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Established liked versus disliked brands: Brain activity, implicit associations and explicit responses

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Abstract: Consumers' attitudes towards established brands were tested using implicit and explicit measures. In particular, late positive potential (LPP) effects were assessed as an implicit neurophysiological measure of motivational significance. The Implicit Association Test (IAT) was used as an implicit behavioural measure of valence-related aspects (affective content) of brand attitude. We constructed individualised stimulus lists of liked and disliked brand types from participants' subjective pre-assessment. Participants then re-rated these visually presented brands whilst brain potential changes were recorded via electroencephalography (EEG). First, self-report measures during the test confirmed pre-assessed attitudes underlining consistent explicit rating performance. Second, liked brands elicited significantly more positive going waveforms (LPPs) than disliked brands over right parietal cortical areas starting at about 800 ms post stimulus onset (reaching statistical significance at around 1,000 ms) and lasting until the end of the recording epoch (2,000 ms). In accordance to the literature, this finding is interpreted as reflecting positive affect-related motivational aspects of liked brands. Finally, the IAT revealed that both liked and disliked brands indeed are associated with affect-related valence. The increased levels of motivation associated with liked brands is interpreted as potentially reflecting increased purchasing intention, but this is of course only speculation at this stage.

ABOUT THE AUTHORS

Shannon S. Bosshard completed this paper as a part of his PhD under the supervision of Peter Walla, an expert in Neurobiology (focus on non-conscious brain processes and human behaviour). Shannon currently studies at the University of Newcastle, Australia. He is interested in consumer behaviour and more specifically, the role that non-conscious processes play in consumer decisions. Peter is a professor of Psychology at the Webster Vienna Private University and head of the Psychology Department, while also running the CanBeLab (Cognitive and Affective Neuroscience & Behavior). He is a conjoint professor at the Newcastle University and senior research fellow at the University of Vienna. Besides their purely academic efforts they also offer neuroconsulting services, which is highly appreciated by various industries.

PUBLIC INTEREST STATEMENT

We are often confronted with well-established brands, some liked others disliked, a result of individual attitude. Traditional market research takes explicit responses (conscious and thoughtful) to measure brand attitude, but recent empirical evidence highlights the fact that implicit (rather unconscious) responses often don't match with conscious decisions.

We compare three different kinds of responses to brand name presentations, two unconscious and one conscious. We found that unconscious measures (brain activity and a reaction time-based measure, the Implicit Association Test) match with conscious responses. It is concluded that established like and dislike are indeed established on various levels of information processing in the brain. Future studies will test whether attitude changes can vary as a function of processing level. This is of great interest to marketers and advertisers. The brain knows more than it admits to consciousness and getting access to unconscious knowledge increases our understanding of human behaviour.

Subjects: Neurobiology; Neuroscience; Psychological Science

Keywords: attitudes; brands; EEG; neuromarketing; information technology; NeuroIS; consumer neuroscience and neuromarketing

1. Introduction

1.1. Background

Everyday we are presented with stimuli that require evaluation. Until recent years, the majority of attitude research was conducted within traditional social psychological studies. However, as competition between businesses grew, and the need for product differentiation became a necessity, emphasis was placed on investigating attitudes within consumer contexts. When making consumer-based decisions, our attitudes towards a brand play a major contributing role regarding whether we make a purchase or not. As a result, attitudes have recently received a large amount of interest within the field of consumer neuroscience. This field has progressively integrated novel methods of assessing attitudes in various consumer contexts (Morin, 2011).

Whether a company is trying to introduce a new brand or promote an existing brand, they are faced with the question of how to assess consumers' attitudes, especially as a consequence of utilising marketing strategies to modify attitudes. Current marketing literature refers to brand attachment when attempting to identify consumers' attitude towards a brand. Brand attachment refers to the strength of the bond between the consumer and the specific brand/product (Park, MacInnis, Priester, Eisingerich, & Iacobucci, 2010). The strength of this bond is said to act as a good indicator of the brands' profitability and the customers' perceived value of the brand (Thomson, MacInnis, & Park, 2005).

It is crucial to use a multidimensional approach and use as many measures as possible to quantify the various aspects of brand attitude as brands themselves are considered to be multidimensional concepts (Aaker, 1997). This approach will complete traditional approaches that rely on surveys and other methodologies that require explicit responses only. The most familiar measures of attitudes are those traditionally used within marketing studies. Generally referred to as traditional measures, or explicit measures, these provide an insight into explicit attitudes, which are deliberate and contemplative evaluations formulated through reasoning (Gawronski & Bodenhausen, 2006). The act of reasoning has the potential to result in a form of cognitive pollution. Cognitive pollution is the process whereby an explicit response becomes polluted as a result of conscious evaluation of a stimulus (Walla, Brenner, & Koller, 2011; Walla & Panksepp, 2013). In order to overcome the effects of cognitive pollution, the use of implicit measures of attitude are suggested as they instead measure implicit attitudes. In contrast to explicit attitudes, implicit attitudes are associations that are automatically activated in the presence of relevant stimuli without any conscious awareness of evaluation (Cunningham, Raye, & Johnson, 2004).

The lack of acknowledgement of implicit factors consistently produced discrepant findings (for review, see De Houwer, Thomas, & Baeyens, 2001). Various recent cases demonstrate discrepancies between explicit and implicit measures (Geiser & Walla, 2011; Grahl, Greiner, & Walla, 2012; Walla, Rosser, Scharfenberger, Duregger, & Bosshard, 2013) and as a result, there has been a recent turn towards implicit measures of attitudes, which are able to provide an insight into non-conscious affective processing, whilst also providing researchers and practitioners with a more complete picture related to brand attitude. For instance, Geiser and Walla (2011) showed that virtually walking through urban environments can result in different effects depending on explicit or implicit measures; Dunning, Auriemmo, Castille, and Hajcak (2010) found a non-linear relationship between the intensity of angry faces and non-conscious, physiological measures. More specifically, Dunning et al. reported that although participants in their study explicitly stated that images of angry faces were increasingly angry, implicit measures (startle amplitude) were only exhibited when the faces presented were maximally angry. Similarly, Grahl et al. (2012) reported that even specific bottle shapes

can elicit a non-conscious affective change, whilst explicit ratings remain constant. In case implicit and explicit measures match up, the complete picture represents strong assurance, and if they don't match up, there is reason to suggest that this discrepancy reflects differences between conscious and non-conscious processing. Those differences could be useful to help shape products and/or marketing strategies.

More recent research presented by Calvert and Brammer (2012) has suggested that attitudes are in many ways, driven by non-conscious processes, thus more comprehensive measures are needed. In contrast to explicit attitudes, implicit attitudes are evaluative associations automatically activated in the presence of a relevant stimulus, regardless of conscious intentionality for evaluation (Cunningham, Espinet, DeYoung, & Zelazo, 2005). This means that both positive and negative evaluations can occur without conscious awareness (Devine, 1989). This automatic nature of implicit evaluations reinforces their conceptualisation as non-conscious processes (Dijksterhuis, 2004). Furthermore, implicit attitudes are shown to be considerably robust (Petty, Tormala, Briñol, & Jarvis, 2006) and better predictors of spontaneous behaviour (Gawronski & Bodenhausen, 2012). With regard to spontaneous behaviour, Wilson et al. (1993), showed that when choosing one of two posters, participants that were asked to provide reasoning for their decisions not only showed different preferences, but also reported being less satisfied with their selection three weeks after the study. Again, such findings reiterate the implication of cognitive pollution during consumer decision-making and the importance of including implicit approaches to consumer research.

1.2. Implicit measurements

Of the behavioural (non-physiological) implicit measures, the Implicit Association Test (IAT; see Greenwald, McGhee, & Schwartz, 1998) is arguably the most popular and effective response latency-based implicit measure. The IAT has been used primarily as a tool within social psychology to determine implicit attitudes and stereotypes of social constructs including race (ecomorphological group) and gender (Banaji & Greenwald, 1995; Banaji & Hardin, 1996; Dovidio, Kawakami, & Gaertner, 2002; Fazio, Jackson, Dunton, & Williams, 1995; Greenwald & Banaji, 1995; Greenwald & Farnham, 2000; Greenwald et al., 1998, 2002). In recent times, however, the use of the IAT has extended into fields including marketing research (Brunel, Tietje, & Greenwald, 2004; Maison, Greenwald, & Bruin, 2001). Nevertheless, it has to be mentioned that the IAT has been met with a number of criticisms regarding legitimacy as a reliable and valid index of implicit attitudes (De Houwer, 2006; De Houwer, Beckers, & Moors, 2007; Fiedler, Messner, & Bluemke, 2006; Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). According to Rothermund and Wentura (2004), rather than the IAT measuring implicit associations, it may instead provide an indication of differences in salience between the two groups of target stimuli. Similarly, Mitchell (2004) found that when completing the IAT, participants sort the stimuli into two categories; one that is accepted and another that is rejected. From these findings, it is possible that the IAT does not measure attitudinal aspects of a stimulus, but instead reflects the means by which participants have sorted the stimuli.

Electroencephalography (EEG) has been demonstrated as a useful physiological technique for obtaining implicit information through a number of approaches. For example, non-conscious verbal memory traces have been shown (e.g. Rugg et al., 1998). Although a limited number of papers have investigated attitudes using EEG, even few of these papers are related to consumer neuroscience (for review see, Wang & Minor, 2008). Of the few papers that are seen to investigate attitudes using EEG within consumer contexts, many have proposed that EEG can differentiate between brand-related stimuli containing either a positive or negative valence. Handy, Smilek, Geiger, Liu, and Schooler (2010) found that when participants rated unfamiliar logos as positive, these stimuli elicited more activity than those that were rated as negative across frontal and parietal regions as late as 600 ms. Further evidence of EEG as suitable means in determining differences between positive and negative stimuli within marketing contexts was put forth by Vecchiato et al. (2010). Rather than investigating brain activity related to positive and negative logos, Vecchiato et al. investigated brain activity in relation to TV commercials. Their research revealed that TV commercials that were rated as pleasant resulted in increased levels of activity than those rated as unpleasant (Vecchiato et al., 2010). Again,

it was reported that frontal and parietal areas were largely involved in the processing of the commercials. Although the literature is scarce, it is clear that EEG reveals some insight into an individual's attitudes and motivation. Through the analysis of asymmetrical activity across the prefrontal cortex, Davidson, Schwartz, Saron, Bennett, and Coleman (1979) suggested that greater activity across the left frontal hemisphere is associated with positive emotions, whereas greater activity across the right frontal hemisphere is associated with more negative emotions. Since this report, motivational components have also been identified with relative increased left and right activity being associated with approach and avoidance systems, respectively (Harmon-Jones, 2004). The asymmetry model has recently proved informative in numerous consumer contexts (e.g. Brown, Randolph, & Burkhalter, 2012; Ohme, Reykowska, Wiener, & Choromanska, 2010; Ohme et al., 2010; Ravaja, Somervuori, & Salminen, 2013; Solnais, Andreu, Sánchez-Fernández, & Andréu-Abela, 2013). For instance, Ravaja et al. revealed that asymmetry over the prefrontal cortex predicts purchase decision when brand and price are varied with greater left frontal activation indicating greater intent to engage in a purchase. In addition, Brown et al. found that when presented with several beverages, participants explicitly stated a preference for one in particular; however brain activity showed no asymmetry effect across left frontal electrode sites, thus, suggesting they were processed as neutral. Brown et al. showed that participants who processed the brands as neutral were more likely to willingly switch from their explicitly stated brand preference when faced with a cheaper alternative.

From these findings, it can be inferred that through the use of EEG, we may be able to identify a link between brain activity and consumer brand attitude. Of most interest for the present study, the most empirically valid EEG approach as an index of motivation and affect has been a distinct event-related potential (ERP) component, the Late Positive Potential (LPP). It has not only been implemented in an expansive volume of research, but also recently received psychometric endorsement which revealed that the LPP demonstrated good to excellent reliability as a measure of emotion/affective processing (see Moran, Jendrusina, & Moser, 2013). According to the literature, stimuli that are emotionally arousing produce an enhanced LPP compared to neutral stimuli (Cacioppo, Crites, Berntson, & Coles, 1993; Cacioppo, Petty, Losch, & Crites, 1994; Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000) and those with greater motivational significance produce larger LPPs (Lang, Simons, & Balaban, 1997). An overall greater LPP sensitivity has been found in the right hemisphere during evaluative tasks (Crites & Cacioppo, 1996).

1.3. The present study

The rationale for the present study was to use the IAT to test whether explicitly rated brands that are liked are indeed associated with positive affect and disliked brands with negative affect. In addition, via EEG recordings we aimed at testing whether or not liked and disliked brands are further associated with different motivational aspects. The present study also extends upon the study by Walla et al. (2011) in that it adds further implicit measures (specifically, EEG and the IAT) to measure brand attitude. They too investigated brand attitude, but focused on startle reflex modulation, heart rate and skin conductance. No studies addressing the sensitivity of ERPs as a measure of brand attitude were expressed in this paper, and to our knowledge remain absent in the current existing literature. Furthermore, in contrast to much of the existing literature, the current study focuses on individual's perceptions of highly familiar brands. We used an online survey to produce individual lists of liked and disliked brands and then invited eligible participants to record brain potentials and take IAT measures. We first hypothesised that self-reported measures during physiological recording would strongly reflect explicit pre-assessment ratings. Following the existing literature, we expected the LPP component to vary as a function of brand attitude allowing us to make inferences about affect-based motivational aspects. Finally, we expected IAT data to also support differences between liked and disliked brands and thus demonstrate its reliably as a measure of brand attitude.

2. Methods

2.1. Participants

Initial recruitment for the study involved 27 participants, 3 of whom were excluded following pre-assessment of brand attitudes. The mean age of the remaining 24 participants (12 females) was 23.58 (SD = 2.39). All participants were tertiary education students recruited by word of mouth. They volunteered and gave their written informed consent. Participants were right handed, had normal or corrected to normal vision, were free of central nervous system affecting medications and had no history of neuropathology. They were also asked to not drink any alcohol or coffee and to not smoke for at least 24 h before the experiment. Participants were financially reimbursed for their time and travel. The study was approved by the Newcastle University Ethics Committee.

2.2. Stimuli

The initial stimulus list for pre-assessment comprised 300 subjectively chosen common brands names, familiar to people from Australia (see Appendix A for list of presented brand names). Using an online survey, participants provided a subjective rating of like or dislike for each brand name on a 21-point Likert scale, ranging from −10 (*Strong Dislike*) to +10 (*Strong Like*). Upon initiation of the experiment, we created individualised stimulus lists using the subjective ratings obtained from the online survey. Each stimulus list comprised 200 brand names, including the participant's 30 most liked brand names, 30 most disliked brand names, 60 neutral brand names and 80 non-target (filler) brand names. This accumulated 120 target brand names across three types; *positive*, *negative* and *neutral*. Brand names were presented in capital white letters, Tahoma font and on a black background (no logos were presented). In the frame of this paper only measures related to liked and disliked brands are further analysed.

2.3. Individual pre-assessment of brand attitudes

Participants subjectively rated 300 brand names using an online survey (via www.limesurvey.com), prior to entering the lab. We required participants to read each brand name and indicate their attitude towards it using a mouse/track pad on the provided slider. Participants were explicitly instructed to not adjust the slider if they were unfamiliar with a particular brand. Rating a brand as *neutral* required the participant to manually click "0". This phase of the experiment occurred at a time of the participant's choosing, with choice of computer also left to their discretion. The survey took on average 15–20 min to complete. Participants who demonstrated adequate familiarity and attitude scope were eligible for the experimental phase of the study. That is, participants who were either unfamiliar with the majority of the brands, or did not have a large spread of attitudes (ranging from strongly liked to strongly disliked) were excluded from the experiment. This came as a result of not being able to construct a stimulus list with discernable positive and negative target items. Three participants were unable to further participate due to such inadequate brand pre-assessment.

2.3.1. Lab experiment

Following completion of pre-assessment, we invited eligible participants individually into the lab. Participants were encouraged to attend the lab within three days of having completed the online survey. During their visit, we collected all explicit and implicit measures of attitudes towards brand names. Explicit measurement involved subjective self report, whilst implicit measures were collected using EEG and the IAT. Upon entering the lab, participants were seated comfortably in front of a 32 inch LED television (screen resolution of 1,024 × 768 pixels). We connected participants to a *BioSemi ActiveTwo* EEG system (BioSemi, Amsterdam, the Netherlands) and measured potential changes using 64 cranial electrodes, as well as 8 external reference electrodes placed lateral ocularly, supraocularly, infraocularly and on the mastoids.

We used the computer program *Presentation* (NeuroBehavioral Systems, Albany, United States) to visually present the appropriate instructions and individualised stimulus lists. The presentation of stimuli in addition to neurophysiological signal recording was conducted from a separate room. We commenced testing with the participant by themselves in a dimly lit room to ensure adequate focus

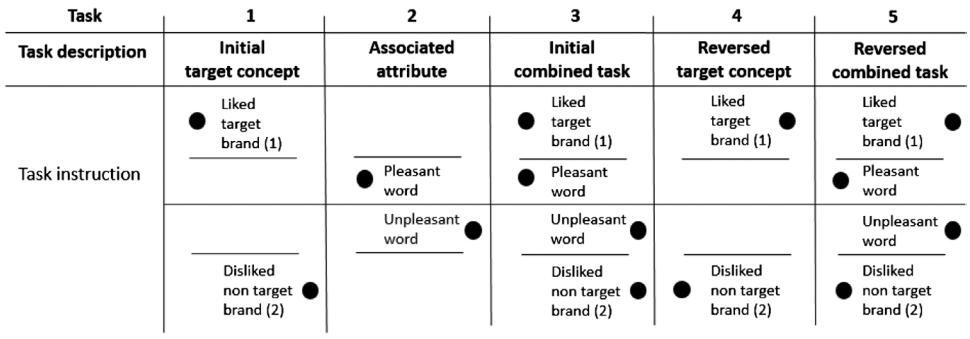

Figure 1. Modified version of the original IAT.

Notes: Filled black circles on the left of the stimulus indicate left button presses and vice versa. Task 3 = congruent, Task 5 = Incongruent condition.Source: Adapted from Greenwald et al. (1998).

on the stimuli. A white fixation-cross appeared on a black background for 500 ms, followed by a brand name for 5 s. Participants provided a self-reported rating of 1 (*Strong Dislike)* to 9 (*Strong Like*) for the brand using a standard keyboard, whilst it was on screen. Brain potential changes and self-report were collected for the 120 target brands. To reduce fatigue effects, participants were provided a break halfway through this stage. Overall, it took approximately 30 min to complete. At this stage, participants had the EEG recording cap removed and were then asked to complete five rounds of the IAT (see Figure 1 for modified IAT).

2.4. Data recording and processing

2.4.1. Self-report and Implicit Association Test

For self-report data, mean ratings of liked and disliked brands were compared using paired-sampled *t*-tests. These analyses were completed at both the pre- and post assessment phases. As for the IAT, we used a modified version of the original test (Greenwald et al., 1998), which consisted of 5 separate discrimination tasks each with 30 visual presentations to be classified as either a target or non-target stimulus. Although the structure and administration of the IAT remained identical to the original IAT, rather than using stimuli that fall under the guise of social psychology (e.g. Faces of different races; Greenwald et al.,1998), we instead used brand names. In task 1 (*initial target concept*) study participants were asked to discriminate between a non-target brand (previously rated as neutral) and a target brand (individually rated liked or disliked brands). Study participants were required to press the "A" key for *target brand* and the "L" key for *non-target brand*. In task 2 (*associated attribute*) participants were visually presented with valenced words and asked to press the "A" key for pleasant words (e.g. beautiful, healthy, happy and perfect) and the "L" key for unpleasant words (e.g. frighten, angry, sad and worthless). In task 3 (*initial combined task*) tasks 1 and 2 were combined. Study participants were asked to press the "A" key in case of target brand or pleasant words and the "L" key when presented with a negative word or a non-target brand. Task 4 (*reversed target concept*) was similar to task 1, however participants were asked to press the "A" key for *non-target brands* and the "L" key for *target brands*. Finally, task 5 (*reversed combined task*) was a combination of task 2 and task 4. Participants were required to press the "A" key in case of non-target brands and pleasant words and the "L" key when presented with a negative word or a non-target brand. In accordance with the existing literature (De Houwer et al., 2001), a comparative analysis was made between reaction times of participants during task 3 and task 5. During each of the blocks, stimuli were presented for 300 ms; however, participants were given 1,500 ms to respond during each trial. Between each stimulus, a fixation cross was presented for 300 ms and between the fixation cross and the following stimulus, was another 700 ms gap. For a pictorial explanation of how the IAT was implemented (see Figure 1). Participants completed one IAT which included a liked brand as a target brand and second IAT which incorporated a disliked brand as a target brand. For a pictorial explanation of how the IAT was implemented (see Figure 1).

2.4.2. Event related potentials

We recorded EEG at a rate of 2,048 samples/s using a 64-channel Bio Semi Active Two system and *ActiView* software (BioSemi, Amsterdam, the Netherlands). Data-sets were processed individually using *EEG-Display* (version 6.3.13; Fulham, Newcastle, Australia). During processing, we reduced the sampling rate to 256 samples/s and applied a band pass filter of 0.1–30 Hz. Blink artefacts were corrected by referencing to the supraocular external electrode (excluding two sets referenced to Fpz due to unclean external signals). In order to eliminate noise generated by eye movements, we conducted horizontal, vertical and radial eye movement corrections (see Croft & Barry, 1999). The data was coded to brand type (i.e. liked and disliked). We established epochs from −100 ms prior to stimulus onset (a baseline), to 2,000 ms following stimulus onset. The resultant epochs were baseline corrected and an average was generated across single trials for each condition. The individual data-sets were then re-referenced to a mastoid electrode. Grand averaged ERPs were generated to display brain activity differences. Grand averaged ERPs were then analysed in 200 ms (between 20 and 1,800 ms) blocks using *t*-tests to compare mean activity during these periods (200 ms–400 ms, 400 ms–600 ms, 600 ms–800 ms etc.)

3. Results

3.1. Self-report at pre-testing

To analyse the self-report data, the responses towards participants' most liked and most disliked brands were collated. We then conducted a paired *t*-test on these two conditions and found that on average, the mean of self-reported liked brands (the top 30 most liked) was 9.44 (SD = 2.49) and the mean of disliked brands (30 least liked brands) was −4.56 (SD = 5.41; see Figure 2). As expected, this effect was seen to be highly significant ($t = 25.765$, df = 118, $p < 0.001$, two-tailed; $d = 3.54$).

3.1.1. Self-report during the lab experiment

In order to assess self-report responses towards liked and disliked brands during the lab experiment, we collated all responses towards participants most liked and most disliked brands. We then conducted a paired *t*-test to assess the sensitivity of self-report to pre-assessed explicit brand attitudes. Consistent with predictions, self-report measures differed significantly according to brand type also during physiological recording ($t = 21.721$, df = 118, $p < 0.001$, two-tailed; $d = 3.03$). As expected, liked brands ($M = 7.39$, SD = 0.98) were rated significantly higher than disliked brands (M = 3.39, SD = 2.03; see Figure 3).

3.1.2. Event-related potentials

We produced averaged ERP figures to broadly assess effects of brand type over the entire epoch of interest. Visual inspection of overlaid ERPs revealed strongest LPP differences between liked and disliked brands at frontal site AF7 and parietal sites P7 and P8 (see Figure 4). We then conducted paired *t*-tests on all above-mentioned electrode sites to compare brand effects.

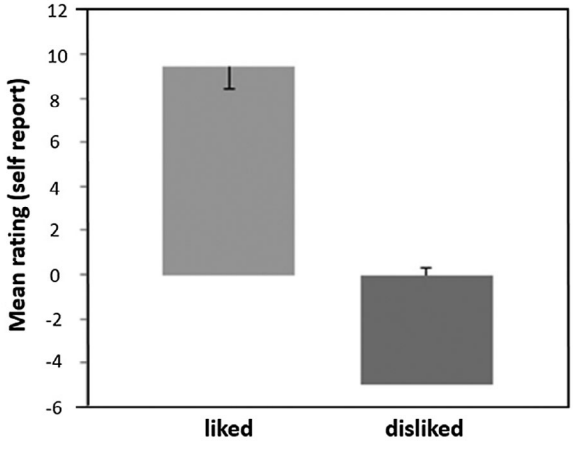

Figure 2. Mean (30 most liked and 30 most disliked) self-reported brand name rating during the online survey.

Note: Ratings are based on a scale from −10 (maximum disliked) to +10 (maximum liked).

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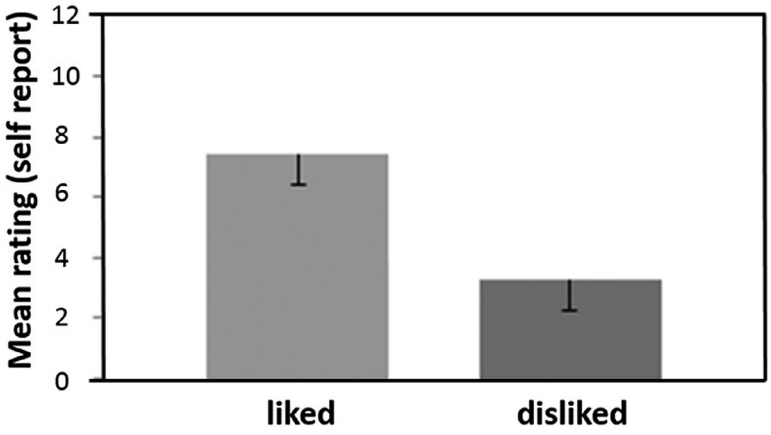

Figure 3. Mean self-reported brand name rating during the physiological recording test session.

Notes: 30 most liked and 30 most disliked brand names. Ratings are based on a scale from 1 (maximum disliked) to 9 (maximum liked).

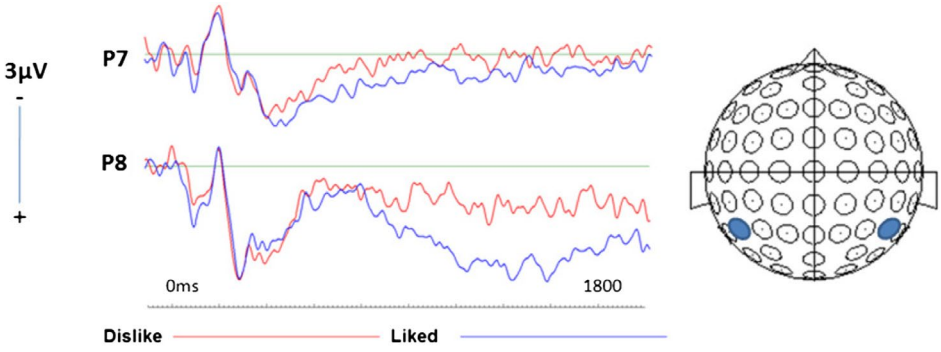

Figure 4. Grand averaged ERPs related to disliked and liked brands.

Note: At P8 liked brands elicited a more positive going potential compared to disliked brands.

Unexpectedly, we saw no significant effect across left frontal electrode site AF7 for the entire duration of the epoch, however we did see a pattern emerging which saw greatest difference at about 1,400 ms (t = −1.773; df = 23; p = 0.089; two-tailed; d = 0.51). In contrast, parietal site P8 saw liked brands evoke more positive activity throughout majority of the ERP. This effect was seen to begin at around 1,000 ms (t = −1.578; df = 23; p = 0.019; two-tailed; d = 0.59) and remain until 1,800 ms, reaching greatest significance at around 1,400 ms (t = 3.110; df = 23; p = 0.005; two-tailed; d = 0.66). Analysis on left parietal site P7 revealed no significant brand effect with greatest significance achieved at around 1,200 ms (t = −1.421; df = 23; p = 0.169; two-tailed; d = 0.26). Figures 4 and 5 show the dominant LPP effect over the right parietal area in relation to liked brands.

3.1.3. Implicit Association Test

During analysis of the IAT responses, we compiled all participants' responses and found the mean reaction time for each phase. We then removed all responses that were provided either too quickly or too slowly. All responses that fell under three standard deviations (calculated in milliseconds) from the overall mean reaction time of each phase were removed. We also removed all incorrect responses. We then analysed the data regarding participants most liked brands (see Figure 6). We conducted a paired t-test and consistent with predictions found that there was a significant difference in reaction time between the congruent condition (M = 607.47 ms, SD = 117.95) and the incongruent condition (M = 677.70 ms, SD = 186.96)(t = −6.457; df = 344; p < 0.001; two-tailed; d = 0.46). We then proceeded to conduct an analysis of participants'' responses towards disliked brands (see Figure 6). We again, as expected, found a significant difference between the congruent condition (M = 630.42 ms, SD = 164.56) and incongruent condition (M = 693.06 ms, SD = 194.03); (t = −4.505; df = 309; p < 0.001; two tailed; d = 0.35).

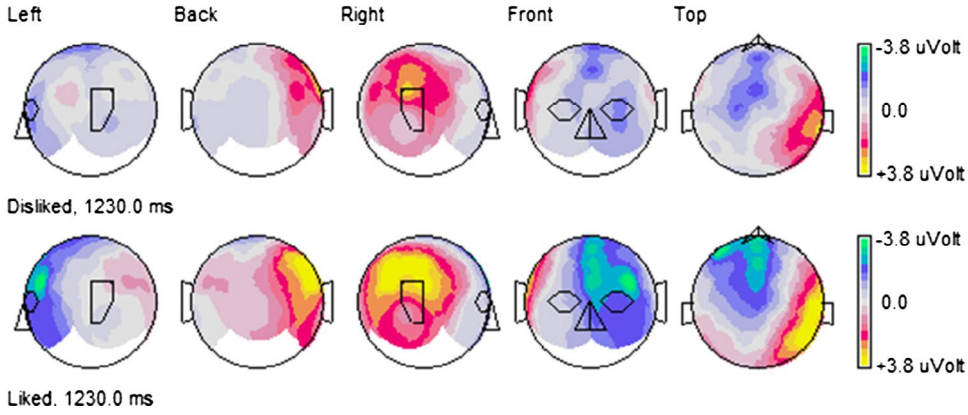

Figure 5. Topographical maps demonstrating a most pronounced LPP over the right parietal cortical area in response to liked brands.

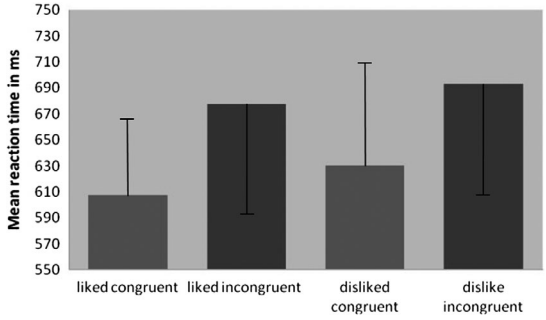

Figure 6. IAT findings demonstrate that our participants had automatic positive associations with prior rated liked brands and negative associations with prior rated disliked brands.

Note: The implicit nature of the IAT might be useful in the future to test evaluative conditioning effects without requiring explicit responses.

4. Discussion

The findings of our study are twofold. Firstly, through the observation of the self-report ratings as well as the late onset of the LPP, we provide evidence that like and dislike as in brand attitude are indeed associated with deep positive and negative affect. Secondly, we demonstrate that liked brands are implicitly associated with increased motivational aspects compared to disliked brands. Although purely speculative at this stage it might be reasonable to believe that this is reflective of increased purchasing intentions related to liked brands.

4.1. Self-report and IAT

Congruent with our predictions, self-reported measures during the lab experiment strongly reflected those obtained during pre-assessment even though the contexts in which both sets of data were collected varied considerably. This indicates the consistent nature of explicitly rated brand like and dislike in the frame of our study. Prior to entering the lab, participants were required to rate brand names using a 21-point scale and not under any time constraints, while participants were only allowed a few seconds to respond using a 9-point scale during neurophysiological recording. Cunningham and Zelazo (2007) state that explicit attitudes are ultimately influenced by two competing motivational drives, to reduce error and reduce cognitive demand. As individuals are allowed to take more time to make decisions, their accuracy is said to increase, however the cognitive load also increases. In contrast, when under time constraints, participants are able to reduce cognitive load, however the chance of errors increase, respectively. With regard to the current study, the pre-assessment phase saw participants take more time to respond, thus their responses were thought to have been more accurate and, in turn, require an increased cognitive load. In contrast, during the physiological recording phase, where participants only had a limited time to respond, the cognitive load was less, but room for error increased. Our results may indicate a trade-off between these two motivations and this may have contributed to the congruent ratings. Such considerations are

important when comparing explicit attitudes obtained over different contexts (Stafleu, de Graaf, van Staveren, & de Jong, 1994). However, most importantly we could confirm that explicit rating performance revealed same results when compared across two different measurement times.

In principle, the IAT has been developed as a measure of a person's automatic and thus rather implicit association between valence-related information and stored mental representations of any content or concept (Greenwald et al., 1998). In our study, the IAT was used to test whether or not implicit associations between positive valence and liked brands and negative valence and disliked brands exist. The results strongly support this hypothesis. Given that like and dislike in our study is reflective of brand attitude, the current research provides further support that the IAT is a suitable means of distinguishing between positive and negative attitudes on a rather non-conscious level, which is consistent with previous research (e.g. Brunel et al., 2004). The results show that reaction time is significantly reduced when participants responded to a liked brand that preceded a pleasant word and also when a disliked brand preceded an unpleasant word (congruent condition). In contrast, the results also show that there is a significant increase in participant's reaction time when responding to liked brands in that preceded a negative word and also for negative brands that preceded a positive word (incongruent condition) indicating a lack of association between those two information. However, it should be noted that our data does not support (or refute) the assumption that the IAT directly measures implicit attitudes, even though we strongly believe that this is the case.

As previously mentioned, the IAT has been met with criticisms regarding its ability to measure implicit attitudes (see De Houwer, 2006) and, although it may be useful as an implicit measure within consumer research, it should be used cautiously. According to Boysen, Vogel, and Madon (2006) people may be able to influence their responses on the IAT and, as a result, alter the outcome of this supposed automatic, implicit task. Therefore, the authors of the current paper suggest that the IAT be used in conjunction with other implicit measures. Further research is needed to define the value of the IAT.

4.2. Event-related potentials

Within social psychological studies, negative and positive stimuli are considered to be more inherently affective (i.e. out-group prejudices, etc.) and are often evolutionary-based mechanisms (i.e. detecting threats; Brewer, 1999) that are both associated with increased motivational levels. In our study, we found evidence that liked brands elicit significantly greater levels of motivation compared to disliked brands, which is interesting. Brand name attitudes are entirely learned and highly semantic (Stuart, Shimp, & Engle, 2001). This is supported by findings that brand attitudes can be derived and shaped without the individual actually having any direct experience with the brand (Ahluwalia, Burnkrant, & Unnava, 2000; Sweldens, Van Osselaer, Janiszewski, & Janiszewski, 2010). This might be a reason for the discrepancy in level of motivation.

Although the lateralised dominance of an enlarged LPP for liked brands to the right hemisphere is in contrast to numerous studies on social attitudes which suggest that the left hemisphere displays a greater LPP for positive attitudes, other research has demonstrated that the right hemisphere is generally more sensitive to LPP effects (Cacioppo, Crites, & Gardner, 1996). There is considerable consensus that this right hemisphere bias in evaluative processing is modulated by the level of motivational significance of the stimulus (Cacioppo et al., 1994, 1996; Cunningham et al., 2005; Cuthbert et al., 2000; Gable & Harmon-Jones, 2013). This understanding of the LPP is very much in line with our own view and we interpret our findings to infer that liked brands, although generating greater activity, implicitly, may not have been perceived as more affective than disliked brands. Instead, liked brands may have been more motivationally arousing. More research into these findings is necessary before clearer conclusions can be drawn.

The considerably late onset of the LPP in our study further supports the suggestion that perhaps; the processing of brands requires a large amount of cognitive and affective processing. A number of

studies have shown significant motivational discrepancies using the LPP as early as 300 ms to 400 ms (Olofsson, Nordin, Sequeira, & Polich, 2008; Pastor et al., 2008). The LPP onset of roughly 1,000 ms in our study infers that considerably more processing occurred before the stimuli were distinguished as either liked or disliked (see Falkenstein, Hohnsbein, & Hoormann, 1994). This late onset could also be a reflection of the use of well-known brands rather than those which are fictitious (as seen in Handy et al., 2010).

Finally, it has to be mentioned that our data regarding frontal sites, although only a trend and not significant, supports existing literature (Davidson et al., 1979; Harmon-Jones, 2004) that liked or positive stimuli evoke greater potentials than disliked or negative stimuli across the left prefrontal cortex. From this finding, we can infer that like other affective stimuli, brands that are liked or more motivationally arousing result in increased potentials across the left prefrontal cortex more so than do disliked or aversive brands; and that this greater level of activity may give an indication of a participant's purchase intention. Although this is only speculation at this stage, it helps forming new hypotheses for future studies with a strong applied aspect.

Although the LPP has been explored in consumer contexts, to our knowledge previous studies have used only novel stimuli (Handy et al., 2010). Our study increased external validity by assessing brand attitudes previously formed in everyday life. The pre-assessment phase further increased the utility of this approach by ensuring strength of subjective participant attitudes. We acknowledge that experimental control is important and more easily obtained using unfamiliar stimuli. However, attitude formation and change does not occur in a vacuum and translatability of research is of particular importance in consumer neuroscience. We therefore recommend further use of established brand stimuli such as those used in the present study. To further expand on the use of existing brands, we also suggest assessment of stimuli such as familiar brand logos and products. These have shown to strongly activate neural systems of familiarity in functional magnetic resonance imaging paradigms (Schaefer, Berens, Heinze, & Rotte, 2006; Tusche, Bode, & Haynes, 2010) and may also demonstrate effects unique from brand names. Moreover, we emphasise the requirement of ensuring appropriate procedures during pre-assessment, such as controlling for factors that influence evaluative error and cognitive demand.

The IAT is a cognitive index of implicit attitudes further higher order than ERP, to the point of being susceptible to cognitive bias (De Houwer, 2006). Given its popularity for attitude assessment (De Houwer, 2006; Gattol, Sääksjärvi, & Carbon, 2011; Hofmann et al., 2005), it may prove useful to consolidate this traditional response-latency measure with such contemporary ERP techniques for a broader scope of attitudes.

4.3. Conclusions

In the present study, self-report, ERP measures and the IAT were demonstrated to be sensitive to pre-assessed brand attitudes. The effects observed using ERP specifically affirms higher order motivational processes as potentially underlying contributors to our explicit results. A larger LPP effect over the right parietal cortex for liked brands inferred greater motivational significance for liked compared to disliked brands. The IAT results suggest that brand attitude is indeed associated with deep affective content. In summary, even though both liked and disliked brands are associated with affective content, liked brands elicited significantly higher levels of motivation levels, which might be reflective of increased purchasing intentions related to liked brands.

Further research expounding the different mechanisms involved in evaluative processes should likewise prove beneficial for understanding attitudes generally and in applied contexts. Broadly, the implications of our own, and prospective related research may also provide clinical insight into severe consumer behaviours such as gambling and substance abuse and dependence (Foxall, 2008). In conclusion, the present study demonstrates that as the field of behavioural sciences progresses, there is a dire need for the field of marketing research to keep up. Given the constant reports of discrepancies between traditional, self-report data and newer, implicit approaches (such as those

mentioned within this paper), it is obvious that the exclusive use of traditional measures must come to an end. It is our responsibility as researchers to promote the use of implicit measures, so that future evaluative research is as comprehensive as possible.

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Appendix A

1. Logitec
2. Kirks
3. Coca-Cola
4. Microsoft
5. Powerade
6. Lipton
7. Apple
8. Samsung
9. Connor
10. IBM
11. GE
12. Intel
13. Nokia
14. Toyota
15. Disney
16. McDonald's
17. Mercedes-Benz
18. Marlboro
19. Lacoste
20. American Express
21. BMW
22. Gillette
23. Louis Vuitton
24. Honda
25. Pepsi
26. Nescafe
27. Hungry Jacks
28. Dell
29. Sony
30. Budweiser
31. Oracle
32. Ford
33. Nike
34. Canon
35. Kellogg's
36. Ikea
37. Siemens
38. Harley-Davidson
39. Gucci
40. Dunlop
41. Philips
42. Nintendo
43. L'Oreal
44. Heinz
45. McCain's
46. Volkswagen
47. Colgate
48. Wrigley's
49. KFC
50. Chanel
51. Avon
52. Nestle
53. Kleenex
54. Vans
55. Pizza Hut
56. Motorola
57. Kodak
58. Adidas
59. Rolex
60. Audi
61. Hyundai
62. Panasonic
63. Kraft
64. Porsche
65. Tiffany & Co.
66. Duracell
67. Moet & Chandon
68. Johnson & Johnson
69. Shell
70. Nissan
71. Starbucks
72. Lexus
73. Smirnoff
74. LG
75. Prada

76. Armani
77. Nivea
78. Levis
79. Vegemite
80. Fosters
81. Aspro
82. Johnnie Walker
83. Speedos
84. Heineken
85. Westpac
86. Ansell
87. Billabong
88. Bluescope
89. Optus
90. Arnotts
91. Bakers Delight
92. Boost Juice
93. Coles
94. Woolworths
95. Angus & Robertson
96. Eagle Boys
97. Dominoes
98. Telstra
99. Dick Smith
100. David Jones
101. Hamilton
102. Energy Australia
103. Qantas
104. Jet Star
105. Officeworks
106. Toshiba
107. Coopers
108. Durex
109. Tooheys
110. Corona
111. Victoria Bitter
112. James Squire
113. Jim Beam
114. Bundaberg
115. Whiskas
116. Pedigree
117. Oak
118. Mount Franklin
119. Peter Alexander
120. Dolce & Gabana
121. Roxy
122. Western Digital
123. Suzuki
124. Subaru
125. Holden
126. Mazda
127. Mitsubishi
128. Cadbury
129. Allen's
130. Starburst
131. Lego
132. Dolmio
133. Guiness
134. Pandora
135. Marc Jacobs
136. Victor & Rolf
137. Lorna Jane
138. Dior
139. Maybelline
140. Winfield
141. Longbeach
142. Gatorade
143. Wilson
144. Fender
145. Gibson
146. Lindt
147. Lynx
148. Tefal
149. Bridgestone
150. Supre
151. Casio
152. Calvin Klein
153. Dove
154. Ripcurl
155. Havaianas
156. Frontline
157. Friskies
158. Ferrari
159. MyDog
160. Vodaphone
161. Dr Lewins
162. Ambi Pur
163. Schick
164. Subway
165. Fisher Price
166. Schweppes
167. Fujitsu
168. Bonds
169. HTC
170. Garnier
171. TRESemme
172. GHD
173. Sea Folly
174. Tiger Lilly
175. Paul Frank
176. Olay
177. Piping Hot
178. Ray-Ban
179. Remington
180. Whitmans
181. Dulux
182. Homebrand
183. Black & Gold
184. No Frills
185. Trills
186. Dilmah
187. Everlast
188. Neutrogena
189. Vera Wang
190. Tony & Guy
191. Cotenelle
192. Revlon
193. Hewlett Packard
194. Oakley
195. Daihatsu
196. Slazenger
197. Tapout
198. Banana Boat
199. Fisher Paykel
200. Converse
201. Hasbro
202. Smiths
203. Panadol
204. Neurofen

205. Eveready
206. Esprit
207. Energizer
208. Guess
209. Globe
210. Lonsdale
211. Mossimo
212. Rusty
213. Volcom
214. Akubra
215. R. M. Williams
216. Ajax
217. Uncle Toby's
218. Glade
219. Walkers
220. Husqvarna
221. Birds Eye
222. Praise
223. Flora
224. Philadelphia
225. Jalna
226. Colby
227. Coon
228. Baileys
229. Victoria's Secret
230. Oral B
231. Bostik
232. John Deere
233. Sega
234. Zippo
235. Tic Tac
236. Mobil
237. Swisse
238. Campbell's
239. Mars
240. Yamaha
241. Sandisk
242. Betty Crocker
243. Maggi
244. Sara Lee
245. Viva
246. Reece
247. Nesquik
248. Mortein
249. Old el Paso
250. Pascall
251. Crayola
252. Radox
253. Trident
254. Evian
255. Twinings
256. Primo
257. Rivers
258. Libra
259. Saxbys
260. Steggles
261. Toblerone
262. Meadowlea
263. Helgas
264. Wonder White
265. White Wings
266. Four Seasons
267. Sunsilk
268. Impulse
269. OMO
270. Sunbeam
271. Red Rock
272. Breville
273. Delonghi
274. Ibanez
275. Steeden
276. Palmolive
277. New Balance
278. Asus
279. Kambrook
280. Nikon
281. Reebok
282. Sharp
283. Virgin
284. Hummer
285. Lamborghini
286. Wrangler
287. Ego
288. Acer
289. Allianz
290. Baxter
291. Chum
292. Clearasil
293. Proactiv
294. Compaq
295. DNKY
296. Dettol
297. Fuji Film
298. Goodyear
299. Dyson
300. Nexcare