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How we relate to brands: Psychological and neurophysiological insights into consumer–brand relationships

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Abstract

In three experiments, this research provides new insights into branding by studying the psychological and neurophysiological mechanisms of how consumers relate to their beloved brands. The authors propose that emotional arousal decreases over the brand relationship span, while inclusion of the brand into the self increases over time. Results of experiment 1 indicate greater self-reported emotional arousal for recently formed brand relationships, as well as decreased emotional arousal and increased inclusion of close brands over time. Additionally, the moderating role of usage frequency of the brand brings out an interesting nuance of the way these effects operate. Experiment 2 measures skin conductance responses and reveals increased emotional arousal for recently formed close relationships but not for established close brand relationships, corroborating the results based on self-reported data. In experiment 3, a functional magnetic resonance imaging study reveals an association between established close 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.

Keywords: Close brand relationships; Self-expansion theory; Skin conductance; Insula; fMRI; Consumer neuroscience

Introduction

"*A man's self is the sum total of all that he can call his.*"

~ William James (1890)

The consumer–brand relationship literature contains myriad consumer–brand relationship constructs, including brand attachment (Thomson, MacInnis, & Park, 2005), brand commitment (Wang, 2002), brand devotion (Pichler & Hemetsberger, 2007), and brand love (Ahuvia, 2005; Carroll & Ahuvia, 2006; Fournier, 1998). Research on these concepts has improved our understanding of the consequences of close consumer–brand relationships for various consumer behaviors, such as loyalty and positive word-of-mouth. However, studies have not fully explored the motivational–emotional aspects associated with close brand relationships. What is the general emotional significance of such close relationships? This question is at the heart of the social–psychological self-expansion theory (Aron & Aron, 1986), which has been applied extensively to human relationships (e.g., Aron, Aron, Tudor, & Nelson, 1991; Aron, Paris, & Aron, 1995) but not yet to brand relationships.

Self-expansion theory suggests that, in early stages, close relationships are motivated by rapid self-expansion—i.e., the

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acquisition of resources, perspectives, and identities that enhance one's ability to accomplish goals—whereas in later stages, close relationships are associated with the inclusion of others into the self, i.e., people tend to consider the close other as part of themselves. Taken together, while one central feature of close personal relationships pertains to the motivation to expand oneself, the other central feature is the overlap between two people. This overlap of "selves" is a consequence of falling in love (Aron & Aron, 1986). Hence, according to this theory, love emanates from this desire to rapidly expand (Aron & Aron, 1996). Love motivates the formation and maintenance of close relationships, with love being the mechanism and motivational force of close relationships. Following this notion, we use love and close relationships synonymously for our purposes.

Recently, Reimann and Aron (2009) suggested that these ideas of relationships may be relevant to consumers' close relationships with brands as people also form a similar type of relationship with objects (Belk, 1988). More often than not, these objects are specific brands, which consumers relate to and use to identify their "selves" (Ahuvia, 2005). Similar to loved others, brands can create a "warm feeling" among consumers, generate a pleasurable experience of being cared for, and ultimately bond consumers in a close connection (Fournier, 1998). Brands can give consumers "ideal selves" to aspire to, as the presentation of self through possessions allows consumers to differ from what may be their "real selves" (Malär, Krohmer, Hoyer, & Nyffenegger, 2011). Given this resemblance of loved brands to loved others, applying theories of close interpersonal relationships to consumer–brand relationship seems feasible.

The specific appeal of self-expansion theory for brand research lies in its motivational–emotional account. Additionally, the theory emphasizes the dynamic character of close relationships and allows for predictions of changes in motivations and emotions as the relationship matures. Thus, self-expansion theory promises a richer understanding of brand relationships at various points of the brand lifecycle.

The present research draws from a variety of psychological and neurophysiological methodologies, including self-report, skin conductance, and brain activation, to empirically test self-expansion theory in the context of consumer–brand relationships. Specifically, consumers' skin conductance responses (SCR), which measure the arousal dimension of emotion (Boucsein, 1992), have the potential to shed new light on how consumers expand their "selves." A process-tracing methodology, the recording of SCR helps provide novel insights on otherwise hidden processes in consumer judgments (Figner & Murphy, 2010). Additionally, functional magnetic resonance imaging (fMRI) makes feasible the analysis of neurophysiological mechanisms in the brain at the time they take place (Reimann, Schilke, Weber, Neuhaus, & Zaichkowsky, 2011; Shiv, 2007; Shiv et al., 2005), because fMRI is not subject to cognitive processes overlapping actual emotional processes (Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010). Participants do not have to recall how they relate to a brand as they do when they provide self-reports, so the fMRI process helps clarify how consumers include brands in their "selves."

Prior research has used fMRI to improve the understanding of cognitive processes associated with brands, including the neural correlates of brand perception and processing (Cheung, Chan, & Sze, 2010), brands' impact on product perception (McClure et al., 2004; Reimann et al., 2010), brand categorization (Schaefer & Rotte, 2007b), brand judgments (Yoon, Gutchess, Feinberg, & Polk, 2006), and brand preference (Paulus & Frank, 2003; Santos, Seixas, Brandao, & Moutinho, 2011; Schaefer & Rotte, 2007a). However, knowledge of the neural underpinnings of brand relationships—especially their underlying motivational–emotional processes—does not appear in the literature.

In testing self-expansion theory in the context of brand relationships, this paper contributes to the extant literature by determining (1) whether rapid self-expansion and inclusion into the self are greater for recently formed close brand relationships compared to established close brand relationships, (2) whether levels of self-expansion and inclusion change over time, and (3) whether usage frequency of the brand influences the effects of time on self-expansion and inclusion. Using a multi-method approach, the present research adds to knowledge of psychological and neurophysiological responses to brands as well as to knowledge of brain areas associated with close brand relationships. Overall, the use of psychophysiological data complements fMRI findings by providing a more comprehensive understanding of the physiological and neural mechanisms of decision-making and, therefore, yields more valuable information by examining the interplay among emotions and behavior (Wong, Xue, & Bechara, 2011).

Conceptual background

Rapid expansion of the self through close brand relationships

Self-expansion theory emphasizes that a central human motive is the desire to rapidly expand one's self, to acquire resources, perspectives, and identities from loved others that enhance one's ability to accomplish goals (Aron, Norman, & Aron, 1998). For example, Aron et al. (1995) tested participants several times over a ten-week period. At each testing, participants answered a number of questions, including items intended to indicate whether they had fallen in love since the last testing and an open-ended listing of self-descriptions (e.g., "Who are you today?"). As self-expansion theory proposes, participants' self-contented domains in their self-descriptions between before falling in love and after falling in love increased more than they did when participants started out in love or when participants did not fall in love.

More specifically, self-expansion theory predicts that the process of rapid expansion is inherently positive and emotionally arousing (Strong & Aron, 2006). Forming a new relationship results in high levels of excited positive arousal, consistent with prior findings on the impact of rapid movement toward a goal on the affective state (Carver & Scheier, 1990). When two people first enter a relationship, they usually experience an initial period of exhilaration. From the perspective of self-expansion theory, this period is the one in which the partners, because of the intense exchange, are expanding their "selves" at a rapid rate. Once they

know each other fairly well, opportunities for further rapid expansion inevitably decrease, so after an initial "honeymoon period," relationship satisfaction typically declines and is maintained at a lowered level over subsequent years (Tucker & Aron, 1993).

Initially, many relationships are fulfilling, because to satisfy their desire to grow and expand, the partners readily engage in new activities, which they might not do alone. To uphold a relationship, couples must find more opportunities to engage in inspiring, exciting, and novel activities together (Aron & Aron, 1986), and through such activities, arousal can create feelings of self-expansion via novelty or challenge (Aron, Aron, & Norman, 2001). This association occurs because novelty and challenge are often accompanied by arousal (Berlyne, 1960). Therefore, with rapid self-expansion emotional arousal increases, and with slow or nonexistent expansion emotional arousal is minimal (Aron, Norman, Aron, McKenna, & Heyman, 2000). An important note is that this arousal mechanism may not only work for the extreme cases of close relationship versus no relationship but may also operate on a continuum from low arousal levels for neutral relationships through medium arousal levels for less close relationships to high levels of arousal for close relationships (Aron et al., 2001).

In applying self-expansion theory to the context of close consumer–brand relationships, we argue that rapid expansion takes place for consumers when a close relationship is newly formed with a brand (i.e., a recently acquired brand that consumers have started to treasure or "just fallen in love with"). We base this claim on the notion that rapid self-expansion and its accompanying positive emotional arousal surface in the initial, exhilarating relationship period. The consumer–brand relationship literature offers conceptual support for this claim. For example, developing brand love may include elements of surprise, arousal, and positive affect (Carroll & Ahuvia, 2006). Further, establishing brand attachment is inherently emotional and may involve the arousing process of developing strong, positive feelings (Thomson et al., 2005). However, this initial arousing period of the consumer–brand relationship may not be linear: it may increase, reach its zenith, level off, and finally decline to a more steady state (Shimp & Madden, 1988), suggesting a potential wear-off effect over time (Richins & Bloch, 1986). Therefore, we propose that a recently formed close consumer–brand relationship is associated with the development of strong, positive affect toward the brand, which is evident in increased emotional arousal. This effect may attenuate for longer-lasting consumer–brand relationships or be insignificant for brands for which consumers do not establish closer connections.

Inclusion of brands into the self

Including others in one's self through close relationships becomes stronger over the span of the relationship as the resources, perspectives, and identities of close others are experienced, to some extent, as one's own (Aron, Aron, & Smollan, 1992; Aron et al., 1991).

The *resources* of a close other that may be included into the self, contain knowledge-related assets (e.g., conceptual, informational, and procedural assets) and social assets (e.g., social status and roles). These assets can facilitate the achievement of goals by allowing one to perceive one's self as having access to or possessing the other's resources, including positive resources (i.e., gains) and negative resources (i.e., losses). For example, in experiments in which participants' monetary allocation decisions were unknown to recipients, participants allocated similar amounts of money to close others but not to non-close others (Aron et al., 1991).

The *perspectives* of a close other, which are potentially included into the self, refer to consciously or nonconsciously experiencing the world from the included other's point of view. Thus, when another person is included into the self, various self-related cognitive biases should also apply to the person who is including the close other. For example, studies that have used memory recall methods have found that items imaged with close others, like items imaged with the self, were less vividly recalled than items imaged with non-close others (Aron et al., 1991).

The *identity* of a close other that may be included into the self contain the features that differentiate one person from other people and objects, primarily in terms of characteristics and memories that locate the person in a social and physical space. For example, when including a close other's identities into the self, people may easily confuse their own characteristics and memories with those of the other (Aron & Fraley, 1999).

We propose that these inclusion mechanisms can help explain why consumers form long-lasting brand relationships. This notion is in line with early consumer research arguing that brands can become symbols of identity (Levy, 1959), that brands and consumers' self-concepts are linked (Grubb & Grathwohl, 1967), and that the consumption of a brand may be highly congruent with one's self-image (Sirgy, 1982). Additionally, researchers have contended that consumers' possessions are a major contributor to and reflection of their identities (Belk, 1988), and have found that the greater the fit between human traits that consistently describe and distinguish an individual and those traits that describe and distinguish a brand, the greater the individual's preference will be for that brand (Malhotra, 1988). More recent work has argued that brand relationships can be an expression of consumer identities (Escalas & Bettman, 2005). For example, a consumer's relationship with the international Mercedes-Benz brand could build on the need to express a unique individual-level identity, while a relationship with a domestic brand, such as a Ford, may relate to a group-level patriotic national identity (Swaminathan, Page, & Gürhan-Canli, 2007).

Despite this important work, prior research has not yet explained the psychological and neurophysiological processes that underlie the inclusion of a brand into the self, such as an identity transfer between brand and self. In this area, "consumer researchers are best positioned to pursue issues dealing with the intersection of identity and brands, which can lead to both theoretical and substantive insights" (Kirmani, 2009, p. 274). A review of existing brand relationship constructs further reveals strong conceptual ties with the inclusion concept of self-expansion theory. For example, brand attachment describes the

emotional connection and the degree to which a consumer views the bond from a long-term perspective and is willing to stay in the relationship (Thomson et al., 2005). Similarly, brand love has been defined as the degree of passionate emotional attachment a satisfied consumer has for a particular brand that results in an established relationship, loyalty, and positive word-of-mouth for that brand (Carroll & Ahuvia, 2006). Building brand trust requires longer-term experiences with the brand, during which the brand never disappoints the consumer, constantly satisfies his or her needs, and regularly meets expectations (e.g., Chaudhuri & Holbrook, 2001). Taken together, most of the existing brand relationship constructs generally describe an established relationship, so they are conceptually tied to the inclusion mechanism of self-expansion theory. This inclusion mechanism predicts that the inclusion into one's self of the resources, perspectives, and identity of a close brand develops over time, ultimately leading to a stronger bond. Thus, we propose that established relationships with brands that are close will involve greater inclusion in consumers' "selves" than either recently formed close relationships or neutral relationships.

Neurophysiological processes underlying brand relationships

Besides investigating self-expansion and self-inclusion based on self-report, this research also applies neurophysiological methodology—skin conductance recording and neuroimaging—to shed additional light on close brand relationships. Specifically, the skin conductance response (SCR) (in earlier research referred to as galvanic skin response), is defined as a momentary increase in the electrical conductivity of the skin coupled with increased activity in the eccrine sweat gland (Dawson, Schell, & Courtney, 2011). The density of these sweat glands is greatest at the palmar surface of the hands, from which SCR is typically measured (Dawson, Schell, & Filion, 2007). Skin conductance recording is a valid method for the study of consumer decision-making. Prior research has shown that when individuals are presented with a stimulus with a possible significant consequence, SCRs are expected to occur in anticipation of that outcome (Bechara, Damasio, Tranel, & Damasio, 1997). These SCRs can reflect both the conscious expectancy of an outcome and/or the nonconscious emotional processes that guides future decision-making (Dawson et al., 2011). We expect to pick up the proposed arousing element of recently formed close consumer–brand relationship with skin conductance recording, a measure of unequivocal changes in the level of emotional arousal. We predict that consumers' SCRs are higher for new close brand relationships than for established close relationships and that these increased SCRs for newer relationships offer convergent validity on how consumers expand their "selves."

We further expect to identify unique brain systems underlying close consumer–brand relationship. Prior research in affective neuroscience has identified the insula (also referred to as the insular cortex or the insular lobe) as a crucial brain structure for receiving input from the body's internal milieu. Generally, humans perceive feelings from their bodies, feeding into an afferent neural system that represents all aspects of the physiological condition of the physical body, including processing of emotion and self-awareness (Craig, 2002). For example, perceiving facial expressions ranging from sad to happy can trigger bodily responses, which in turn are associated with insula activation (Britton, Taylor, Sudheimer, & Liberzon, 2006). In the context of decisions, the insula integrates these bodily states into conscious feelings and decision-making processes (Bechara & Damasio, 2005; Reimann & Bechara, 2010).

The insula is subdivided into two major regions. The posterior region (toward the back of the brain) is ascribed to the integration of somatosensory and motor functions and the sense of balance. The anterior region (toward the front of the brain) has been associated with the integration of bodily information into emotional and motivational functions through its reciprocal connections to "limbic" brain regions such as the anterior cingular cortex, the ventromedial prefrontal cortex, the amygdala, and the ventral striatum (Mesulam & Mufson, 1982). More recent research has provided evidence that activation of the insula is strongly correlated with individuals' ratings of urges (Naqvi & Bechara, 2009). For example, consumers with an urge for alcohol (Myrick et al., 2004) or nicotine (McClernon, Hiott, Huettel, & Rose, 2005) demonstrated increased activation in the insula.

Based on these insights, we expect that established close brand relationships, when compared with neutral brand relationships, should be associated with increased activation in the insula because the insula integrates bodily information (e.g., an urge to possess the loved brand) into emotional and motivational functions. Indeed, in the context of interpersonal relationships, several fMRI studies have provided neurophysiological evidence that increased insula activation is strongly associated with romantic love (Bartels & Zeki, 2000), maternal love (Bartels & Zeki, 2004), and unconditional love (Beauregard, Courtemanche, Paquette, & St-Pierre, 2009). Another fMRI investigation found that adopting the perspective of a loved one increases insula activation (Cheng, Chen, Lin, Chou, & Decety, 2010).

These findings are in line with other previous investigations on distinct but related concepts such as loss aversion and regret. Specifically, researchers have linked insula activation to loss aversion for products (Knutson, Rick, Wimmer, Prelec, & Loewenstein, 2007) and money (Knutson & Bossaerts, 2007) as well as regret in the context of decision-making (Chua, Gonzalez, Taylor, Welsh, & Liberzon, 2009). These findings suggest that losing a treasured object or regretting a negative decision elicits insula activation. In summary, previous fMRI investigations point to the insula as a crucial neurophysiological mechanism for diverse but related psychological phenomena such as urging, addiction, loss aversion, and interpersonal love—all of which can be traced back to the insula's core function of receiving input from the body's internal milieu (Bechara, 2005; Reimann & Bechara, 2010; Reimann & Zimbardo, 2011).

Yet, besides the notion that the insula is implicated in close consumer–brand relationship, alternative explanations may be inferred from the literature. Specifically, extant neuroimaging studies on branding offer further insights. For example, for both Pepsi and Coke blind taste tests resulted in increased activation of the ventromedial prefrontal cortex (McClure et al., 2004), which is part of the reward network but is also implicated in executive

control functions. Once the brand name was introduced to the task, increased activation in the hippocampus, dorsolateral prefrontal cortex (dlPFC), and midbrain was found for Coke, but less so for Pepsi. While McClure et al. (2004) did not manipulate the level of relationship with the brand (as we do in this research), an important note is that structures other than the insula are essential in brand processing. With respect to the findings of McClure et al. (2004), one may argue that finding activity in the hippocampus—for many decades considered to be the central brain system for memory (Scoville & Milner, 1957)—and the dlPFC—strongly associated with working memory (Cohen et al., 1997; D'Esposito et al., 1995; McCarthy et al., 1994)—could be due to Coke's outstanding brand awareness among consumers.

Research on self-processing has also identified other brain areas that may be implicated in self-expansion and inclusion of close brands into the self. For example, Kelley et al. (2002) find the medial frontal cortex engaged during self-referential processing, and Lieberman (2007) names the basal ganglia in a review of brain areas relevant for social connection with close others. Moreover, at the interface of branding and self-processing, Yoon et al. (2006) find greater activation in the medial prefrontal cortex when people make judgments about persons versus judgments about brands.

Usage frequency, rapid self-expansion, and inclusions into the self

The proposed temporal effects describe generic process mechanisms of (1) rapid self-expansion and (2) inclusion of the brand into the self. Hence, given the breadth of possible forms of consumer–brand relationships (e.g., Fournier (1998) lists 15 different forms), investigation of the nuances of these effects seems warranted.

The brand relationship literature suggests that usage frequency of the brand is an important factor differentiating forms of consumer–brand relationships. For example, Fournier (1998) contrasts "childhood friendships," described as infrequently engaged-in brand relationships, with "casual friendships," defined as requiring more regular interactions. Additionally, self-expansion theory on human relationship implies that interaction frequency could potentially work as a moderator of the effects of time on arousal and inclusion. Over the relationship span, it is assumed that—with increasing interaction frequency—relationship partners will increasingly loose the desire to rapidly self-expand themselves (Aron & Aron, 1996). In this vein, one would hypothesize that the more frequently a consumer uses a brand, the stronger the negative effect of time on self-expansion. Yet, it is unclear whether consumer–brand relationships are actually subject to such an effect. One could also bring forward a competing hypothesis, stating that high usage frequency does not or only slightly accelerates the effect of time on self-expansion, because high usage frequency signalizes that the brand is still exciting to its user (Wansink & Huffman, 2001). Self-expansion theory implies that high usage frequency increases the positive effect of time on inclusion of the close brand into the self (Reimann & Aron, 2009). In human relationships, greater inclusion is characterized as both increased overlapping of the partners' "selves" and escalated reciprocity of disclosures between relationship partners (Aron & Aron, 1996). Many close brand relationships may operate on similar reciprocity principles with a strong congruity in the consumer's self image with the image of the brand (Fournier, 1998). This reciprocity facilitates the inclusion of the brand into the self over time. Therefore, we expect that the usage frequency accelerates the positive effect of time on the inclusion of the brand into the self.

Experiment 1

Overview and method

The first experiment tests whether consumers' self-expansion for a brand is more rapid when the close consumer–brand relationship is recent, and whether the degree to which a brand is included into the self is greater when the close consumer–brand relationship is more persistent. Our between-subjects, repeated-measure experimental design consisted of two sessions separated by six months. In the relationship condition, we asked participants to select a brand with which they had very recently (i.e., less than one month ago) formed a close relationship in the sense of having started to treasure, look forward to, be motivated to get, and love the brand. Participants were then asked to take three minutes to write about the product category of the brand (i.e., tangible good or intangible service), the usage frequency (i.e., daily or monthly), why they had recently formed this relationship, and how. Our goal was to confront participants with brands they had recently fallen in love with, so that they would recall the specific brand they had selected. In the neutral condition, participants were asked to take three minutes to write about a brand they had no relationship with (i.e., a brand they felt completely neutral about and neither loved nor hated). In the second session, conducted six months later, participants were asked to write about these specific brands again. Examples of brands in the relationship condition included Adidas, Google, and Infiniti.

As manipulation checks, participants were asked to fill out three different brand relationship measures relating to brand love (Carroll & Ahuvia, 2006), brand commitment (Wang, 2002), and brand trust (Chaudhuri & Holbrook, 2001). These measures were selected to ensure the effectiveness of the manipulation since different types of close relationships can exist (Fournier, 1998). Examples of brand love items are "This brand is totally awesome" and "This brand is pure delight," examples of brand commitment items are "When it comes to offers, I am committed to this brand" and "I feel a strong attachment to this brand," and examples of brand trust items are "I trust this brand" and "This is an honest brand." All items were measured on a six-point (1) completely disagree to (6) completely agree scale.

To test for rapid self-expansion, we measured self-reported arousal using the affect grid (Russell, Weiss, & Mendelsohn, 1989). The affect grid permits participants to express their affective state on a nine-by-nine matrix that varies along the dimensions of arousal and valence. We expected that arousal levels for participants who had formed a close brand

relationship would be higher in the first session (T1) than in the second session six months later (T2). We also predicted that arousal would be generally higher for participants in the two relationship conditions than for participants in the neutral condition. Further, to test for inclusion of the brand into the self, we created the brand inclusion diagram (1=low to 6=high), adapted from measures of inclusion for interpersonal relationships (Aron et al., 1991) (see Fig. 1). Following the proposed theoretical model, we expected that participants who had formed a close brand relationship would exhibit greater levels of inclusion in T2 than in T1, and compared to participants in the neutral condition.

The experiment was conducted by means of an online task. In the first session (at time T1), 234 respondents were recruited through a web survey research company and randomly assigned to each condition (117 participants in the relationship condition and 117 in the neutral condition). For the second session, six months later (at time T2), 202 of the original 234 participants responded (107 participants in the relationship condition and 95 in the neutral condition). Manipulation checks showed that participants in the relationship condition were significantly more "in love" with their brands (M_{T1}=4.20; M_{T2}=3.81) than were participants in the neutral condition (M_{T1}=1.88; M_{T2}=1.83), $t_{T1}(232)=22.90$, $p<.001$ and $t_{T2}(200)=15.64$, $p<.001$. Participants in the relationship condition were also significantly more committed to their brands (M_{T1}=4.64; M_{T2}=4.68) than participants in the neutral condition (M_{T1}=2.16; M_{T2}=2.17), $t_{T1}(232)=19.01$, $p<.001$ and $t_{T2}(200)=18.18$, $p<.001$. Participants in the relationship condition also trusted their brands significantly more (M_{T1}=4.44; M_{T2}=4.57) than participants in the neutral condition (M_{T1}=1.91; M_{T2}=1.68), $t_{T1}(232)=23.77$, $p<.001$ and $t_{T2}(200)=25.32$, $p<.001$. Cronbach's alphas for brand love, brand commitment, and brand trust exceeded the required threshold of .7 (Nunnally, 1978).

Results

We compared both conditions and both time points by running several 2 (time: T1, T2)×2 (relationship type: close, neutral) between-subjects, repeated-measure analyses of variance. The result revealed a significant main effect of time on arousal, $F(2, 200)=27.67$, $p<.001$, supporting the hypothesis that with time, arousal levels decrease for close relationships. Comparing the mean arousal levels between time points, paired *t*-tests showed a significantly higher arousal level for close relationships at T1 ($M_{arousal\ T1\ close}$=7.31) than for close relationships at T2 ($M_{arousal\ T2\ close}$=6.05), $t(106)=6.83$, $p<.001$, supporting the hypothesis of the negative effect of time on the level of arousal in close relationships. Comparing the mean arousal levels for the neutral relationship type at T1 ($M_{arousal\ T1\ neutral}$=4.73) with those at T2 ($M_{arousal\ T2\ neutral}$=4.45) revealed no significant differences, $t(94)=1.19$, n.s.. In sum, arousal levels were significantly higher for recently formed close relationships than for either established close relationships or neutral relationships. Moreover, the interaction of time and relationship type was significant, $F(2, 200)=11.46$, $p<.01$, which means that the two relationship type groups are changing over time but in different ways. Specifically, the level of arousal decreases to a significantly greater extent for close relationships than for neutral relationships.

Studying the effect of time on self-reported valence levels, another analysis of variance revealed no main effect of time on valence, $F(2, 200)=.74$, n.s. Results showed nonsignificant differences in valence levels between T1 and T2 for both the close relationship condition ($M_{valence\ T1\ close}$=7.82; $M_{valence\ T2\ close}$=7.79, n.s.) and the neutral relationship condition ($M_{valence\ T1\ neutral}$=5.05; $M_{valence\ T2\ neutral}$=4.91, n.s.). An interaction of time and relationship type was also nonsignificant, $F(2, 200)=.34$, n.s. Taken together, results showed that time did not have an effect on valence levels. For close relationships, the valence level remained highly positive across the two time points, and for neutral relationships, valence levels maintained neutral scores.

Analyzing the effect of time on self-reported inclusion levels revealed a significant main effect of time on the magnitude of inclusion of the brand into the self, $F(2, 200)=65.65$, $p<.001$. Pertaining to the mean inclusion levels between time points, paired *t*-tests reveal significantly lower inclusion level for close relationships at T1 ($M_{inclusion\ T1\ close}$=3.02) than for close relationships at T2 ($M_{inclusion\ T2\ close}$=4.20), $t(106)=-9.69$, $p<.001$, supporting our claims of the positive effect of time on the degree of inclusion of a close brand into the self. Comparing the mean inclusion levels for the neutral relationship type at T1 ($M_{inclusion\ T1\ neutral}$=1.81) with those at T2 ($M_{inclusion\ T2\ neutral}$=1.95) showed no significant differences, $t(94)=-1.31$, n.s. Taken together, results show that inclusion levels were significantly higher for established close relationships than for either recently formed close relationships or neutral relationships. Further, an interaction of time and relationship type was significant, $F(2, 200)=41.16$, $p<.001$, again showing that the two relationship type groups are changing over time but in different ways. In particular, the magnitude of inclusion of a brand over time is much greater for close brands than for neutral brands.

As participants also told us how often they used the brand, for example very frequently (i.e., on a daily basis) or less frequently (i.e., monthly), we divided the sample into another two groups: the low usage group, n_1=62, and the high usage

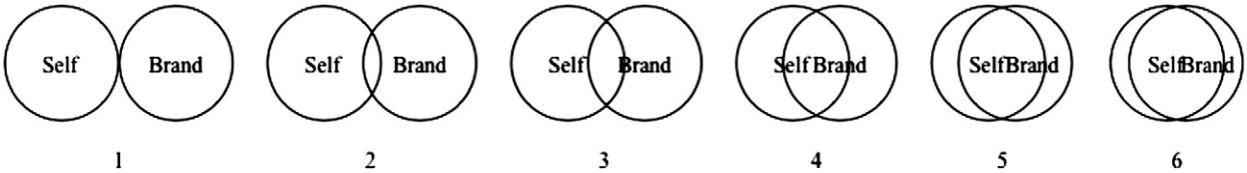

Fig. 1. Brand inclusion diagram.

group, $n_2 = 45$. Results showed that the impact of time on arousal was only marginally greater for more frequently used brands than for less frequently used brands, $F(2, 105) = 2.82$, $p < .1$. However, as expected, usage frequency of the brand mattered for the effect of time on levels of inclusion. An interaction between time and usage frequency showed that the impact of time on inclusion was significantly greater for more frequently used brands than for less frequently used brands, $F(2, 105) = 4.23$, $p < .05$, indicating a moderating effect of a brand's usage frequency on the relationship between time and inclusion. These findings show that while usage frequency of a close brand had only little impact on the negative effect of time on arousal, it did have a significant impact on the positive effect of time on inclusion. The more often one uses it, the more self-included the brand becomes over time.

Discussion

In experiment 1, participants who had recently formed a close brand relationship exhibited significantly more emotional arousal than did participants with either an established close relationship or a neutral relationship. Further, participants manifested greater levels of inclusion for established brand relationships than for either recently formed relationships or neutral relationships. In other words, participants who had developed a close brand relationship only six months prior exhibited less emotional arousal than in the first session. However, they self-included the brand to a greater extent. Interestingly, usage frequency of a close brand had only little impact on the negative effect of time on arousal; which means that the negative time effect was maintained, but not at higher pace for more frequently used brands. Hence, usage frequency had a significant impact on the positive effect of time on inclusion of the brand into the self. The more often one uses the brand, the more self-included it becomes over time. To further validate these conclusions and overcome issues with self-reported emotional states, cognitive biases, and/or social-desirability, we designed experiments 2 and 3 to perform neurophysiological testing of the proposed effects.

Experiment 2

Overview and method

Experiment 2 recorded participants' skin conductance responses (SCR) while they were viewing brands to which they (1) had recently formed a close relationship, (2) held an established close relationship, and (3) had a neutral established relationship. For the recently formed close relationship condition, participants were asked to name eight brands to which they had developed a close relationship within the past month. For the established close relationship condition, participants were asked to name eight brands to which they had held a close relationship for more than six months. For the neutral relationship condition, the same participants were asked to name eight brands to which they had no relationships—that is, a brand they felt completely neutral about and neither loved nor hated.

Participants were presented with their selected brands in the E-Prime software in pseudorandom order for ten seconds each with a four-second gap between brand presentations, resulting in 24 SCR per participant (i.e., eight SCR for recently formed close relationships, eight SCR for established close relationships, and eight SCR for neutral relationships). All brands were presented in high pictorial quality before a white background and featured the brand logo and name. Examples of brands in the recently formed relationship condition were Apple, FC Barcelona, and Virgin Atlantic.

Skin conductance was recorded using a pair of silver chloride electrodes with sodium chloride gel, which were placed on the participants' left hands. Twenty-five participants volunteered for this experiment, resulting in a data set of $25 \times 24 = 600$ skin conductance responses (200 SCR in the recently formed close relationship condition, 200 SCR in the established close relationship condition, and 200 SCR in the neutral condition).

Manipulation checks showed that participants self-reported significant differences in brand love between those brands with which they had very recently formed a close relationship ($M = 4.25$), those with which they had an established close relationship ($M = 4.19$), and those with which they held a neutral relationship ($M = 2.71$), $F(1, 24) = 29.95$, $p < .001$ (for each participant and each condition, the mean score for brand love was calculated and then compared across conditions). The manipulation checks also revealed significant differences in brand commitment between recently formed close relationships ($M = 4.31$), established close relationships ($M = 4.27$), and neutral relationships ($M = 1.94$), $F(1, 24) = 15.53$, $p < .01$, and in brand trust between recently formed close relationships ($M = 3.80$), established close relationships ($M = 4.02$), and neutral relationships ($M = 2.41$), $F(1, 24) = 4.34$, $p < .05$. Cronbach's alphas for all three scales again exceeded the required threshold of .7 (Nunnally, 1978).

Results

Skin conductance responses represent unequivocal changes in the level of emotional arousal (Dawson et al., 2011). These changes can be small in amplitude and are typically defined as greater than .05 microSiemens (μS) above baseline (Boucsein, 1992). The normalized SCR to a brand was the peak SCR (1-4 s into the ten-second presentation) from which we subtracted the baseline (the minimum SCR within the 4 s following a brand presentation). For each participant and each condition, we calculated the mean change in SCR across all eight trials. To account for the within-subjects design, we used a repeated-measure analysis of variance with time as the within-subject factor (time: recently formed close relationship, established close relationship) to compare conditions. We found a main effect of time on SCR, with recently formed close relationships featuring significantly greater levels of arousal ($M_{SCR\ change,\ recently\ formed\ close} = .28$ μS) than established close relationships ($M_{SCR\ change,\ established\ close} = .21$ μS), $F(1, 24) = 8.67$, $p < .01$, providing additional support for the proposed negative effect of time on SCR as a measure of arousal.

Further, SCR to neutral brand relationships ($M_{SCR\ change,\ neutral} = .20$ μS) were significantly smaller than were SCR to recently formed close relationships ($M_{SCR\ change,\ recently\ formed\ close} = .28$,

$t(24) = -5.01$, $p < .001$), but not significantly different from SCR to established close relationships ($M_{SCR\ change,\ established\ close} = .21$, $t(24) = -.46$, n.s.). These results replicate our findings from experiment 1 and show that greater emotional arousal for recently formed close brand relationships occurs in comparison to both established close relationships and neutral relationships.

Participants also self-reported the arousal and valence levels for each brand in each condition on the affect grid (Russell et al., 1989). A repeated-measure analysis of variance with time as the within-subjects factor revealed a significant main effect of time on arousal, with a significantly higher arousal level for recently formed close relationships ($M_{arousal,\ recently\ formed\ close} = 6.96$) than for established close relationships ($M_{arousal,\ established\ close} = 5.54$), $F(1, 24) = 6.92$, $p < .05$. Moreover, self-reported arousal to neutral brand relationships ($M_{arousal,\ neutral} = 4.85$) was also significantly lower than arousal to brands to which participants had recently formed relationships ($M_{arousal,\ recently\ formed\ close} = 6.96$, $t(24) = -3.07$, $p < .01$), but not significantly different from arousal to established relationships ($M_{arousal,\ established\ close} = 5.54$, $t(24) = -.86$, n.s.). This self-report measure replicated earlier findings in experiment 1 and validates the SCR finding of this experiment.

We also analyzed the effect of time on self-reported valence levels. As expected, results revealed nonsignificant differences in valence levels between both close relationship conditions ($M_{valence,\ recently\ formed\ close} = 8.04$; $M_{valence,\ established\ close} = 7.82$; n.s.). In sum, time did not have an effect on valence levels, replicating results from experiment 1. Moreover, since participants had also reported their level of inclusion on the brand inclusion diagram (see Fig. 1), we ran another within-subjects analysis of variance, which revealed greater levels of inclusion of brands to which participants held established relationships ($M_{inclusion,\ established\ close} = 5.27$) than of brands to which participants had just recently formed a close relationship ($M_{inclusion,\ recently\ formed\ close} = 2.72$), $F(1, 24) = 78.24$, $p < .001$. Furthermore, inclusion scores for neutral brand relationships ($M_{inclusion,\ neutral} = 2.21$) were also significantly smaller than were inclusion scores for both recently formed close relationships ($M_{inclusion,\ recently\ formed\ close} = 2.72$, $t(24) = -2.18$, $p < .05$) and established close relationships ($M_{inclusion,\ established\ close} = 5.27$, $t(24) = -16.17$, $p < .001$). This latter finding also replicates experiment 1, which states that inclusion levels of a brand for which a close relationship was recently formed and inclusion levels of a neural brand are significantly lower than those for a brand with an established close relationship.

We also investigated the role of usage frequency of the brand in arousal and inclusion of the brand. Because we had calculated mean arousal and inclusion scores to account for the within-subjects design, we calculated the percentage of frequent usage of the brand (to illustrate how we calculated the percentage: e.g., one participant stated that 8 of her 24 brands were used daily, resulting in a 33.3% daily usage rate). As expected, we found an interaction between time and usage frequency, with the positive impact of time on inclusion being significantly greater for more frequently used brands than for less frequently used brands, $F(2, 23) = 8.11$, $p < .01$. Hence, the impact of time on arousal was not significantly greater for more frequently used brands than for less frequently used brands, $F(2, 23) = 1.59$, n.s. In sum, this experiment replicates findings from experiment 1: while usage frequency of a close brand has little or no impact on the negative effect of time on arousal, it does have a significant impact on the positive effect of time on inclusion of the brand.

Discussion

In terms of SCR, experiment 2 revealed greater emotional arousal in response to recently formed close relationships as compared to both established close relationships and neutral relationships. Therefore, the results provide additional support for our findings from experiment 1, sustaining the notion that close, newly developed consumer–brand relationships trigger greater emotional arousal. This neurophysiological finding was additionally validated by a self-reported measure of arousal, which pointed in the same direction as the SCR results. Experiment 2 also replicated the second mechanism of close brand relationships: greater self-reported inclusion of brands for established close relationships as compared to both recently formed close relationships and neutral relationships. Since this latter finding was based on the paper-and-pencil measure of inclusion (see Fig. 1), the underlying neurophysiological mechanisms of inclusion of brands into the self are not yet understood. Experiment 3, which focused on the comparison of established close brand relationships with neutral brand relationships, was designed to shed light on this underlying process.

Experiment 3

Overview and method

Experiment 3 determines whether established close brand relationships are associated with increased insula activation and aims at explaining the neurophysiological mechanism of inclusion of close brands into the self. An additional rationale for conducting this study was to employ a brand choice task rather than a brand evaluation task (experiment 1) or a brand presentation task (experiment 2). The choice phase was included in the task to actively engage participants (Knutson et al., 2007). Functional magnetic resonance imaging (fMRI) was used to test for the inclusion effect. Complementing results from our previous experiments, fMRI permits the measurement and localization of brain activations to generate a more fundamental conceptualization of underlying processes by providing confirmatory evidence about the existence of psychological phenomena (Reimann et al., 2011; Shiv et al., 2005).

The within-subjects, repeated-measure experimental design included two conditions. For the relationship condition, participants named four brands with which they had held a close relationship for a long time, and for the neutral condition, they named four brands with which they had no relationship (i.e., a brand they felt completely neutral about and neither loved nor hated). Examples of brands for which participants reported an established close relationship included Disney, In-N-Out Burger, and Starbucks Coffee. The Appendix reports the fMRI data collection and analyses procedures in more detail.

Following manipulation check procedures from experiments 1 and 2, we found significant differences on the brand love scale between conditions ($M_{brand\ love,\ established\ close}$=4.61; $M_{brand\ love,\ neutral}$=2.55, $t(15)=10.13$, $p<.001$), on the brand commitment scale between conditions ($M_{brand\ commitment,\ established\ close}$=4.06; $M_{brand\ commitment,\ neutral}$=2.48, $t(15)=6.30$, $p<.001$), and on the brand trust scale between conditions ($M_{brand\ trust,\ established\ close}$=5.43; $M_{brand\ trust,\ neutral}$=2.68, $t(15)=9.11$, $p<.001$).

Participants also stated their levels of inclusion on the brand inclusion diagram (see Fig. 1), resulting in significantly greater inclusion of close brands compared to neutral brands ($M_{inclusion,\ established\ close}$=4.65; $M_{inclusion,\ neutral}$=2.36, $t(15)=9.85$, $p<.001$). Participants further self-reported the arousal and valence levels for each brand in each condition on the affect grid (Russell et al., 1989). As expected, results revealed nonsignificant differences between arousal levels for close brands compared to neutral brands ($M_{arousal,\ established\ close}$=4.58; $M_{arousal,\ neutral}$=3.86, $t(15)=1.58$, n.s.) and between valence levels for close brands compared to neutral brands ($M_{valence,\ established\ close}$=5.62; $M_{valence,\ neutral}$=5.34, $t(15)=.98$, n.s.). In sum, while we found nonsignificant differences between conditions for levels of arousal and valence, significant differences do exist between conditions for levels of inclusion, as predicted.

After we collected brands from participants, we invited participants to the brain imaging facility where they gave written informed consent and underwent a medical screening for neuroimaging eligibility. Participants also performed a shorter training version of the task to alleviate unnecessary confusion or learning effects. Once inside the brain scanner, participants lay on their backs and were presented with the full version of the task through a mirror located directly in front of their eyes. The task consisted of 32 trials, each starting with an anticipation phase during which the brand was presented (4 s), followed by a choice phase in which the participants could choose the brand (or not) by pressing "1" (or "2") on a response box (2 s). Next, choice or rejection was confirmed (2 s), followed by a fixation phase (2 s). Fig. 2 illustrates the task. All brands were presented in high quality before a white background and featured the brand logo and name.

Sixteen participants (eight females) volunteered for experiment 3. Brand presentations were repeated twice, resulting in a data set of 16 participants × 8 brands × 2 repetitions = 256 brand presentations (128 brand presentations in the established close relationship condition and 128 brand presentations in the neutral relationship condition).

Results

In line with the established finding that affective responses occur before a judgment or an actual choice is made (Bechara et al., 1997; Ernst & Paulus, 2005), we expected that increased insula activation would arise in the anticipation phase *before* the actual choice is made in form of a button press. This approach is also in line with behavioral decision theory, which argues that decision makers try to anticipate the different possible consequences of their actions (Shiv & Huber, 2000). Therefore, we view the anticipation phase as a key trial phase to assess the underlying emotional processes about the brand–self relationship and we focused our analyses on this four-second phase of the task (Knutson et al., 2007).

A random-effects general linear model at the whole-brain level revealed significant activation increases in both the right and left insula of participants while they were anticipating making choices of brands with which they held established close relationships compared to when they were anticipating making choices of brands with which they had neutral relationships ($p<.001$, uncorrected). An additional second-level random-effects general linear model at the region of interest—that is, the insula—confirmed the significant activation increase in the insula for established close relationships compared to neutral relationships ($p<.001$). See Fig. 3 for an illustration of brain activations for the anticipation of choices of close brand relationships compared to the anticipation of choices of neutral relationships, which highlights increased insula activation.

Results from the whole-brain analysis also revealed increased activation in brain areas other than the insula. Specifically, we found increased activation in the caudate, the parietal lobe, and the occipital lobe. The caudate, which is part of the striatum, has been associated with the anticipation of reward as opposed to the actual experience of reward (Knutson & Greer, 2008; Reimann et al., 2010). Areas of the parietal lobe have been implicated in cognitive processing, including calculation (Hedgcock & Rao, 2009), and the occipital lobe plays a critical role in human visual processing (Clarke & Miklossy, 1990). Besides identifying activation increases, we also found significant activation decreases in the frontal lobe, particularly in the frontal gyrus. This decrease in frontal lobe activation could refer to a decrease in willpower and self-control (Fellows, 2004). Table 1 summarizes changes in activation, including information on the corresponding hemisphere and Brodmann area (i.e., a classification system of cortical regions, see Brodmann, 1909), Talairach coordinates of the peak activation voxel (i.e., the most active voxel in the identified region), and average *t*-statistic for the contrast between established close brand relationships and neutral brand relationships.

Further analysis of scale data and neuroimaging data revealed a significant positive correlation between participants' ratings on the brand inclusion diagram (Fig. 1) and activation increases in the insula for the anticipation of choices of close brands compared to the activation of choices of neutral brands ($r=.46$, $p<.01$), further substantiating our claims.

Discussion

The present neuroimaging experiment supports the notion that the insula plays a significant role in the anticipation of choices of brands with which established close relationships exist. Prior research has found that the insula is active in the integration of bodily information into emotional and motivational functions (Mesulam & Mufson, 1982). Other work has shown that activation of the insula is strongly correlated with individuals' ratings of urges (Naqvi & Bechara, 2009). Anticipating the choice of a brand with which an established close

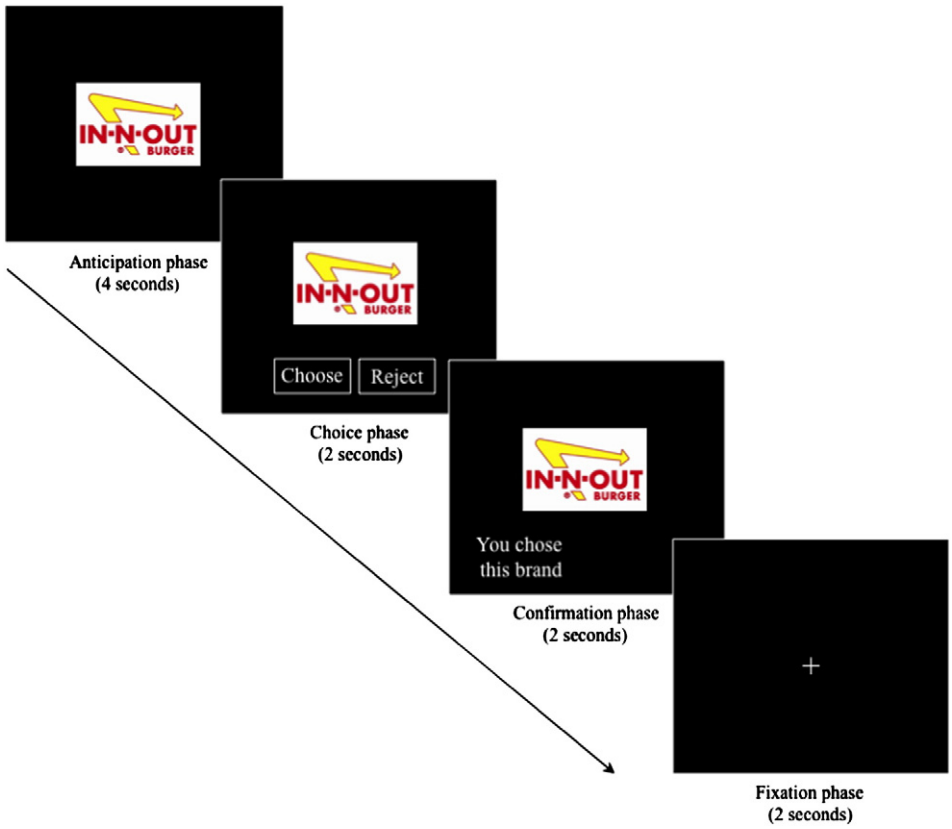

Fig. 2. Task used in experiment 3.

relationship exists could have elicited bodily responses, which subsequently triggered motivational–emotional processing in the form of urging or craving for the specific beloved brand. Our results stand for all aspects of the physiological condition of the physical body, such as the representation of a "material me" (Craig, 2002). While other brain areas, such as the prefrontal cortex and anterior cingulate cortex, have been implicated in self-control and decision-making, these areas are mainly engaged when the choice has a conflict and a certain inhibitory control over some choice tendency is exerted. In contrast, the insula is engaged more in the subjective and affective evaluation of a choice (e.g., what it feels like), and perhaps this explains our observed insula activation in the current study.

Besides increased insula activation, we also found increased activation in the caudate and decreased activation in the frontal lobe, especially the prefrontal system. Investigators have argued that the caudate is responsible for the transfer from controlled to automatic and habitual behaviors (Everitt & Robbins, 2005). Prior research has also referred to this neural system as the "impulsive system" and has shown that it becomes hyperactive in consumers with substance abuse problems (Bechara, 2005). While the impulsive system may

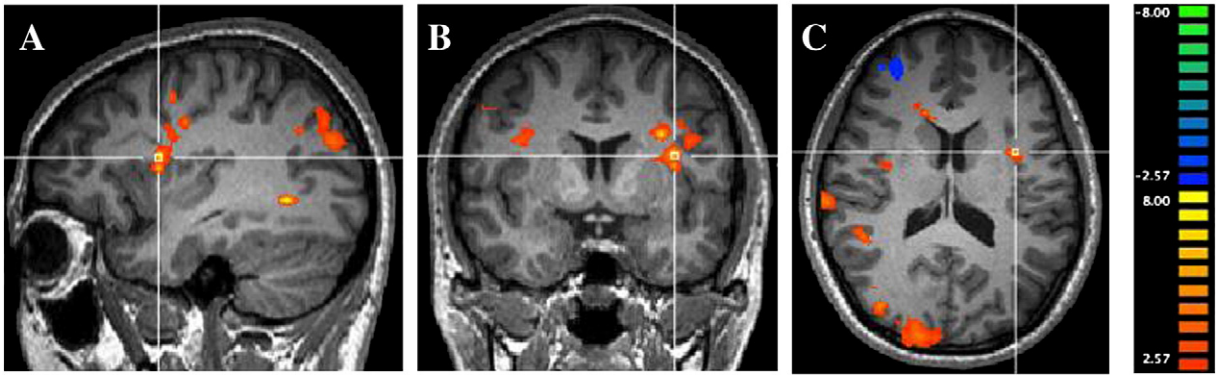

Fig. 3. Significantly stronger activation in the insula during the anticipation of choice of close brands compared to neutral brands. Note: The color bar shows the *t*-values; colors from red to yellow indicate activation increases, and colors from blue to green indicate activation decreases. The insula is marked by cross lines. Panel A shows a saggital slice through the brain (i.e., sideways), panel B features the corresponding coronal slice (i.e., from the front), and panel C shows the corresponding horizontal slice.

Table 1
Brain regions that show significant differences in activation for close compared to neutral consumer–brand relationships.

Brain area	Hemisphere	Brodmann area	x	y	z	Average *t*-statistic
Brain regions with significant increases in activation						
Insula	Left	13	−33	4	18	8.15
	Right	13	33	−2	23	3.89
Caudate	Right	n/a	19	26	6	6.20
	Left	n/a	−15	26	7	3.40
Parietal lobe: postcentral gyrus	Right	40	64	−26	21	8.10
Occipital lobe: medial occipital gyrus	Right	18	17	−92	13	4.25
Brain regions with significant decreases in activation						
Frontal lobe: frontal gyrus	Right	10	27	45	9	−6.55
	Left	8	−4	39	39	−5.46

Note: n=16; random effects. The x, y, and z coordinates are Talairach coordinates of the peak activation voxel in the identified brain region.

explain one important aspect of automatic and habitual behaviors, clearly it does not explain how consumers control behavior. Therefore, the so-called "executive control system," which depends primarily on the functions of the prefrontal cortex, is necessary to control more basic impulses and allow more flexible pursuit of long-term goals (Fellows, 2004). In sum, this system enables consumers to exert willpower and self-control.

Consistent with prior investigations in domains such as addiction (Naqvi & Bechara, 2009, 2010), we argue that consumers translate bodily signals (processed in the insula) into what they then subjectively experience as urging for the brand. This increased insula activation may in turn (1) exacerbate more automatic and habitual choice behavior of the beloved brand (processed in the caudate) and (2) weaken the inhibitory function of self-control against choosing that brand (processed in the frontal lobe).

Overall, the present fMRI results provide novel insights into the role of the insula in close brand relationships. At the same time, this research also supports earlier neurophysiological work that showed increased insula activation being strongly associated with love in human relationships (Bartels & Zeki, 2000, 2004; Beauregard et al., 2009; Cheng et al., 2010) but also diverse yet related phenomena such a loss aversion (Knutson & Bossaerts, 2007; Knutson et al., 2007) and regret (Chua et al., 2009).

General discussion

The present research shows that emotional arousal abates as one uses a new loved brand over time, while inclusion of the beloved brand into the self increases over time. Therefore, this research introduces an interactive effect of relationship length and relationship closeness on emotional arousal and inclusion. This study also demonstrates that arousal and inclusion into the self are identified with unique neurophysiological processes of increased skin conductance responses and insula activation. By integrating several psychological and neurophysiological concepts and measures, this research sheds new light on the unique characteristics of close consumer–brand relationships and enlightens the conceptualization and measurement of how consumers relate to brands over time.

This research makes a theoretical contribution to the brand relationship literature by introducing self-expansion theory to consumer research and applying it to the development and maintenance of brand relationships (i.e., person–object relationships). Using a multimethod approach, we found that (1) close consumer–brand relationships are based on two psychological mechanisms—rapid self-expansion and inclusion into the self (experiment 1); (2) consumers rapidly expand their "selves" for recently formed close brand relationships over both established close relationships and neutral relationships, as shown by increased SCR (experiment 2); and (3) when compared with neutral relationships, established close consumer–brand relationships are associated with activation of the insula, a brain area responsible for urging, addiction, loss aversion, and interpersonal love (experiment 3). Taken together, these results contribute to knowledge of how consumers relate to brands over time, suggesting that close brand relationships can generally be explained by self-expansion and inclusion mechanisms whose roles differ depending on whether the relationship is new or persistent.

Furthermore, the present research makes a methodological contribution to the measurement of brand relationships. More specifically, this research provides a simple yet effective instrument to assess the level of inclusion of brands. We have shown the brand inclusion diagram (see Fig. 1) to be a valuable indicator of how closely connected a consumer is to a brand. In the future, this instrument may serve as both a cross-sectional measure and a longitudinal measure of brand relationships. One interesting result is that this paper-and-pencil brand inclusion measure correlates with fMRI data. The combined analysis of paper-and-pencil measures and blood flow in specific brain areas is a step forward in theory building and confirmation (Reimann et al., 2010).

Limitations

Besides making important contributions to the extant research, the present study has some limitations. First, the neurophysiological operationalizations of rapid self-expansion as arousal and inclusion into self as insula activation may be limited to some extent. In particular, we acknowledge that these are just two ways of operationalizing, and other forms of operationalization may exist. For example, to further investigate the notion of greater self-expansion for recently formed brand relationships and explore whether recently formed close relationships increase levels of self-efficacy or self-esteem, future investigators could apply a self-efficacy measure (Bandura, 1977) or a self-esteem measure (Rosenberg, 1979) before and after consumers are confronted with their beloved brands. To further study the neurophysiological underpinnings of inclusion of a close brand, researchers could manipulate brain regions other than the insula. Specifically, transcranial magnetic stimulation could be applied to manipulate the medial prefrontal cortex and examine its role in close versus neutral brand relationships. Second, another limitation of the present research may relate to the fact that the effect of longevity of the brand relationship is not the same across all

close relationships. Fournier (1998) features 15 different forms of consumer–brand relationships, including casual friends/buddies, kinships, and secret affairs, hence alternative trajectories may exist for these different relationship forms, a possibility that warrants investigation. Third, other moderating variables, such as the brand's personality or the consumer's actual consumption experience, could affect both the link between time and rapid self-expansion and the link between time and inclusion of the brand in one's self.

Avenues for future research

The aforementioned limitations already offer ample opportunities for future investigation, which are complemented by the following open questions that warrant more further research. First, we might ask if close brand relationships are addictive to a certain extent? Our finding of insula activation for close brands gives rise to this speculation. Earlier studies have implicated the insula in addiction to alcohol (e.g., Myrick et al., 2004) and nicotine (e.g., McClernon et al., 2005), raising the question of whether close brands share a similar mechanism. Future investigations could further differentiate a simple urge for these brands (e.g., being committed to a specific brand) from more intense addiction to these brands (e.g., being devoted to a specific brand), two processes ascribed to the insula. Second, the present research only had two time points, six months apart. But, what are the effects over years? And how long does it take a consumer to be completely identified with the brand? Third, research into the effects of individual differences on the processes underlying close brand relationships may be fruitful. In particular, does personality affect the way consumers rapidly self-expand and include beloved brands into their "selves"? Investigators might analyze whether certain personality traits are particularly prone to these brand relationship mechanisms. Fourth and final, we might ask at what point in their lives do consumers develop these relationships altogether. The subjects used in these studies were younger consumers, on the uphill road of consumption. What about the 55-plus group who already owns everything? Does it take "more" from a brand to be loved at a latter age? Do the intangible goods become more attractive at that age? Consumption patterns do change over the lifecycle and maybe consumer brand relationships are a bit different, when one has "everything."

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Appendix A

FMRI data collection

Brain imaging was conducted using a full-body 3.0 Tesla Siemens Magnetom scanner (manufactured by Siemens AG, Erlangen, Germany) fitted with a 12-channel matrix head coil. For structural imaging, a high-resolution image of the brain was acquired with a 3D T1-weighted MPRAGE sequence (echo time (TE)/repetition time (TR)/inversion time = 3.1/2530/800 ms, flip angle = 10°, matrix = 256 × 256, field of view (FOV) = 56 mm, slice thickness = 1 mm without gap). For functional imaging, a time series of 176 volumes with 41 slices in the transverse plane was obtained using single-shot gradient-echo planar imaging (TR = 2000 ms, TE = 25 ms, flip angle = 90°, resolution = 3.0 mm × 3.0 mm × 2.5 mm, and FOV = 192 mm). Brain data were preprocessed and analyzed using BrainVoyager QX 2.2 (manufactured by Brain Innovation B.V., Maastricht, The Netherlands).

FMRI data analysis

For each participant, we used standard methods to perform linear image realignment, co-registration, non-linear normalization to stereotactic anatomical space, and spatial smoothing with a three-dimensional Gaussian kernel, 4 mm full-width at half maximum (FWHM). Participants' anatomical images were normalized to the Talairach and Tournoux (1988) brain template. Changes in the BOLD (blood oxygen level dependence) contrast were assessed for each voxel using the volume map (i.e., the map of brain function over the course of the experiment) of each participant. We grouped the brain data into five unique predictors: "Anticipation of choices of close brands," "Anticipation of choices of neutral brands," "Choice," "Confirmation," and "Fixation." The onset of each of the five predictors was convolved with a two-gamma hemodynamic response function to identify voxels with blood flow that correlated with the predictors. A random-effects general linear model at the whole-brain level resulted in several different activation increases as summarized in Table 1. The global threshold was set to $p < .001$, uncorrected, and we set the cluster threshold at 20 continuous voxels based on the cluster-level statistical threshold estimator tool in BrainVoyager QX. Further, we tested specific brain region activation using a region-of-interest (ROI) approach by running second-level random-effects general linear models at the ROI. We defined the ROI—that is, the insula—on the basis of a standard neuroanatomical atlas (Haines, 2008). We then created spheres around these coordinates. The ROI analysis confirms the results from the whole-brain analysis and reveals increased activation in the left and right insula ($p < .001$). Our approach is in line with prior consumer neuroscience research as reported in Dietvorst et al. (2009), Hedgcock and Rao (2009), Kable (2011), Reimann et al. (2011), and Yoon et al. (2006), for example.

Our hypothesis-driven approach is significant in that it circumvents issues with reverse inference, a problem commonly encountered in fMRI research (Christoff & Owen, 2006; Poldrack, 2006). Researchers typically use fMRI to measure

brain activation while a subject is performing a specific task. These data then allow forward inferences of information about the role of a specific brain region in brain function (Poldrack, 2006). Even so, prior research has increasingly used fMRI data to infer in the opposite direction—making reverse inferences—by concluding that a specific brain function is based on the activation of an identified brain area. In the present study, we responded to this issue of reverse inference by (1) providing an ex-ante hypothesis on the insula being involved in close brands given prior knowledge on the insula being implicated in diverse but related psychological phenomena such as urging, addiction, loss aversion, and interpersonal love, (2) by linking the task that participants performed with the neuroimaging data, and (3) by reporting all relevant task characteristics (Christoff & Owen, 2006; Reimann et al., 2011). Specifically, in our fMRI data analysis, we focused on the anticipation phase of the task and then contrasted the anticipation phase of close brands with the anticipation phase of neutral brands. This analysis approach revealed increased activation in the insula in both hemispheres of the brain. We then "forward-infer" by arguing that the anticipation of choice of brands to which one has established a long-lasting, close relationship is associated with insula activation. We then revisited our ex-ante hypothesis in the discussion section of our fMRI study to discuss the results.

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