When Products Compete for Consumers Attention:

How Selective Attention Affects Preferences

Arnd Florack and Martin Egger

University of Vienna, Austria

Ronald Hübner

University of Konstanz, Germany

This manuscript is a draft of a manuscript accepted for publication in the Journal of Business Research:

Florack, A., Egger, M., & Hübner, R. (in press). When products compete for consumer attention: How selective attention affects preferences. Journal of Business Research.

Author Note

Arnd Florack, Department of Psychology, University of Vienna, Austria; Martin Egger, Department of Psychology, University of Vienna, Austria; Ronald Hübner, Department of Psychology, University of Konstanz, Germany. The first and second author contributed equally to the manuscript.

The present research was supported by the Austrian Science Fund (FWF; Research Grant: I 3727 – G27).

Correspondence concerning this article should be addressed to Arnd Florack, Department of Psychology, University of Vienna, Universitaetsstrasse 7, 1010 Vienna, Austria. E-Mail: arnd.florack@univie.ac.at

Declarations of interest: none

Abstract

A basic idea in vision research is that selective attention determines not only which information is processed, but also how stimuli are evaluated and choices are made. In line with this reasoning, researchers provided initial evidence for effects of selective attention on product choice. However, little is known about the processes that underlie these effects. Hence, we examined several possible mechanisms that are discussed to explain effects of selective attention on product preferences. In three eye tracking experiments, we found that allocating attention to products while neglecting others led to an increase in preferences compared to just looking at products. We showed that this effect could not be explained by learning motor responses that are unrelated to preferences, and we also observed the effect of selective attention on preferences when we controlled for the time participants' gaze actually dwelled on the products.

Keywords: selective attention, preference, consumer choice, eye tracking

When Products Compete for Consumer Attention: How Selective Attention Affects Preferences

Marketing managers regard exposure to products as an important tool to increase sales (Karrh, McKee, & Pardun, 2003), and pricing for advertising is often based on the number of exposures (Bolland, 1989; Hoffman & Novak, 2000). However, exposure to products does not necessarily mean that consumers attend to products. Due to consumers' limited visual processing capacity (e.g., Bays & Husain, 2008; Cowan, 2010), the attention of consumers is selective (de Fockert, Rees, Frith, & Lavie, 2001), and one product often competes for attention with other products or stimuli. But does it matter for the formation of preferences whether products compete for attention or receive the undivided attention of consumers?

Even though extant research has investigated the effects of selective attention on response times and error rates in the identification of objects (e.g., DeSchepper & Treisman, 1996; Neill, 1977; Neill, Valdes, Terry, & Gorfein, 1992; Tipper, 1985; Tipper & Driver, 1988), research on the effects of selective attention in one situation on preferences in later situations is scarce (Fenske & Raymond, 2006), and largely neglected in the area of consumer research. To our knowledge, only Janiszewski, Kuo, and Tavassoli (2013) examined the delayed effects of selective attention on product choice. The researchers asked participants to complete a task that required them to selectively attend to some products while simultaneously neglecting others. In a subsequent task, participants indicated their preferences for the previously presented products. Intriguingly, participants preferred a product more often when they had attended to it in the first task than when they had neglected it.

Janiszewski et al. (2013) impressively demonstrated the reliability of the effects of attention and inattention on preferences across five studies. However, they did not investigate whether selective attention in the first task affected selective attention in the second task and whether learned selective attention could explain the differences in preferences. In other words, research has yet to determine whether selective attention in an unrelated task affects how quickly individuals can subsequently direct their attention to a product and how long they look at the product while making a choice.

In addition, no research has investigated whether the retrieval of learned selection responses that are unrelated to attention and preferences can explain the observed impact of selective attention on choice. Finally, previous research has not studied whether the advantages of selective attention and disadvantages of neglect remain observable when the amount of time consumers look at the products is the same. Presenting a product for one second, for instance, does not mean that the consumers' eye fixations dwell on it for one second. Hence, do the observed effects of selective attention on preferences disappear when we control for the time consumers attend to the products? Indeed, we assume that this will not be the case and that more intense processing of target products under conditions of competition might evoke effects on preferences that go beyond just looking at a product. However, research has not yet provided evidence for this assumption.

Therefore, the objectives of the present studies were (a) to use eye tracking to investigate whether selective attention during an exposure phase affects preferences in a subsequent choice phase that is mediated by attention processes, (b) to test the retrieval of learned responses as a possible explanation for effects of selective attention on choice, and (c) to examine whether the effects of selective attention can be observed when choices for products are studied that have been attended to for the same amount of time, but which differ in whether they received selective attention (in the presence of distractors) or unselective attention (in the absence of distractors).

The present research contributes to the marketing and business literature by providing insights into the effects on preferences of allocating attention to or neglecting products in visually complex environments. Consumers are exposed to visually complex environments in many contexts. For example, when consumers buy products in stores they have to selectively attend to certain products and ignore others. Similarly, in many different forms of advertising the advertised product or brand competes for attention with other information. It is important for marketers to know whether and when the presentation of products in such contexts supports or impedes the formation of product preferences. Janiszewski et al. (2013, p. 1271) concluded that research in this area "is nascent but promises a variety of new insights that are central to marketing". We agree with this view. Knowing when the heuristic that every exposure is helpful might not support or even impair marketing goals is highly relevant for marketers.

Theoretical Background

Whereas research on effects of selective attention and inattention on preference is scarce, a great deal of research has investigated the effects of mere exposure on preferences (e.g., Bornstein & D'Agostino, 1992; Monahan, Murphy, & Zajonc, 2000; Zajonc, 1968). It is a robust phenomenon that people evaluate objects more positively when they have been repeatedly exposed to the objects compared with when they have not been exposed to the objects (Bornstein, 1989). For example, Baker (1999) found that more exposures to a certain brand led to a higher likelihood of choosing that brand. However, it is important to note that first evidence suggests that mere exposure – meaning the duration or frequency a stimulus has been presented – cannot explain the observed effects of selective attention on preferences. In the studies by Janiszewski et al. (2013), for instance, the presentation time was the same for all products. Yet, participants preferred products that had been targets (distractors) in a selective attention task more (less) often than comparison products that had been presented on a screen before without any distractors.

A possible explanation for effects of selective attention on preferences can be derived from the biased competition model. The biased competition model of visual attention was built on the concepts of competition and selectivity in visual processing (Desimone & Duncan, 1995). Because people have a limited capacity for visual processing, visual stimuli compete for resources. For example, if consumers have to choose a bottle of shampoo from a shelf in the supermarket, they cannot attend to all shampoos on the shelf at the same time. The products compete for consumers' attention. In such a context, the processing of relevant information is enhanced, whereas the processing of less relevant information is impaired on a neuronal level (Desimone, 1998; Reynolds & Chelazzi, 2004), and consumers' neuronal networks might learn to attend to certain products and to ignore others. In subsequent contexts, the learned enhancement of the target product should therefore help the chooser to detect the target product earlier, and the learned impairment of the distractor product should blind the chooser to the distractor product during a later exposure.

Interestingly, the findings by Janiszewski et al. (2013) already provided first evidence that a biased competition model offers a good explanation for the effects of selective attention and inattention. In one study, the researchers found that target and distractor products evoked larger effects on preferences when the distance between the products was small than when it was large (Experiment 2). A closer distance between the products makes it more difficult to find the product, enhancing the competition for attention. Moreover, other studies suggested that selective attention directly affects subsequent attention processes. For example, Chelazzi, Miller, Duncan, and Desimone (1993) demonstrated that neurons in monkeys respond (do not respond) to prior targets (distractors) before the onset of a saccadic eye movement toward the targets (distractors). Moreover, studies on negative priming have shown a response disadvantage (slower response times) after selective inattention (e.g., Fox, 1995; Frings, Schneider, & Fox, 2015; May, Kane, & Hasher, 1995). Based on these studies and the idea that attention plays an important role in the decision-making process (Orquin & Mueller Loose, 2013), a reasonable hypothesis might be that targets have an attention advantage and distractors have an attention disadvantage in a subsequent choice phase and that individuals are able to direct their attention to targets more quickly or for a longer time than to distractors. However, this hypothesis has yet to be tested.

In addition to the abovementioned accounts, the learning and retrieval of motor responses should be considered as an alternative explanation of effects of selective attention on preference choices. A central element of the procedure used in studies to induce selective attention is that participants are instructed to respond to a target product by pressing a key while they should ignore a distractor product (Janiszewski et al., 2013). Participants might learn this response pattern und retrieve it when they have to choose a product. Indeed, selecting the target product in the search task, and selecting the preferred product in the preference choice task requires a similar motor response. Therefore, it cannot be excluded that participants first learned a certain response in the search task and then retrieved the same response from memory in the subsequent choice task.

Such response retrieval effects have been discussed with respect to effects of negative priming on response speed (e.g., Frings et al., 2015; Neill et al., 1992; Tipper, 2001), but response retrieval effects do not necessarily show the formation of preferences. However, if selective attention indeed increases the preference of the attended object, then this effect should also occur when the response mode in the preference choice task is different from that in the search task. Studies on the effects of selective attention on preferences have not varied the response mode yet. A simple variation would be that participants indicate which one of two options they like less, instead of which they prefer. If this method of measuring preferences were applied, a response retrieval account would predict that participants respond to the product that they selectively attended to before and indicate that they like it less. By contrast, if selective attention increases preferences (Janiszewski et al., 2013), participants should still prefer the product that they have attended to before (and not indicate that they like it less).

Finally, a conservative test of the assumptions derived from the biased competition model would include the examination of selective attention on products that were looked at for the same amount of time as alternative choice options. Similar to a mere exposure effect, different amounts of attention on stimuli can influence preferences (Orquin & Mueller Loose, 2013). Therefore, to see the pure effect of selective attention on preferences, it is necessary to exclude differences in attention as a possible confound. Previous research has been limited in setting equal time intervals for the presentation of products only. If competition in attention increases the effects on preferences, this should hold also when the dwell times of the eye gaze on the products which represent the alternative options in a subsequent choice task are the same as for the target products. Such a test requires two steps. First, the measurement of the time consumers dwelled on a product. And second, the presentation of another product, which will be terminated when participants have dwelled on it for the same amount of time as for the first product. These two products can then be compared in a subsequent choice task, and it can be tested whether manipulated selective attention affects preferences beyond the amount of time consumers' gaze dwelled on the products.

To sum up, previous studies have found first evidence for the effects of selective attention on preferences in choice situations (Janiszewski et al., 2013). However, the mechanisms driving these effects have to be examined and the applied paradigm has to be specified further. First, research has not yet provided evidence for the assumption that selective attention directly influences attention in a subsequent choice phase. Consumers might find products more quickly and look at them for longer if they had attended to them before. Second, it is possible that the observed effects of selective attention on choice are a consequence of a selection response learned during the first exposure and retrieved during the choice. Third, a conservative test of the effect of selective attention on preferences would use a matching of the amount of time consumers' gaze dwells on the products that are compared in choice and not only equal time intervals for the presentation of the products on the screen.

Overview of the Experiments and Hypotheses

In the present experiments, we distinguished between an exposure phase and a preference choice phase, similar to Janiszewski et al. (2013). In the exposure phase, participants were asked to respond to one group of products (target products) and to actively ignore the other group of products (distractor products). Also, participants viewed additional products (neutral products) for which no response was required. In a subsequent choice phase, we asked participants to indicate their preferences in choosing between target (distractor) products and neutral products. Importantly, we varied this task in Experiment 1. In one condition, participants were asked which product they prefer. In another condition, participants were asked which product they do *not* prefer. This variation allowed us to examine whether response retrieval could explain the previously observed effects. In all experiments, we assessed the viewing behavior of the participants with eye tracking.

In line with research on selective attention effects, we formulated the following hypotheses.

H1: In a preference choice phase, participants will be more (less) likely to prefer products they had selectively attended (not attended) to in a prior exposure phase.

Furthermore, we expected participants to spend a longer time dwelling on target compared with distractor products in the exposure phase.

H2: In the exposure phase, participants will spend more time dwelling on target products compared with distractor products.

On the basis of the biased competition model, we further expected that the preceding attention/inattention would affect attention during the choice phase.

H3: In the preference choice phase, participants will more quickly find and spend more time dwelling on products that were target products during the exposure phase compared with products that were distractor products in the exposure phase.

If the retrieval of a learned response can explain the effects of selective attention paradigms in previous research, the results should support the following hypothesis. Please note that this hypothesis is not fully congruent with H1.

H4: In the choice phase, participants will choose products they selectively attended to previously, irrespectively of whether they are asked to choose a preferred or an unpreferred product.

In Experiments 2 and 3, we also matched the amount of time participants' gaze dwelled on the products, but we expected the effects of selective attention to occur even when the dwell times were matched.

Experiment 1

In Experiment 1, we studied response retrieval as a potential explanation for the effects observed in selective attention studies by varying the choice mode, and we used eye tracking to illuminate whether in the preference choice phase, individuals attend differently to products that were targets and distractors in the preceding exposure phase.

Method

Participants. We recruited 156 psychology students in their first semester at a large European university. The participants were given course credits for their participation. We had to exclude 17 participants from the statistical analyses. Thirteen participants did not meet the eye tracking calibration criteria of 0.90 degrees on both axes, and four participants could not complete the study as planned due to technical issues. Data from 139 participants were used in the analyses (M_{age} = 21.2 years, SD_{age} = 4.94 years; 73.4% women).

Design. We applied a 2 (role of stimulus product: target vs. distractor) x 2 (choice mode: selection of the preferred product vs. selection of the unpreferred product) x 2 (comparison product: neutral vs. novel product) design. The product and choice mode conditions were within-subject conditions. The comparison product condition was a between-subjects condition.

Material and apparatus. We used 80 products from 8 different product categories: body wash, chips, cookies, lemonade, soap, soy milk, sparkling water, and yogurt. Participants were not familiar with the products, and the products were not available in supermarkets in the country where the study was conducted. The presentation of products as target, distractor, or neutral stimulus was randomized per participant. Each participant saw all products during the experiment.

We tracked participants' eye movements during the experiment with an SMI RED 500 remote eye tracker with a sampling rate of 250 Hz. The monitor had a refresh rate of 60 Hz, a resolution of 1680 px width and 1050 px height (22 inch) and was positioned in 65 cm distance in front of the participant. We positioned all products presented during the experiment in an area of interest that had a size of 250 pixels in width and 500 pixels in height. When two products appeared on the screen side by side, the distance between the areas of interest were 44 pixels (1.3 cm).

Procedure. Upon arrival at the laboratory, participants were briefed on the study, signed informed consent, and the eye tracker was calibrated for their eye movements. Next, participants completed the exposure phase in which they were presented with target, distractor, and neutral products, and asked to correctly select the target product. To familiarize participants with the procedure, we conducted a short training. Thereafter, we presented a series of six comic strips to clear participants' short-term memory before they moved to the choice phase. Each of these six comic strips had an exposure time of 10 s, adding up to 60 s. Finally, participants completed the choice phase. Participants were then debriefed, thanked, and dismissed. The search task in the exposure phase and preference choice task in the choice phase are described below (a web appendix illustrates the procedures for all experiments).

Exposure phase (induction of selective attention). Each trial in the exposure phase consisted of a combination of two search tasks (Figure 1). Both search tasks were identical regarding procedure and were combined to keep the duration and frequency of the presentation of target, distractor, and neutral products constant. Each participant completed a total of 16 trials. We presented each product twice for 1 s. In Search Task A, we presented the target and neutral product twice for 1 s, and the distractor once for 1 s. In the Search Task B, we presented the distractor again as a distractor for 1 s and the neutral product again as a neutral product for 1 s, but with another target product. Each search task followed a fixed procedure (Figure 2). Following a fixation cross (1 s), participants were presented with a target product and the text "Target" for 1 s. Thereafter, they were simultaneously exposed to the target and a distractor product for another 1 s, and on the subsequent screen asked to indicate the side on which the target product had appeared by pressing either "A" for the left side or "L" for the right side on the keyboard. The target was randomly presented on the left or right. After participants pressed the key corresponding to their decision, a third, neutral product was presented with the text "clearing visual memory" for 1 s. We told participants that the purpose of this screen was to clear their visual memory, but, in truth, this product represented the neutral comparison alternative used in the subsequent choice phase. Finally, a separation screen appeared for 1 s with the text "Please wait" to prepare participants for the next trial. When the side of the target was not correctly indicated, an error message

("Unfortunately, your response was wrong!") was presented for 1 s after the separation screen.

Choice phase (preference choice task). Overall, participants made 32 choices, each between two options. One option was always a target or a distractor product, the second option was either a neutral or novel product, depending on the comparison product condition. Each participant made 16 choices between a target and a neutral (novel) product, and 16 choices between a distractor and a neutral (novel) product. The procedure for one choice is displayed in Figure 3. Following a fixation cross in the middle of the screen (1 s), participants saw the two choice options for 1 s. After the screen was cleared, a choice screen appeared with no time limit. Participants' task was to indicate the preferred or the unpreferred alternative, depending on the choice mode. In the choice mode condition with the selection of preferred product, participants answered to the question "Which product do you prefer?" by clicking on either the "left product" button or the "right product" button using a computer mouse. In the choice mode condition with the selection of unpreferred product, the question was "Which product do you NOT prefer?". After participants made their choice, a separation screen "Please wait" appeared for 1 s, and the next choice trial started. All participants completed the choice task in both choice mode condition. We randomized per participant whether they had to select the preferred products before or after selecting the unpreferred products.

Results

Attention (exposure phase). First, we analyzed the mean times spent dwelling on each product type. The dwell times for all presentations of a product type (target, distractor, neutral) were summed. In support of Hypothesis 2, the time spent dwelling on target products (M = 754 ms, SD = 86) was significantly longer than the time spent dwelling on distractor products (M = 168 ms, SD = 82), $t(138) = 49.88$, $p < .001$, $d_z = 4.23$. Furthermore, the time spent dwelling on neutral products (*M* = 704 ms, *SD* = 108) was longer than the time spent dwelling on distractor products, $t(138) = 51.96$, $p < .001$, $d_z = 4.41$. In addition, and not hypothesized, the time spent dwelling on target products was longer than the time spent dwelling on neutral products, $t(138) = 4.53$, $p < .001$, $d_z = 0.38$.

Preferences. To test the effects of selective attention on preference, we computed a mixed-design analysis of variance with comparison product (neutral vs. novel product) as a between-subjects factor and role of stimulus product (target vs. distractor) and choice mode (selection of the preferred product vs. selection of the unpreferred product) as within-subject factors. Preference for the products was the dependent measure. Regarding the choice mode conditions, choosing a product as the preferred product and not choosing it as an unpreferred product were coded as preference. We hypothesized that participants would be more likely to prefer products they had selectively attended to in the exposure phase (Hypothesis 1). In line with this hypothesis, we found a main effect of the role of the stimulus product on preference, $F(1, 137) = 5.37$, $p = .022$, $\eta_p^2 = .038$. Participants preferred the target products in 53.42% (*SD* = 12.75) of the choices and the distractor products in 49.69% (*SD* = 11.83) of the choices. The choice against the neutral and novel products (difference from 50%) was significant for the target products, $t(138) = 3.16$, $p = .002$, $d = 0.27$, but not for the distractor products, $t(138) = 0.31$, $p = 0.754$, $d = 0.03$ (Figure 4).

We found no evidence to support the response retrieval hypothesis. A response retrieval effect would have been revealed in an interaction between product and choice mode. However, the interaction of role of stimulus product and choice mode was not significant, $F(1, 137) = 0.77$, $p = .381$, $\eta_p^2 = .006$. All other main and interaction effects were not significant either, $F(1, 137) < 1$, *ns*.

Attention (choice phase). In the preference choice phase, the participants attended to 99.42% of the former target products (*SD* = 2.60) and to 99.33% of the former distractor products (*SD* = 2.22) at least once, $t(138) = 0.36$, $p = .716$, $d_z = 0.03$. We expected that participants would more quickly locate and spend more time attending to products that had been target products in the exposure phase compared with those that had been distractor products. To test our hypothesis, we first computed a mixed-design analysis of variance with dwell time for the attended-to products as the dependent measure. The comparison product (neutral or novel) was a between-subject factor, and role of stimulus product (target vs. distractor) and choice mode (selection of preferred vs. selection of unpreferred product) were within-subject factors. The main effect of role of stimulus product, $F(1, 137) = 3.27$, $p = .073$, $\eta_p^2 = .023$, and the interactions of role of stimulus product with choice mode, $F(1, 137) = 1.59$, $p = .209$, $\eta_p^2 = .012$, and with the comparison product, $F(1, 137) = 3.05$, $p = .083$, $\eta_p^2 = .022$, were not significant. In a second step, we calculated a mixed-design analysis of variance with the fixation count for the products as dependent measure. For the fixation count measure, we also included the products that had not been attended to in the choice phase (fixation count = 0). The results were similar to when the dwell time was the dependent measure. Neither the interaction of role of stimulus with choice mode, $F(1, 137) = 0.10$, $p = .751$, $\eta_p^2 = .001$, nor the interaction with the comparison product, $F(1, 137) = 1.19$, $p = .278$, $\eta_p^2 = .009$, was significant. Only the main effect of role of stimulus product was significant, $F(1, 137) = 4.42$, $p = .037$, $\eta_p^2 = .031$. However, the direction was contrary to our hypothesis. The fixations on the target products ($M = 1.64$, $SD = 0.27$) were slightly less frequent than the fixations on the distractor products ($M = 1.69$, $SD = 0.29$).

Furthermore, we computed a second mixed-design analysis of variance with the time to first fixation for the attended-to products as the dependent measure. Again, the expected main effect of role of stimulus product, $F(1, 137) = 0.93$, $p = .337$, $\eta_p^2 = .007$, and the interactions of role of stimulus product with choice mode, $F(1, 137) = 2.11$, $p = .149$, $\eta_p^2 = .015$, and with the comparison product, $F(1, 137) = 2.96$, $p = .088$, $\eta_p^2 = .021$, were not significant. Thus, Experiment 1 provided no evidence that selective attention during the exposure phase influenced attention in the preference choice phase.

Discussion

The results of Experiment 1 were in line with the findings of prior studies that have found that selective attention during an exposure phase can influence the evaluation of artificial stimuli and faces (Fenske & Raymond, 2006) and the preference for products (Janiszewski et al., 2013). Participants preferred products more frequently when they had attended to them in a prior exposure phase compared with when they had ignored them.

Most importantly, we found no evidence that the learning of a simple selection response was responsible for the observed effects. If the search task during the exposure phase were to lead to the learning of a simple selection response, participants would have chosen the target product when asked to select the preferred product as well as when asked to select the unpreferred product. However, this was not the case. Participants' preference for the products was not moderated by the choice mode.

Contrary to our expectations, we did not find that participants looked more often or for significantly longer at the target products compared to the distractor products during the preference choice phase. Furthermore, we found no difference in time to first fixation between the target and distractor products. Thus, at least for the applied paradigm, attention during the preference choice phase could not explain the effect of previous selective attention on subsequent preference choice.

Whereas we found no differences between dwell times on the target and distractor products during the choice phase, we found that, in the exposure phase, participants spent more time dwelling on the target products compared with the neutral products. Also, they spent more time dwelling on the neutral products compared with the distractor products. Thus, we cannot rule out that it was not the action of selection that produced the observed effects but the length of attention. A first hint that not only the length of attention is important can be derived from the finding that the choice shares were not affected by whether the comparison product was presented for 2 seconds (neutral products) or not at all (novel products) in the exposure phase. To better disentangle the effects of selective attention and length of viewing times, we conducted Experiment 2.

Experiment 2

In Experiment 2, we extended the basic paradigm used in Experiment 1 by manipulating one important aspect: In 50% of the trials in the exposure phase, we used the procedure from Experiment 1, but in the remaining 50% of the trials, we matched the attention times of the target (distractor) products and the corresponding neutral products. In these trials, we measured how long participants attended to each target (distractor) product and in a subsequent trial, we presented a neutral product for the same amount of time. During the subsequent choice phase, participants chose between a target (distractor) and a neutral product to which they had paid approximately equal attention before. We compared the choices in this condition with the choices in a condition in which we did not control for the lengths of the attention times. By using the two variants of the paradigm, we were able to determine whether the visual processing during the act of making a selection between a target and distractor product compared to the undivided attention to the neutral product triggered the effects on preference choices or whether differences in attention duration influenced the effects.

Method

Participants. We recruited 122 participants who were given either course credit or 8 Euros for financial compensation. We excluded 10 participants who did not meet the eye tracking calibration criteria of a deviation of 0.90 degrees on both axes and eight participants who could not complete the study as planned due to technical issues. Thus, we conducted the statistical analyses with a total of 104 participants (M_{age} = 22.6 years, SD_{age} = 4.1 years; 72.1% women).

Design. We applied a 2 (role of stimulus product: target vs. distractor) x 2 (presentation mode: matched vs. unmatched presentation of the neutral products during the exposure phase) within-subject design. Because in Experiment 1 there was no effect between novel and neutral comparison alternatives in the choice phase, we did not use novel products in the exposure phase as choice options. Furthermore, since in Experiment 1 we found no effect between choosing preferred or unpreferred choice options, we let participants choose only the preferred choice option.

Material. We used 64 products from eight product categories (body wash, chips, cookies, lemonade, soap, soy milk, sparkling water, and yogurt). As in Experiment 1, the products were unfamiliar to the participants, and each trial consisted of products from only one category. The presentation of products as target, distractor, or neutral stimuli as well as the assignment of the products to the matched or unmatched presentation mode was randomized per participant.

Procedure. The procedure of Experiment 2 was similar to the one applied in Experiment 1, but all variations were within-subject (the detailed procedure is illustrated in the web appendix). We added fixation crosses in the middle of the screen before the search tasks and before the presentation of the neutral products. All fixation crosses were sensitive to participants' gaze, and a fixation of 1 s was necessary to continue. In the exposure phase, participants completed a total of 16 trials. Each trial consisted of two search tasks and both search tasks were identical regarding the procedure and were combined to keep the duration and frequency of the presentation of target, distractor, and neutral products constant. In the choice phase, participants made eight choices between target and neutral products and eight choices between distractor and neutral products. Half of the choices followed a matched presentation of the neutral products in the exposure phase, whereas the other half of the choices followed an unmatched presentation in the exposure phase. The presentation order of the choice conditions was randomized per participant.

Matched versus unmatched presentation of the neutral stimuli. In the unmatched presentation mode, the presentation times were the same as in Experiment 1. In the matched presentation mode, we aligned the presentation time of the neutral stimuli with the time spent focusing on either a target or distractor product that was later used as a second option in the choice task. To establish comparable attention times, we measured each gaze within a defined area of interest for each target and each distractor product. Furthermore, we measured each gaze within a defined area of interest for the neutral products. It is important to mention that the presentation screen with a neutral product was cleared immediately when participants had attended to this product for as long as they had attended to the corresponding target or distractor product before.

Because all products were presented twice on the screen, we always matched the presentation time for both occurrences. For example, when a target (distractor) product was presented 400 ms during the first occurrence and 200 ms during a second occurrence, we stopped the presentation of a neutral product when a participant had looked on it for 400 ms at one occurrence and for 200 ms at the other occurrence. We matched the attention for the first occurrence of the distractor product and the first occurrence of the relevant neutral product, as well as for the second occurrence of the distractor product and the second occurrence of the relevant neutral product. Moreover, we randomly matched either the first (target screen) or the second occurrence of the target product (search screen) with the first or second occurrence of the relevant neutral product (the procedure is illustrated in the web appendix).

To hold the number of exposures constant for all stimuli, we presented each neutral product for at least one frame on the screen, even when the corresponding target or distractor product was not attended to at all. The applied procedure guaranteed that the time spent focusing on the neutral products approximated the time spent focusing on the corresponding target or distractor products. But it is important to mention that small deviations between 20 and 30 ms on average occurred because of (a) the display refresh rate, (b) the presentation of the neutral products for at least one frame, and (c) differences between the gaze point matching procedure and actual dwell time calculations. In the matched presentation mode, the mean differences between the dwell times were 22 ms (SD = 37) for the corresponding target and neutral products and 30 ms (SD = 27) for the corresponding distractor and neutral products. In the unmatched presentation mode, the mean differences between the dwell times were 150 ms (SD = 128) for the corresponding target and neutral products and 607 ms (SD = 194) for the corresponding distractor and neutral products. The mean dwell times for all conditions are depicted in Table 1.

Results

Preferences. To investigate whether matched attention during the exposure phase influenced preferences, we computed a repeated-measures analysis of variance with role of stimulus product (target vs. distractor) and the presentation mode (matched vs. unmatched) as within-subject factors. We found a significant main effect of the role of the stimulus product, $F(1, 103) = 5.20$, $p = .025$, $\eta_p^2 = .048$. As expected, participants chose target products over neutral products (M = 58.41%, SD = 17.11) more often than they chose distractor products over neutral products (M = 52.40%, SD = 18.85). For the target products, $t(103) = 5.02$, $p < .001$, $d = 0.49$, but not for the distractor products, $t(103) = 1.30$, $p = .196$, $d = 0.13$, the choice against the neutral products (difference from 50%) was significant. The result is displayed in Figure 5. It is important to mention that the difference between the matched and unmatched presentation modes, $F(1, 103) = 1.35$, $p = .248$, $\eta_p^2 = .013$, and the interaction between the role of the stimulus product and the presentation mode were not significant, $F(1, 103) = 0.04$, $p = .836$, $\eta_p^2 < .001$. The preferences for all conditions are presented in Table 2.

Attention (choice phase). In the preference choice phase, the participants attended to 97.12% of the former target products in the unmatched condition (*SD* = 10.63) and to 96.63% in the matched condition (*SD* = 11.05) at least once. Furthermore, participants attended to 96.63% of the former distractor products in the unmatched condition (*SD* = 9.26) and to 95.19% in the matched condition (*SD* = 13.07) at least once. No main effects and interactions were significant, $F(1,103) < 1.40$, ns. As in Experiment 1, the dwell time and time to first fixation for the attended-to products in the choice phase did not differ between target and distractor products, $F_{\text{dwell time}}(1, 103) = 1.54$, $p = .218$, $\eta_p^2 = .015$, $F_{\text{time to first fixation}}(1, 103) = 0.58$, $p = .453$, $\eta_p^2 = .005$. The main effect of the presentation mode $F_{\text{dwell time}}(1, 103) = 1.68$, $p = .198$, $\eta_p^2 = .016$, $F_{\text{time to first fixation}}(1, 103) = 0.14$, $p = .712$, $\eta_p^2 = .001$, and the interaction effects between the role of stimulus product and the presentation mode on the dwell time, $F_{\text{dwell time}}(1, 103) = 1.05$, $p = .308$, $\eta_p^2 = .010$, and the time to first fixation, $F_{\text{time to first fixation}}(1, 103) = 0.01$, $p = .920$, $\eta_p^2 < .001$, were not significant, either. Similarly, the fixation count for all products did not differ between target and distractor products as well. There was no main effect of role of stimulus product on the fixation count, $F(1, 103) = 0.49$, $p = .485$, $\eta_p^2 = .005$, no main effect of the presentation mode, $F(1, 103) = 2.24$, $p = .138$, $\eta_p^2 = .021$, and no interaction of role of stimulus with the presentation mode, $F(1, 103) = 0.61$, $p = .436$, $\eta_p^2 = .006$.

Discussion

In Experiment 2, we matched the attention times for the target (distractor) products and the corresponding neutral stimuli in half of the trials, and we did not match the attention times in the other half of the trials. This variation in the procedure did not change the finding that target products, but not distractor products, were preferred more often than neutral products, which were, depending on the condition, either visible or actually dwelled on for approximately the same duration.

Even if the matching procedure led to a comparable duration of dwell times on target (distractor) products and the relevant neutral comparison alternatives, we observed slightly shorter dwell times for the target products compared to the dwell times for the neutral comparison alternative. But because the dwell times were shorter and not longer for the target products, this cannot explain the differences in preferences. A mere exposure-based explanation would imply that longer attention leads to an increase in preferences. To further improve the matching procedure and to optimize the applied procedure, we conducted Experiment 3.

Experiment 3

In Experiment 3, we applied a number of changes to the procedure. First, we increased the number of trials and second, no longer used text labels on the screen. Indeed, such labels could distract participants or lead to learning of associations of the products with the texts. Third, we improved the algorithm for the matching procedure to achieve a smaller difference in dwell times on the matched products. Also, we applied matching for all trials. Hence, there was no comparison to a non-matching condition as in Experiment 2.

Method

Participants. We recruited 54 participants who were given course credit for participation. We excluded 4 participants for whom we could not achieve the calibration criteria of 0.90 degrees deviation on both axis for the dominant eye. Thus, we conducted the statistical analyses with a total of 50 participants (M_{age} = 20.6 years, SD_{age} = 1.5 years; 92.0 % women).

Design. We applied a 2 condition (role of stimulus product: target vs. distractor) within-subject design.

Material and apparatus. We used 80 products from ten product categories (cheese, chips, cookies, fruit gums, jam, ketchup, lemonade, soy milk, sparkling water, and yogurt). As in Experiment 1 and 2, the products were not available in stores in the country where the study was conducted, and each trial consisted of products from only one category. The presentation of products as target, distractor, or neutral stimuli as well as the sequence of categories and position on left or right side in exposure phase and choice phase were randomized per participant by the software.

We tracked participants' eye movements during the experiment with an Eyelink 1000 Plus stationary eye tracker in remote mode with a sampling rate of 1000 Hz. The monitor had a refresh rate of 144 Hz, a resolution of 1920 px width and 1080 px height (24 inch) and was positioned in 80 cm distance in front of the participant.

Procedure. The procedure was similar to the one applied in Experiment 2 (the procedure is illustrated in the web appendix). In the exposure phase, participants completed a total of 20 trials. Each trial consisted of two search tasks and both search tasks were identical regarding the procedure and were combined to keep the duration and frequency of the presentation of target, distractor, and neutral products constant. In contrast to Experiment 2, we removed the labels from the target product and neutral product screen. Instead, before a new target product appeared, we presented a blue fixation cross within a blue circle to indicate that a new target product would show up afterwards. Participants completed a training procedure to familiarize themselves with the task. To increase visual space between the start fixation position and the areas of interest of a search screen, we positioned the fixation cross presented before the search screen central above the products' defined area of interest. This was also true for the fixation cross before the product presentation screen during the choice phase. In the choice phase, participants made ten choices between target and neutral products and ten choices between distractor and neutral products in randomized order. Participants indicated their choice by pressing either “A” or “L” on the keyboard.

Matched presentation of the neutral stimuli. Similar to Experiment 2, we aligned the presentation times of the neutral stimuli with the time spent focusing on either a target or distractor product that was later used as a second option in the choice task. To enhance the matching, we adopted and improved the matching algorithm used in Experiment 2. We established comparable attention times by measuring not only the gaze points but also the actual fixation durations within a defined area of interest for each occurrence of a target or distractor product. Saccades and blinks were excluded for matching. Moreover, we measured each fixation duration within a defined area of interest for the neutral products and cleared the screen immediately when participants had attended to the neutral product for as long as they had attended to the corresponding target or distractor product before. As in Experiment 2, to hold the number of exposures and the presentation procedure constant for all stimuli, we presented each neutral product for at least one frame on the screen, even when the corresponding target or distractor product was not attended to at all.

Our modifications of the matching algorithm reduced attention differences for matched products compared to Experiment 2. The mean differences in the fixation duration were 4 ms (SD = 23 ms) between the corresponding target (M = 1456 ms, SD = 179) and neutral products (M = 1461 ms, SD = 178), and 8 ms (SD = 14 ms) between the corresponding distractor (M = 426 ms, SD = 148) and neutral products (M = 433 ms, SD = 146).

Results

Preferences. As expected, participants chose target products over matched neutral products (M = 59.20%, SD = 16.52) more often than they chose distractor products over matched neutral products (*M* = 49.40%, *SD* = 16.21), $t(49) = 2.91$, $p = .005$, $d_z = 0.41$. As in Experiment 2, for the target products, $t(49) = 3.94$, $p < .001$, $d = 0.56$, but not for the distractor products, $t(49) = 0.26$, $p = 0.795$, $d = 0.04$, the likelihood of choice against the neutral products (difference from 50%) was significant. The result is displayed in Figure 6.

To test whether our results hold under more restrictive criteria, we computed a further analysis in which we excluded all trials from the analysis in which (a) the differences in matched attention between the comparison alternatives were greater than 20 ms, (b) participants did not attend to both occurrences of a target or distractor during the exposure phase at least once (fixation duration = 0 ms), and (c) made a false response in one or both search tasks per trial during the exposure phase. These criteria did not change the overall results. Participants still chose target products over matched neutral products (*M* = 60.70%, *SD* = 27.93) more often than they chose distractor products over matched neutral products (*M* = 47.72%, *SD* = 21.70), $t(49) = 2.40$, $p = .020$, $d_z = 0.34$. For the target products, $t(49) = 2.71$, $p = .009$, $d = 0.38$, but not for the distractor products, $t(49) = 0.74$, $p = 0.461$, $d = 0.11$, the likelihood of choice against the neutral products (difference from 50%) was significant.

Discussion

In Experiment 3, we replicated the results from Experiment 2 with an improved procedure to match the fixation durations of the target (distractor) products and the relevant neutral comparison products. Hence, Experiment 3 provides further evidence for the robustness of the observed effect that selectively allocating attention to a product while neglecting another product enhances preferences compared to just looking at a product for the same amount of time.

General Discussion

A basic idea in vision research is that selective visual attention determines not only which information is processed but also how stimuli are evaluated and choices are made.

Despite the fact that researchers had already provided initial evidence for this idea over a decade ago (Raymond, Fenske, & Tavassoli, 2003; Shimojo, Simion, Shimojo, & Scheier, 2003), research on the effects of selective attention on product evaluations and product choice is still scarce, and little is known about the processes that underlie the observed effects. In the present research, we replicated the effects of selective attention on preferences in choice and examined the underlying processes in more detail.

In particular, we explored whether selective attention in a first task would influence patterns of attention in a subsequent choice task or whether the paradigm used to show the effects of selective attention on choice would influence choice through response retrieval. In Experiment 1, we replicated the basic effect of selective attention on choice observed in previous research and found no evidence that this effect could be explained by response retrieval, time to first fixation, or duration of attention during the choice phase. Previous research (Janiszewski et al., 2013; Raymond et al., 2003) had not determined whether individuals only learn to respond to the target stimuli and not to respond to the distractor stimuli or whether they learn to attend more quickly or for longer periods of time to target stimuli in comparison with distractor stimuli. The present research provides no evidence for such explanations and supports the idea that selective attention affects preferences independently of any learning related to responding or attending.

Importantly, the present research provides further support for the differentiation of effects of mere exposure and selective attention. Janiszewski et al. (2013) already demonstrated that products that had received selective attention were preferred over products that had been presented for the same amount of time, but without distractor products and without the requirement of selective attention. We found the same effects in Experiment 1. But it is important to note that Janiszewski et al. (2013) did not apply eye tracking to match the duration participants' gaze dwelled on the target (distractor) and the neutral comparison products which, however, is important to further distinguish the observed effects from mere exposure effects. In this context, it is also relevant that research on gaze cascading effects (Shimojo et al., 2003) found that the spatial distribution of eye fixations influences the formation of preferences and computational models suggest that fixations at a stimulus predict preferences for binary (Krajbich, Armel, & Rangel, 2010) and multiple (Krajbich & Rangel, 2011) choices. In Experiment 2 and 3, we therefore attempted to keep the attention times for the comparison pairs in the choice task equal. Hence, participants looked for an approximately equal time at the target and neutral products. Still, we found the preference advantage for the target compared to the neutral products. Because the selective attention task did not have any meaning beyond selecting the side where the target was presented, we therefore demonstrated that the selective attention to target products led to an increase in preferences and that this effect is different from mere exposure effects.

Although the findings of the present studies are largely congruent to the findings of previous research (Janiszewski et al., 2013), we did not observe that selective neglect led to a reduction of preferences. In none of our three experiments, we observed that the choice likelihoods for the distractor products were lower than for the neutral products, which were used as alternative options in the choice phase. At present, it is difficult to explain why we did not observe the neglect effects, because our design was very similar to the one used in previous studies (Janiszewski et al., 2013). Future research might further disentangle when inattention might lead to inhibition effects and reduced preferences that persist over a longer period of time (Serfas, Florack, Büttner, & Vögeding, 2017).

Limitations and Future Research

The specific paradigm to induce selective attention we applied in the present studies and which has been applied in previous studies (Janiszewski et al., 2013) has the strong advantage that the exposure frequency for target, distractor, and neutral products is controlled for, and that mere exposure cannot explain the observed effects. However, the applied paradigm has specifications that have to be considered in the interpretation of the results. First, we presented the target product first in each trial before the distractor or the neutral product occurred on the screen. Second, participants actively searched for the target product. At present, we do not know whether these two aspects are important to produce the observed effect on preferences. From an ecological perspective, these two elements seem to be similar to a typical search task in a shopping context. Individuals first visualize a product in mind and then search for it while distracted by other products. But we cannot rule out that this procedure induces primacy effects and an improved memory for the target product just because it is shown first (Biswas, Grewal, & Roggeveen, 2010). Moreover, a basic characteristic of the applied paradigm was that the number of products presented on the screen varied based on the role of the product in the design. For example, the neutral product was always presented alone, while the target product appeared one time alone and one time together with the distractor product. As regards the comparison between the target and neutral products in choice, this design provides a very conservative test of our hypothesis, because the neutral product received the full attention without any competition. However, the structural aspects of the presentation are not equal and it is important to replicate the effects of selective attention on choice with paradigms that keep these aspects of the presentation constant across the different roles of products. Researchers could, for example, ask participants to search for a product that belongs to a certain product category instead of presenting the target product first (e.g., participants could search for a sweet product while ignoring the salty products). Moreover, researchers could present two neutral products at the same time on the screen, but without a search task.

Managerial and Practical Implications

The study of selective attention has high practical relevance. Not only in the shelves of a supermarket, but also in advertising, products and brands compete for consumers' attention. At sporting events, for example, different perimeter advertisements attempt to get the attention of consumers. The present research suggests that in such contexts, selective attention is beneficial for building up preferences. Interestingly, sometimes the simultaneous presentation of two products or brands is even intended by companies. In brand alliances, for example, companies present products that might be used in the same contexts together (e.g., an orange juice and cereals for breakfast). Taking into account that consumers attempt to get a quick impression about the advertised brand and the goal of the advertisement (Elsen, Pieters, & Wedel, 2016; Pieters, & Wedel, 2012), selective attention might occur in such contexts and one brand might be the winner of this competition – but this is not what the companies intend.

An important question is of course how marketers could effectively use the knowledge on the effects of selective attention. Since the basic finding of the present research is that selectively allocating attention to a product in a visually complex environment (with other products that compete for attention) supports the formation of preferences for this product more than just looking at the product without any distraction, marketers could design search games where consumers have to find a product. Such search games should be more effective than the simple presentation of a product in an advertisement. Furthermore, marketers might increase the products' or ad's salience. Indeed, changing banner advertisements or advertising models looking at a product (gaze cueing) might help to direct attention as well (Palcu, Sudkamp, & Florack, 2017). But note that it is a question for future research whether such a direction of attention evokes the same effects as the visual processing in a search task.

Finally, we would like to note that individuals differ in their tendency to attend to information in the background (Büttner, Wieber, Schulz, Bayer, Florack, & Gollwitzer, 2014; Chua, Boland, & Nisbett, 2005) and products that are not related to the focal goal of a task (Büttner, Florack, Leder, Paul, Serfas, & Schulz, 2014). Consumers who browse through product offers with an open mindset and an experiential shopping orientation (Büttner, Florack, & Göritz, 2013, 2014), for example, should be more likely to have broad focus of attention and to attend to “distracting” products. So far, research has not studied whether such a broad focus of attention compared to a narrow focus of attention moderates the effects of selective attention. For example, it would be highly interesting to get more insights into whether consumers with a narrow focus of attention are more likely to show a selective attention effect on preferences than consumers with a broad focus of attention. Indeed, such a mechanism could help consumers with a narrow focus of attention to execute their shopping task (e.g., purchasing products from a shopping list) without being tempted by additional products (e.g., the chocolate which is not on the shopping list).

To sum up, the present research illustrates that not every exposure to products affects preferences in the same way. Interestingly, selectively allocating attention to a product in a visually complex setting with other products present evokes more positive effects on preferences compared to attending to a product without any distraction present. Hence, marketers should not attempt to avoid visually complex environments, but they should guarantee that their products win the competition for attention and they could even use visually complex environments for search games to support the formation of preferences.

References

Baker, W. E. (1999). When can affective conditioning and mere exposure directly influence brand choice? *Journal of Advertising, 28*, 31-46.

Bays, P. M., & Husain, M. (2008). Dynamic shifts of limited working memory resources in human vision. *Science, 321*, 851-854.

Biswas, D., Grewal, D., & Roggeveen, A. (2010). How the order of sampled experiential products affects choice. *Journal of Marketing Research, 47*, 508-519.

Bolland, E. J. (1989). Advertising vs. Public Relations: A comparison using cost-per-thousand for print ads and PR placements. *Public Relations Quarterly, 34*, 10-12.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin, 106*, 265-289.

Bornstein, R. F., & D'Agostino, P. R. (1992). Stimulus recognition and the mere exposure effect. *Journal of Personality and Social Psychology, 63*, 545-552.

Büttner, O., Florack, A. & Göritz, A. (2013). Shopping orientation and mindsets: How motivation influences consumer information processing during shopping. *Psychology and Marketing, 30*, 779-793.

Büttner, O., Florack, A., & Göritz, S. (2014). Shopping orientation as a stable consumer disposition and its influence on consumers' evaluations of retailer communication. *European Journal of Marketing, 48*, 1026–1045.

Büttner, O., Florack, A., Leder, H., Paul, M., Serfas, B., & Schulz, A.-M. (2014). Hard to ignore: impulsive buyers show an attentional bias in shopping situations. *Social Psychological and Personality Science, 5*, 343-351.

Büttner, O. B., Wieber, F., Schulz, A. M., Bayer, U. C., Florack, A., & Gollwitzer, P. M. (2014). Visual attention and goal pursuit: Deliberative and implemental mindsets affect breadth of attention. *Personality and Social Psychology Bulletin, 40*, 1248-1259.

Chelazzi, L., Miller, E. K., Duncan, J., & Desimone, R. (1993). A neural basis for visual search in inferior temporal cortex. *Nature, 363*, 345-347.

Chua, F. H., Boland, J. E., & Nisbett, R. E. (2005). Cultural variations in eye movements during scene perception. *Proceedings of the National Academy of Sciences, 102*, 12629-12633.

Cowan, N. (2010). The magical mystery four: How is working memory capacity limited, and why? *Current Directions in Psychological Science, 19*, 51-57.

de Fockert, J. W., Rees, G., Frith, C. D., & Lavie, N. (2001). The role of working memory in visual selective attention. *Science, 291*, 1803-1806.

DeSchepper, B., & Treisman, A. (1996). Visual memory for novel shapes: Implicit coding without attention. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 22*, 27-47.

Desimone, R. (1998). Visual attention mediated by biased competition in extrastriate visual cortex. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences, 353*, 1245-1255.

Desimone, R., & Duncan, J. (1995). Neural mechanisms of selective visual attention. *Annual Review of Neuroscience, 18*, 193-222.

Elsen, M., Pieters, R., & Wedel, M. (2016). Thin slice impressions: How advertising evaluation depends on exposure duration. *Journal of Marketing Research, 53*, 563-579.

Fenske, M. J., & Raymond, J. E. (2006). Affective influences of selective attention. *Current Directions in Psychological Science, 15*, 312-316.

Fox, E. (1995). Negative priming from ignored distractors in visual selection: A review.

Psychonomic Bulletin & Review, 2, 145-173.

Frings, C., Schneider, K. K., & Fox, E. (2015). The negative priming paradigm: An update and implications for selective attention. *Psychological Bulletin Review, 22*, 1577-1597.

Gwinn, R., Leber, A. B., & Krajbich, I. (2019). The spillover effects of attentional learning on value-based choice. *Cognition, 182*, 294-306.

Hoffman, D. L., & Novak, T. P. (2000). Advertising pricing models for the world wide web. In D. Hurley, B. Kahin, & H. Varian (Eds.), *Internet publishing and beyond: The economics of digital information and intellectual property* (pp. 45-61). Cambridge, MA: MIT Press.

Janiszewski, C., Kuo, A., & Tavassoli, N. T. (2013). The influence of selective attention and inattention to products on subsequent choice. *Journal of Consumer Research, 39*, 1258-1274.

Karrh, J. A., McKee, K. B., & Pardun, C. J. (2003). Practitioners' evolving views on product placement effectiveness. *Journal of Advertising Research, 43*, 138–149.

Krajbich, I., Armel, K. C., & Rangel, A. (2010). Visual fixations and the computation and comparison of value in simple choice. *Nature Neuroscience, 13*, 1292-1298.

Krajbich, I., & Rangel, A. (2011). Multialternative drift-diffusion model predicts the relationship between visual fixations and choice in value-based decisions. *Proceedings of the National Academy of Sciences of the United States of America, 108*, 13852-13857.

May, C. P., Kane, M. J., & Hasher, L. (1995). Determinants of negative priming. *Psychological Bulletin, 118*, 35-54.

Monahan, J. L., Murphy, S. T., & Zajonc, R. B. (2000). Subliminal mere exposure: Specific, general, and diffuse effects. *Psychological Science, 11*, 462-466.

Neill, W. T. (1977). Inhibitory and Facilitatory Processes in Selective Attention. *Journal of Experimental Psychology: Human Perception and Performance, 3*, 444-450.

Neill, W. T., Valdes, L. A., Terry, K. M. & Gorfein, D. S. (1992). Persistence of negative priming: II. Evidence for episodic trace retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18*, 993-1000.

Orquin, J. L., & Mueller Loose, S. (2013). Attention and choice: A review on eye movements in decision making. *Acta Psychologica, 144*, 190-206.

Palcu, J., Sudkamp, J., & Florack, A. (2017). Judgments at gaze value: Gaze cuing in banner advertisements, its effect on attention allocation and product judgments. *Frontiers in Psychology, 8*, 881.

Pieters, R., & Wedel, M. (2012). Ad gist: Ad communication in a single eye fixation. *Marketing Science, 31*, 59-73.

Raymond, J. E., Fenske, M. J., & Tavassoli, N. T. (2003). Selective attention determines emotional responses to novel visual stimuli. *Psychological Science, 14*, 537-542.

Reynolds, J. H., & Chelazzi, L. (2004). Attentional modulation of visual processing. *Annual Review of Neuroscience, 27*, 611-647.

Serfas, B., Florack, A., Büttner, O., & Vögeding, T. (2017). What does it take for sour grapes to remain sour? Persistent effects of behavioral inhibition in go/no-go tasks on the evaluation of appetitive stimuli. *Motivation Science, 3*, 1-18.

Shimojo, S., Simion, C., Shimojo, E., & Scheier, C. (2003). Gaze bias both reflects and influences preference. *Nature Neuroscience, 6*, 1317-1322.

Tipper, S. P. (1985). The negative priming effect: Inhibitory priming by ignored objects. *Quarterly Journal of Experimental Psychology, 37*, 571-590.

Tipper, S. P. (2001). Does negative priming reflect inhibitory mechanisms? A review and integration of conflicting views. *Quarterly Journal of Experimental Psychology, 54*, 321-343.

Tipper, S. P., & Driver, J. (1988). Negative priming between pictures and words in a selective attention task: Evidence for semantic processing of ignored stimuli. *Memory & Cognition, 16*, 64-70.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9*, 1-27.

Table 1

Mean Dwell Times in the Exposure Phase (Experiment 2)

		Dwell times [ms]			
		Unmatched		Matched	
		M	*SD*	*M*	*SD*
Target vs. Neutral	Target	681.52	112.92	669.78	125.22
	Neutral	831.58	172.27	691.59	115.38
Distractor vs. Neutral	Distractor	217.04	116.13	223.29	120.16
	Neutral	824.14	177.50	253.75	120.38

Table 2

Preference Choices in the Choice Tasks (Experiment 2)

		Chosen [%]			
		Unmatched		Matched	
		M	*SD*	*M*	*SD*
Target vs. Neutral	Target	57.21	23.80	59.62	22.93
	Neutral	42.79	23.80	40.38	22.93
Distractor vs. Neutral	Distractor	50.72	26.41	54.09	26.56
	Neutral	49.28	26.41	45.91	26.56

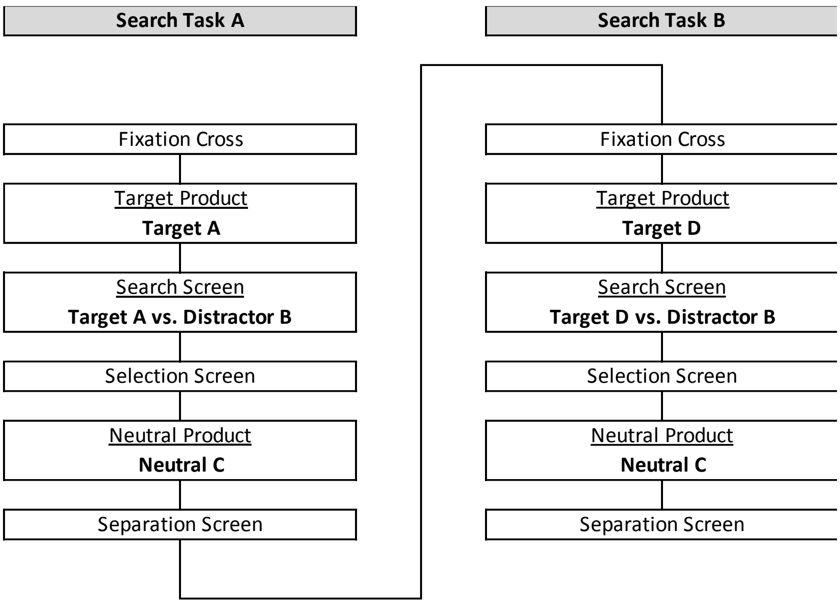

Figure 1. Conceptual overview of the trial structure of one trial in the exposure phase of Experiment 1. One trial consists of two search tasks (Search Task A and Search Task B).

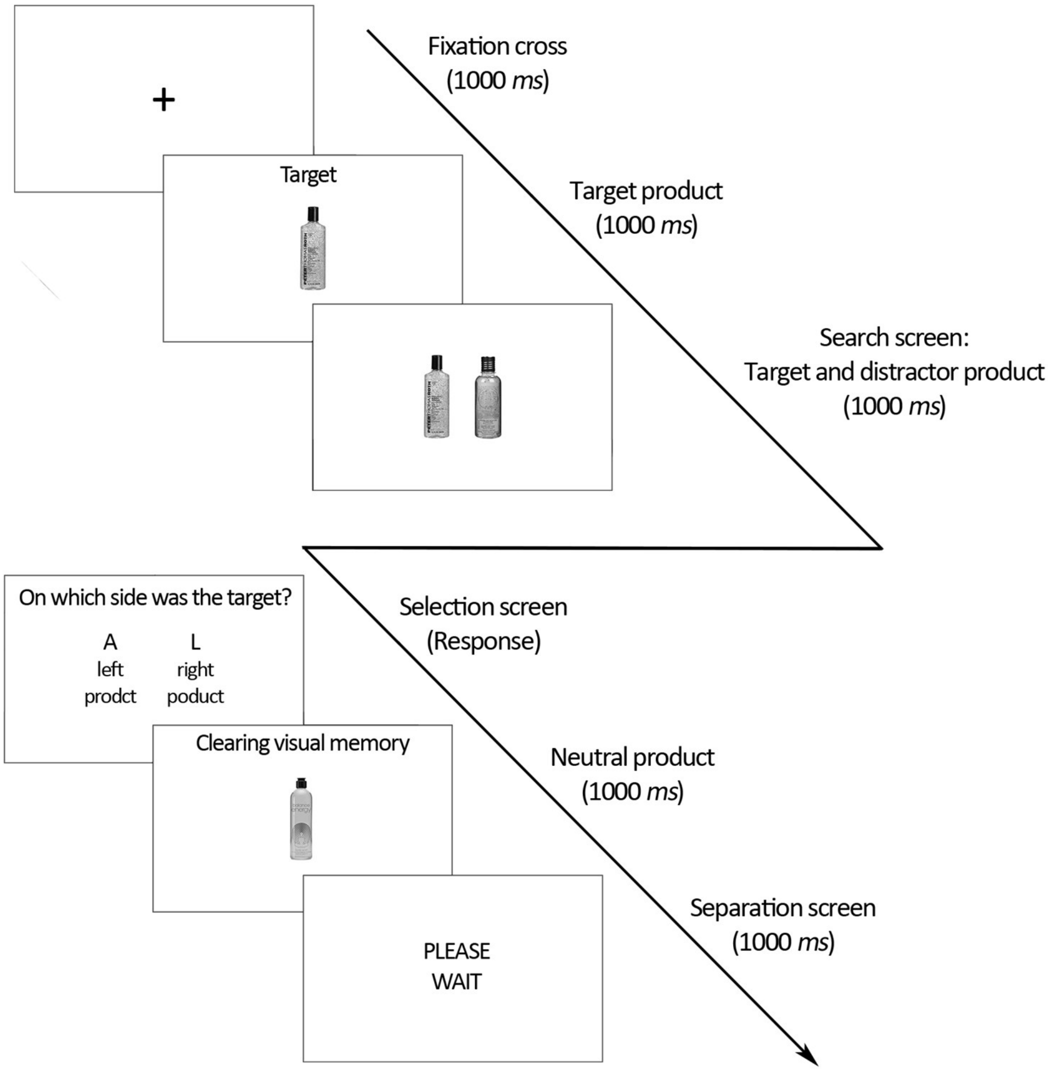

Figure 2. Example sequence of the search task during the exposure phase in Experiment.

Please note that one trial consisted of two search tasks.

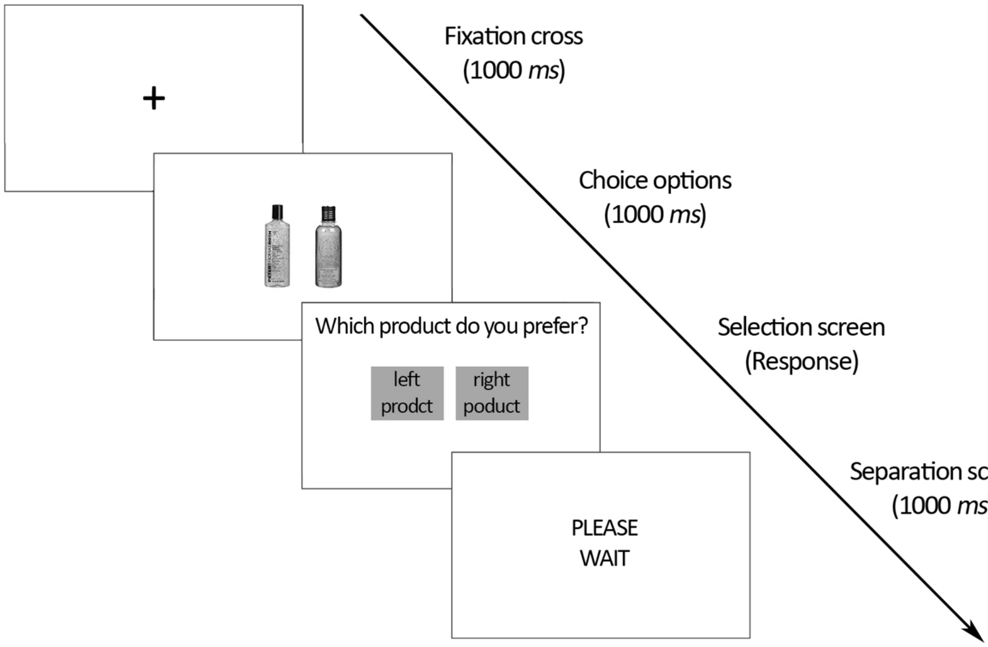

Figure 3. Example sequence of the choice task during the choice phase in Experiment 1.

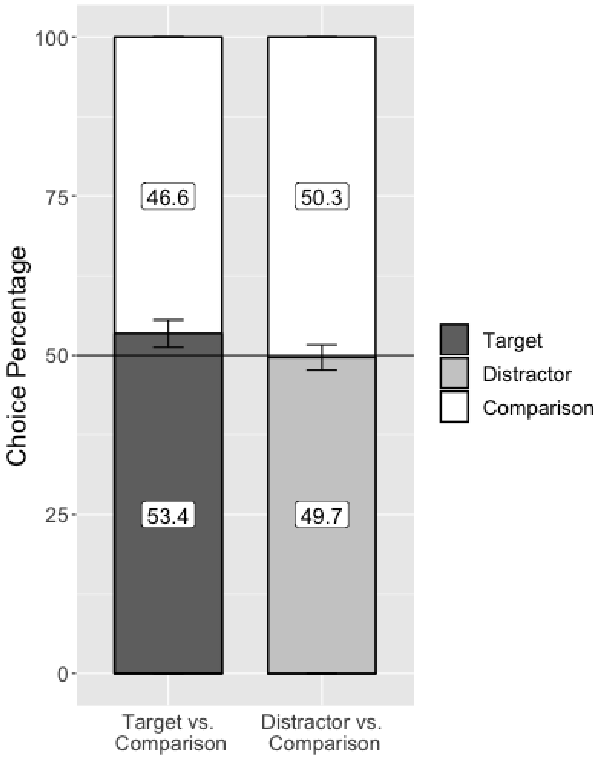

Figure 4. Main effect of role of stimulus (target vs. distractor) on choice in Experiment 1. Comparison products were either neutral or novel products. Error bars show the 95 % confidence interval.

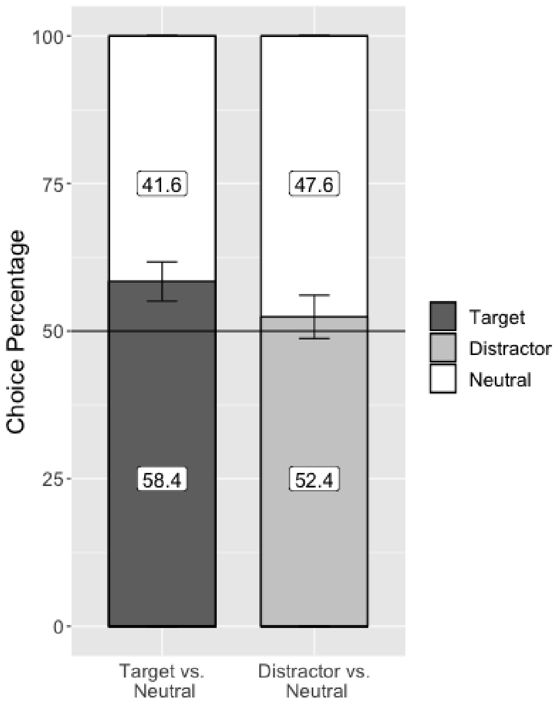

Figure 5. Main effect of role of stimulus (target vs. distractor) on choice in Experiment 2. Error bars show the 95 % confidence interval.

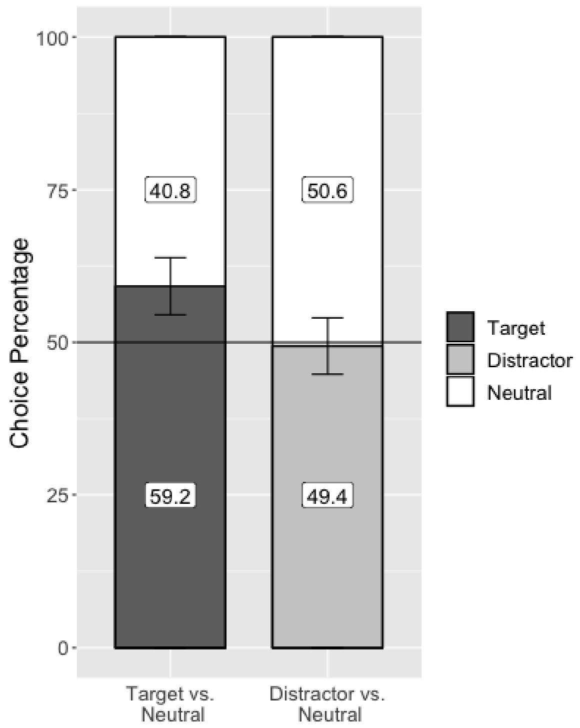

Figure 6. Main effect of role of stimulus (target vs. distractor) on choice in Experiment 3.

Error bars show the 95 % confidence interval.