptual fluency, processes based on conceptual fluency in implicit memory are automatic and operate without necessarily drawing upon explicit memory. At the visual level, to associate a brand in semantic memory with semantic attributes, advertisements use essentially two codes: images and words. In the Dual-Coding Model, Paivio (1986) explains that images and words are encoded differently in memory.

Most studies comparing the effects in explicit memory of advertisements consisting of images or words support the idea that images are superior, in the sense that they contain more information than words (Gardner & Houston, 1986). With an equally high level of attention, images activate explicit semantic memory more rapidly than do words (Nelson, Reed, & McEvoy, 1977). Images in advertising make consumers more familiar with the product and allow them to formulate more beliefs about it (Yi, 1990).

Since no studies have been conducted in the implicit-effects context, we attempt here to better understand what effects pop-ups showing either the brand logo accompanied (1) by an image indicating the product category or (2) by word(s) indicating the product category might have on attitudinal, cognitive, and conative judgments of the advertised brands. In a real-world situation with an identical exposure time, for example 3 seconds, we think that processing and attention levels will differ according to the pop-up's content. We hypothesized that the pop-up containing both the logo and words would lead Internet users, even ones not interested in the ad, to "read the words in their head," i.e., to allocate more attention to a pop-up containing words than to a pop-up containing an image. This process consists of producing a subvocalized articulatory (or phonological) loop in working memory that activates semantic memory (Baddeley, Lewis, & Vallar, 1984; Tavassoli, 2003) and contributes to better memorization of the word and its meaning. The exposure of a word automatically triggers oral motor simulations that are involved in pronouncing this word, because being exposed to words automatically triggers the overlearned response to read them (Topolinski & Strack, 2009). We think that this additional processing does not take place for a pop-up containing the logo and an image, since the process of "translating" the image into words only occurs if the consumer pays sufficient attention to the advertisement, which is not the case on the Internet where the consumer's attention is elsewhere (he is chatting, watching a video, . . .). We expected this greater attention – not very strong but still significant – activated by the pop-up containing the logo and words, to be sufficient to create a strong semantic association effect between the brand and the product, and thus a more accessible memory

network and greater conceptual fluency. Glaser and Glaser (1989) show that with limited cognitive resources, a word works better than an image in activating the stored lexicon and the subvocalized articulatory loop in memory. The subvocalized articulatory loop is thought to facilitate memorization of the word better than an image does, so when the product is represented in words rather than as an image, a stronger association between the brand and the product is formed.

While brand-product semantic association effects should be stronger for the ad showing the logo with words, we predicted, conversely, that the affective effects would be stronger for the advertisement showing the logo with an image. We expected that in this implicit-effects context, pop-ups containing the logo and image would trigger a better attitude toward the brand. This hypothesis is consistent with Zajonc's (2000) primacy of affect model. The latter author explains that for phylogenetic reasons, a holistic stimulus such as an image is more easily associated with positive affect in memory. This hypothesis also aligns with studies by Lee and Labroo (2004), who showed that images generate a greater affective fluency. At the time of judgment, if affect is perceived to be diagnostic, it is likely to be used as input to decision making (Fang, Singh, & Ahluwalia, 2007).

Effects of Time on the Impact of Advertising Viewed at a Low Attention Level

Several studies that have used scales well-suited to measuring explicit memory effects (rating scale, Likert semantic differential scale) have found positive effects of advertising after delays that rarely exceed 1 week (e.g. Shavitt & Brock, 1990). However, in the implicit-effects context, psychological processes are not based on explicit memory. Shapiro and Krishnan (2001) showed that explicit-memory effects decrease (1) when the level of attention allocated to advertising drops, and (2) when the delay between exposures and judgments is longer (seven days). This is not the case with implicit memory. Several experiments in social psychology have shown that implicit-memory judgments, like implicit attitudes, are often more stable, robust, and maintained over a longer time period than explicit attitudes, which are grounded in explicit memory (Wilson, Lindsey, & Schooler, 2000). In comparing the effects of processing advertising with a high vs. low attention level, Chattopadhyay and Nedungadi (1992) showed that explicit-memory attitudes became less favorable over time when messages were processed at a low attention level. Working in an implicit-effect context, our objective was to study greater time delays than those examined in advertising research to date.

Accessibility of Judgments

We measured the explicit verbal judgments of the brand using a dichotomous "yes-no" response. We added another type of measure to assess implicit memory: response time. Response time is a good measure of the accessibility of judgments (Arpan, Rhodes, & Roskos-Ewoldsen, 2007). The stronger the association in memory between a semantic concept or an attitudinal evaluation and the brand, the more accessible that concept or evaluation will be when judgments or attitudinal responses are being made. When the person sees the logo of an advertised brand, a sensory representation of the brand is activated in memory. Some hundredths of a second later, the activation spreads across the semantic network and preactivates brand evaluations, attributes, and associated concepts. The greater the accessibility of these elements, the shorter the response time to questions about them. The faster people respond "yes" to an attitudinal question, the more accessible the positive attitude is. Attitude accessibility is a useful concept for advertising research in that it is the factor most predictive of future behavior (Glasman & Albarracín, 2006).

Experimental design and hypotheses

In the implicit-effects context, we wanted to determine the effects of repeated brief exposure to a pop-up for a fictitious and unknown brand containing either (a) the brand logo by itself, (b) the logo

with the product category represented in words, and (c) the logo with the product category represented with an image. In the effects-measuring phase (after a delay of 7 days for some subjects and 3 months for the others), when subjects are once again shown the brand logo by itself without being told they had already seen it, they will think they have in fact never seen the logo before. They will be unable to recall either the exposure context or the type of product being promoted, even when assisted by a cue. The experimental design was as follows: 3 (types of advertising content: brand alone (B), brand and image (BI); brand and words (BW); between-subjects variable) \times 2 (time delay: 7 days vs. 3 months; between-subjects variable), to which we added a control condition that was not part of the experimental design: a group exposed to a pop-up containing a filler brand.

Based on the studies cited above, we formulated the following hypotheses.

First Set of Hypotheses

Hypothesis 1.1: Because of the perceptual fluency, when shown the logo by itself 7 days after initial exposure and without being given any other information on the brand (i.e., product not known), subjects exposed to the pop-ups, whatever the content, will have a more favorable attitude toward the brand than subjects not exposed.

Given the robustness of implicit memory (Roediger, 1990):

Hypothesis 1.2: The effects predicted in hypothesis 1.1 will still be observable 3 months after exposure.

Second Set of Hypotheses

Hypothesis 2.1: Seven days after exposure, individuals exposed to the pop-up containing the brand logo with the product represented in words will exhibit a stronger brand-product association than those exposed to the pop-up containing the logo with a product image. These individuals will associate the brand to the product to a greater extent than the individuals exposed to the brand logo alone, and than the nonexposed individuals (see later, the pre-survey).

Given the robustness of semantic associations in implicit memory:

Hypothesis 2.2: The semantic-association effects described in hypothesis 2.1 will still be observed after 3 months.

Third Set of Hypotheses

Based on the idea that subjects will engage in a metacognitive process to interpret their experience of fluency, we set forth the following hypotheses.

Hypothesis 3.1: Seven days later, judgments concerning the quality of this brand of products will be more favorable among subjects exposed to the pop-up showing the brand logo along with the product represented in words or an image, as compared to subjects exposed to the logo by itself. These groups will judge the quality of the products more favorably than the nonexposed subjects.

Hypothesis 3.2: Seven days later, intent to purchase the brand will be greater among subjects exposed to the pop-up showing the brand logo along with the product represented in words or an image, as compared to subjects exposed to the brand logo alone. The latter group will have a greater intent to purchase than the nonexposed subjects.

What happens when an item is formulated in such a way as to induce the person to give a response that is inconsistent with one of his/her other cognitive judgments of the brand? We contend that subjects are capable of “self-correcting” their response. In this case, the judging process is more complex and takes more time (Courbet, 2003). We devised an opposite-polarity item called “cheap products,” which would have opposite connotations from the item “quality products.” The greater the fluency, the more time should be required for the inhibition/correction phase and the longer the “no” RTs should be:

Hypothesis 3.3: Seven days after exposure, the “no” RTs of subjects exposed to the pop-up showing the brand logo with the product represented in words or an image should be longer than the “no” RTs of subjects exposed to the brand logo alone. The “no” RTs of the latter group, in turn, should be longer than the “no” RTs of the nonexposed subjects.

Hypothesis 4: Seven days after exposure, attitudes toward the brand will be more favorable among subjects exposed to the product represented as an image than among subjects exposed to the product represented in words. Attitudes toward the brand of the latter group will be better than that of subjects exposed to the brand logo only.

Since the existing research does not allow us to formulate a hypothesis as to the evolution of effects over a longer term on any of the above dependent variables, we formulated the following research questions: Three months later, what are the effects of repeated exposure to the pop-up containing the logo either by itself, or along with the product represented as an image or in words on the dependant variables?

Method

We produced a professional-quality website entitled “Health.com,” geared primarily to students. The site’s tree structure consisted of five HTML pages, including a home page and four additional pages, each developing a theme related to the connections between diet and health. When a person pulls up any one of the four pages, a pop-up for the brand “Lomis” is displayed for 3 seconds. This limited duration avoids producing a strong psychological discomfort (Edwards, Li, & Lee, 2002) and ensured that all participants would be exposed to the pop-up for the same length of time. Lomis is a fictitious brand created specifically for the experiment, along with a fictitious logo. Firstly, the brand name and the logo (see Appendix A) were designed to be judged positively by the majority of people when they are unaware of the type of product being advertised. Secondly, we chose a type of product that does not contain any symbolism in either the brand name or logo, namely, bottled mineral water. A presurvey conducted on a sample of 41 subjects with the same profile as that of the experimental subjects (age: $m=23,1$; men: 49%; women: 51%) confirmed that these two criteria were fulfilled.

Materials and Pretest

We designed three different pop-ups. All three displayed the “Lomis” logo and had the same dimensions. The space occupied by the brand logo, its placement, the layout of the message, and the colors (black and white to avoid any connotations) were the same for each ad. The first pop-up contained only the

brand logo (brand logo alone: B). The second pop-up was the same as the first, except that we added a black-and-white image of a bottle of mineral water under the brand logo (brand logo + image: BI – See Appendix A). In the third pop-up, we replaced the image with the two words: “mineral water” (brand logo + words: BW). The font color (black) and amount of space occupied by the words were the same as in the BI pop-up. We also created a pop-up with a filler brand to be used on a control group, and logos for three fictitious brands that would serve as fillers during the recording of the dependent variables.

Presurvey on the Relevance of the Second Set of Hypotheses

We conducted a presurvey using the concurrent verbal protocol analysis method to find out whether the subvocalized articulatory loop (Baddeley, Lewis, & Vallar, 1984) was implemented (see Appendix B). The results confirmed that more people in the group exposed to the pop-up with the logo + words verbalized the product category than in the group exposed to the pop-up with the logo + image. The hypothesis that exposure to the pop-up containing the logo + words is more likely to activate the subvocalized articulatory loop is therefore relevant.

Subjects

Because all subjects had to be easily recontacted 7 days and then 3 months after exposure, we chose to perform the experiment with students. Moreover, this young population is one of the most frequent users of the Internet. Three hundred ninety-eight male (49%) and female (51%) students (19 to 23 years of age, $m=21.1$ years, from the Universities of Nancy and Avignon, France) participated in the experiment. The subjects were randomly divided into seven groups. In the six experimental groups, the subjects saw all the pages of the website and were exposed to four repetitions of either the B, BI, or BW pop-up, each exposure lasting 3 seconds.

Procedure and Setup of the Implicit-Effects Context

For phase 1, the experimenters explained to the subjects they were conducting a poll for the French Ministry of Health on “Student Diet and Health.” They were asked to spend a few minutes consulting a website related to diet and health, just as they would consult websites in their everyday life. On average, it took subjects 4 minutes to read the website. Afterwards, they responded to a short written questionnaire in which they gave their opinions on the quality and usefulness of the website for improving students’ dietary habits. This questionnaire was only for the purpose of keeping the cover story credible. Following the exposure session, an appointment was made for participation in another survey for a commercial company (7 days later or 3 months later).

On phase 2, run 7 days later (or 3 months later), a different experimenter (different from the one in the first phase) explained that he was conducting a survey for a commercial company that wanted to bring out new brands and to test them before launching them on the market (the cover story). The subjects were given several minutes to answer a questionnaire administered by computer about four new brands (“Lomis” and three filler brands). Our goals were, firstly, that the subjects not make the connection between the brands and the pop-ups seen during the exposure to the “Health.com” website, and secondly, that they would think they were seeing these brands for the first time.

Phase 3 took place a few minutes after the second phase. A postexperimental questionnaire was passed to establish a bona fide implicit-effects context (see Appendix C). The subjects had neither explicit memory trace of the brand (logo, product, pop-up . . .), nor trace of the context of exposure. They thought they were seeing the brand for the first time.

Dependent Variables (DV) Measured, and Method of Recording Response Times

The DVs consisted of the response (“yes” or “no”) to various questions, and the time subjects took to respond (Fazio, 1990). The questionnaire was administered in this order: “You are going to see a

series of four new brands. Without knowing what type of product is being marketed, say whether you like these new brands” (item: attitude toward the brand, product not known). Then four brand logos (three fillers and the “Lomis” brand) appeared in random order throughout the questionnaire.

The second set of questions measured semantic associations. The subject had to say, for each of four brands presented one by one, whether the brands were suitable for marketing five different types of products (yogurt, pens, computers, mineral water, household products; item: “suitable for the product”). Each product category was shown separately, in random order. The material was designed to control for effects of the presentation order of the two formats, image and words (Foos & Goolkasian, 2008). For each presentation of the product, the screen was divided into two parts taking up equal amounts of space. We designed two different presentations: (a) the product image at the top of the screen with the product category in words under it, and (b) the product category in words at the top of the screen with the product image under it. Subjects were randomly shown either presentation (a) or presentation (b).

In the third set of questions, the brands were associated with a specific product category. The questions were administered randomly: “Suppose the company chooses the Lomis brand as a brand of mineral water. Answer the following questions as correctly and quickly as you can: “Is Lomis a brand [. . .] of quality products?” (first cognitive item); “of cheap products?” (second cognitive item with opposite polarity from the first cognitive item); “that I like?” (item: attitude toward the brand, product known); “that I would definitely buy?” (item: purchase intention).

Finally, subjects were shown two products on the screen, the product being tested and another brand in the same product category, and asked to say which one they would buy if they only had a choice between these two brands offered at the same price (“forced purchase” conative item). We presented the logo of an actual existing brand (that is fairly well known in France), along with the brand being tested, side-by-side on the same screen. The location on either the right or left of the screen was randomized each time. The dependent variables for the control group (CG) were recorded 7 days after exposure to the website with a pop-up of an unrelated filler logo displayed under the same conditions as in the experimental groups.

Results

Following the procedure of Fazio (1990), the outliers with RTs of more than 4 seconds were capped at 4 seconds. The results were processed using three types of statistical analysis. First, the data involving “yes-no” verbal responses were analyzed with chi-square tests. Second, for the RTs, we performed 3×2 analyses of variance (ANOVA) to analyze main effects and interactions, using the following design: 3 (types of advertising content: brand logo alone, brand logo + image, brand logo + words) \times 2 (time delays: 7 days, 3 months). Finally, pairwise comparisons of the mean RTs were performed using Student’s t-test, specifically to compare the experimental groups with the CG.

Results for First Set of Hypotheses

Concerning the verbal responses, which were mainly positive in all groups (see Table 1), the pairwise comparisons of the number of responses in each experimental group and in the control group, using chi-square tests, did not indicate any significant statistical differences. This is consistent with the results of the presurvey, so we went on to analyze the response times, a more sensitive measure. As expected, the ANOVA did not reveal any effect of the content or time-delay factors. But in comparing each experimental group to the CG, the t-tests revealed that mean “yes” RTs in the six conditions were significantly shorter than those of the control group (all p 's $< .05$; see Table 2). The positive effects on attitude toward the brand held after 3 months. There was no significant difference between the “yes” RTs for the groups exposed to different content. Hypotheses 1.1 and 1.2 are validated.

Table 1 Results on the Different Items and Response Time (RT) for All Seven Groups (Descriptive Statistics)

Group	Attitude Toward the Brand (product not known)		Brand Suitable for the Product		Attitude Toward the Brand (product known)		Quality Products		Cheap Products		Purchase Intention		Forced Purchase								
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No							
	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n						
B7d	46	13	1592	19	38	2719	40	15	2188	32	23	2379	22	33	2605	45	11	2015	29	16	2039
			(1041)			(889)			(566)			(530)			(708)			(736)			(997)
BW7d	46	16	1520	47	16	1752	42	21	1808	34	18	1678	26	37	2976	46	17	1715	29	22	1931
			(607)			(903)			(907)			(778)			(537)			(636)			(1009)
BI7d	36	20	1585	32	23	2156	38	17	1415	36	26	1728	21	33	2938	45	11	1365	30	22	1532
			(1019)			(889)			(336)			(811)			(784)			(632)			(398)
B3m	34	14	1715	14	27	2862	30	15	2578	28	18	2362	16	28	2604	32	13	2374	25	14	2169
			(1115)			(702)			(1106)			(841)			(871)			(637)			(1064)
BW3m	37	14	1776	37	9	1744	31	15	2279	29	19	1710	20	25	3026	35	10	2175	26	17	2189
			(989)			(826)			(1010)			(552)			(565)			(875)			(615)
BI3m	34	18	1763	30	20	2192	37	16	1867	32	20	1966	22	31	2987	37	15	1810	27	20	1920
			(1011)			(621)			(834)			(805)			(591)			(809)			(697)
CG	41	19	2236	22	38	2734	20	40	2629	35	25	2740	22	38	2263	21	39	2446	16	44	2529
			(796)			(1266)			(608)			(817)			(660)			(639)			(439)

Note: Yes (No) RT = Time to answer “yes” (“no”) in milliseconds. N = number of participants. M = mean. SD= standard deviation. BW3m: brand logo + words after 3 months. BW7d: brand logo + words after 7 days. B3m: brand logo alone after 3 months. BI3m: brand logo + image after 3 months. B7d: brand logo alone after 7 days. BI7d: brand logo + image after 7 days. CG : control group.

Table 2 Comparisons of the Mean RTs of the Experimental and Control Groups (Student's t-test)

Attitude Toward the Brand (product not known), “yes” RTs

Group	CG
BW3m	2.26 (75)*
BW7j	4.75(85)***
BI3m	2.26 (73)*
BI7d	3.14(75)**
B3m	2.35(73)*
B7d	3.21(85)**

“Brand Suitable for the Product”, “yes” RTs

	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	3.64 (57)***		4.48 (49)***		2.46 (65)*	ns
BW7d	3.69 (67)***	3.96 (64)***		1.97(77)*		
BI3m	2.04 (50)*		3.2 (42)**	ns		
BI7d	1.97(52)*	2.18(49)*				
B3m	ns	ns				
B7d	ns					

Attitude Toward the Brand (product known), “yes” RTs

	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	ns		Ns		ns	2.09 (71)*
BW7d	3.67(60)***	2.26(80)*		2.52 (78)*		
BI3m	3.60(55)***		3.0 (65)**	3.10 (73)**		
BI7d	9.82(56)***	7.28(76)***				
B3m	ns	1.93(68)*				
B7d	2.78 (58)**					

“Quality products”, “yes” RTs

	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	5.78 (62)***		3.47(55)**		ns	ns
BW7d	5.61 (69)***	4.33 (67)***		ns		
BI3m	3.9 (65)***		Ns	ns		
BI7d	5.17 (67)***	3.88 (65)***				
B3m	ns	ns				
B7d	2.15 (66)*					

“Cheap products”, “No” RTs

	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	4.74 (61)***		2.06 (51)*		ns	ns
BW7d	5.08 (72)***	2.46 (67)*		ns		
BI3m	4.70 (66)***		1.99 (56)*	ns		
BI7d	3.91(68)***	1.98 (63)*				
B3m	ns	ns				
B7d	2.10 (69)*					

Table 2 (Continued)

Purchase Intention, “yes” RTs						
	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	ns		ns		ns	2.74 (79)**
BW7d	4.36 (65)***	ns		2.63 (89)**		
BI3m	3.09 (56)**		3.18 (67)**	2.79 (80)**		
BI7d	6.45 (64)***	3.53 (89)***				
B3m	ns	4.09 (76)***				
B7d	4.07(65)***					

“forced purchase”, “yes” RTs						
	CG	B7d	B3m	BI7d	BI3m	BW7d
BW3m	ns		ns		ns	ns
BW7d	2.43 (46)*	ns		2.01 (57)*		
BI3m	3.36 (44)**		ns	2.62 (55)**		
BI7d	8.21(47)***	2.58 (57)*				
B3m	ns	ns				
B7d	2.01(46)*					

Note: Each cell contains the value of *t* (df). ns: nonsignificant. * $p < .05$. ** $p < .01$. *** $p < .001$. BW3m: brand logo + words after 3 months. BW7d: brand logo + words after 7 days. B3m: brand logo alone after 3 months. BI3m: brand logo + image after 3 months. B7d: brand logo alone after 7 days. BI7d: brand logo + image after 7 days. CG: control group. Only the comparisons relevant to the hypotheses are included.

Results for Second Set of Hypotheses

Concerning judgments on whether the Lomis brand was suitable for the mineral-water product category, in the after-7-days condition, the statistically significant results of the chi-square tests allowed us to rank the numbers of “yes” responses in decreasing order as follows: More subjects in group BW judged the brand logo suitable than did subjects in group BI ($\chi^2 (1, N = 118) = 3.6, p = .05$); more subjects in group BI judged the brand suitable than did subjects in group B or in the control group (respectively $\chi^2 (1, N = 120) = 10.6, p < .001$; $\chi^2 (1, N = 115) = 5.3, p < .05$).

Concerning the “yes” response time for the item “suitable for the product,” the ANOVA showed a significant effect of the content variable ($F (2, 173) = 18.96, p < .001$). In the after-7-days condition, the results of the *t*-tests allowed us to establish the following ranking, based on statistically significant differences between the groups (all p 's $< .05$): “yes” RT of group BW $<$ “yes” RT of group BI $<$ “yes” RT of group B. The “yes” RT of group B did not differ significantly from the CG’s “yes” RT (see Table 2). Hypothesis 2.1 is validated.¹

In the after-3-months condition, the statistically significant chi-square tests allowed us to rank the numbers of “yes” responses in the following descending order: More subjects in group BW judged the brand suitable for mineral water than did subjects in group BI ($\chi^2 (1, N = 96) = 4.7, p < .05$); more subjects in group BI judged the brand suitable than did subjects in group B and in group CG (respectively $\chi^2 (1, N = 91) = 6.3, p = .01$; $\chi^2 (1, N = 110) = 6.0, p = .01$). As to the RTs on the “suitable for the product” item, the results of the *t*-tests allowed us to establish the following ranking based on statistically significant differences between the groups (all p 's $< .05$): “yes” RT of group BW

< “yes” RT of group BI < “yes” RT of group B. The “yes” RT of the Bs did not differ from the “yes” RT of the CGs (see Table 1). Hypothesis 2.2 is validated.

Results for Third Set of Hypotheses

Judgments on quality of products and purchase intentions (Product Known)

Concerning the “quality products” item, there was no statistically significant difference between the experimental and control groups on verbal responses, which were mainly positive (see Table 2). Concerning the “yes” response times, the ANOVA based on the 3×2 experimental design yielded a significant effect of the content variable ($F(2, 186) = 14.55, p < .001$). The t tests showed that in the after-7-days condition, group BW’s “yes” RT did not differ significantly from group BI’s “yes” RT. Both the BW and BI group’s “yes” RTs were lower than group B’s “yes” RT. The latter was lower than the CG’s “yes” RT, and significantly so (all p ’s < .05). Hypothesis 3.1 is validated. Some effects were maintained over the 3-month period: The “yes” RT of the subjects exposed to the ad with the brand logo and words or an image (there was no statistically significant difference between these two groups) was lower than the CG “yes” RT ($p < .001$). However, we did not observe any difference between the “yes” RTs of the B and CG groups. Concerning the verbal responses according to pop-up content, the effects were the same for the two conative variables: purchase intention and purchase intention in the forced-choice situation. These results are consistent with our expectations. The subjects in the exposed groups, whatever the content or time delay, responded mostly positively (see Table 3). There were no statistically significant differences between the six experimental groups on any conative dependent variable. In the pairwise comparisons of the experimental groups with the CG, whose responses were mostly negative, the chi-square systematically revealed significant differences (all p ’s < .01) on the intent-to-purchase and forced-purchase items. These effects still held after 3 months.

Concerning the “yes” response times, the ANOVA conducted with a 3×2 experimental design yielded a significant main effect of the content and delay variables. Concerning the content factor, the results were as follows: for the intent-to-purchase item ($F(2, 235) = 11.13, p < .001$), for the forced-purchase item ($F(2, 160) = 3.58, p < .05$). Concerning the delay factor, the results were as follows: for the intent-to-purchase item ($F(1, 235) = 29.49, p < .001$) and for the forced-purchase item ($F(1, 160) = 4.15, p < .05$). In the after-seven-days condition, the effects were the same for the two conative variables. The t-tests showed that response time for all subjects exposed to the ads, regardless of their content, had significantly shorter RTs than did the control group (see Table 2). However, there were significant differences (all p ’s < .05) between the “yes” RTs of the different groups, which can be ranked as follows: BI’s RT < (BW’s RT \approx B’s RT) < GC’s RT. Hypothesis 3.2 is only partially validated, in the sense that no significant difference was observed between the “yes” RTs of the BW and B groups. In the after-3-months condition, the effects were the same for the two conative variables. The t-tests did not yield any significant differences between the RTs of groups BW, B, and CG. Only the BI’s “yes” RT was lower than the GC’s “yes” RT ($p < .01$).

Judgments on cheapness of products (Product Known). Concerning the “cheap products” item, there was no statistically significant difference between the experimental and control groups as to the verbal responses, which were mainly negative. Concerning the “no” response time, the ANOVA based on the 3×2 experimental design yielded a significant effect of the content variable ($F(2, 178) = 6.16, p < .01$). In the after-7-days condition, the t-tests showed that the “no” RTs of the groups exposed to an ad including the brand logo with either an image or words (we did not observe any statistically significant difference between these two groups) were significantly higher than the “no” RTs of subjects exposed to the brand logo alone (see Table 2). The latter were significantly higher than the “no” RTs of the control group (all p ’s < .05). Hypothesis 3.3 is validated. Most of these effects still held after a

Table 3 Comparisons of Verbal Responses of the Experimental Groups and Control Group for the Conative Items: Purchase Intention and Forced Purchase

		BW3m		BW7d		B3m		BI3m		B7d		BI7d		
Purchase intention		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	
		35	10	46	17	32	13	37	15	45	11	45	11	
CG	yes	21	$\chi^2(1) = 18.9^{***}$		$\chi^2(1) = 17.9^{***}$		$\chi^2(1) = 13.4^{***}$		$\chi^2(1) = 14.6^{***}$		$\chi^2(1) = 24.3^{***}$		$\chi^2(1) = 24.3^{***}$	
	no	39												
Forced purchase		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	
		26	17	29	22	25	14	27	20	29	16	30	22	
CG	yes	19	$\chi^2(1) = 8.44^{**}$		$\chi^2(1) = 7.1^{**}$		$\chi^2(1) = 10.1^{***}$		$\chi^2(1) = 7.1^{**}$		$\chi^2(1) = 11.1^{***}$		$\chi^2(1) = 7.7^{**}$	
	no	41												

Note: BW3m: brand logo + words after 3 months. BW7d: brand logo + words after 7 days. B3m: brand logo alone after 3 months. BI3m: brand logo + image after 3 months. B7d: brand logo alone after 7 days. BI7d: brand logo + image after 7 days. CG: control group. * $p < .05$ ** $p < .01$ *** $p < .001$.

period of 3 months: The “no” RTs of the subjects exposed to the ad showing the brand logo with the words or the image (these two groups did not differ significantly from each other) were greater than the “no” RT for subjects who saw the ad with the brand logo alone. A significant difference was no longer found between the latter group’s “no” RT and the CG’s “no” RT.

Attitude toward the brand (Product Known). Concerning the verbal responses according to pop-up content, in the 7-days condition for the three experimental groups, there were no significant differences due to content. The mainly positive responses of each of the BI, BW, and B groups differed significantly from the mainly negative responses of the control group (respectively, $\chi^2(1, N = 115) = 14.7, p < .001$; $\chi^2(1, N = 123) = 13.7, p < .001$; $\chi^2(1, N = 115) = 17.8, p < .001$). In the after-3-months condition for the three experimental groups, there were no significant differences due to content. The mainly positive responses of groups BI, BW, and B differed significantly from the mainly negative responses of the control group (respectively, $\chi^2(1, N = 113) = 11.4, p < .001$; $\chi^2(1, N = 06) = 12, p < .001$; $\chi^2(1, N = 105) = 11.4, p < .001$). Concerning the “yes” response times, the ANOVA performed with a 3×2 design yielded a significant effect of the content variable ($F(2, 212) = 14.84, p < .001$) and the time-delay variable ($F(1, 212) = 15.39, p < .001$). The t-tests yielded significant differences between the group scores, which fell into the following ranking: after seven days: BI’s “yes” RT < BW’s “yes” RT < B’s “yes” RT < CG’s “yes” RT; hypothesis 4 is validated. After three months, the “yes” RTs of the BI, BW, and B groups in the 3-months condition decreased significantly as compared to those of these same groups in the 7-days condition (see Table 2). After three months, only the BI’s RTs remained significantly below the CG’s RTs ($p < .001$).

Discussion

In order to meet the conditions of everyday life, we devised an experimental context wherein subjects were exposed to pop-ups, though allocating little attention to them. We compared three message formats – the brand logo by itself, the logo with a product image, and the logo with words indicating the product category – order to study their long-term effects on affective, cognitive and conative brand judgments. The effects were either measured 7 days later or 3 months later, at which point the subjects remembered neither the ads nor the brand logo, thinking they were seeing them for the first time.

Seven days later, when the brand of the product was not indicated to the subjects in the questionnaire, the results showed that accessibility of positive attitudes toward the brand was stronger among all

subjects exposed, whatever the content of the pop-ups. The results confirmed that exposure effects (Zajonc, 1968) can indeed be generated by pop-ups in implicit memory, while extending the delay typically studied in advertising research to 3 months. The pop-ups showing the brand logo with a product represented either in an image or in words produced association effects and conceptual fluency in implicit semantic memory that were observable 7 days after exposure. These effects still held 3 months later. The association effects were stronger with the words than with the image. When receivers are free to allocate the desired amount of attention to processing of the ad, a pop-up combining a brand logo with a product described in words is thought to activate a subvocalized articulatory loop (Baddeley, Lewis, & Vallar, 1984), which means that a little more attention would be focused on the pop-up linking the brand logo with words than on the one linking the brand with an image. Indeed the exposure of a word automatically triggers oral motor simulations that are involved in pronouncing this word, because being exposed to words automatically triggers the overlearned response to read them (Topolinski & Strack, 2009). This supplementary processing would generate greater conceptual fluency between the brand and the product in implicit memory.

After 7 days, regardless of the type of pop-up, the exposure changed the subjects' attitude toward the brand – mainly negative among nonexposed subjects – to mainly positive attitudes (when the product was known). The same result was obtained for the verbal judgments related to purchase intentions. The favorable effects on attitude and purchase intentions, noted here regardless of pop-up content, still held after a delay of 3 months.

The results indicated a greater effect of the pop-up containing the image, both on attitude toward the brand and intent to purchase (as compared to the other pop-ups), both after 7 days and after 3 months. Part of the results can be explained in terms of the total amount of fluency in memory networks involving the logo: The total fluency generated by BI was greater than that generated by BW, which was greater than that generated by B. Two possible processes operating at reception time may work together. Firstly, exposure to the logo accompanied by a product image led to strong perceptual fluency (Wippich, Melzer, & Mecklenbrauker, 1998) but semantic fluency was quantitatively weaker compared to that generated by the pop-up with words. However, the total amount of fluency generated by the image was stronger. Secondly, according to Zajonc's (2000) model of affect primacy, as compared to words, images are more easily associated with positive affective traces in memory. However, to account for the judgments made later, the PF/M may not suffice. While the PF/M assumes that process facilitation is an affectively neutral, arousal-like experience, the hedonic fluency model HFM (Winkielman & Cacioppo, 2001; see Fang, Singh, & Ahluwalia, 2007) presents an alternative affect-based explanation. High fluency indicates stimulus familiarity, which signals a harmless situation and can generate positive evaluation. One of the processes implied in the HFM is the use of affect as an information model, where subjects infer their evaluations from how they feel ("how do I feel about it" heuristic; Schwarz & Clore, 1983). While the pop-up with the image seemed to generate less semantic fluency than the pop-up with words, the results indicated that the association with the image produces strong effects due to perceptual fluency and/or hedonic fluency. It is interesting to note that, while the greater semantic fluency caused by exposure to the pop-up with words led subjects to more easily associate the product with the brand, this did not trigger better effects on attitude toward the brand or intent to purchase. The superiority of the image over words for the attitude and purchase intentions effects still existed 3 months later.

By comparison with the control group's results, exposure to the pop-up containing the logo by itself gave rise to more positive effects on verbal responses about attitude and purchase intentions, both after 7 days and after 3 months. With this exposure, positive accessibility of attitudes and purchase intentions were higher 7 days later; accessibility of positive judgments as to the quality was also higher after 7 days. However, the latter effects did not hold after 3 months. Because exposure to the logo by itself led to an increase in perceptual fluency only (Lee, 2001), these overall effects did not last as long as

those of the other two pop-ups and were greatly weakened after 3 months. As compared to the pop-up containing the logo by itself, the pop-ups with the logo and a product image or words – content that promotes more fluency as well – led to better effects on attitude toward the brand (product known) and on positive judgments about the quality and cheapness of the products after a delay of 7 days. Some of these effects still held three months later.

Concerning the comparison between BI and BW, because of the relative independence of the cognitive and affective systems, it is logical that there was no difference in response accessibility on the purely cognitive items “quality products” and “cheap products,” in the sense that the strong hedonic fluency and the addition of affect caused by the image were not used to evaluate cognitive attributes. After 3 months, the effects on the accessibility of the purchase intentions were still observed among subjects exposed to the image, whereas in the group exposed to the words, the effects of accessibility on purchase intentions disappeared. The fluency generated by the words was not retained in implicit memory over this long delay. Regarding purchase intentions, the superiority of the pop-up with the image over the one with words can be explained by the fact that conative judgments made in a context where subjects must produce a rapid response for a product in which they have low involvement are essentially based on attitude accessibility (Schuette & Fazio, 1995). Attitude accessibility is stronger following exposure to an image.

By analyzing the differences between the “opposite-polarity” variables, that is, “quality products” and “cheap products,” we demonstrated that while the fluency misattribution process, automatically activated when the person must respond rapidly, led to a preponderance of positive responses, the cognitive system is capable of “self-correcting” the automatic response and inhibiting the preactivated positive response. People are capable of producing different judgments, in order to make all of their cognitive judgments about a brand consistent with each other. In line with the PF/M model, the implementation of controlled processes can cancel the automatic effects of exposure to brands, on judgments expressed (Courbet, 2003). The inhibitory response took even more time among subjects who had more overall fluency, that is to say, among those who were exposed to the logo along with an image or words.

Conclusion

The results contribute to the literature and to e-advertising research (Li, 2011) because they demonstrate that in everyday situations, differing content of Internet pop-ups processed at a low attention level and later forgotten can have long-term effects. Our results supplement existing research by extending the models on processing of words and images in advertising by showing how images and words in pop-ups impact cognitive, affective, and conative variables differently over the long term. On a methodological level, these results demonstrate the value of recording response times, insofar as the type of measures typically used are not sensitive enough and therefore underestimate the effects of e-advertising.

Regarding the limitations of the present experiment, extending the results to the entire population of Internet users would require repeating the experiment on populations with qualitatively different profiles. It would also be useful to repeat the experiment using different logos, other types of products, different page layouts and different formats for the interstitial ads. A future study might try to better understand the respective roles of perceptual, conceptual, and hedonic fluency in judgments made after exposure to ads with differing content and perceived at a low attention level.

Some appropriate new research avenues would be to further increase the delay after exposure, and to study different time durations and different numbers of exposure repetitions. In the fundamental research on e-advertising, it would be interesting to find out why images are more readily associated than words with positive effects in memory. Is it because the stimuli are richer? Another heuristic approach might be to study the effects on implicit memory when the pop-ups must be closed by the Net surfer, thus

causing irritation and psychological reactance (Edwards, Li, & Lee, 2002). By extending the scope of the study to other digital medias, new interesting perspectives for research could be carried out on the effects of new advertising formats; for example, on outdoor advertising (e.g. LED or LCD advertising screens, on bus stops or billboards). In a more général manner numerous other areas of interest are open to this field of research, such as computer mediated communication in which the receivers have only a weak level of attention. Nonadvertising “pop-ups” which are more and more commonly used on our computer screens and smart phones, as well as for announcing new messages on Facebook, or informing us of a new e-mail or Skype contact, could also be another area of interest for such research. These new areas, ripe for investigations, could most certainly, increase our knowledge concerning cognitive and affective processes and the not necessarily conscious impact following a rapid perception of a textual message or coded iconic message which appears on the many screens that make-up our present-day environment.

Note

- 1 To make sure that the effects indeed came from an association and from conceptual fluency in memory between Lomis and mineral water, we calculated the mean number of “yes” responses and the mean Yes RT on the item “Is Lomis suitable for the product . . . ?” for the four other products included in the marketing survey (yogurt, pens, computers, household products), after 7 days. For the BW and BI groups as compared to the mean score for the four products, Lomis was judged as being better suited to mineral water ($p < .01$ and $p < .05$, respectively).

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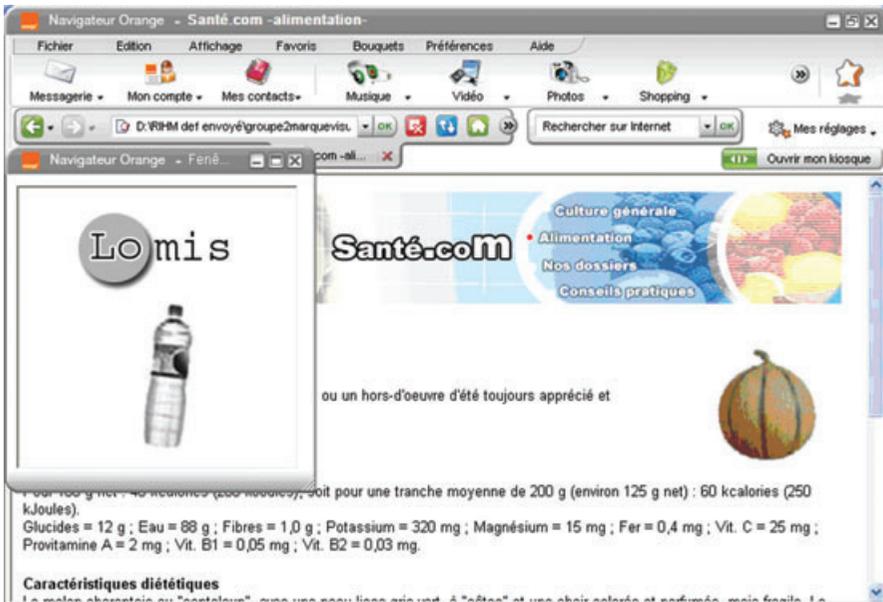
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Appendix A: Pop-Up Consisting of the Brand Logo and the Product Represented in an Image (BI)



Appendix B: Presurvey on the Relevance of the Second Set of Hypotheses

The concurrent verbal protocol rests on the principle that subjects' verbalizations are a reliable indicator of their cognitive responses and of the subvocalized inner speech taking place in working memory. The subjects were instructed to consult the website in as normal a way as possible, just as they are accustomed to doing, and to "say out loud everything that they were thinking and saying to themselves in their head." They were told not to force or censor themselves. The experimenter, sitting behind the subject, made an audio recording of all verbalizations. After a practice session of about two minutes with a different, neutral website (one that was not likely to generate cognitions that would interfere with the results of the presurvey), the subjects viewed the experimental website. Ninety subjects with the same profiles as the experimental subjects participated in the pre-survey (age: $m = 22,6$; men: 50%, women: 50%). They were randomly divided into three groups ($n = 30$), each group consulting a website displaying one of the three pop-ups. A content analysis was conducted on the pop-up verbalizations. The results showed that, regardless of pop-up content, the same number of people verbalized the brand name (17/30 vs 2/30, χ^2 Yates (1) = 4.14, $p < .05$).

Appendix C: The Postexperimental Questionnaire

The postexperimental questionnaire was based on studies of memory in cognitive psychology (Tulving, 1995). The subjects were asked to say honestly if they thought it was the first time they had seen the four brands, or if they thought they had seen one or more of them before, and if so, which ones (we were assessing recognition of the "Lomis" brand) and in what context. We then assessed

subjects' recall of the exposure context. Next, we asked them whether, at the time of answering, they knew what type of product was being marketed with this brand name. If they answered yes, they were asked to specify the type of product and how they knew of it. Then it was explained to them that one brand in the questionnaire they had just answered had been seen on the website "Health.com" in the first phase of the experiment. We asked the subjects whether they knew which one it was. Thus we measured memorization after giving them a cue. We eliminated the data gathered from three subjects who responded affirmatively to at least one of the questions and who thus drew on explicit memory traces to answer the questionnaire.