

The effects of task demand and web information type on recognition of verbal emotional advertising

Completed Research Paper

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Abstract

Studies report that users avoid looking at areas they consider to display advertising. The objective of the present study was to systematically investigate the influences of task demand, and web information type on recognition of verbal emotional advertising when people focus on a primary task.

Our findings contribute important insights into preattentive processing research. First, the empirical evidence implies that preattentive processing can extract enough semantic information from nonfocal verbal stimuli to determine the emotional content of a nonfocal word. Second, the study suggests the driver of attentional interference effects may be impacted by the visual field. Finally, the comparison between text-based and picture-based webpage indicates that the recognition of positive emotional headlines outperforms the recognition of negative ones in the picture-based webpage. Headlines featuring high arousal words were recognized more often than headlines featuring low arousal words. These findings provide strategies of ad copy and placement for marketers.

Keywords

Task demand; Web information type; Emotion; Advertising; Recognition

Introduction

The increasing use of the World Wide Web has promised a fast-growing and user-friendly medium for advertising. Investment in online advertising is growing and is expected to overcome traditional media (ZenithOptimedia 2011). Thus, having the attention of online consumers is especially important. However, recent studies have reported that users avoid looking at areas they consider to display advertising (Benway 1998; Drèze and Hussherr 2003; Hervet et al. 2011).

The inconsistency between the decreasing attention on advertising (Hervet et al. 2011) and the growing investment made in online advertising (ZenithOptimedia 2011) deserves further research. As Hsieh & Chen (2011) point out, the attention available for advertisements, method applied to process the web information, and user's mental workload can have more influence on ad effectiveness than the visual design of advertisements. Therefore, it has become more important to select a proper context for advertising that can elicit more attention from consumers.

Several marketing studies have reported that words with varied emotional valences play a critical role in capturing attention (Nielsen and Shapiro 2009; Shapiro 1999). However, existing research has yet to systematically investigate the effects of users' task demand on the attention grabbing effect elicited by emotional words. The objective of the present study was to investigate the influences of task demand, and web information type on recognition of verbal emotional advertising when people focus on a primary task. First, we investigated whether the verbal emotional cues in advertising are detected preattentively and processed differently under the text-based versus the picture-based web content condition. Furthermore, we manipulated task processing load to investigate its impacts on influencing the resource strategy. Finally, we examined whether different web information types result in different resources available for peripheral advertisements.

Theoretical Background and Research Hypotheses

Hemispheric Asymmetry for Emotional Processing

Before shifting attention to a specific location, people engage in a preattentive processing of the environment automatically. The visual field in which a stimulus appears can constrain preattentive processing to one hemisphere of the brain and consequently influence the formation of a mental representation of the stimulus (Janiszewski 1993). The lateralization of brain functions for emotional processing varies in their ability to encode and store the mental representation of emotional content.

According to the valence hypothesis, hemispheric asymmetry for emotion depends on valence. While valence hypothesis proposes a right hemisphere (RH) advantage for the perception of negative stimuli and an left hemisphere (LH) advantage for the perception of positive stimuli, there appear to be differences for the perception of verbal and nonverbal emotional (e.g., facial expressions, and pictures) stimuli (Bayer et al. 2011; Holtgraves and Felton 2011; Hughes and Rutherford 2013; Mneimne et al. 2010). Further, attention capture by emotional stimuli is often proposed to be driven by negativity. However, most negative stimuli used in studies to date are also highly arousing. Whether it is valence or arousal that accounts for the effect of emotion on attention is not clear (Fernandes et al. 2011).

In the present study, we examined the preattentive detection of emotion words in a cluttered online environment, in which participants focused their attention on the primary task. To investigate whether it is valence or arousal that accounts for the effect of emotion, the emotion words were equated in terms of arousal (Garavan et al. 2001). The emotion words were embedded in the headlines of nonfocal advertisements and presented to the RVF (right visual field)/LH. According to the hemispheric asymmetry for emotion processing and the prediction of valence hypothesis, we expected enhanced memory for positive emotion words than negative emotion words presented to the RVF.

H1: When advertisements irrelevant to the primary task appear on the RVF, headlines featuring positive words are more likely to be recognized than headlines featuring negative words.

Orienting Attention Responses

The presence of emotional distracter information can compete with other stimuli for attentional resources and cause interference with a primary task (Buodo et al. 2002; Fox et al. 2002). For example, using a Stroop (1935) color-naming task, Pratto and Oliver (1991) find that when presented with ego-threatening words, participants shift their attention from a primary task (i.e., naming the color of the word font) to an unrelated task (i.e., processing the meaning of the word).

Emotional, especially threat-related, information evoke automatic orienting responses to attract visual attentive processing (Williams et al. 1997). Studies show enhanced detection for emotional than neutral items on visual search tasks (Eastwood et al. 2001; Fox et al. 2005). Further, Roskos-Ewoldsen et al. (1992) show that highly accessible attitudes serve an orienting function, automatically shifting attention away from the current fixation point to an area of the visual display that contains items with strong object-attitude associations.

Distinguishing attention grabbing versus attention holding is important so as to explore the attention shifts from cognitive processing of emotional information (Fox et al. 2001; Schimmack 2005). However, previous studies have differed in terms of the spatial relationship between target stimuli and distracters. In some studies, targets and distracters appear separately at fixation and in the periphery (Pessoa et al. 2002), separately and away from fixation (Vuilleumier et al. 2001), overlapping and at fixation (Anderson et al. 2003), or overlapping and in the periphery (Williams et al. 2005). The spatial location of competing stimuli is important because data suggest that spatially contiguous distracting features can generate greater interference (MacLeod 1991). To demonstrate orienting attention responses do occur when stimuli are presented outside the focal view, redesigning the task is necessary.

Arousing Stimuli and Orienting Attention Responses

The arousal theory literature suggests that arousal level is what modulates attentional focus, with highly arousing affect attention capture, regardless of valence (Schimmack 2005; Vogt et al. 2008). For example,

Lang et al. (1993) have shown that participants chose to look at highly arousing images for longer than non-arousing images. Similarly, studies have shown a reduced attentional blink when a second target, to be detected within a stream of rapidly presented images, was highly arousing positive and negative verbs (Keil and Ihssen 2004) or sexual/taboo words (Anderson 2005; Arnell et al. 2007).

The findings of enhanced memory performance for high-arousing stimuli are well documented (Cahill 1998; Dolcos et al. 2004; Kensinger and Corkin 2004; Mickley Steinmetz and Kensinger 2009). Memory enhancement for written words might result from enhanced perceptual processing and attention capture, as has been shown for arousing stimuli (Keil and Ihssen 2004; Keil et al. 2006; Lang et al. 1998). In Vo and colleagues' (2008) study, the findings indicate that emotional arousal facilitates processing both during encoding and retrieval (Bayer et al. 2011; for a review on emotional memory, see Hamann 2001).

In general, high arousal value of emotional content demand attentional preference and orient attention responses (Nielsen et al. 2010). To summarize, we propose:

H2: When advertisements appear outside the area of focal attention, headlines featuring high arousal words are more likely to be recognized than headlines featuring low arousal words.

Processing Load on Emotion Processing

There are two resource strategies for processing environmental stimuli: attentive and preattentive (Janiszewski 1993). The attentive resource strategy applies when individuals voluntarily divert their attention away from the primary task and nonfocal stimuli are processed attentively. According to the attentive resource strategy, processing load of the primary task influences the mental resources available to attend and process nonfocal stimuli in the surroundings (Hsieh and Chen 2011; Janiszewski 1993; Sternberg and Mio 2008). Studies that have used multiple levels of processing load on emotion processing during unattended conditions support the view that emotion processing is subject to the availability of attentional resources (Pessoa et al. 2002; Pessoa et al. 2005). For example, while negatively-valenced photos have been found to interfere with competing tasks, this interference was only observed for tasks that did not require significant attentional resources (Okon-Singer et al. 2007).

In contrast, the preattentive resource strategy applies when the secondary stimuli are initially processed preattentively and the initial analysis causes attention shifts that result in superior memory for emotional content (Nielsen et al. 2010). According to "matching activation" (Janiszewski 1993), the increasing demands on the processing in one hemisphere of the brain (processing of the primary task) also increase the resources available for processing in the opposite hemisphere (preattentively processing of the distracters). For example, Nielsen et al. (2010) found when users focused on text reading, high processing load of the primary task led to greater attention and better memory for nonfocal advertising featuring highly arousal stimuli.

In this study, the primary task is to focus on processing the main content of online webpage while the advertisements are presented to the right of text (RVH/LH). While preattentive analysis of the peripheral environment would form a mental representation of significant information and cause attention shift, the memory trace of this analysis may be resource dependent. According to matching activation and hemispheric asymmetry for emotional processing (positive words are better processed by LH than negative words), the memory for ad headlines featuring positive words would be better when the processing demands of primary task are relatively higher than when they are relatively lower.

H3: When advertisements irrelevant to the primary task appear on the right visual field, increasing the resource demands of the primary task (a) increases the recognition of ad headlines featuring positive words and (b) does not affect the recognition of ad headlines featuring negative words.

Similarly, high levels of emotional arousal demand attentional preference and orient attention responses (Nielsen et al. 2010). Thus, the same prediction might be expected for high arousing emotional stimuli under high primary task demands than under low primary task demands.

H4: When advertisements appear outside the area of focal attention, increasing the resource demands of the primary task (a) increases the recognition of ad headlines featuring high arousal words and (b) does not affect the recognition of ad headlines featuring low arousal words.

Web Information Type

Distinct web information types involve different processing resources which may impact users' attention toward advertisements. According to the eye-tracking study on viewing webpages, the sequential path of text-reading task and the non-sequential feature of picture-viewing task indicate that viewers execute different strategies for perceiving information (Tang and Jhuang 2005). That is, executing text-reading and picture-viewing tasks involve different mental processes and visual perceptions (Sipe 1998).

In a recent study, Hsieh and Chen (2011) proposed four common information types (text-based, text-picture mixed, picture-based and video-based information) and explored the perception of internet advertising on a structured series of similarly themed pages. The researchers found that when people were asked to browse the pages in a relaxed manner, the picture- and video-based webpage received higher attention on banner advertising than the text-based and text-picture mixed webpage.

In the present study, we examine the impact of web information type (text-based versus picture-based webpages) on the preattentive detection of emotion words in a cluttered online environment. Based on prior research findings, we propose:

H5: When advertisements appear outside the area of focal attention, the recognition of emotional headlines for text-based webpage is different from recognition for picture-based webpage.

Methodology

Participants

One hundred and twenty-eight undergraduate business students at the Nanhua University, Taiwan participated in the experiment. Each participant was paid \$3.5 (USD) per hour for their participation. Separate groups of sixty-four participants took part in the text-based task and picture-based task. Each group of sixty-four participants was further divided into separate groups of thirty-two for the low processing load task and the high processing load task.

Layout of Experimental Webpage

The contents of the webpage were classified into two parts: (1) the main content for the primary task and (2) peripheral (nonfocal) target and distracter advertisements. These two parts competed for a viewer's limited amount of attention resources. All target advertisements appeared in the right column, and the main content appeared in the left column. In addition to a target advertisement, each webpage had two distracter advertisements to mimic the cluttered online environment. On each page, one distracter advertisement was placed at the top of the webpage, spanning two columns. The other distracter advertisement was in the right column and below the target advertisement. The experimental advertisements were placed so that their centers were outside the area of attention when focusing on the primary task placed on the left hand side. Figure 1 depicts a schematic illustration of the webpage layout.

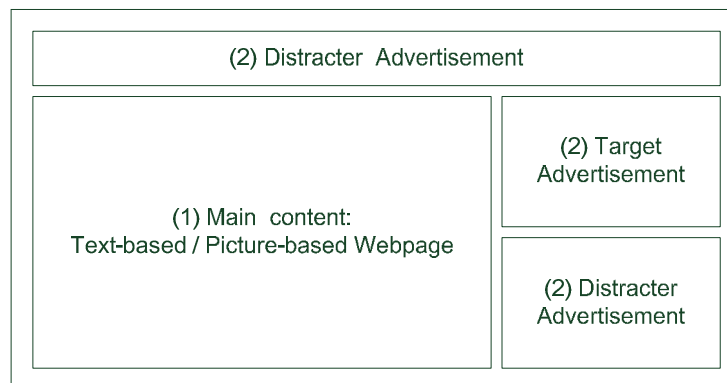


Figure 1. Schematic illustration of the webpage layout

Advertising Stimuli

The word stimulus set consisted of 8 words from the personality-trait adjectives (Pratto and Oliver 1991). To avoid the confounding effects of valence (desirable / undesirable) and arousal (slight / extreme) on ad recognition, four words rated as positive (e.g., “confident”) and four words rated as negative (e.g., “immature”) were selected. Within the four words, two words were rated as high arousal (e.g., “selfish”) and two as being low arousal (e.g., “extroverted”). The target adjectives (valence vs. arousal) were embedded in a two- to three- word headline, creating eight headlines.

Each target advertisement comprised one headline and a brand logo novel to the study population. Eight advertisements were created using a 2 (valence: positive versus negative) X 2 (arousal: high versus low) The ad headlines were centered and presented in 36-point Microsoft JhengHei font to maintain signal strength (Nielsen et al. 2010). Below the headline appeared a brand logo. Each participant saw all eight headlines.

Web Contents

We adapted the primary task manipulation from prior studies (Janiszewski 1993; Nielsen et al. 2010), in which processing load and attentive resources were manipulated. Attentive resources were constrained by making time pressure salient, and processing load was manipulated as a between-subjects factor.

In the text-based webpage condition, to create a primary task that featured high and low processing load conditions, eight famous sightseeing spots were selected. Descriptions about these sightseeing spots were created as follows: The low (high) processing load condition featured fewer (more) meaningful words. The conditions did not differ in description length. Pretests with 30 participants confirmed that for all eight descriptions, the high processing load condition was rated as significantly more difficult to read.

In the picture-based webpage condition, pictures were extracted from several online shopping websites. In the low (high) processing load condition, each webpage comprised four (sixteen) items from the same shopping product for a total of eight shopping categories (ex. shirts, shoes, hats, etc.). Pretests confirmed that the high processing load condition demanded more processing time.

Design and Procedure

The experiment was designed with web information type (text- versus picture-based) and processing load (high versus low) as between-subjects factors, and target word emotion (valence and arousal) as within-subjects factors.

In the text-based webpage condition, participants were told that they would read a series of descriptions of sightseeing spots and later in the study they had to answer questions about the sightseeing spots. In the picture-based webpage condition, participants were told that they would have to choose one item from each shopping webpage, either as gifts for their friends or for themselves. After finishing the task, pertinent data such as name, sex, education, etc. were recorded. In addition to the questions about the sightseeing spots, an unexpected advertisement-recognition file was shown to the participants on the screen as an advertisement memory test.

Dependent Measures

Eight memory test pages were used for headline recognition to evaluate participants’ processing of target advertisements. Each page had three headlines, one from the target advertisements and two distracter headlines featuring either the desirable or undesirable trait adjectives from Pratto and John (1991). Participants were asked to indicate if any one of the three headlines had been presented during the experiment.

Results

Headline Recognition for Text-based Webpage

In the text-based webpage condition, to test the effect of processing load on attention shifts to headlines featuring emotional words, the rates of correct recognition of headlines were analyzed in a $2 \times 2 \times 2$ mixed ANOVA crossing valence (positive vs. negative) and arousal (high vs. low) as within-subjects variables and processing load (high vs. low) as a between-subjects variable. The analysis did not reveal the main effect of headline word valence predicted in H1 ($F(1, 62) < 1, p > 0.1$). In contrast, the analysis revealed the main effect of headline arousal ($F(1, 62) = 13.222, p < 0.001$). In support of H2, headlines featuring high arousal words were recognized more often than headlines featuring low arousal words ($M_{\text{high arousal}} = 0.47, M_{\text{low arousal}} = 0.29$).

Figure 3 illustrates the effect of processing load on emotion headlines processing. As H3 predicted, the analysis revealed an interaction between headline word valence and processing load ($F(1, 62) = 4.864, p < 0.05$). Confirming H3a, planned contrasts revealed that participants recognized significantly more positive emotional headlines in the high processing load condition than in the low processing load condition ($M_{\text{positive/high processing load}} = 0.48, M_{\text{positive/low processing load}} = 0.31, F(1, 62) = 7.532, p < 0.01$). Consistent with H3b, the result revealed no effect of processing load for negative emotional headlines ($M_{\text{negative/high processing load}} = 0.38, M_{\text{negative/low processing load}} = 0.35, F(1, 62) < 1, p > 0.1$).

While the analysis did not reveal an interaction between headline word arousal and processing load ($F(1, 62) = 1.012, p > 0.1$), the recognition performance was in accord with the predicted direction. In partial support of H4a, planned contrasts revealed that participants recognized significantly more high arousal emotional headlines in the high processing load condition than in the low processing load condition ($M_{\text{high arousal/high processing load}} = 0.53, M_{\text{high arousal/low processing load}} = 0.41, F(1, 62) = 3.172, p < 0.08$). Consistent with H4b, the result revealed no effect of processing load for low arousal emotional headlines ($M_{\text{low arousal/high processing load}} = 0.30, M_{\text{low arousal/low processing load}} = 0.28, F(1, 62) < 1, p > 0.1$).

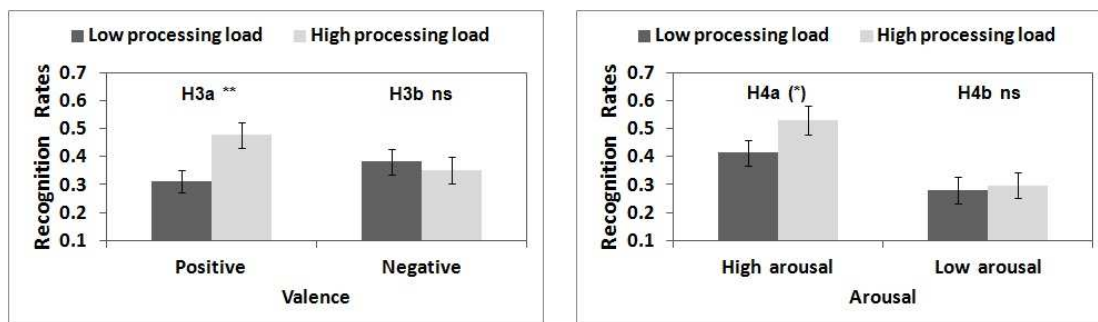


Figure 3. Recognition rates of ad headlines across emotional valence, arousal, and processing load for text-based webpage

Headline Recognition for Picture-based Webpage

In the picture-based webpage condition, to test the effect of processing load on attention shifts to headlines featuring emotional words, the rates of correct recognition of headlines were analyzed in a $2 \times 2 \times 2$ mixed ANOVA crossing valence (positive vs. negative) and arousal (high vs. low) as within-subjects variables and processing load (high vs. low) as a between-subjects variable. The analysis revealed the main effect of headline word valence ($F(1, 62) = 41.351, p < 0.001$). In support of H1, headlines featuring positive words were recognized more than headlines featuring negative words ($M_{\text{positive}} = 0.54, M_{\text{negative}} = 0.26$). Further, the analysis revealed the main effect of headline arousal ($F(1, 62) = 57.531, p < 0.001$). In support of H2, headlines featuring high arousal words were recognized more than headlines featuring low arousal words ($M_{\text{high arousal}} = 0.55, M_{\text{low arousal}} = 0.25$).

Figure 4 illustrates the effect of processing load on emotion headlines processing. The analysis revealed a marginal significant interaction between headline word valence and processing load ($F(1, 62) = 3.422, p < 0.07$). However, the results demonstrated opposite trend to what was expected. In contrast to H3a, the

result revealed no effect of processing load for positive emotional headlines ($M_{\text{positive/high processing load}} = 0.56$, $M_{\text{positive/low processing load}} = 0.52$, $F(1, 62) < 1$, $p > 0.1$). Contrary to H3b, planned contrasts revealed that participants recognized significantly more negative emotional headlines in the low processing load condition than in the high processing load condition ($M_{\text{negative/high processing load}} = 0.20$, $M_{\text{negative/low processing load}} = 0.32$, $F(1, 62) = 4.966$, $p < 0.05$). Inconsistent with H4, the analysis did not reveal an interaction between headline word arousal and processing load ($F(1, 62) < 1$, $p > 0.1$; $M_{\text{high arousal/high processing load}} = 0.52$, $M_{\text{high arousal/low processing load}} = 0.58$, $F(1, 62) = 1.093$, $p > 0.1$; $M_{\text{low arousal/high processing load}} = 0.24$, $M_{\text{low arousal/low processing load}} = 0.27$, $F(1, 62) < 1$, $p > 0.1$).

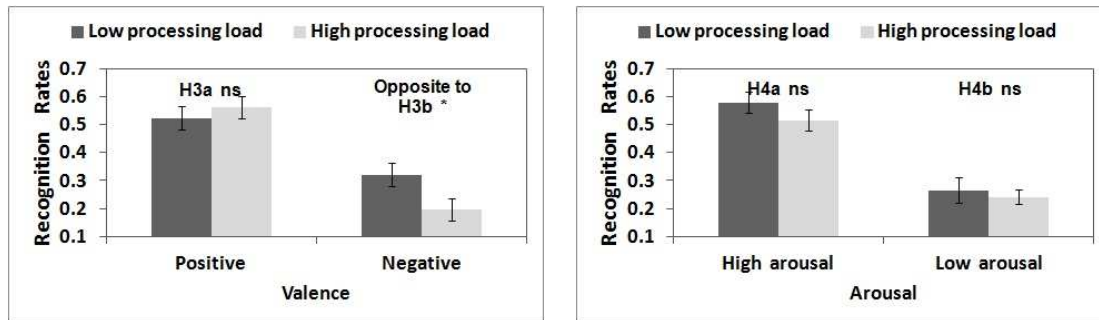


Figure 4. Recognition rates of ad headlines across emotional valence, arousal, and processing load for picture-based webpage

Comparison of Web Information Type for Headline Recognition

To examine the effect of web information type on attention shifts to headlines featuring emotional words, the rates of correct recognition of headlines were analyzed in a $2 \times 2 \times 2$ mixed ANOVA crossing valence (positive vs. negative) and arousal (high vs. low) as within-subjects variables and web information type (text-based vs. picture-based) as a between-subjects variable. As shown in Figure 5, the analysis revealed an interaction between headline word valence and web information type ($F(1, 126) = 16.122$, $p < 0.001$). While in the picture-based condition positive emotional headlines were recognized more often than negative emotional headlines ($M_{\text{positive/picture-based}} = 0.54$, $M_{\text{negative/picture-based}} = 0.26$, $t(63) = 6.310$, $p < 0.01$), in the text-based condition the difference between positive and negative emotional headlines was not significant ($M_{\text{positive/text-based}} = 0.39$, $M_{\text{negative/text-based}} = 0.37$, $t(63) < 1$, $p > 0.1$). Confirming H5, with regard to headline word valence, the recognition performance for text-based webpage was different from recognition performance for picture-based webpage.

In contrast, the analysis revealed no interaction between headline word arousal and web information type ($F(1, 126) = 2.973$, $p > 0.05$). In the picture-based condition, participants recognized significantly more high arousal than low arousal emotional headlines ($M_{\text{high arousal/picture-based}} = 0.55$, $M_{\text{low arousal/picture-based}} = 0.25$, $t(63) = 7.630$, $p < 0.001$). Similarly, in the text-based condition, participants recognized significantly more high arousal than low arousal emotional headlines ($M_{\text{high arousal/text-based}} = 0.47$, $M_{\text{low arousal/text-based}} = 0.29$, $t(63) = 3.636$, $p = 0.001$). Inconsistent with H5, with regard to headline word arousal, the recognition performance showed no difference between text-based webpage and picture-based webpage.

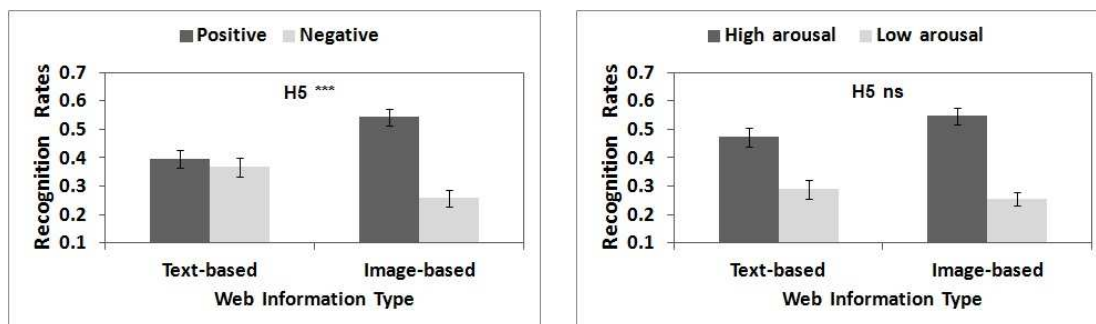


Figure 5. Recognition rates of ad headlines across emotional valence, arousal, and web information type

Discussion

Our findings contribute important insights into preattentive processing research. First, the empirical evidence suggests that preattentive processing can extract enough semantic information from nonfocal verbal stimuli to determine the emotional content of a nonfocal word. Second, we extend research on attentional interference by demonstrating that the driver of attentional interference effects may be impacted by the visual field. Finally, the comparison between text-based and picture-based webpage indicates that the recognition of positive emotional headlines outperform the recognition of negative ones in the picture-based webpage. Further, headlines featuring high arousal words were recognized more often than headlines featuring low arousal words in both text-based and picture-based webpage. These findings provide strategies of ad copy and placement for marketers.

In addition, the effects of emotion on ad headlines recognition differ as a function of processing load and web information type. Under text-based webpage condition, under high processing load condition, headlines featuring positive emotional words were recognized more than the same headlines in the low processing load condition. The effect of processing load is also evident for headlines featuring high arousal emotional words. Consistent with preattentive resource strategy explanation, more demands on the resources allocated to one hemisphere (the primary task) lead to matching resources in the opposing hemisphere allocated to preattentively process the secondary nonfocal stimulus. However, under picture-based webpage condition, the effect of processing load did not influence emotion ad headlines recognition.

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