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The Effect of Incidental Prices in Online Display Ads on Consumer Internal Reference Price

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ABSTRACT

The main objective of this research is to investigate how price information in online display advertisements affects the consumer's internal reference price (IRP). The internet context differs from prior pricing research contexts in which consumers allocate all or none of their conscious attention to price stimuli. In this context, consumers allocate some of their attention to ads, but they do so incidentally. Across four studies, we show that these incidental exposures to price information in online ads influence the IRP. The results suggest that the price magnitude used in the online ad (either low or high) determines the price anchoring mechanism at play. The price magnitude in conjunction with ad repetition and ad type (price comparing ad vs. single price ad) also affect the consumer's IRP. By uncovering these effects in online display advertising, this research contributes to pricing and online advertising research and provides specific insights for online marketers.

KEYWORDS

price anchoring; online advertising; price cognition; eye tracking; ad repetition; reference price; online display ads; online pricing

Introduction

Online display ads are so prevalent that an average consumer is exposed to 11,250 online display ads per month [16]. The internet provides marketers with affordable targeting tools to increase the effectiveness of their online ads [19; 56]. These tools, such as real-time bidding platforms, enable marketers to select which products to advertise, which consumers to target, and how frequently to do so. However, most online display ads go unnoticed because consumers are mainly concerned with their main goal in visiting a web page (e.g., reading news), and they typically avoid engaging with such ads [14; 15; 40; 42; 66]. Therefore, to understand the impact of online advertising, we need to examine consumers' incidental exposure to online ads. Following Shapiro [2], the term "incidental exposure" refers to any contextual and minor stimulus (e.g., an ad) to which consumers pay minimal attention when conducting a main task (e.g., finding information). When exposed to this peripheral stimulus, consumers are engaged with a main task that requires higher cognitive processing; they do not consider the peripheral stimulus as being relevant for conducting their central task. Even if consumers do not actively engage with this contextual stimulus, they can still be affected by its presence [2; 11; 13; 50]. In sum, an exposure is considered incidental when participants are vaguely aware of the presence of an ad; they perceive this ad to have little relevance to their main task and pay limited attention to this stimulus.

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Online display ads regularly contain price information. However, and surprisingly, previous work on online display ads has not considered the impact of price information on the consumer's price judgment. Accordingly, our main objective is to examine how consumers process price information contained in an online ad in the context of incidental exposure; specifically, we study the effect of ad repetition on the consumer's internal reference price (IRP) in this particular context. We suggest that the magnitude of price stimuli (higher vs. lower price than the IRP) presented in the online ad determines the price processing mechanism, which in turn influences the effect of ad repetition on the consumer's IRP.

The literature suggests two price processing anchoring mechanisms: (1) An indirect semantic mechanism that requires extensive cognitive processing and (2) a numerical mechanism that demands limited cognitive processing [2; 4; 64]. We suggest that the anchoring mechanism at play is numerical when consumers are exposed to ads containing low prices (i.e., lower than the IRP; hereafter low-price ads). In this situation, ad repetition should strengthen the anchoring effect; each exposure increasing the effect of the low advertised price on the consumer's IRP. In turn, when the consumer is incidentally exposed to ads containing high prices (i.e., higher than their IRP; hereafter high-price ads), we suggest that the dominant anchoring mechanism will be semantic. In addition, ad repetition should have no further effect on the IRP because the consumer has extensively processed the ad during the first exposure and the product knowledge has remained accessible during repeated exposures.

To investigate these effects, we conducted four studies: Three online experiments (Studies 1, 2 and 4) and one eye-tracking lab study (Study 3). Our results confirm our main assumption. In an online environment, consumers are more likely to process high-price ads through the more cognitively demanding mechanism (i.e., semantic anchoring), whereas they turn to the less cognitively demanding mechanism (numerical anchoring) for low-price ads. In addition, ad repetition increases the anchoring effect of price stimuli only when ads contain a low-price stimulus. Relatedly, for price-comparing ads, which present two prices (the selling price (e.g., Now $9.99) and the advertised reference price (e.g., Was $12.99), our results show that the advertised reference price (i.e., higher price, e.g., $12.99) dominates the overall anchoring effect. Thus, in this context, the semantic anchoring mechanism dominates the overall anchoring effect. Accordingly, in this context, ad repetition has a limited effect because consumers process high prices more intensively than low prices.

By investigating the anchoring effects of price stimuli in online display ads, our contributions are threefold. First, we aim to extend the price anchoring research by using a different and more realistic context in which consumers are exposed to price anchors incidentally. In this context, consumers can detect the price, but they pay limited attention to such stimuli. This is to be contrasted with much of price anchoring research which has examined the implicit effects of price stimuli when either displayed *subliminally*, so participants were not able to detect price stimuli, or when displayed *explicitly*. Second, we contribute to price anchoring research by examining the effect of price magnitude on the dominant anchoring mechanism. To the best of our knowledge, no research has investigated the price stimulus itself as a factor that can determine how consumers process price stimuli. Third, by examining the interaction of price magnitude and ad repetition, we contribute to price anchoring and advertising research by showing that ad repetition is less effective for high-price ads.

The current research is structured as follows. First, we review behavioral price research and price anchoring mechanisms to explain the effects of ad repetition on the IRP in online environments. Then, we present an online experiment in which we examine the effect of ad repetition for high-price and low-price ads (Study 1). Next, in Study 2, we extend the findings of the first study by examining the effect of ad repetition for price-comparing ads—that is, ads simultaneously showing high advertised reference price (ARP) and low-selling price stimuli (SP). Then, to better understand the process at play, we present an eye-tracking study that is designed to compare the price-anchoring mechanism for online display ads containing either high or low prices (Study 3). Finally, Study 4 brings further support for the role that anchoring mechanisms play in determining the effect of ad repetition by manipulating the level of cognitive load, which changes the dominant anchoring mechanism for high-price ads. At the end, we discuss the theoretical contributions and managerial implications of our results and suggest future avenues for research.

Background Literature

Incidental Ads and Consumers' Price Judgment

Behavioral price research holds that consumers evaluate the price of an offering by comparing it to an internal dynamic standard referred to as the *internal reference price* (IRP) [12]. According to adaptation-level theory [23], whenever consumers encounter a new price stimulus (e.g., the price of an advertised product), their IRP gets updated automatically as it moves toward the new price stimulus. That is, after being exposed to a price that is lower (higher), the consumer's IRP decreases (increases) [12]. The degree of this shift depends on several factors including, the range and frequency of previously exposed prices, the consumer's product knowledge, the plausibility of contextual prices, and the saliency of price stimuli (for a review see [43]). In sum, all prior price information and new price stimuli are incorporated, consciously or not, in the consumer's IRP [12].

Consumers usually do not pay much attention to online display ads [14; 66]. However, this lack of attention does not mean that the content of online ads, such as price, does not have an effect on the consumer's IRP. Price anchoring research shows that incidental exposure to a price stimulus may have a nonconscious effect on the consumer's price judgment [50; 53]. Such an effect implies that consumers are aware of the price stimulus, but they are not aware of its effect on their judgment because they do not consider this information to be relevant [1]. For instance, Nunes and Boatwright [48] show that the price of an unrelated product (e.g., a sweatshirt) placed next to a target product (e.g., a CD) affects the consumer's willingness to pay for the target product.

According to prior research (for a review see [12; 50; 59]), it is expected that the incidental exposure to price information in online display ads would exert an anchoring effect on the IRP. Here, recent findings show that even when consumers are exposed to incidental ads, a minimal level of attention to these ads is observed [13]. Previous eye-tracking studies show that even when consumers try to ignore online display ads, they still fixate on these ads at least once [24]. Even though they may not

recall the content of these ads, their judgment is still affected by the presence of such stimuli [66]. For the sake of clarity, we use the expression "implicit effect" to qualify the anchoring effect of incidental ad exposures.

The Two Price Anchoring Mechanisms

To explain the implicit effect of incidental price stimuli on a consumer's price judgment, previous studies (e.g., [2; 33, 34]) suggest two cognitive mechanisms: (1) A numerical anchoring mechanism based on Anchoring-and-adjustment theory [61], and (2) a semantic anchoring mechanism based on a Selective-accessibility mechanism [57; 64]. According to the numerical anchoring mechanism, exposure to a price anchor increases the likelihood that it will be used as an arbitrary anchor in subsequent price judgments [47]. The semantic anchoring mechanism, however, is indirect. Through this mechanism, exposure to the price of a product increases the accessibility of product-related knowledge (in consumers' memory), which is consistent with the price anchor. Consequently, at the time of price judgment, the price-consistent product knowledge, which now becomes accessible, affects the consumer's assessment [2]. See Figure 1 for a visual comparison between these two mechanisms.

Previous studies [2] show evidence that semantic anchoring requires more cognitive processing than numerical anchoring. Consistent with this view, increasing the cognitive load at the time of exposure makes the consumer use a numerical anchoring rather than a semantic one as the dominant mechanism [2; 4; 64]. For example, Adaval and Wyer [2] show that thinking about a product before being exposed to a price anchor diminishes the anchoring effect. They argue that thinking about a product before being exposed to its price anchor prevents a semantic anchoring; the overall anchoring is limited to the numerical type in this context. In addition, Blankenship et al. [4] show that when consumers are under low cognitive load, the anchoring effect is stronger when they are exposed to anchor-consistent product knowledge than when they are exposed to anchor-inconsistent product knowledge. However, when they increased the consumer's cognitive load, the difference between anchor-consistent and anchor-inconsistent product

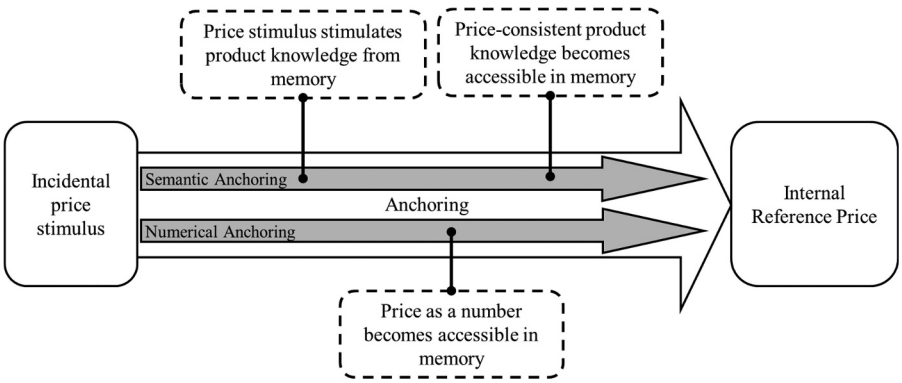

Figure 1. The Two Anchoring Mechanisms Suggested in Price Anchoring Literature

knowledge conditions diminished. The fact that the cognitive load reduces the impact of anchor-consistent knowledge supports the notion that semantic anchoring is more cognitively demanding than numerical anchoring.

Building on this evidence, it is reasonable to consider semantic anchoring to be a more cognitively demanding mechanism than numerical anchoring. In numerical anchoring, the anchor becomes simply more accessible in memory. However, in semantic anchoring, the anchor should stimulate anchor-consistent product knowledge first, and then, the consumer should use this accessible knowledge in his/her following judgments. If the exposure to the anchor is repeated, semantic anchoring stimulates even more processing because during each repeated exposure, the consumer evaluates the anchor against an increasingly accessible product knowledge. Here, prior research notes that the product knowledge, which becomes accessible as a result of a semantic anchoring mechanism, persists longer and is more resistant to change [2; 64].

We suggest that the price stimulus—that is, a price being lower or higher than the IRP—can determine which mechanism dominates the overall price-anchoring effect. As mentioned, consumers evaluate a new price by using their IRP (for a review see [12]). In this process, they act mostly in a loss-averse way [31; 32] and are more sensitive to prices that are greater than their IRP compared to those below it (e.g., [9]). Accordingly, we argue that the probability that consumers pay attention to a high-price stimulus is higher than a low-price stimulus after an incidental exposure. Therefore, we suggest that incidental exposure to high-price online ads is more likely to trigger the more cognitively demanding anchoring mechanism (i.e., semantic). We make the opposite prediction when online ads feature a low-price. In this case, it is more likely that the less cognitively demanding anchoring mechanism (i.e., numerical) will become the dominant one.

Ad Repetition and Price Anchoring Mechanisms

The evidence reviewed above suggests that the price level in online display ads influences the consumer's subsequent price judgment. We add to the understanding of this effect by incorporating the effect of "ad repetition" [44; 65]. We posit that the effect of ad repetition on price judgment depends on the dominant anchoring mechanism.

Specifically, we suggest that ad repetition improves the anchoring effect on price judgment only for the less cognitively demanding anchoring mechanism (i.e., numerical). When numerical anchoring is the dominant mechanism (i.e., for low-price ads), the repetition increases the accessibility of a price in one's memory, and it increases the probability that the price stimulus acts as an anchor in price judgment. Thus, more exposures should lead to a greater effect of the price anchor. If consumers repeatedly encounter an ad containing a low price, each repeated exposure should improve the anchoring effect and should reduce their IRP.

In contrast, when the semantic anchoring mechanism is dominant (i.e., for high-price ads), we suggest that ad repetition does not improve the anchoring effect. In this context, the first exposure stimulates existing product knowledge from the consumer's memory. Since the effect of semantic anchoring is more durable [64], the product knowledge is still accessible in the consumer's memory during repeated exposures. Accordingly, these repetitions should not have any additional impact on the consumer's price judgment. It should be noted that repetition could lead to the generation of a greater amount of anchor-consistent

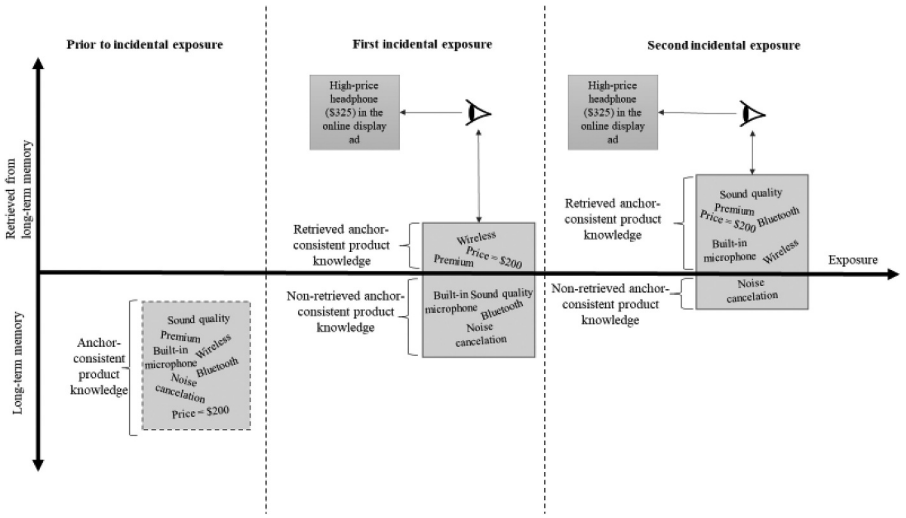

Figure 2. The effect of ad repetition on fixation duration for a semantic anchoring mechanism (high-price ad)

product knowledge[1] However, the semantic anchoring should not change because the new stimulated product knowledge is consistent with the previously retrieved information. Therefore, for an ad containing a high price, we predict that repeated exposures will not change the consumer's IRP. Formally:

H1a: When consumers are incidentally exposed to online display ads, ad repetition decreases their IRP when exposed to low-price ads.

H1b: When consumers are incidentally exposed to online display ads, ad repetition does not change their IRP when exposed to high-price ads.

Price-comparing Ads

Price-comparing ads feature both a low selling price (SP; e.g., "Now $8.99") and a high advertised reference price (ARP; e.g., "Regularly $11.99"). Prior studies [3; 7; 20; 33; 35] that have examined the impact of price-comparing ads usually assume that consumers evaluate them with their full attention. In such a context, prior work [3; 7; 21; 45; 55] shows that both the selling price and the advertised reference price affect the consumer's IRP. Chandrashekaran and Grewal [8] showed that consumers are more affected by the selling price than the advertised reference price because the selling price is more informative. Kan et al. [33] found that the effect of an advertised reference price on the consumer's IRP depends on the anchoring mechanism. When there is an overlap between the product knowledge primed by the SP and the ARP, the latter information (ARP) has a stronger effect on the IRP.

[1]We further elaborate on the functioning of the semantic anchoring mechanism in the "Eye Tracking and Price Cognition" section and in Figure 2.

By manipulating the relative font size of the ARP and SP, Aggarwal and Vaidyanathan [3] change the attention that participants paid to these stimuli, which affects how consumers process the ad. In these studies, the participants had to evaluate the ads attentively.

In online environments, however, consumers are exposed to ads incidentally and may not be willing or able to fully process both price stimuli. Hence, they may not perceive any difference between the two price stimuli in terms of their informative value. Building on our first hypothesis, we argue that consumers process the "high price" component of comparative ads in greater depth than the "low price" component when they are exposed to them incidentally. As a result, the "high price" component, compared to its "low price" counterpart, is more diagnostic in predicting the IRP. If we compare the predicted outcomes for price-comparing ads with those of regular ads containing only a low (high) price, we expect that the resulting IRP will be higher (similar) for the price-comparing ad, compared to the low-price (high-price) ad. Specifically:

H2a: When consumers are incidentally exposed to online display ads, their IRP will be greater when exposed to a price-comparing ad, compared to a low-price ad.

H2b: When consumers are incidentally exposed to online display ads, their IRP will be similar when exposed to a price-comparing ad, compared to a high-price ad.

A direct result of H2 is that ad repetition does not improve the effect of price-comparing ads on the IRP in the context of incidental ad exposure. In other words, we make the same predictions as with H1b for comparative ads. Ad repetition should not change the consumer's IRP when incidentally exposed to price-comparing ads.

Eye Tracking and Price Cognition

Even though consumers avoid looking at online display ads [14; 39; 40; 66], eye-tracking studies show that they fixate on ads at least once during each page visit [24]. In these cases, fixation duration on ads typically varies between 100 and 300 milliseconds [26]. Although this duration is short, it is long enough for consumers to process the ad content to some extent [52]. The fixation duration is important not only because it is an indicator of attention, but also because it indicates the amount of cognitive processing [26; 29, 30]. The Eye-mind hypothesis, introduced by Just and Carpenter [29], postulates that consumers process what they are looking at, which means that a longer fixation time is associated with deeper cognitive processing [26].

Previous studies [14; 40] show that the saliency of a display can influence the amount of attention devoted to the ad, which itself is associated with greater cognitive processing [63]. However, the relationship between price anchors (in online display ads) and fixation duration has not been extensively investigated. The only exception is an eye-tracking study by Menon et al. [46]; when several prices were displayed in posts on Facebook, fixation duration dropped and rose again when the price moved from a low to a high value. It should be noted that this research was not conducted in an incidental exposure context; participants were asked to look at posts containing price information.

As previously explained, we argue that the dominant anchoring mechanism is influenced by the value of the price stimulus and the level of cognitive processing at the time of incidental exposure. Therefore, when consumers are incidentally exposed to online ads, the fixation duration on the ad should be affected by the value of price stimulus because fixation duration is a proxy for the level of cognitive processing [26]. That is, when the online ad contains a low price, we suggest that the numerical price anchoring mechanism will be activated, which demands less processing. However, when the ad contains a high price, it is more likely that the semantic anchoring mechanism will be triggered, which demands more cognitive processing. Therefore, fixation duration should be longer on an online ad that contains a high price, compared to one containing a low price.

H3a: When consumers encounter an online display ad incidentally, their average fixation duration is longer for a high-price ad, compared to a low-price ad.

Several eye-tracking studies have also measured pupil diameter as a proxy for cognitive load and changes in attentional capacity (see [36] for a review). Importantly, researchers observe that pupillometry may provide an index for cognitive processing even before the awareness of the existence of the stimulus [10]. Therefore, in an incidental exposure context, we expect that pupil size should be greater when consumers are exposed to an ad containing a high price, compared to an ad with a low price.

H3b: When consumers incidentally encounter an online display ad, their pupil diameter is larger for a high-price ad, compared to a low-price ad.

Now, we turn to explaining the effects of ad repetition on fixation time by building on prior eye-tracking studies investigating the relationships between repetition, cognitive processing, and fixation time (e.g., [24; 38]). Specifically, we hypothesize that the fixation duration is not affected by ad repetition when they use numerical anchoring in the context of low-price ads. As we suggest in H3, ads with low prices should not trigger deeper cognitive processing. When consumers are repeatedly exposed to online ads with a low price, they should process such ads by using the less cognitively demanding process during the first exposure. In this case, there is no carry-over effect on the following exposures, and they keep on processing the stimulus as they did on their first exposure.

H4a: When consumers are repeatedly exposed to the same online low-price display ad, their average fixation duration does not change with the number of exposures to the ad.

In contrast, when consumers are exposed to an online ad with a high price in the first repetition, the price anchor stimulates some price-consistent product knowledge in their memory (i.e., semantic anchoring), but not the entire product knowledge. This product knowledge remains in the consumer's memory after the first exposure to the stimulus [2]. Previous studies suggest that consumers first retrieve background product knowledge when they are initially exposed to anchors [2; 4]. Since consumers process the incidental ads with minimal

attention, we posit that the first exposure does not allow retrieval of all anchor-consistent product knowledge. With this anchor mechanism, each repetition provides a new opportunity to retrieve more anchor-consistent product knowledge. As the number of ad repetitions increases, the incidental price stimulus is evaluated against a larger body of information, which requires more fixation time and processing. See Figure 2 for an illustration of the process underlying H4b.

H4b: When consumers are repeatedly exposed to the same online high-price display ad, their average fixation duration increases with the number of exposures to the ad.

The Role of Cognitive Load

Our previous hypotheses state that when consumers are incidentally exposed to high-price ads, they process the featured price stimulus through semantic anchoring. This means that these ads stimulate greater cognitive processing—that is, they should have longer eye fixation and larger pupil size when processing these ads. However, if consumers are already experiencing high cognitive load at the time of incidental exposure (because they are paying more attention to their primary task), it is less likely that the dominant anchoring mechanism will be the semantic one. In such a context (i.e., high cognitive load), we argue that consumers will process the high-price ads through the less cognitively demanding anchoring mechanism (i.e., numerical). Consistent with our prior explanations, in this case, the repetition of the ad should increase the anchoring effect, thus increasing the IRP. Previous studies (for a review see [22]) show that factors such as time pressure or multitasking can increase cognitive load. Therefore, if the ad contains a high price in the context of time pressure, the dominant price anchoring mechanism should be the numerical one, and ad repetition should increase the IRP.

H5: When consumers are incidentally exposed to high-price ads, ad repetition increases their IRP when they are experiencing time pressure (i.e., greater cognitive load).

Overview of Studies

To test the hypotheses, we conducted four studies. The first two studies are online experiments that test H1 and H2 by comparing participants' IRP after being exposed to either high-price or low-price ads once or repeatedly. Study 3 is an eye-tracking experiment used to investigate H3 and H4. Study 4 was conducted to test H5 by comparing the effect of ad repetition for high-price ads when participants were under time pressure and when not under time pressure.

Study 1: Ad Repetition Effect

Study 1 examined the effect of ad repetition on the participants' IRP with the aid of an online experiment. The objective was to test H1 by manipulating ad repetition and the magnitude of price stimuli (high-price ad or low-price ad) in online display ads when participants are exposed to the ads incidentally.

Design

To manipulate ad repetition, we changed the number of target ads displayed on the web page visited by participants so that they encountered the target ad once, twice, or three times. The target ads contained a price which was either lower or higher than the consumer's IRP. Hence, the experimental design was a 3 (ad repetition: 1, 2, or 3) × 2 (ad price: Lower than IRP ad or higher than IRP) between-subjects design. The structure of the web page was based on a cnet.com page containing several images, including banners, headers, footers, and peripheral images.

Ad repetition manipulation

For the manipulation of ad repetitions, three locations (top, middle, and bottom of the page) between the text paragraphs were designated to display the target and filler ads. For the single-exposure condition, the target ad was displayed in the middle of the web page, while two filler ads were displayed at the top and bottom of the web page. For the two-exposure condition, the filler ad was displayed in the top location of the page and the target ad was displayed twice in the two other locations. For the three-exposure condition, the target ad was displayed in all three locations on the page.

Ad price manipulation

For this experiment, we designed a set of online display ads promoting a model of wireless headphones. This product was selected because it is a *search* product (rather than an *experience* product, cf. 34); hence, the relation between price and quality is more objective. Also, this product is known by consumers of every age and with different levels of technical knowledge. Finally, in the market, this product category includes a wide range of prices from well-known to lesser-known brands. We conducted a pretest with 24 participants recruited from an online sample of US consumers to measure their acceptable price range for wireless headphones. Using these results, we selected two price points: a $45 price as the low price and a $325 price as the high price. The low (high) price was lower (higher) than the average of the lowest (highest) acceptable price reported by participants. Using the target headphones model, we designed a 250-by-300-pixel display ad containing an image of the headphones and its price. To allow for variance in association with the price, no product descriptions were included in the ads. Thus, two versions of the target ad were designed: high-price ad with a $325 price stimulus and a low-price ad with a $45 price stimulus.

Sample and Procedure

A sample of 320 US consumers (median age 45-54 years old, 38.5% female) was recruited through an online panel. Three participants were excluded because they did not answer the main questions. Participants were told that they were going to be presented with a web page and that their task was to read it carefully and answer some questions about it afterwards. There was no indication of target ads or price stimuli in the instructions. Several marketing studies have employed this strategy to examine implicit effects of ads in online and offline contexts [15; 27; 39; 54; 66]. Following that, participants were asked to complete

a questionnaire containing questions about their expected price for wireless headphones on the market and for the specific headphones in the target ad, confidence in their price knowledge, ad recall, and demographics.

Measurements

Internal reference price

Internal reference price (IRP) is an internal dynamic standard, and there is no validated self-reported scale to measure it [45]. Thomas and Menon [58] show that, although IRP is correlated with expected price (EP), the former is more malleable than the latter. That is, when consumers are exposed to a new price stimulus, the probability that their IRP will change is greater than the probability that their EP will change, since the latter requires that consumers have confidence in their price knowledge. Therefore, instead of measuring IRP directly, we measured expected average market price as a proxy for IRP and a form of conservative test, which increases our confidence that the proposed factors (i.e., price magnitude and number of repetitions) affects the IRP as expected. The EP measure is adapted from Thomas and Menon [58], and participants were asked to mention their estimate of the average price of wireless headphones on the market. In addition to the EP for headphones, we measured the EP for the target model of headphone displayed in the ad[2]

We also measured the participants' confidence in their price knowledge with a question that asked whether they were confident that their price estimate was close to the real market price. We used a 7-point Likert scale with values ranging from "Strongly agree" to "Strongly disagree". We measured confidence in price knowledge to rule out an alternative explanation that ad repetition could result in higher confidence in price knowledge, which, in turn, would affect price judgment.

Ad recall

We measured the participants' ad recall by asking whether they recalled seeing ads for headphones. We also asked them whether the ads contained a price. If participants had previously mentioned that they did not recall any ad, we stated that there were indeed some headphones ads and then asked them to answer the price-recall question with a well-informed guess. After that question, we asked all the participants to state the price mentioned in the ad.

Pretest

We performed a pretest with 157 US consumers recruited through an online panel to examine whether incidental exposure to online display ads had any impact on price judgment. The pretest had a one-factor between-subjects design in which participants were randomly assigned to one of the three conditions corresponding to the three types of ad: lower than IRP ad ($45 headphones), higher than IRP ad ($325 headphones), and no-price ad. The procedure in this pretest was the same as the one used

[2]Moreover, we measured the participants' willingness to pay, as another highly correlated variable with IRP, for the 3 models of headphones from 3 different brands, and the results were in agreement with the EP results.

Table 1. Mean, Standard Deviation (SD), and Cell Size for Participants' IRP (Study 2)

	Single Exposure			Three Exposures		
Type of Ad	N	Mean	SD	N	Mean	SD
High-price Ads	26	119.50	117.85	27	120.70	97.52
Price-comparing Ads	26	98.81	97.40	27	111.41	104.15
Low-price Ads	27	81.56	73.68	18	67.77	46.24

in Study 1. The results revealed that participants in the high-price condition had a higher expected market price for a set of headphones than those in the low-price condition (M_{Diff} = 92.502; t(54.923)= 5.704, p<.001). For participants in the no-price condition, their estimate of expected market price was higher than that of participants in the low-price condition (M_{Diff} = -16.561, t(91.574)= 2.356, p<.021), but lower than participants in the high-price condition (M_{Diff} = 75.940, t(62.430)= 4.519, p<.001). These results suggest that the participants' price perception can be affected by incidental exposure to online display ads and that the high (low) price stimulus selected for the main experiment was significantly higher (lower) than the participants' IRP.

Results

H1 predicts that increasing the number of exposures improves the anchoring effect only for ads whose advertised price is lower than the consumer's IRP. A two-way ANOVA was conducted to compare the main effects of ad repetition and the interaction between ad price and ad repetition on participants' estimate of expected market prices for the product category and the target model of headphones. Since the results for both expected market price for the target model of headphones and headphones as a product category were similar, we report here only the results for the EP of the product category. Figure 3 shows the results (for complete results please see Table 1 in Appendix A). As expected, the main effect of the ad price was significant (F(1, 311) = 46.250, p<.001, η^2=.129); participants' EPs were significantly higher when they were exposed to the high-price ads (M=170.306) than when they were exposed to the low-price ads (M=126.617).

The results also reveal that there was a significant interaction between ad price and ad repetition (F(2, 311)=3.147, p=.044, η^2=.020; Figure 3).The difference between the high-price and the low-price ads was greater when participants were in the three repetition condition (M_{diff}=113.311; F= 29.856, p < .001, η^2=.216) than when they were exposed to the target ad only once (M_{diff}=43.690; F=4.300, p=.040, η^2=.035). Planned contrasts showed that increasing the number of ad repetitions from one to three significantly increased the anchoring effect when the participants were exposed to the low-price ad (F=5.879, p=.025), thus supporting H1a. However, for participants who were exposed to the high-price ad, increasing the number of ad repetitions did not change their EP (F=1.437, p=.232), thus supporting H1b.

We suggest that the observed effects are due to an implicit anchoring effect. To support our claim, we performed three additional analyses. First, as mentioned, Thomas and Menon [58] show that ad repetition increases consumers' confidence in their price knowledge which, in turn, affects their internal reference price. In their experiments, participants who

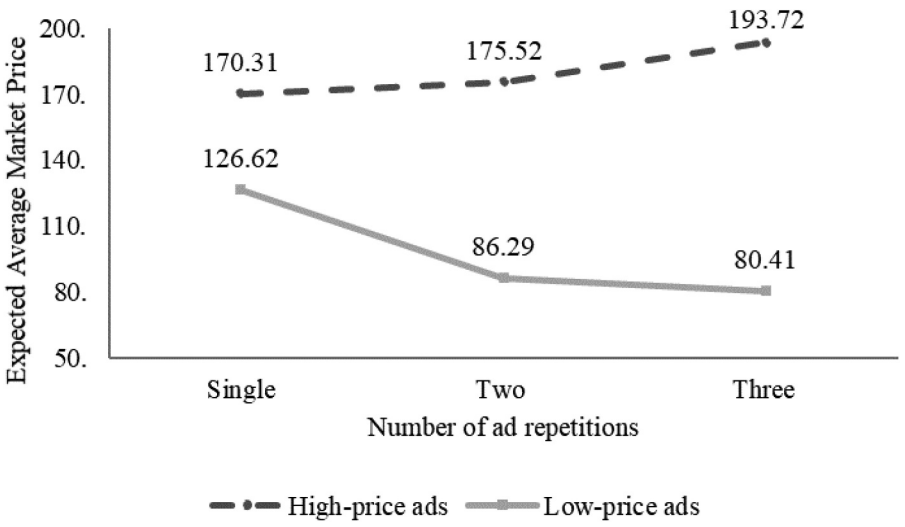

Figure 3. Mean of Expected Average Market Price (Study 1)

were repeatedly exposed to high-price ads, on which their attention was focused, had higher confidence in their price knowledge and higher IRP than those who were exposed to the price only once. However, in our study, neither the prices in the ad (higher or lower than IRP) nor the ad repetition affected participants' confidence in their price knowledge.[3] This result suggests that the observed effect of ad repetition is not due to a change in consumers' confidence in their price knowledge. Moreover, the fact that ad repetition did not affect the participants' confidence in price knowledge supports our assumption that they were not paying attention to the ads, because, otherwise, those who were exposed to the target ads repeatedly would have reported greater confidence.

Second, results about price recall and ad recall, which are a measure of explicit memory and a proxy for conscious processing of an ad [66], cannot explain all the observed effects. To correctly measure participants' target ad recall, we asked whether they recalled any price information in any of the ads. This is a better measure of ad recall of the target ads because they were the only ads that contained price stimuli. Of all the participants, 50.8% recalled an ad containing price information. This figure is comparable to those reported in prior studies [14; 66] that investigated incidental exposure to online display ads in a real-life context. These results support our assumption that the experimental procedure prevented participants from paying attention to the ads.

Third, we performed an additional ANOVA analysis while controlling for price recall. The interaction between ad price and ad repetition on the participants' EP remained significant ($F(2, 310)=4.243$, $p=.015$, $\eta^2=.027$). This result shows that the observed effects on the participants' EP did not depend on whether participants recalled the price stimulus in the target ads, supporting our assumption that the observed effects can be categorized as an implicit effect of incidental exposure to online display ads in which participants paid limited attention to the ads.

[3]All p-values were larger than .5; detailed results are available upon request.

Discussion

In accordance with previous studies [e.g., 1; 38], which found that price stimuli can affect price perception without the conscious attention of consumers, Study 1 shows that consumers' IRP can be affected by the price information in online display ads to which they are incidentally exposed. We found that ad repetition improved the effects of online ads on IRP only when they contained prices lower than the consumer's IRP (H1a). When the ads contained prices higher than the consumers' IRP, ad repetition did not affect their IRP (H1b). Results show that participants' explicit memory of the ads cannot explain the effect of incidental price information on their IRP. Both the participants who recalled the ads and those who did not were affected by the price stimuli in the ads. Participants who were repeatedly exposed to the high-price ad recalled it better than those who were exposed to it only once, but their EP was not affected by ad repetition. That a portion of participants recalled seeing the ad does not rule out that the incidental ads had an implicit effect on their IRP. As mentioned, an implicit effect occurs when consumers are not aware of the potential effect of a stimulus on their judgment, for example when they judge the stimulus irrelevant to their main task. We propose that high prices motivate consumers to pay more attention to incidental ads which in turn increases the probability that they process the price anchors through the more cognitively demanding semantic anchoring mechanism. On the other hand, when participants were repeatedly exposed to an ad with a price lower than their IRP, their explicit memory did not change, but the effect of the price stimulus improved. These findings indicate that the effects of conscious price processing, i.e., explicit memory, and implicit effects of incidental price exposure do not necessarily move in the same direction.

Study 2: Ad Repetition for Price-comparing Ads

In Study 1, the target ads contained only one piece of price information (a price either lower or higher than the participants' IRP). In Study 2, we examined the effect of ad repetition when the target ad contains two prices, an advertised reference price and a selling price to test H2. Moreover, unlike Study 1, in which the content of the web page and the product category in the target ads were about the same product (i.e., headphones), we used a different product category for the target ads while keeping the same page content. By using a different product category, we aimed to reduce the likelihood that participants might find the target ads relevant and pay more attention to them. Additionally, we used a fictitious brand for the target ad to prevent any association between price and brand name or any bias that might be due to familiarity with the brand.

Stimuli and Design

Pretest

We administered a pretest to an online panel of 57 US consumers and measured their product involvement, product knowledge, and price knowledge for 15 different product categories that we had previously selected based on a focus group discussion. All products were gender-neutral and search products. According to the pretest results, we found that for wireless speakers, participants have a moderate level of

product knowledge[4] (M=4.13, SD=1.961), a moderate level of price knowledge[5] (M=3.81, SD=1.869), and a moderate level of product involvement[6] (M=4.13, SD=1.920). We selected wireless speakers for Study 2 since consumers were neither extremely familiar, nor extremely unfamiliar with this category. The average expected market price was $117.98 (SD=80.89). Based on the accepted price range for wireless speakers, we selected $45.99 and $325.99 as the lower and higher than IRP price stimuli.

Stimuli development

Three versions of a 250-by-300 pixels ad were designed for three experimental conditions: Low-price ad, high-price ad, and a price-comparing ad containing both the selling price (SP; the lower than IRP price stimulus) and advertised reference price (ARP; the higher than IRP price stimulus). The latter presented SP and ARP in the format of "Was $325.99, Now $45.99". To control the effect of attention, both price stimuli were displayed in the same font size [3] (see Appendix B).

Design and procedure

A sample of one hundred and fifty-one (151) US consumers was recruited from an online panel using a small monetary compensation as an inducement. They were randomly assigned to one of six conditions of a 2 (number of ad repetitions: Single vs three repetitions) × 3 (type of ad: Low-price only, high-price only, and price-comparing ad) between-subjects design (median age 45 to 54 years old, female 62.3%). As in Study 1, participants were told to read a web page in order later to answer some questions about its content; the page design was the same as the one we used in Study 1. There was no mention of any price information or display ads in the instructions. After exposure to the ads, we measured the participants' expected average market price (EP) as proxy for IRP.

Results

Table 1 shows the participants' expected average market price (EP) for the wireless speaker in each condition. Overall, participants who were exposed to the high-price ad had a higher EP than those who were exposed to the low-price ad ($F(1, 94)=5.982$, $p=.016$, $\eta^2=.060$). Although in the expected direction, the results did not provide additional support for H1a: Ad repetition decreased participants' EP when there were exposed to low-price ad, but this was not statistically significant (M_{diff} = 13.377; $F(1, 43)=.497$, $p=.485$). Results did, however, provide additional support for H1b: Ad repetition did not influence the participants' EP in the high-price ad condition (M_{diff} =1.204; $F(1, 51)<.005$, $p=.962$). However, further analysis of simple effects brings indirect support for H1a. Among participants who were exposed to the target ad only once, EP was not statistically different between those in the high-price

[4]7-point Likert Scale (1=Strongly Disagree; 7=Strongly Agree): "I feel I know enough about this product category."
[5]7-point Likert Scale (1=Strongly Disagree; 7=Strongly Agree): "I feel confident in saying that my general knowledge of prices of products in the above depicted product category is quite good."
[6]7-Point Likert Scale (1=Strongly Disagree; 7=Strongly Agree): "On my personal perception, this product category is important to me."

condition and those in the low-price condition (M_{diff}= 37.944, F(1, 51)=1.992, p=.164, η^2=.038); however, among participants who were exposed to the target ads three times, those who were exposed to the high-price ad had statistically higher EP than those who were exposed to the low-price ad (M_{diff}= 52.926, F(1,43)=4.458, p=.038, η^2=.096). In other words, the effect of ad repetition was different for high-price compared to low-price ads.

H2 predicts that consumers that are exposed to low-price ads should have lower IRP than those who are exposed to price-comparing ads (H2a), but the IRP of consumers who are exposed to price-comparing ads should not be different than those who are exposed to high-price ads (H2b). Results of an ANOVA suggest that participants who were in low-price ad condition had lower EP than those who were in price-comparing ad condition (F(1, 94)=2.975, one-sided p=.044, η^2=.031). Analysis of simple effects shows that among those who were exposed to the ad three times, participants who were exposed to the price-comparing ad had a higher EP than those who were exposed to the low-price ad (M_{diff} = 43.626, t(38.503)=1.912, one-sided p=.032). For participants exposed to the target ads once, those who were exposed to price-comparing ads had a higher EP than those who were exposed to the low-price ad, but the difference was not statistically significant (M_{diff} = 17.252, t(51) =.729, p=.469). These results partially support H2a.

As H2b predicted, there was no statistical difference between the EP of participants in the price-comparing ad condition and the EP of those in high-price condition (F(1, 102)=.546, p=.462, η^2=.003). Analysis of simple effects also shows that there was no significant difference between price-comparing and high-price conditions whether the participants were exposed to the target ad once (M_{diff} = 20.692, t(50)=.690, p=.493) or exposed to the target ads three times (M_{diff} = 9.297. t(52)=.339, p=.736). Based on H1b, we expected that ad repetition would not change the participants' EP because participants process the higher ARP through the more cognitively demanding semantic processing. Accordingly, results show that the EP of participants who were exposed to the price-comparing ad once and those who were exposed to it three times was not statistically different (M_{diff} = 12.60, t(51)=.454, p=.651).

Ad recall

As only the target ads contained price stimuli, price recall is a better measure of the participants' explicit memory of ads. Of all the participants, 44.40% recalled seeing a price stimulus in the ads. These results are comparable to those of Study 1 and support the manipulation which was intended to prevent participants from focusing their attention on the target ads.[7]

Discussion

Results of Study 2 show that ad repetition does not improve the impact of price-comparing ads in online environments. The fact that participants who were exposed to the price-comparing ad had higher reported EP than those who were exposed to the low-price ad (overall and after three repetitions) and the fact that there was no such

[7]Adding price recall as a control variable does not change the results.

difference between the high-price ad and the price-comparing ad lend support to H2. This is in accordance with the notion that when online consumers are incidentally exposed to price-comparing ads, they process the higher advertised reference price deeper than the lower selling price. This observation is contrary to previous studies, such as Chandrashekaran and Grewal [9], which posit that consumer are more affected by the selling price than the advertised reference price because the former is more informative. In addition, results partially replicate those of Study 1. It also extends the generalizability of Study 1 findings, since it shows that the effect of ad repetition for online ads is not confined to ads in which the advertised product is congruent with the content of the web page.

Study 3: Eye-tracking and Price Anchoring Mechanisms

As suggested, Studies 1 and 2 show that the effect of ad repetition on the consumer's IRP price is moderated by the value of the price depicted in the ads. We argue that this is because the anchoring mechanism used for ads depicting a price that is greater than the consumer's IRP is the semantic mechanism while the mechanism for ads presenting a price lower than the consumer's IRP is the numerical mechanism. Building on these findings, the objective of Study 3 is to test the anchoring mechanisms for the high- and low-price ads and to compare consumers' price processing during a single exposure with their processing across multiple exposures (i.e., ad repetition). Prior research highlights that the attention given to a stimulus is an appropriate proxy for measuring cognitive processing [39; 42; 63]. Eye-tracking has been widely used to measure the consumer's attention to visual stimuli [51; 63]. In addition, eye-tracking serves to measure gaze behavior in a non-intrusive manner with a high level of precision [49]. Therefore, to examine anchoring mechanisms of incidental online ads, eye-tracking is the method of choice.

Accordingly, we designed an eye-tracking experiment to test H3 and H4. When consumers are exposed to an ad with a price greater than their IRP (vs. an ad with a price lower than their IRP), we suggest that they will fixate longer on this ad (H3a) and spend more cognitive resources on it (H3b). Further, as they repeatedly encounter this ad, their average fixation duration time will remain the same for an ad that is featuring a lower price than their IRP (H4a) but will increase for ads showing a higher price than their IRP (H4b). To examine price anchoring mechanisms, we compare the gaze behavior when participants were exposed to the incidental ads for the first time versus when they were exposed to the same incidental ads for the second and third time (i.e., repeated exposures). Therefore, in this experiment, unlike Studies 1 and 3, in which we manipulated ad repetition as a between-subjects factor, all participants in Study 3 were exposed to 3 target ads, but we compared the gaze behavior during the first, second, and third exposure. Note that participants during the first exposure were not aware that they were going to be exposed to the ad for a second or third time. Therefore, although we did not manipulate ad repetition directly in this study, by manipulating the ad location as a within-subject factor, we were able to examine how participants processed price stimuli during repeated exposures.

Design, Procedure, and Sample

This experiment used a 2 (ad price: Low-price ad or high-price ad) × 3 (ad location: Top, middle, or bottom of the web page) mixed design in which the ad location was the within-subject factor. We recruited 65 participants and provided them with a $20 gift card as a compensation for their participation in the experiment. One participant was removed from data analysis due to a technical issue during the experiment. They were randomly assigned to one of the two ad price conditions. Following the eye tracker calibration, participants were told that they would consult two web pages during the experiment and were asked to study those pages carefully since they would have to answer questions regarding their content afterwards. The structure of the web pages was based on real web pages; they contained several images, including banners, headers, footers, and peripheral images (see Appendix C for images of the target web pages). The participants' first task was a warm-up task in which they were exposed to the first web page in which a filler ad was displayed in three different locations on the page (top, middle, and bottom sections). After reading this web page, participants were asked to describe in writing the general content of the web page. This initial task helped to prevent participants from guessing the main objective of the study while encouraging them to focus on the web page's content, not the ad.

The second task was the target web page task, whose content was a purchasing guide for headphones. It contained the target ad, which was displayed in three different locations (top, middle, and bottom sections). The target ad featured a price stimulus that was either lower or higher than the participant's IRP (low-price or high-price ad). After studying the web page at their own pace, participants answered questions that measured their EP as well as their ad recall and price recall. To control for other environmental factors that may affect pupil diameter [26; 35], we conducted the experiment in a single lab room in which the temperature, humidity, and environmental light were all kept constant.

Stimuli Development

For the target ad in this study, we used the same product as in Study 1 (wireless headphones). Using the target headphones model, we designed a 250-by-300-pixel display ad containing an image of the headphones and the brand name. The brand is real, and it offers various models within a wide range of prices. To allow for variance in association with the price, no product description was included in the ads. Thus, two versions of the target ad were designed: High-price ad with a $325 price stimulus and a low-price ad with a $45 price stimulus (see Appendix D for the target ads).

Apparatus

This experiment was performed on a computer with a screen resolution of 1280 × 1024 pixels. Eye movements were recorded with a SMI iView X Eye-Tracker version 2.4 (SMI GmbH, 2009). Its resolution rate was 60 Hz and eye movements were captured by an infrared camera at the bottom of a 19" computer screen located about 65 cm from the participants.

All participants performed a calibration task before the main task. A tolerance of 0.5° at the distance of 65 cm was maintained for error between calibration and validation. If the error was larger, the calibration procedure was repeated until the participants successfully met the required level. Four participants marginally passed the calibration test, and we let them continue the test. Further analysis of the results showed that including these four participants does not change the findings, therefore, we report results including them.

Measurement

Fixation duration

Eye-tracking tools record several types of fixation duration. In this study, we defined the three target ads as the three areas of interest (AOIs) and measured the average fixation duration on each AOI as well as the sum of all fixations inside each AOI divided by the total number of fixations during the task.

Pupil size

SMI software provides pupil size in millimeters for each fixation. One major argument against the use of pupil size is that the effect of cognitive processing is small compared to the effect of light [26]. However, in our controlled setting, all participants performed the experimental tasks in the same room, which had constant luminosity, and the web pages' contrast and brightness were also constant. Before participants saw the first ad, they had spent at least 15 seconds on the web page, which is above the 2-5 seconds threshold recommended for baseline formation [26].

Internal reference price and Ad Recall

Following the procedure used in Studies 1 and 2, we measured the participants' EP and ad recall.

Results

Due to technical limitations, for some participants, fixations on one to two of AOIs were not recorded (~12%). Since participants were scrolling the target page, this behavior may have prevented the eye-tracker from recording fixations on an AOI. Therefore, to analyze the eye tracking data, we ran a linear mixed-effect model (MIXED), which can handle correlated data with unequal variances and allows for an unequal number of repetitions [18]. The summary of the main results is presented in Table 2 and Figure 4.

Fixation duration

Consistent with H3a, participants in the high-price condition had on average a longer fixation duration on ads (M=460.420ms) than did those in the low-price condition (M=362.151ms; $F(1, 55{,}123)=8.990$, $p=.004$). For the low-price condition, the average fixation duration did not statistically change when participants were repeatedly exposed to the same ad ($F(2, 108.265)<1$), thus providing support for H4a. In addition, consistent with H4b, for the high-price condition, the fixation duration increased after each exposure ($F(2, 104.630)=9.473$, $p<.005$).

Pupil size

As expected, results revealed that participants in the high-price condition had on average a larger pupil size (M=3.573mm) during their fixations on the ads than participants in the low-price condition (M=3.394mm; F(1, 85.384)=4.979, p=.028). These results support H3b.

Number of fixations

Number of fixations has been used as an indicator of conscious attention for online display ads (e.g., [24; 26; 42]). We measured the number of fixations on each ad and examined the difference between the low-price and high-price ad condition. The main effect was not significant (F(1, 60.557)<.005, Figure 5), but results indicated that the ad location had a significant effect on fixation. The number of fixations dropped significantly after each exposure (F(2, 105.523)=14.357, p<.005). These results suggest that the participants learned the content of the ad at the first exposure and used that knowledge to avoid the ad during subsequent exposures.

Ad recall

Although the target ad was displayed three times on the web page, 30% of the participants failed to recall seeing any ad promoting headphones; this figure did not differ between the two price conditions ($\chi 2(1) = 1.120$, $p = .290$). After they had been informed that there were headphone ads, they were asked to mention if they remembered any price in the ads, and 61.5% of the participants did not recall any price in the ads. We also asked all participants to state what the price in the ad was, but only 21.1% of them mentioned the correct price. These results confirm that the procedure prevented participants from focusing their attention on the target ads[8]

Internal reference price

We asked participants to indicate what they thought was the average price of headphones on the market. Although in the expected direction, there was not a statistically significant difference between the low-price and high-price ad conditions for participants' EP (F(1,63)<1). This result does not support the incidental effect of price stimuli on EP found in Studies 1 and 2, potentially because of the smaller sample size of Study 3. However, it suggests that participants did not pay attention to ads, and that our study setting is similar to real online environments.

Table 2. Mean (Standard Deviation) and Cell Size for Participants' Gaze Behavior (Study 3)

	High-price Ads				Low-price Ads			
Ad location	Pupil Size (mm)	Fixation Duration (ms)	Number of Fixations	N	Pupil Size (mm)	Fixation Duration (ms)	Number of Fixations	N
Top	3.548 (.404)	323.506 (140.916)	8.27 (7.152)	27	3.413 (.342)	328.479 (121.453)	8.45 (6.544)	29
Middle	3.624 (.364)	470.289 (277.376)	5.67 (4.361)	24	3.396 (.361)	351.882 (124.919)	5.03 (3.554)	31
Bottom	3.549 (.423)	587.465 (342.399)	3.21 (1.179)	24	3.373 (.339)	406.091 (218.234)	3.63 (2.06)	24

[8]We also controlled for the effect of price recall, as proxy for ad recall, and our results did not change.

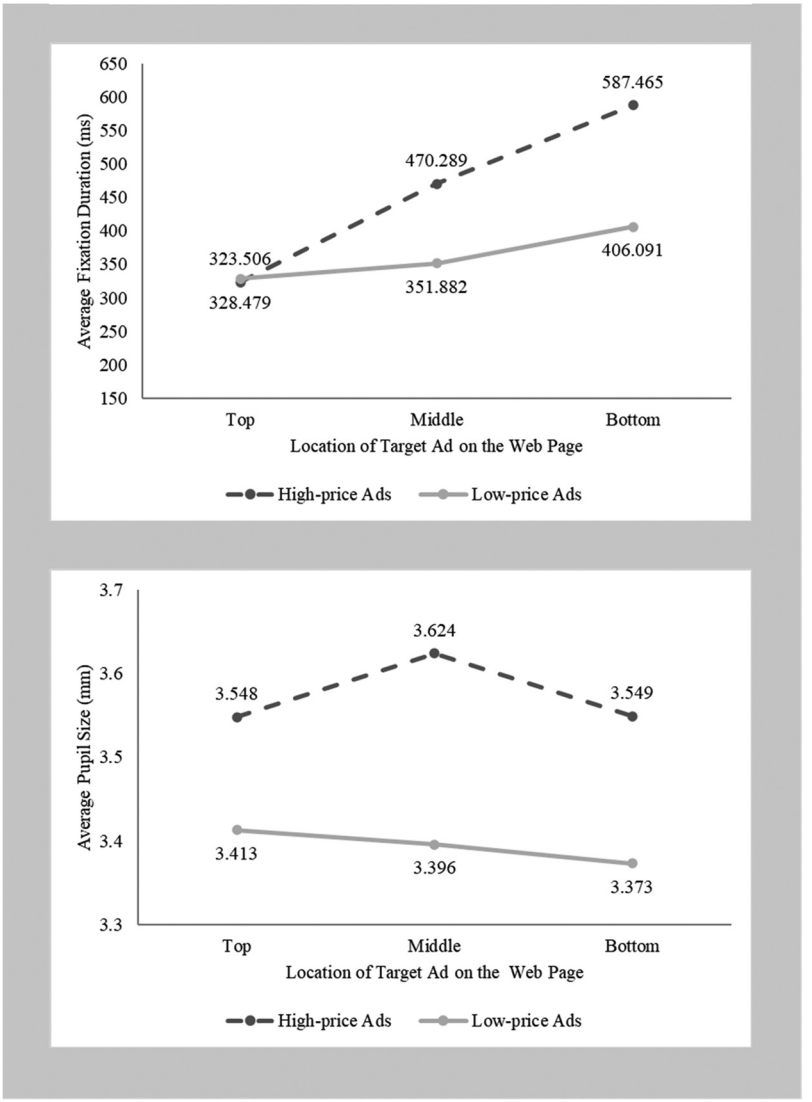

Figure 4. Average fixation duration and average pupil size of on each ad

Ex-post test

Our hypotheses are based on the assumption that differences in gaze behaviors are explained by the price anchoring mechanism used by consumers: A more cognitively demanding mechanism (i.e., semantic anchoring) for high-price ads and a less cognitively demanding mechanism (i.e., numerical anchoring) for the low-price ads. However, it can be argued that participants paid greater attention to high-price ads than the low-price ads because the high-price stimulus was not a regular price for headphones. We believe this could not explain the observed behaviors for three reasons. First, both high- and low-price

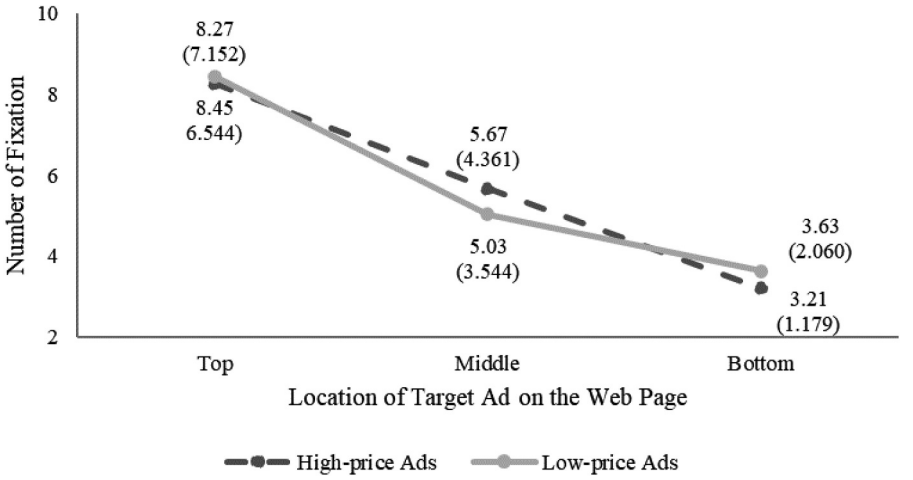

Figure 5. Number of Fixations on Each Ad (Study 3)

stimuli were significantly different from the acceptable price range for the target product according to the pretest's results in Study 1. Second, the number of fixations, as a proxy for conscious attention, was not different for high-price and low-price ads.

Third, we conducted an online experiment by recruiting 101 participants through Amazon Mechanical Turk to rule out this alternative explanation. Participants were asked to explicitly evaluate either the high- or low-price ad that was used in the eye-tracking study. On a scale of 1 (= not at all) to 7 (= very much), we measured the extent to which participants viewed the ad as being interesting (M = 3.70; SD = 1.973), attractive (M = 3.66; SD = 1.865), manipulative (M = 2.79; SD = 1.645) and unusual (M = 2.94; SD = 1.938). Also, we measured the extent to which the participants viewed the ads as being believable using four items (credible, believable, reliable, and reasonable) (M = 4.0718; SD = 1.655; α=.928); this last measure was adapted from Feldman, Bearden, and Hardesty [17].

Overall, there were no statistically significant difference among two conditions for all our measures, including "interesting" ($M_{high\text{-}price}$ = 3.87; $M_{low\text{-}price}$ = 3.50; t(99)=945, p =.347), attractive ($M_{high\text{-}price}$ = 3.57; $M_{low\text{-}price}$ = 3.76; t(98)=.497; p = .620), manipulative ($M_{high\text{-}price}$ = 2.62; $M_{low\text{-}price}$ = 3.00; t(99)=1.164 p =.247), unusual ($M_{high\text{-}price}$ = 3.07; $M_{low\text{-}price}$ = 2.78; t(99)=748; p = .457), and the "believable" scale ($M_{high\text{-}price}$ = 4.17; $M_{low\text{-}price}$ = 3.95; t(99) =.638 p = .525). These results allow ruling out the alternative explanations that our core results would be explained by different levels of interest or credibility associated with our price manipulations.

Discussion

The results of this third study provide support for H3 and H4. The fact that participants had on average a longer fixation duration (H3a) and a larger pupil size (H3b) on the high-price ads supports our contention that they processed the ads containing a high-price through a more cognitively demanding processing anchoring mechanism while they processed low-price ads

through a lesser cognitively demanding one[9] Furthermore, the results show that the number of fixations on the ad dropped as repetition increased. This finding reveals that participants, having become aware of the ad during first incidental exposure, were consciously avoiding the ad during following exposures for both types of ads. However, when participants were repeatedly exposed to the high-price ad, their fixation duration increased (H4b). Thus, while participants were consciously avoiding the ad, as the number of fixations dropped, the cognitive processing of the high-price ad increased as repetition increased. In other words, the conscious gaze behavior, i.e., ad avoidance, and the nonconscious behavior, i.e., fixation duration, evolve in opposite directions for the high-price ads. On the other hand, repeated exposure to the low-price ads did not affect the fixation duration (H4a). The low-price ads did not motivate consumers to pay more attention to them.

It could be argued that not all the fixations were incidental; some of them might have been intentional. Therefore, we repeated the analysis, but instead of average fixation duration and average pupil size, we used the first fixation on each ad. Several studies consider the first fixation to be an unintentional fixation that consumers have no control over (for a comparison between different fixation measurements, see [16]). All the above-mentioned results for fixation behaviors, fixation time, and pupil size were intensified when we considered only the first fixation on each target ad instead of the average of all fixations. In addition, since an individual's gaze behavior is idiosyncratic [26; 62] and there is no standard threshold to distinguish between conscious and nonconscious fixation duration, we perform an additional analysis controlling for individual factors in gaze behavior. We used a linear mixed-effect model (MIXED) for the average fixation duration and added the first fixation duration into the model as a covariate. Results were equivalent to the ones obtained with the original analysis. These two supplemental analyses provide additional support to Study 3′s findings.

Study 4: Manipulating Cognitive Load

According to H5, if consumers are exposed to high-price ads under high cognitive load, ad repetition can improve the anchoring effect because there is less likely that they use the more cognitively demanding semantic anchoring to process price stimuli contained in online display ads. Study 4 is designed to examine this hypothesis. In order to manipulate cognitive load, we use time pressure, which can increase cognitive load [22].

Design, Stimuli, and Sample

The experiment was a 2 (cognitive load: High vs. low) x 2 (ad repetition: 1 exposure vs. 3 exposures) between-subjects design. In these four conditions, the target stimulus was an advertised price greater than participants' IRP (i.e., high-price ad). The stimuli were similar to those used in Studies 1 and 2. The target ad was a headphones ad. To manipulate the cognitive load, we asked participants in the high cognitive load

[9]Note that the average fixation duration was longer on high-price ads than low-price ads for the middle and bottom ads, but not for the top ad.

condition to read the web page in 45 seconds. In Studies 1 and 2, most participants spent 45 seconds or less on the reading task. In the low cognitive load condition, participants were free to spend as much time as they wanted on the webpage. After reading the web page, participants answered questions measuring their EP.

With the aid of an online panel, US resident participants were recruited. At the beginning of the study, participants were given a list of products, including headphones, and were asked to mention which of these products they had any kind of shopping experience with in the previous six months. Those who selected headphones were directed to this experiment. Using this recruitment procedure, a sample of 233 participants was recruited who were randomly assigned to one of the four conditions.

Results

H5 predicts that, for high-price ads, ad repetition should result in higher IRP when participants are under time pressure; but when they do not experience time pressure, ad repetition should not influence their IRP. Table 3 displays participants' EP for wireless headphones. The results of a two-way ANOVA revealed a significant interaction between two factors, i.e., cognitive load and number of repetitions ($F(1,229)=4.649$, $p=.032$, $\eta^2=0.20$) and a significant effect of repetition ($F(1,229)=5.282$, $p=.022$, $\eta^2=0.23$). A closer analysis of the results shows that ad repetition was only significant when participants were under time pressure, i.e., high cognitive load. Those who were exposed to the target ad three times reported higher expected average market price than those who were exposed to the target ad only once ($M=52.965$, $t(107)=2.861$, $p=.005$). For the participants who did not experience time pressure, i.e. low cognitive load condition, ad repetition did not have any significant effect on their expected average of market prices ($M=1.690$, ($t(111)=.122$, $p=.931$). These results support H5.

Discussion

In previous studies, we compared the effect of ad repetition for low-price ads when the less cognitively demanding numerical anchoring mechanism is dominant versus high-price ads when the more cognitively demanding semantic anchoring mechanism is dominant. Study 4 compares the ad repetition effect when participants are exposed to a high-price ad, but when their anchoring mechanism is manipulated through cognitive load. Results show that when participants were under high cognitive load, ad repetition improved the anchoring effect, unlike previous studies. Thus, ad repetition can improve the anchoring effect for high-price ads if the dominant anchoring mechanism becomes the numerical one, which is more likely when individuals are under high cognitive load.

Table 3. Mean, Standard Deviation (SD), and Cell Size for Participants' Expected Average Market Price (Study 4)

	High-Cognitive Load			Low-Cognitive Load		
	Mean	SD	N	Mean	SD	N
1 Exposure	87.862	85.724	51	114.525	84.600	59
3 Exposures	140.827	104.923	58	116.215	84.958	65

General Discussion

One eye-tracking experiment and three online experiments investigated the effects of price stimuli in online display ads as they are processed by consumers in real-life settings. That is, when consumers are exposed to them incidentally. Note that prior research on price anchoring, for the most part, considers two types of contextual price anchors: (1) explicit anchors that are presented on the basis of the standard anchoring paradigm [60] and (2) subliminal anchors that are displayed below the consumer's perceptual threshold (e.g., 15 ms in the experiments by Adaval and Monroe [1]). The consumer's exposure to price information in online display ads—the context of this research—is unlike any of the above-mentioned operationalizations of price anchoring. It differs from the standard anchoring procedure because consumers usually do not process the price in online ads as deeply as they process price anchors in standard anchoring paradigms. Furthermore, incidental exposure to online ads differs from subliminal anchoring. In the latter, participants are repeatedly exposed to price anchors below their perceptual threshold; but in online environments, consumers usually fixate on ads for a longer duration than their perceptual threshold[10] [19; 36].

Theoretical Contributions

Behavioral price research has already shown that the consumer's IRP is affected by incidental contextual price information (for a review see [12]). The current research makes extra steps by examining the price anchoring mechanisms that dominate the overall effect, and by considering the effects of ad repetition. Following the recent approach [2; 4; 64] in price anchoring research that posits that price anchors affect the consumer's judgment through both the Anchoring-and-adjustment mechanism [60] and the Selective-accessibility mechanism [57], the central contribution of our research is to show that, in online contexts, different anchoring mechanisms are triggered by high-price ads and low-price ads and that the effect of ad repetition depends on which anchoring mechanism becomes the dominant one.

First, results of Studies 1-3 show that when the price shown in an online display ad is higher (lower) than the consumer's IRP, it is more likely that the more (less) cognitively demanding semantic (numerical) anchoring mechanism become the dominant one. The effect of price magnitude on price processing has not been examined in previous studies.

Second, our results show that, in the context of online display ads, ad repetition increases the price anchoring effect only when the numerical anchoring is the dominant mechanism. Therefore, if consumers are exposed to low-price ads, ad repetition can decrease their IRP, but if they are exposed to high-price ads, ad repetition does not change their IRP.

Third, results suggest that repetition of high-price ads can lead to an increase in consumers' IRP in contexts where they are under greater cognitive load. In this context, the dominant anchoring mechanism becomes the numerical one.

[10]In their review of eye-tracking studies, Holmqvist et al. [26] mention that eye fixations are mostly around 200-300 ms, although they can be as short as 30-40 ms. The fixation duration is important not only because it is an indicator of attention, but also because, according to the eye-mind hypothesis [26], it is an indicator of the amount of cognitive processing. Given that the exposure time is less than 30 ms in subliminal priming, whereas the fixation duration for online display ads is usually longer than 100 ms, consumers should process online display ads more deeply than price anchors in subliminal priming.

Fourth, although previous studies considered the effect of price-comparing ads on the consumer's IRP, they only examined this effect when the ad was at the center of the consumer's attention. More importantly, they consider the cumulative effect of both price stimuli, the selling price, and the advertised reference price. Our results show that when consumers are incidentally exposed to price-comparing ads, the advertised reference price (i.e., higher price) affects consumers internal reference price more than the advertised selling price (i.e., lower price). Thus, they use higher cognitive processing for the higher price than the lower selling price. Prior studies, such Grewal et al.'s [21], suggested the inverse phenomenon.

Fifth, we provide new evidence for the hybrid model of price anchoring mechanism by comparing participants' fixation duration and pupil size between repeated exposures to online display ads to which consumers are incidentally exposed. Eye fixation and pupillometry provide a spontaneous measure over which participants have no control [36]. In line with previous eye-tracking studies on online advertising [14; 66], our results show that even though participants did not recall the target ad, they fixated on the ad several times. When participants were repeatedly exposed to the same ad, the number of fixations on the ad dropped, but they still fixated on the ad at least once. The fact that participants had fewer fixations on ads as repetition increased supports the idea that online consumers intentionally avoid display ads, but it also shows that they fail to avoid the ads completely. Moreover, in support of our claim that price stimuli in ads can affect consumers' gaze behavior, participants had longer fixation duration and larger pupil size for the ads that contained a price that was higher than their IRP. Therefore, price can be considered a bottom-up factor that affects consumers' attention when they are incidentally exposed to ads. Our results show that the consumer's conscious attention (e.g., ad avoidance in Study 3) and nonconscious attention (e.g., fixation duration) can evolve in opposite directions.

Practical Implications

Our findings can help online marketers design better online display ads and plan their ad placement strategies more effectively. With the help of advertising technology (e.g., real-time-bidding ad platforms) marketers can now more than ever personalize and target ads to specific consumers [5; 37; 41; 56; 67]. However, the effect of these new practices on the online consumer's price judgment is unknown for the most part. The results of this research shed some light on this issue. First, according to the results, by controlling the magnitude of the price information presented in the ad, marketers can increase the consumer's level of attention to online ads as well as improve their subsequent price judgment. Therefore, while marketers have a range of choices of products in various categories to advertise in online environments, given the tendency of consumers to avoid paying attention to online display ads, it may be better to select products that are priced above average in a product category to increase consumers' attention to the ads so that they will recall them better.

Second, we suggest that decisions about employing the ad repetition strategy in an online environment should be based on the price stimuli featured in the ads. Generally, consumers may intentionally avoid repeated ads, but our findings suggest that ad repetition can be effective because it can increase the level of cognitive processing (for high-

price ads). Results also suggest that ad repetition in the case of products priced lower than the consumer's IRP can lower the IRP. If the goal of an advertising campaign is to communicate a price promotion, e.g., price reduction, it is better to include a price that is above the consumer's IRP as the advertised reference price to compensate for the negative effects of ad repetition.

Finally, this study indicates that consumers are vulnerable to inflated advertised reference prices in online environments. When price comparing ads are displayed incidentally in online contexts, our results show that the selling price does not affect the consumers' IRP; they are affected only by the advertised reference price.

Limitations and Future Research

Some limitations of our studies should be noted. First, the low-value and high-value price anchors used in our experiments are subjective. For example, we define the low-value price as any price lower than the consumer's IRP. Nevertheless, the internal reference price is an internal standard and it is better to operationalize it as a range of accepted prices than as a specific price point [12; 28]. Therefore, our argument that consumers devote less cognitive processing to process incidental low-price ads might not reflect the whole story. One alternative explanation could be that consumers use less cognitive-demanding numerical anchoring for price stimuli that are in their acceptable price range, and when price stimuli fall out of their acceptable price range, either below or above, the dominant anchoring mechanism becomes the more cognitive-demanding semantic anchoring. Second, in this research, we assume that price magnitude can influence which price anchoring mechanism dominates. However, if consumers are more involved with the purchase decision, they may be more motivated to process the display ads even when the ads feature low prices. Moreover, when consumers have more product-category knowledge, they may find the high-price ads to be unrealistic. In this scenario, a *contrast* effect, based on Assimilation-contrast theory [8], may occur. Therefore, we suggest that the proposed framework should be tested at several price levels as well as at different levels of product involvement, price knowledge, and brand familiarity to improve the generalizability of our findings.

In Study 3, we used average fixation duration and pupil size. However, eye-tracking studies also use total fixation duration as a proxy for attention to visual stimuli [26; 49]. This measure considers all fixations, the short and the long fixations together. However, we used average fixation duration because we predicted that participants would consciously try to avoid looking at ads during repeated exposures, so the number of fixations (the within-subject factor) would drop and, as a result of this, total fixation duration would decrease no matter if consumers process ads deeply or not, and this would have prevented testing H4a and H4b. Note that the number of fixations does not change among two price conditions (the between-subject factor), therefore, by averaging the fixation duration, we take into account the consumer's conscious ad avoidance. Nevertheless, we invite scholars to test hypotheses by focusing on total fixation duration by employing different experimental designs.

Another limitation of the eye-tracking study pertains to the use of pupil size as a proxy for the level of processing while pupil size is sensitive to a wide range of environmental and individual factors [35]. In this study, we controlled for factors such as environmental light, temperature, and humidity as well as the stimuli's novelty or

surprise. For example, to reduce the potential impacts of the stimuli's novelty, we used a known brand, and we only changed the prices. On a related note, in all four studies, some participants recalled seeing the target display ads or recalled the price stimuli, while others did not recall seeing the ads. As mentioned in the Introduction section, the context of this research is incidental online display ads, and whether participants recalled the ads does not rule out the implicit effect of price stimuli if they did not find the price stimuli relevant. However, we suggest that future studies could use procedures that can compare intentional fixations versus incidental fixations to better compare the cognitive anchoring mechanisms for high versus low prices and during repeated exposures.

Finally, in the era of big data, online retailers can now track the search activities of consumers and record the products they search for or the products they exclude from their consideration set [25]. In this study, we assume that the target ads are displayed to consumers who are not involved in a search for the promoted product. However, consumers' prior search activity or the decision-making stage in which they are situated can influence how they process price stimuli [6] or the level of their attention to ads [8; 62]. While our results emphasize that the effectiveness of display ads depends on how consumers process the ads at the time of exposure, it would be of practical interest to investigate the relationship between consumers' processing of price stimuli in online display ads and their browsing history, including their search activity or the stage of decision-making they are in.

Conclusions

This research investigates the effects of price anchors in the unique context of online display ads, when consumers are incidentally exposed to the ads. By examining the price anchoring mechanisms that dominate the overall effect, and by considering the effects of ad repetition, we show that these incidental exposures to price information in online ads influence the IRP and that ad repetition improves the anchoring effect of price stimuli in the ads only when ads feature price stimuli that are lower than consumers' IRP; when ads feature price stimuli that are higher than IRP, ad repetition does not change the IRP. The eye-tracking experiment supports our hypothesis that the anchoring mechanism is different for low- and high-price ads. Our findings can help marketers design better online display ads by deciding what product, a premium or a low-price option in category, can be used in online display ads to promote a product category and by planning more effectively their ad placement strategy.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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