Mark Lett (2012) 23:745–759
DOI 10.1007/s11002-012-9176-3

Novel versus familiar brands: An analysis of neurophysiology, response latency, and choice

Martin Reimann · Raquel Castaño · Judith Zaichkowsky · Antoine Bechara

Published online: 2 May 2012

Abstract Two experiments were conducted to analyze neurophysiological activation, response latency, and actual brand choice concerning novel and familiar brands. The results show that (1) the choice of novel brands (compared to the choice of familiar brands) is preceded by increased activation of both the cingulate gyrus and the ventromedial prefrontal cortex, as measured by a functional magnetic resonance imaging (fMRI) study; (2) novel brands are associated with longer choice response latency than familiar brands; and (3) positive mood enhances response latency of choosing novel brands compared to familiar brands.

Keywords Branding · Consumer neuroscience · Functional magnetic resonance imaging (fMRI) · Mood induction · Neuromarketing · Response latency

M. Reimann (✉) · A. Bechara
Department of Psychology, Brain & Creativity Institute, University of Southern California, 3620 McClintock Avenue, Los Angeles, CA 90089-1061, USA
e-mail: mreimann@usc.edu

R. Castaño
Department of Marketing, EGADE Business School, Tecnológico de Monterrey, Avenida Fundadores y Rufino Tamayo, Garza García, Nuevo Leon, Mexico 66269

J. Zaichkowsky
Beedie School of Business, Simon Fraser University, 500 Granville Street, Vancouver, Canada V6C 1W6

A. Bechara
Douglas Mental Health University Institute, Clinical Research Division, McGill University, 6875 LaSalle Boulevard, Montreal, Quebec, Canada H4H 1R3

A. Bechara
Department of Neurology, UI Hospitals and Clinics, University of Iowa, 200 Hawkins Drive, 2007 RCP, Iowa City, IA 52242, USA

1 Introduction

Market researchers recently estimated that, despite extensive brand development efforts, up to 95 % of new brand introductions fail (Nobel 2011; Schneider and Hall 2011). Reaching consumers in today's competitive market is a difficult task, but insight into the psychological processes underlying the choice of novel versus familiar brands might lead to a better understanding of consumers' choice and evaluation processes. The present research focuses on understanding prechoice processes in order to help explain how some novel brands stick and others do not (Keller and Lehmann 2006; Keller 2009). Accessing psychological processes is difficult because consumers have typically not yet formed any associations or attitudes for novel stimuli. Thus, existing psychometric measures of brand processing may not work effectively and may even fail to predict a novel brand's performance (Dillon et al. 2001). Of course, some reasons have been found for novel brands "stickiness" including consumers appreciating novel brands' intriguing logo design (Henderson et al. 2004), easy-to-process brand names (Yorkston and Menon 2004), or aesthetic packaging (Reimann et al. 2010). These reasons provide some initial explanation for why consumers sometimes try out novel brands.

However, none of these factors fully explain the *core* psychological underpinnings of novel brand choice. In the present research, functional magnetic resonance imaging (fMRI) is used to tap into these core mechanisms in the brain. Recent research has shown that functional brain imaging can effectively reveal affective and cognitive processes related to brands (cf. Reimann et al. 2011). Contemporary brain imaging has made substantial progress on some of the neurophysiological processes associated with *familiar* brands including the neural correlates of brand perception and processing (e.g., Cheung et al. 2010), brands' impact on product perception (e.g., McClure et al. 2004), brand recall (e.g., Esch et al. 2012), brand categorization (e.g., Schaefer and Rotte 2007), brand judgments (e.g., Yoon et al. 2006), and brand preference (e.g., Santos et al. 2011). However, brain imaging has been used to a significantly lesser extent to determine the neurophysiological keystone of *novel* brands. One recent fMRI study revealed an association between deeply loved brands (when compared to newly formed brand relationships) and activation of the insula, a brain area previously found to be a crucial mechanism in diverse but related psychological phenomena such as urging, addiction, loss aversion, and interpersonal love (Reimann et al. 2012b). However, that research focused on a comparison of the neurophysiological responses to establish brand relationships with those to newly formed brand relationships—both of which participants were familiar with. Thus, participants had already established associations and attitudes regarding these two categories of relationships. As such, consumers' psychological and neurophysiological processes in response to brands in the very early stages of the brand lifecycle—i.e., when brands were recently developed, novel, and thus literally unknown—are not well understood.

For these reasons, we created a brand choice task in which participants chose or rejected novel and familiar brands while undergoing fMRI (Experiment 1). Because previous investigations have argued that stimulus-induced affect (e.g., emotional responses stemming from the brand itself) can have a profound effect on perception and choice (Shiv and Fedorikhin 2002; Pham 2004, 2007), we focused on *neutrally valenced* novel brand logos and compared them to neutrally valenced familiar logos. This approach allowed us to focus on the "wanting" element of brand choice as

opposed to the "liking" element. While the study of brand liking typically focuses on the comparison of positively versus negatively valenced brands (Reimann et al. 2012a), the study of "brand wanting" separates the liking aspect by analyzing neutral brands and thus concentrates on motivation-related processes leading to choice. Prior neuroscience research has disentangled these two elements, showing that they arise from two separable neural systems (Berridge 1996). As a reminder, a major goal of the present research was to investigate how certain novel brands "stick" in consumers' minds and—more importantly—are ultimately chosen over others, regardless of consumers liking the logo, the slogan, or the name.

Prior research has shown response latency (sometimes also referred to as reaction time) to be a valid gauge of the time it takes to carry out basic mental processes (Luce 1986). In particular, response latency is an effective measure for distinguishing memory-based responses (which are associated with shorter response latency) from new responses constructed on the spot as information is encountered and integrated (which are associated with longer response latency; Bizer et al. 2006; Cronley et al 2010; Kardes 1988; Stayman and Kardes 1992). Due to the underlying cognitive processes of perceiving information and integrating it into memory, we expected novel brands to be associated with longer response latency than familiar brands. To test this prediction, we measured response latency as well as choice in a behavioral experiment (Experiment 2).

Choice as a behavioral measure simply sheds light on individuals' preference construction (Bettman et al. 1998). Therefore, both response latency and choice measures are appropriate to gain further understanding of the underlying core processes of novel brands. While the stimulus-based affect (that may be integral to brand logos) was kept constant by comparing neutrally valenced novel brands with neutrally valenced familiar brands, we introduced a manipulation of the incidental affect (i.e., participants' mood states) to investigate whether diffuse affective states, such as mood, can differentially impact brand responses. This is an important question as previous research has shown that mood influences the way people process and act on information. In particular, Kahn and Isen (1993) provided evidence that the induction of positive affect in choice tasks led to a greater preference for exploration and trying new things. Lee and Sternthal (1999) showed further that a positive mood enhances brand learning by stimulating the use of categorization strategies at the time of encoding; in other words, it facilitates learning how a new brand or product may be used.

This research aims at making a contribution to the literature on several fronts. First, an improved understanding of the core psychological and neurophysiological underpinnings of novel brands and their affective and cognitive correlates would have important implications both for knowledge on the neural basis of branding and for increasing the success of new brands.

Second, by acknowledging the important difference between integral (i.e., stimulus-based) affect versus incidental (i.e., mood-based) affect and by introducing a mood manipulation in Experiment 2, we aim at making a contribution to the literature on affect and choice. Although the notion of a strong affective basis of choice has been recognized in previous behavioral work (e.g., Hsee and Hastie 2006; Isen 1993; Loewenstein and Lerner 2003), it remains unclear how affect impacts choice, since the bulk of prior research in this area has been more outcome-focused than process-focused (Carlson et al. 2008). Specifically, prior research has called for a more rigorous disentanglement of the roles of affect and memory in choice (Bettman et al. 1998; Mellers et al. 1998).

Third, because our experiments tap into (1) the role of affect in choice by studying the effect of mood on novel brand choice and (2) the role of memory in choice by analyzing response latency to novel/familiar brand choice as an indicator for memory processing, the present research also speaks to the important literature on response latency in choice (Cronley et al. 2010; Kardes 1988; Stayman and Kardes 1992).

Fourth, our methodological selection—i.e., the combination of measures of blood flow in the brain, choice response latency, and actual choice—heeds calls for the study of physiology in consumer behavior that have been advanced in both classic work (e.g., Kroeber-Riel 1979; Sanbonmatsu and Kardes 1988) and more recent investigations (e.g., Reimann et al. 2011).

2 Conceptual background and hypotheses

2.1 Neurophysiological responses to novel brand choices

Several neural structures have been shown to be key components of the neural circuitry underlying decision making. Somatic marker theory (Damasio 1994) has been advanced as a framework for how somatic information (also sometimes referred to as bodily or emotional information) is used to arrive at advantageous decisions (Reimann and Bechara 2010). According to this theory, the amygdala is crucial for triggering somatic states from emotional events that occur in the environment for the first time (i.e., primary inducers), while the medial prefrontal cortex (mPFC) is vital for triggering somatic states from existing information stored in memories, knowledge, and cognition (i.e., secondary inducers).

2.1.1 The amygdala and the processing of primary inducers

For novel stimuli that occur in the environment, somatic marker theory predicts increased amygdala activation. As a word of caution, however, these environmental stimuli must be very emotionally salient in order to engage amygdala activation. For example, several studies have shown the amygdala to be relevant in the processing of emotionally salient events such as potential threats (Wilensky et al. 2006; Amano et al. 2011), unpredictable monetary gambles (Hsu et al. 2005), and warning cues such as a rising sound (Bach et al. 2008). Following this account, for choices of novel brands that are neutrally valenced, we would predict not to find increased amygdala activation because, to engage the amygdala, environmental stimuli must be highly emotionally arousing.

2.1.2 The mPFC and the processing of secondary inducers and the execution of control

Somatic marker theory provides additional clues on the functional neuroanatomy of novel versus familiar stimuli: we argue that novel brands engage the mPFC region to a significantly greater extent than familiar brands. The theory contends that when pondering a decision (in this case, choosing or rejecting a brand), the immediate and future prospects of an option may trigger numerous emotional responses that accumulate in an overall positive or negative affective signal as input for a decision (i.e., either a "go" or a "no-go"

signal). This signal is processed in the mPFC and associated with decreased activation for a "go" signal and increased activation for a "no-go" signal (Reimann and Bechara 2010). The mPFC region has been identified as one critical structure in a neural system serving risky decision making (e.g., Damasio 1994). Lesioning the mPFC has been found to lead to overly risky behaviors and disadvantageous choices (Bechara et al. 1997). Along these lines, engaging participants in decisions of novel versus familiar brands could possibly recruit greater mPFC activation in the form of a "no-go" signal that "risk is involved" when choosing the novel brand compared to the familiar brand.

2.1.3 The mesolimbic dopamine system, the cingulate gyrus, and the lure of reward

At the same time, because humans are generally curious beings (Glanzer 1958), we argue that there could also be a "lure of reward" involved with choosing novel over familiar options. Indeed, previous investigations have provided evidence in favor of such a lure of reward during risky decision making (Xue et al. 2009), which supports the relationship between acceptable levels of risk and novelty seeking in behavioral studies (Isen and Geva 1987; Isen and Patrick 1983). Following this line of research, we propose that novel brands (compared to familiar brands) may engage structures of the reward network. Here, the mesolimbic dopamine system (the core reward system; Wise 1978; Wise and Rompre 1989) may be implicated. In addition, other reward-related structures may be involved, such as the cingulate gyrus that has been implicated in reward-based decision making (Bush et al. 2002), in guiding voluntary choices (Kennerley et al. 2006) and, more generally speaking, in the integration of bodily, attentional, and emotional information (Bush et al. 2000). For the choice of novel brands, such bodily and attentional information could be interpreted as stimulus-based activation (Reimann et al. 2012a).

Behavioral decision theory argues that decision makers try to accurately anticipate the different possible consequences of their actions (Shiv and Huber 2000). To do so, they must accurately predict both what consequences might occur and how those consequences will be experienced (Frisch & Clemen 1994). This notion is in line with research on lesion patients and neuroimaging studies, both of which argue that the underlying neurophysiological process arises *prior* to the behavioral act of carrying out the decision (Bechara et al. 1997; Levin et al. 2012). Our experiment will, therefore, focus on the anticipation phase *preceding* the actual behavioral act of choosing.

As a word of caution, though, familiar brands may possibly be rewarding as well (Schaefer and Rotte 2007). Yet, in the present research, we compared neutrally valenced novel brands with neutrally valenced familiar brands. As such, we argue that neutrally valenced novel brands are more rewarding then neutrally valenced familiar brands. Because we accounted for actual choice in our analyses and focused our analyses on those brain activation changes preceding choice, we expect the "lure of reward" to be greater for the riskier novel brands than the less risky familiar brands. Building on somatic marker theory and the idea of reward-based decision making, we hypothesize:

H1. Choices of neutrally valenced novel brands are preceded by increased activation in executive control areas and reward areas of the brain when compared to choices of neutrally valenced familiar brands.

2.2 Response latency to novel brand choices

It has been shown that the processing of novel stimuli differs from the processing of familiar stimuli on several dimensions. Novel stimuli are processed more globally and more abstractly than familiar stimuli, the latter of which are processed more locally and concretely (Förster et al. 2009). Temporal construal theory suggests that local processing and concrete thinking accentuate both affective responses (Trope and Liberman 2010) and fluency-based intuitive responses (Tsai & Thomas 2011), which could lead to shorter processing times for familiar stimuli. Additionally, it has been shown that novel stimuli are processed less fluently than familiar stimuli due to the mere exposure effect that makes familiar stimuli more salient in memory and, thus, quicker to process (Fang et al. 2007; Janiszewski & Meyvis 2001).

In line with previous research (e.g., Kardes 1988; Luce 1986), we use response latency as a measure of the time it takes to carry out psychological processes, which helps us to gain insights about fundamental processes underlying novel versus familiar brands. Retrieving previously formed memory-based responses is fast, which should become evident in faster response latency. Conversely, constructing new responses requires time and cognitive effort and, thus, should yield longer response latency (Bizer et al. 2006). Following these accounts, we expect novel brands to activate global, more abstract, stimulus-based processing that may require more processing time (i.e., longer choice response latency) than memory-based, more fluent processing. We further expect familiar brands to activate local, more concrete memory-based processing, which may require less processing time (i.e., shorter choice response latency) since brands are accessing existing associations and attitudes. Therefore, we hypothesize:

H2. Novel brands are associated with longer choice response latency than familiar brands.

2.3 Affect, mood, and response latency to novel brand choices

Although affect has been recognized to have a strong impact on both cognitions and downstream decision making (Mellers et al. 1998), the specific nature of its impact is controversial (Herr et al. 2012). For example, while some research holds that positive affect improves the efficiency of information integration and the capacity to process information (Isen 1993; Herr et al. 2012), other research suggests that positive affect is associated with more heuristic processing as well as diminished reasoning and decision making (Schwarz and Bless 1991).

The present research tries to contribute to the extant literature by focusing on the affect produced by a person's mood state (incidental affect), which is different from affect produced by the stimuli themselves (integral affect; Pham 2004). Prior research has shown that positive mood may result in novelty seeking. For example, Kahn and Isen (1993) found that a positive mood manipulation increased novelty seeking, whereas a negative mood manipulation does not. However, previous research is unclear as to whether a specific mood state will lead to longer or shorter response latency. Because positive mood has been associated with novelty seeking (Kahn and Isen 1993; Roehm and Roehm 2005), we expect that inducing a positive mood will

increase response latency for novel brands because of increased search and processing times. We further propose that a positive mood will also increase the number of novel brand choices due to an increased desire for novel stimuli. On the contrary, we suppose that inducing a negative mood will decrease response latency for familiar brands because of a lack of desire for novel stimuli and, thus, faster search and processing times. Consequently, in negative mood states, we expect an increase in the number of familiar brand choices because of decrease novelty seeking. We hypothesize:

H3. The more positive (negative) the mood is, the longer (shorter) choice response latency for novel (familiar) brands and the more likely novel (familiar) brand choice will be.

3 Experiment 1

3.1 Overview and method

A within-subject experimental design with novelty of the brand (i.e., novel or familiar) as the within-subject factor was used to test hypothesis 1 and aimed at shedding light on the neurophysiological processes underlying the choice of novel versus familiar brands. FMRI was employed while participants were engaged in a choice task.

For the novel condition, a graphic designer created 20 unique logos, following established procedures to arrive at holistic logo designs (Orth and Malkewitz 2008). A name or slogan within the logos were not included in order to minimize semantic associations stored in memory. Novel brand logos were pretested among an independent sample of 22 raters. These raters evaluated each novel brand logo on a valence scale with -1 being "negative," 0 being "neutral," and +1 being "positive" (Lang et al. 1997). Results revealed that novel brand logos were on average perceived as neutrally valenced (M_{valence}=.06), suggesting that raters did not hold any positive or negative predispositions for or against the brand logos.

For the familiar condition, each study participant was asked to select and e-mail to us, logos of 20 brands he or she knew well but felt neutral about (i.e., brands they neither liked nor disliked). Participants rated each brand logo—both the novel brands and their self-selected familiar brands—on a valence scale with -1 being "negative," 0 being "neutral," and +1 being "positive." Results confirmed that participants on average viewed both the novel brands ($M_{\text{valence novel}}$=.02) and the self-selected familiar brands ($M_{\text{valence familiar}}$=.06) as neutrally valenced (nonsignificant differences between means, $p>.1$). We further calculated the average valence rating per brand across all participants and then correlated the ratings obtained from the study participants with those from the independent raters. The results revealed that the valence ratings of the novel brands correlated strongly and significantly between this experiment's participants and the independent raters (r=.67, $p<.001$), providing evidence for high interrater reliability.

Seventeen participants were recruited from the undergraduate subject pool at a large private university, resulting in a data set of 17×40=680 different choices (340 choices on novel brands and 340 choices on familiar brands). All participants were

healthy, had no history of neurological or psychiatric disease, successfully performed a medical screening for neuroimaging eligibility, and gave written informed consent. Prior to the brain scans, participants engaged a brief training task to deal with any task-related confusion before the actual experiment. For the training task, we used different brands than in the subsequent actual task. Once inside the scanner, participants could see the task stimuli through a mirror in front of their eyes. Stimuli were presented via the presentation software E-Prime. Each of the 40 trials of the choice task started with a two-second phase prompting participants with the words "Get ready" ("preparation phase"), followed by the four-second presentation of the brand logo ("anticipation phase"), and then a two-second choice phase in which participants chose or rejected brands ("choice phase"). Finally, a two-second "fixation phase" ended the trial before the next one began. Participants provided responses by pressing one of two buttons ("Choose" or "Reject") on a response box. The task continued if a participant failed to respond; however, participants responded in 99 % of all trials.

3.2 Results

Because participants had already viewed the brand logo for four seconds in the anticipation phase before being prompted to make their choice within the two-second choice phase, we did not expect differences in response latency. Indeed, response latency differences (measured in milliseconds, ms) were nonsignificant between novel and familiar brands for both "Choose" ($M_{\text{RL choose novel}}$=1,498 ms versus $M_{\text{RL choose familiar}}$=1,457 ms, $p>.1$) and "Reject" ($M_{\text{RL reject novel}}$=1,146 ms versus $M_{\text{RL reject familiar}}$=1,098 ms, $p>.1$). Frequency counts of choices showed that participants chose neutrally valenced familiar brands (54 % chosen, 46 % rejected) significantly more often than neutrally valenced novel brands (47 % chosen, 53 % rejected), $p<.01$.

We analyzed the neuroimaging data with the BrainVoyager QX software and focused our analysis on the anticipation phase (i.e., the four-second phase *before* the choice phase). This approach is in line with both behavioral decision theory and decision neuroscience, which both predict that decision makers try to accurately *anticipate* the different possible consequences of their actions (Levin et al. 2012; Shiv and Huber 2000). To account for actual choice, the data from the anticipation phases was divided into two subsets: one set of data contained the anticipation phases preceding choices of novel brands and the other set of data included the anticipation phases preceding choices of familiar brands. The brain data was grouped into five predictors: (1) "anticipation of novel brand choices" (i.e., all four-second intervals during the anticipation of novel brand choices), (2) "anticipation of familiar brand choices" (i.e., all four-second intervals during the anticipation of familiar brand choices), (3) "preparation" (i.e., all two-second preparation intervals), (4) "choice" (i.e., all two-second choice intervals), and (5) "fixation" (i.e., all two-second fixation intervals).

The global statistical threshold was set to $p<.05$, uncorrected, and data were submitted to a random-effect general linear model. When comparing the predictor "anticipation of novel brand choices" with the predictor "anticipation of familiar brand choices," results revealed significant increases in activation in the medial frontal gyrus, including ventromedial prefrontal cortex (vmPFC; Talairach coordinates

of the peak activation voxel: -4, 56, -12; $t(16)=3.01$, $p<.01$) and the cingulate gyrus (Talairach coordinates of the peak activation voxel: -4, 4, 42; $t(16)=5.94$, $p<.001$) prior to choosing neutrally valenced novel brands. Moreover, there was a significant increase in activation in the occipital lobe, which is the primary vision cortex (Talairach coordinates of the peak activation voxel: 4, -74, -6; $t(16)=4.23$, $p<.01$).

3.3 Discussion

Consistent with hypothesis 1, the results revealed that prior to choosing novel brands (compared to familiar brands), participants engaged both an executive control area (i.e., the vmPFC) and an area of the reward system (i.e., the cingulate gyrus). This finding suggests that the choice of novel brands (compared to the choice of familiar brands) implicates a valuation process (including both a "go" versus "no-go" weighing and a risk assessment) as well as the lure of reward, which is consistent with prior decision neuroscience research in the domain of risky decision making (Bechara et al. 1997; Xue et al. 2009). The fMRI study also suggests that participants engaged in a stimulus-based integration of bodily and attentional information (Bush et al. 2000), a core function ascribed to the cingulate gryus. This is an interesting finding, given that participants self-reported neutral valence for the novel brands, which would suggest limited engagement of bodily/emotional information.

The present finding provides some indication of why we may expect longer response latency for novel compared to familiar brands (hypothesis 2). We found that participants engaged in stimulus-based integration of bodily and attentional information, hence longer response latency might result for novel versus familiar brands. To test this claim, we conducted Experiment 2.

4 Experiment 2

4.1 Overview and method

Experiment 2 sheds light on the response latency underlying the choice of novel versus familiar brands, studies the effect of a mood induction on this effect, and tests hypotheses 2 and 3. A 3×2 experimental design with the between-subject factor of mood (i.e., positive, neutral, or negative incidental affect) and the within-subject factor of novelty of the stimulus (i.e., novel or familiar) was employed. A total of 129 graduate students of a large public university participated (43 participants in each mood condition), resulting in 129×40=5,160 brand choices (1,720 choices each in the positive, neutral, and negative mood conditions). We used a mood induction procedure before participants engaged in the choice task to allow us to focus on affect produced by an individual's mood state (i.e., incidental affect), which is different from affect produced by the stimuli themselves (i.e., integral affect; Pham 2004). It is important to note that, consistent with Experiment 1, all stimuli used in the present experiment were rated as neutrally valenced both by participants and by a sample of independent raters. Thus, identified differences in affect are likely to stem from incidental affect, not from integral affect.

Participants were randomly assigned to either the positive, neutral, or negative mood condition and then were shown a series of pictures from the International Affective Picture System (IAPS; Lang et al. 1997). Participants could view these pictures for as long as five minutes. We selected ten pictures in each category, showing other people in positive situations (e.g., with a newborn baby, as a happy couple), presenting neutral stimuli (e.g., a wooden basket), or showing other people in negative situations (e.g., in a car accident, in war). A manipulation check (Russell et al. 1989) revealed that participants' mood states varied significantly on the valence dimension across conditions (positive mood: M_{valence}=6.16; neutral mood: M_{valence}=4.72; negative mood: M_{valence}=3.98), $F(2,126)=14.76$, $p<.001$). Arousal levels were medium but not significantly different across the three conditions (positive mood: M_{arousal}=4.93; neutral mood: M_{arousal}=4.54; negative mood: M_{arousal}=4.79, $F(2,126)=1.32$, $p>.2$).

Following procedures from Experiment 1, participants were presented with 20 neutral novel brands (same logos as reported in Experiment 1) as well as with 20 neutral familiar brands (which each participant self-selected and e-mailed to us prior to the experiment). Before the mood induction procedure, participants rated each brand—both the novel brands and their self-selected familiar brands—on a valence scale with -1 being "negative," 0 being "neutral," and +1 being "positive" (Lang et al. 1997). Results confirmed that participants on average viewed both the novel brands ($M_{\text{valence novel}}$=.04) and the self-selected familiar brands ($M_{\text{valence familiar}}$=.08) as neutrally valenced (nonsignificant differences between means, $p>.1$). We further calculated the average valence rating per brand across all participants and then correlated the ratings obtained from the study participants with those from the independent raters (details on the independent raters are reported in Experiment 1). The results revealed that the valence ratings of the novel brands correlated strongly and significantly between the study participants and the independent raters (r=.83, $p<.001$), providing evidence for high interrater reliability. Taken together, the results showed that integral affect (i.e., logo-based affect) could be largely ruled out, because both study participants and independent raters viewed logos as being neutral.

Participants underwent a brief training task to deal with any task-related confusion before the actual experiment. Different brands were used in the training task than in the full-length task. Stimuli were again randomly presented in the presentation software E-Prime. Each trial of the full-length choice task started with a two-second "preparation phase," prompting participants with the words "Get ready," followed by the presentation of the brand logo and the product category ("choice phase"). During the choice phase, participants were given four seconds to decide by pressing either 1 ("Choose") or 2 ("Reject") on the computer's keyboard. Finally, a two-second fixation phase ended the trial before the next one appeared. The task continued if participants failed to respond; however, participants responded in 98 % of all trials. In the full-length task, participants saw both their self-selected brands and the set of novel brands.

4.2 Results

A repeated-measure analysis of variance with mood as between-subject factor and familiarity as within-subject factor revealed a significant main effect of mood on

response latency (RL) to choose a brand, $F(2,126)=7.88$, $p<.01$. The finding supports our premise that the response latency of novel brands in the positive mood condition is significantly higher ($M_{\text{RL novel, positive mood}}=2{,}167$ ms) than the response latency of novel brands in the neutral ($M_{\text{RL novel, neutral mood}}=1{,}575$ ms) and negative ($M_{\text{RL novel, negative mood}}=1{,}694$ ms) mood conditions, as well as familiar brands in the positive ($M_{\text{RL familiar, positive mood}}=1{,}430$ ms), neutral ($M_{\text{RL familiar, neutral mood}}=1{,}445$ ms), and negative ($M_{\text{RL familiar, negative mood}}=1{,}311$ ms) mood conditions. Results also revealed that average response latency was significantly longer for novel brands than for familiar brands, $F(1,126)=46.07$, $p<.001$. Moreover, the mood x novelty interaction was significant, $F(2,126)=8.24$, $p<.001$, indicating that the effect of novelty on response latency differed when mood was positive compared to when it was neutral or negative.

We also analyzed the choice data and calculated frequency counts of choices across all 5,160 trials. Data were submitted to a binary logistic regression with mood (i.e., negative, neutral, positive) as the categorical predictor variable and choice (i.e., choose or reject) as the dependent variable. The results revealed a significant effect of mood on brand choice (regression coefficient $B=0.39$, standard error SE=0.03, exp $(B)=.68$, $p<.001$, and $\chi^2=27.97$, $p<.001$), with more positive mood resulting in more choices of the novel brand than familiar brands. In particular, participants chose novel brands to a considerably greater extent in the positive mood condition (71 % chosen, 29 % rejected) than in the neutral (62 % chosen, 38 % rejected) and negative (46 % chosen, 54 % rejected) mood conditions ($p<.01$). Furthermore, participants chose familiar brands to a significantly greater extent in the negative mood condition (67 % chosen, 33 % rejected) than in the neutral (53 % chosen, 47 % rejected) and positive (58 % chosen, 42 % rejected) mood conditions ($p<.01$).

4.3 Discussion

When positive mood was induced prior to the decision, consumers tended to choose more novel brands, while induction of negative mood had the opposite effect. More importantly, results from Experiment 2 provide insights into the underlying process accounts of this behavioral difference in brand choice. Specifically, positive mood increased consumers' choice response latency for novel brands compared to neutral or negative mood states. Given that response latency can be used as an effective measure for distinguishing memory-based responses (associated with shorter response latency) from new responses constructed on the spot as information is encountered and integrated (associated with longer response latency; Cronley et al. 2010; Kardes 1988), this finding shows that positive mood facilitates the construction of new responses for these novel brands, whereas negative mood makes this processes less effective.

5 General discussion

This research demonstrates three findings. First, the choice of novel brands (compared to the choice of familiar brands) is preceded by activation of the cingulate gyrus and the ventromedial prefrontal cortex, according to a fMRI study. Second, novel brands are associated with longer choice response latency

than familiar brands and finally, positive mood enhances response latency of choosing novel brands compared to familiar brands.

A major goal of the present research was to investigate why certain brands "stick" in consumers' minds and are ultimately chosen over others, regardless of consumers liking the logo, the slogan, or the name associated with the brand. The fMRI experiment provides some answers to this question, showing evidence of the engagement of the cingulate gyrus, a brain area ascribed to reward-based decision making and the integration of bodily and attentional information, and the medial prefrontal cortex, an executive control area. Following these results, it can be argued that novel brands—while presenting a risk to the decision maker—also trigger a lure of reward.

It was also found that novel brands are associated with longer choice response latency than familiar brands. Interestingly, previous research found that faster response latency to stimuli had favorable rather than unfavorable evaluative implications, due to differences in expectations about the prevalence of favorable versus unfavorable stimuli (Herr and Page 2004; Herr et al. 2012). The present investigation extends previous research by identifying response latency effects even among neutrally valenced stimuli. We further show that positive mood increases the construction of new responses for these novel brands, whereas negative mood makes these processes less effective.

This research provides new insight into the core psychological and neurophysiological underpinnings of novel brands when compared to familiar brands, offering key implications for both the understanding on the neural basis of branding and for increasing the sustainability of novel brands. Further, the effect of the mood manipulation in Experiment 2 makes a contribution to the literature on affect and choice by highlighting the distinct roles that affect, mood, and memory-related processing play in choice (e.g., Bettman et al. 1998; Mellers et al. 1998). Third, this research also speaks to the literature on response latency in choice (e.g., Cronley et al. 2010) by showing the differential effects of stimulus novelty and mood on response latency. Finally, the combined measures of blood flow, response latency, and actual choice provide interesting insight into physiological mechanisms of consumers' choice behavior.

Our research also raises some important questions. Given the importance of creating new brands and brand extensions, what are the design features that make a brand logo "wanted"? Why are some brands' designs more desirable than others, making consumers curious about the product they represent? Perhaps a unique combination of novel visual features elicits an aesthetic experience in consumers. This effect might be accompanied by a unique interaction of bodily responses, including visual fixation of the object, facial expressions of curiosity and interest, or feelings of pleasantness and warmth. To answer these questions, future research could add psychophysiological measures, such as eye tracking or facial expression measurement, in conjunction with classical behavioral experiments.

Acknowledgments The authors thank the editor, Frank Kardes, and two anonymous reviewers as well as Oliver Schilke and Gui Xue, and the session audiences of the 2010 Association for Consumer Research Annual Conference and the 2011 American Marketing Association Summer Conference for valuable comments on earlier versions of this research. This work was supported by a generous grant from the Google & WPP Marketing Research Awards Program, Grant #2009-10.

References

Amano, T., Duvarci, S., Popa, D., & Paré, D. (2011). The fear circuit revisited: Contributions of the basal amygdala nuclei to conditioned fear. *Journal of Neuroscience, 31*(43), 15481–15489.

Bach, D. R., Schächinger, H., Neuhoff, J. G., Esposito, F., Di Salle, F., Lehmann, C., et al. (2008). Rising sound intensity: An intrinsic warning cue activating the amygdala. *Cerebral Cortex, 18* (1), 145–150.

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275*(5304), 1293–1295.

Berridge, K. C. (1996). Food reward: Brain substrates of wanting and liking. *Neuroscience and Biobehavioral Reviews, 20*(1), 1–25.

Bettman, J. R., Luce, M. F., & Payne, J. W. (1998). Constructive consumer choice processes. *Journal of Consumer Research, 25*(3), 187–217.

Bizer, G. Y., Tormala, Z. L., Rucker, D. D., & Petty, R. E. (2006). Memory-based versus on-line processing: Implications for attitude strength. *Journal of Experimental Social Psychology, 42*(5), 646–653.

Bush, G., Luu, P., & Posner, M. (2000). Cognitive and emotional influences in anterior cingulate cortex. *Trends in Cognitive Sciences, 4*(6), 215–222.

Bush, G., Vogt, B. A., Holmes, J., Dale, A. M., Greve, D., Jenike, M. A., et al. (2002). Dorsal anterior cingulate cortex: A role in reward-based decision making. *Proceedings of the National Academy of Sciences, 99*(1), 523–528.

Carlson, K. A., Janiszewski, C., Keeney, R. L., Krantz, D. H., Kunreuther, H. C., Luce, M. F., et al. (2008). A theoretical framework for goal-based choice and for prescriptive analysis. *Marketing Letters, 19*(3), 241–254.

Cheung, M., Chan, A., & Sze, S. (2010). Electrophysiological correlates of brand names. *Neuroscience Letters, 485*(3), 178–182.

Cronley, M. L., Mantel, S. P., & Kardes, F. R. (2010). Effects of accuracy motivation and need to evaluate on mode of attitude formation and attitude-behavior consistency. *Journal of Consumer Psychology, 20* (3), 274–281.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Putnam.

Dillon, W. R., Madden, T. J., Kirmani, A., & Mukherjee, S. (2001). Understanding what's in a brand rating: A model for assessing brand and attribute effects and their relationship to brand equity. *Journal of Marketing Research, 38*(4), 415–429.

Esch, F., Moell, T., Schmitt, B., Elger, C., Neuhaus, C., & Weber, B. (2012). Brands on the brain: Do consumers use declarative information or experienced emotions to evaluate brands? *Journal of Consumer Psychology, 22*(1), 75–85.

Fang, X., Singh, S., & Ahluwalia, R. (2007). An examination of different explanations for the mere exposure effect. *Journal of Consumer Research, 34*(1), 97–103.

Förster, J., Liberman, N., & Shapira, O. (2009). Preparing for novel versus familiar events: Shifts in global and local processing. *Journal of Experimental Psychology: General, 138*(3), 383–399.

Frisch, D., & Clemen, R. (1994). Beyond expected utility: Rethinking behavioral decision research. *Psychological Bulletin, 116*(1), 46–54.

Glanzer, M. (1958). Curiosity, exploratory drive, and stimulus satiation. *Psychological Bulletin, 55*(5), 302–315.

Henderson, P. W., Geise, J. A., & Cote, J. A. (2004). Impression management using typeface design. *Journal of Marketing, 68*(4), 60–72.

Herr, P. M., & Page, C. M. (2004). Asymmetric association of liking and disliking judgments: So what's not to like? *Journal of Consumer Research, 30*(4), 588–601.

Herr, P. M., Page, C. M., Pfeiffer, B. E., & Davis, D. F. (2012). Affective influences on evaluative processing. *Journal of Consumer Research, 38*(5), 833–845.

Hsee, C. K., & Hastie, R. (2006). Decision and experience: Why don't we choose what makes us happy? *Trends in Cognitive Sciences, 10*(1), 31–37.

Hsu, M., Bhatt, M., Adolphs, R., Tranel, D., & Camerer, C. (2005). Neural systems responding to degrees of uncertainty in human decision-making. *Science, 310*(5754), 1680–1683.

Isen, A. M. (1993). Positive affect and decision making. In J. M. Haviland (Ed.), *Handbook of emotions* (pp. 261–277). New York: Guilford Press.

Isen, A. M., & Geva, N. (1987). The influence of positive affect on acceptable level of risk: The person with a large canoe has a large worry. *Organizational Behavior and Human Decision Processes, 39*(2), 145–154.

Isen, A. M., & Patrick, R. (1983). The effect of positive feelings on risk-taking: When the chips are down. *Organizational Behavior and Human Decision Processes, 31*(2), 194–202.
Janiszewski, C., & Meyvis, T. (2001). Effects of brand logo complexity, repetition, and spacing on processing fluency and judgment. *Journal of Consumer Research, 28*(1), 18–32.
Kahn, B., & Isen, A. (1993). The influence of positive affect on variety seeking among safe, enjoyable products. *Journal of Consumer Research, 20*(2), 257–270.
Kardes, F. R. (1988). Spontaneous inference processes in advertising: The effects of conclusion omission and involvement on persuasion. *Journal of Consumer Research, 15*(2), 225–233.
Keller, K. (2009). Building strong brands in a modern marketing communications environment. *Journal of Marketing Communications, 15*(2–3), 139–155.
Keller, K., & Lehmann, D. R. (2006). Brands and branding: Research findings and future priorities. *Marketing Science, 25*(6), 740–759.
Kennerley, S., Walton, M., Behrens, T., Buckley, M., & Rushworth, M. (2006). Optimal decision making and the anterior cingulate cortex. *Nature Neuroscience, 9*(7), 940–947.
Kroeber-Riel, W. (1979). Activation research: Psychobiological approaches in consumer research. *Journal of Consumer Research, 5*(4), 240–250.
Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). *International affective picture system (IAPS): Technical manual and affective ratings*. FL: Gainesville.
Lee, A. Y., & Sternthal, B. (1999). The effects of positive mood on memory. *Journal of Consumer Research, 26*(2), 115–127.
Levin, I. P., Xue, G., Weller, J. A., Reimann, M., Lauriola, M., & Bechara, A. (2012). A neuropsychological approach to understanding risk-taking for potential gains and losses. *Frontiers in Neuroscience, 6* (15), 1–11.
Loewenstein, G., & Lerner, J. (2003). The role of affect in decision making. In R. Davidson, H. Goldsmith, & K. Scherer (Eds.), *Handbook of affective science* (pp. 619–642). New York: Oxford University Press.
Luce, R. D. (1986). *Response times: Their role in inferring elementary mental organization*. New York: Oxford University Press.
McClure, S. M., Li, J., Tomlin, D., Cypert, K. S., Montague, L. M., & Montague, P. R. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron, 44*(2), 379–387.
Mellers, B. A., Schwartz, A., & Cooke, A. D. J. (1998). Judgment and decision making. *Annual Review of Psychology, 49*(1), 447–477.
Nobel, C. (2011). Clay Christensen's milkshake marketing, *Harvard Business School working knowledge*, February 14, 2011, available at: http://hbswk.hbs.edu/item/6496.html.
Orth, U. R., & Malkewitz, K. (2008). Holistic package design and consumer brand impressions. *Journal of Marketing, 72*(3), 64–81.
Pham, M. T. (2004). The logic of feeling. *Journal of Consumer Psychology, 14*(4), 360–369.
Pham, M. (2007). Emotions and rationality: A critical review and interpretation of empirical evidence. *Review of General Psychology, 11*(2), 155–178.
Reimann, M., & Bechara, A. (2010). The somatic marker framework as a neurological theory of decision-making: Review, conceptual comparisons, and future neuroeconomic research. *Journal of Economic Psychology, 31*(5), 767–776.
Reimann, M., Zaichkowsky, J., Neuhaus, C., Bender, T., & Weber, B. (2010). Aesthetic package design: A behavioral, neural, and psychological investigation. *Journal of Consumer Psychology, 20*(4), 431–441.
Reimann, M., Schilke, O., Weber, B., Neuhaus, C., & Zaichkowsky, J. (2011). Functional magnetic resonance imaging in consumer research: A review and application. *Psychology and Marketing, 28* (6), 608–637.
Reimann, M., Castaño, R., Zaichkowsky, J., & Bechara, A. (2012). How we relate to brands: Psychological and neurophysiological insights into consumer-brand relationships. *Journal of Consumer Psychology, 22*(1), 128–142.
Reimann, M., Feye, W., Malter, A. J., Ackerman, J., Castaño, R., Garg, N., Kreuzbauer, R., Labroo, A. A., Lee, A. Y., Morrin, M., Nenkov, G. Y., Nielsen, J. H., Perez, M., Pol, G., Rosa, J. A., Yoon, C., & Zhong, C. (2012b). Embodiment in judgment and choice, *Journal of Neuroscience, Psychology, and Economics, 5*(2), 104–123.
Roehm, H. A., & Roehm, M. L. (2005). Revisiting the effect of positive mood on variety seeking. *Journal of Consumer Research, 32*(2), 330–336.
Russel, J. A., Weiss, A., & Mendelsohn, G. A. (1989). Affect grid: A single-item scale of pleasure and arousal. *Journal of Personality and Social Psychology. 57*(3), 493–502.
Sanbonmatsu, D. M., & Kardes, F. R. (1988). The effects of physiological arousal on information processing and persuasion. *Journal of Consumer Research, 15*(3), 379–385.

Santos, J. P., Seixas, D., Brandao, S., & Moutinho, L. (2011). Investigating the role of the ventromedial prefrontal cortex in the assessment of brands. *Frontiers in Neuroscience, 5*(1), 1–8.

Schaefer, M., & Rotte, M. (2007). Favorite brands as cultural objects modulate reward circuit. *Neuro-Report, 18*(2), 141–145.

Schneider, J., & Hall, J. (2011). Why most product launches fail. *Harvard Business Review, 89*(4), 21–23.

Schwarz, N., & Bless, H. (1991). Happy and mindless, but sad and smart? The impact of affective states on analytic reasoning. In: J. P. Forgas (Ed.). *Emotion and social judgment* (pp. 55–71): Elmsford: Pergamon.

Shiv, B., & Fedorikhin, A. (2002). Spontaneous versus controlled influences of stimulus based affect on choice behavior. *Organizational Behavior and Human Decision Processes, 87*(2), 342–70.

Shiv, B., & Huber, J. (2000). The impact of anticipating satisfaction on consumer choice. *Journal of Consumer Research, 27*(2), 202–216.

Stayman, D. M., & Kardes, F. R. (1992). Spontaneous inference processes in advertising: Effects of need for cognition and self-monitoring on inference generation and utilization. *Journal of Consumer Psychology, 1*(2), 125–142.

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychology Review, 117*(2), 440–463.

Tsai, C. I., & Manoj, T. (2011). When do feelings of fluency matter? How abstract and concrete thinking influence fluency effects. *Psychological Science, 20*(10), 1–7.

Wilensky, A. E., Schafe, G. E., Kristensen, M. P., & LeDoux, J. E. (2006). Rethinking the fear circuit: The central nucleus of the amygdala is required for the acquisiton, consolidation, and expression of Pavlovian fear conditioning. *Journal of Neuroscience, 26*(48), 12387–12396.

Wise, R. A. (1978). Catecholamine theories of reward: A critical review. *Brain Research, 152*(2), 215–247.

Wise, R. A., & Rompre, P.-P. (1989). Brain dopamine and reward. *Annual Review of Psychology, 40*(1), 191–225.

Xue, G., Lu, Z., Levin, I. P., Weller, J. A., Li, X., & Bechara, A. (2009). Functional dissociations of risk and reward processing in the medial prefrontal cortex. *Cerebral Cortex, 19*(5), 1019–1027.

Yoon, C., Gutchess, A. H., Feinberg, F., & Polk, T. A. (2006). A functional magnetic resonance imaging study of neural dissociations between brand and person judgments. *Journal of Consumer Research, 33*(1), 31–40.

Yorkston, E., & Menon, G. (2004). A sound idea: Phonetic effects of brand names on consumer judgments. *Journal of Consumer Research, 31*(1), 43–51.