A study of unconscious emotional and cognitive responses to tourism images using a neuroscience method

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Abstract

Purpose – This applied neuroscience study aims to understand how direct and unconscious emotional and cognitive responses underlie travel destination preferences. State-of-the-art neuroscience tools and methods were used, including stationary eye tracking and brain scanning electroencephalography (EEG) to assess emotional and cognitive responses to destination images and assets. To the researchers’ knowledge, this study is the first applied neuroscience study in tourism research and thus opens a new path of research and enquiry to this area. This paper is an attempt to understand specific mental processes in human tourism behaviours, and it is suggest that unconscious emotional and cognitive responses are natural processes that need to be studied and understood, not as special cases, but embedded as natural parts of tourism research.

Design/methodology/approach – To better understand consumers’ unconscious responses to possible travel destinations, a 3 x 5 factorial design was run with the factors being stimulus type (images, printed names and videos) and travel destination (Dubai, Abu Dhabi, Hong Kong, New York and London). Eye-tracking calibration was done with a nine-point fixation test and the EEG calibration was done using functional localizer tests based on the ABM B-ALERT calibration process. This calibration procedure allows reliable tracking of emotional and cognitive responses over time. Thirty Emirati (nationals of the UAE) participants, consisting of equal numbers of males and females (15) were recruited from the UAE and signed informed consent. Each participant was positioned in front of an eye tracker and computer screen, and brain-scanning equipment was mounted; then, each participant underwent eye-tracking and neuroimaging calibration procedures. A Tobii T60XL eye tracker and an ABM X-10 EEG brain scanner, both running iMotions v5.1 in a Windows 7 environment, were used.

Findings – General emotional and cognitive differences were identified between the channels through which travel destinations are presented. Words about and names of travel destinations cause higher cognitive

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loads, which may not be surprising, given the greater associative load that words have than images. Of particular interest is the hypothesis that images evoke stronger affective responses than verbal representations. However, as previously noted (Holmes and Mathews, 2005), empirical evidence for this assumption seems surprisingly sparse. The present study and the context provided here suggest that decisions on travel destination have an unconscious component and a direct component that may drive or affect overt preference and actual choice.

Research limitations/implications – The limitations of this paper is that first, neuromarketing is not dependent on sample sizes; however, future studies could build on this paper to understand why there is a preference for cities. It is suggested that unconscious emotional and cognitive responses are natural processes that need to be studied and understood, not as special cases, but embedded as natural parts of tourism research.

Originality/value – Thus, tourism research may indeed be a suitable field for understanding the brain bases of complex preference formation and choice. Various researchers have found that a destination image is typically measured using cognitive, affective and behavioural components, and further stated that the cognitive image component of a destination was found to have a significant positive effect on the affective image component and overall destination image (Stylidis et al., 2017). Therefore, this research which has introduced brain scanning can be used to better understand the underlying unconscious emotional and cognitive processes that affect consumer thought and action. An understanding of what goes on in the human unconscious mind is very important for destination marketers, this can help in the integrated marketing communication process to create a destination image and brand.

Keywords Motivation, Neuroscience, Neuromarketing, Cognitive, Destination image, Emotional

Paper type Research paper

1. Introduction
Tourism is a major contributor to GDP – $7.6 tn (10.2 per cent of GDP in 2017), 6.6 per cent of exports and responsible for one in 10 jobs (WTTC, 2017). Muslims are approximately one in seven of the world population and hence a significant sector bound by a common religion. It is estimated that the global Islamic economy is valued at $1.9 tn. However, Muslims do not always pick destinations based on whether it fulfils the halal tourism criteria. Islamic tourism at the broader level embraces concepts at the economic, cultural and religious (conservative) level, though the field is not without some dispute or overlap between terms (El-Gohary, 2016). In fact, Shakiry (2006) defines Islamic Tourism as all forms of tourism except those that go against Islamic values. Muslims also look for popular destinations though being halal-friendly is a competitive advantage (Henderson, 2016), and they may settle for destinations that are Muslim-friendly (Cetin and Dincer, 2016). In fact, previous studies on Middle East nationals show the key motivations to go to the west were socialization, novelty, prestige, shopping, rest and relaxation (Ladki et al., 2002; Michael et al., 2011).

Sandikci (2011) mentions that there is a need to understand how Islam and marketing inform each other and manage the stereotypes that exist between the east and west in relating to images associated with Islam. The term “Islamic Marketing” is new and there is still much academic debate on what it means (Wilson, 2012). Further, Wilson and Grant (2013) state that Islamic marketing should not just be considered a truism, a phenomenon, a noumenon, an ideology or even a paradigm, but it should be a new focal phase torchbearer, in the same fashion as “Green” and “Digital” marketing have previously and continue to do so. Therefore, the study and research in Islamic marketing should become another new strain of marketing (Wilson and Grant, 2012).

This is one of the first studies to use neuromarketing to research Muslim customers’ unconscious emotional responses. Li et al. (2015, p. 805) review methods to assess tourist emotions and conclude “psychophysiological measurement techniques have been reported
in the marketing, advertising and media literature”; however, to the best knowledge of the authors, no studies are reported in the tourism literature. Instead, studies of emotion in the tourism literature invariably use self-report questionnaire methods which capture only tourists’ high-order emotions and are subject to a variety of forms of bias. The unconscious emotional responses can provide unbiased portrayal of individuals’ initial emotional reactions when exposed to a stimulus have been largely ignored. Hence, this paper contributes to the growing field of tourism and consumer behaviour by extending the methodology, by using neuroscience to understand consumer behaviours. The findings can be used by destination marketers to tap into the unconscious bias that exists in consumer minds. We add to the growing literature on Islamic marketing by understanding the comfort level of places (indicated by cognitive load), the preference of media (word, print and video) and emotional response.

This paper is structured as follows: it begins with the abstract and introduction (see above), followed by a discussion of the literature which includes, destination image, destination image and media, destination image research and non-conscious research on images, then moves on to the research methods discussion which includes, bridging the gap in studying tourism using novel neuroscience methods, then onto a discussion on unconscious emotional and cognitive responses to destination images (a discussion from a research methods perspective) and finally onto the main methodology section. Next, the results are discussed, followed by the summary and discussion of the research paper and finally the list of references used.

2. Destination image

Gartner (1994) finds that as competitiveness between destinations increases, the touristic image, will become an important selection factor. The image of a destination is constantly being studied in the field of tourism, marketing, communication and branding; further, it is found to be one of the most investigated topics in the area of marketing in tourism studies (Sun, et al., 2014). “Destination image is defined as an attitudinal construct that is composed by the individual’s mental representation of knowledge (beliefs), emotions, and overall impression of the destination” (Baloglu and McCleary 1999: 870). It (destination image) plays an important role in tourist behaviour throughout a tourist’s experience: in choosing a destination (a priori); in comparing expectations with experience, which precedes the state of satisfaction and perceived quality (in loco) and in revisiting, spreading knowledge of the destination by word of mouth and recommending it to friends and family (Agapito et al., 2013).

Destination image is typically measured using cognitive, affective and behavioural components (Baloglu and Brinberg 1997; Cai, 2002; Lopes 2011; Stepchenkova and Mills, 2010). Over the years, agreement has developed across disciplines and fields that that cognitive image responses impact affective responses (Holbrook, 1978; Lin et al., 2007; Anand et al., 1988; Stern and Krakover, 1993; Russel and Prat, 1980). In this context, Stylidis, et al. (2017) found that the cognitive image component of a destination was found to have a significant positive effect on the affective image component and overall destination image. Further, Veasna et al. (2013) found that a positive destination image enhances a stronger cognitive attachment to a destination; hence, destination image is positively related to destination attachment.

Pike (2002) reviewed 142 papers from 1973 to 2000 on the topic destination image and found that papers on the topic that studied Middle East were few, rarely had competing destinations and mostly looked at countries and only two of the 59 papers looked at local residents. Tasci and Gartner (2007), using Stabler’s (1998) model, suggested that a
destination has three sources of image formation: one source is the “supply-side”, that is, the destination itself, and shows the influence of Destination Marketing Organizations (DMOs). Typically, residents have been categorized in many image studies as part of the supply side (Alcañiz et al., 2005). The second source is “independent” or “autonomous”; these are intermediate factors between the destination and receivers, modifying, enhancing and diminishing the information cues being transmitted, for example, through news articles, educational materials, movies and popular culture. The third source is the “demand side”, or image receivers, who can be various stakeholders, including tourists and residents. This raises interesting questions for this area of research as tourists and locals have different perception of place images. Agapito et al. (2010) find differences in destination image measurement between tourists and locals with respect to the cognitive component while the affective component between the two groups are similar. There is a need for more studies on residents’ local perceptions of their own destination image compared to others as they are key influencers for tourism (Bramwell and Rawding, 1996; Kotsi et al., 2018).

Destination image is a subjective interpretation made by individuals that influences tourist behaviour (Beerli and Martin, 2004; Tasci and Gartner, 2007; Tapachai and Waryszak, 2000). Because images can act as mental short-cuts for information processing used in decision making (Kotler and Gertner 2002), this field is important. A meta-analysis of 152 articles published between 2000 and 2007 find that new methodologies are being used to study DI (Stephenkova and Mills, 2010), but neuroscience was not one of them.

3. Destination image and media

The role of media in brand building has been long recognized, but this has not been systematically studied in the context of place branding. Franzen and Bouwman (2001) concluded that brands reside in the brain through a complex neural network of associations (pieces of information, meanings, experiences, emotions, images, intentions). A destination choice is influenced by the mental images a tourist forms; such images can be based either on expected experiences or ones that appear in mass media depicting the destination or both (Pan and Li, 2011). According to Lee and Gretzel (2012), when tourists form certain conceptions of a destination in their minds, they may become more likely to consider visiting the destination. For example, many people imagine Australia as a place with an unspoiled environment and plenty of nature-based activities, and these images are reinforced by Tourism Australia in their various advertising campaigns. According to Mackay and Fesenmaier (2000), pictures not only present the product (destination) but also can communicate attributes, characteristics, concepts, values and ideas. Mitchell (1986) and Deighton and Schindler (1988) suggested that the visual component is a key ingredient in advertising, which creates an image that then becomes an artificially created differentiation, as product attribute beliefs are formed and influenced.

Mackay and Fesenmaier (2000) showed that before visitation, the destination image is dependent more on visual input than on the destination’s actual features. Day et al. (2002) found that the visual aspects of promotional materials receive more attention, and they illustrate the dimensions of the destination. This means, except for those who actually visit it, the image of a destination is based only on cues that appear in visual messages. Terzidou et al. (2018) research in the field of religious tourism found that when the iconic image of the Virgin Mary was shown on television in Greece it had positive effects on the island of Tinos in Greece, and this can increase the number of religious tourists to Tinos.

Ramsoy (2015) stated that most brand communication relies on the two senses of sight and hearing. Babin and Burns (1997) state that advertisers using pictures, words, sound
effects and, more literally, instructions to imagine, stimulate the mental imagery of viewers. Hence, one of the foremost duties of DMOs is the creation of messages that arouse positive destination images in tourists’ minds and motivate them to visit the destination (Huang et al., 2010).

Media affects brand image and destination image. Traditional media studied is often limited to print and video and more recently social media. Bruhn et al. (2012) find that traditional media impacts brand awareness more than social media, but social media strongly influence brand image. Hence, we need to look at the impact of words, as hashtags (#) are gaining importance and impact brands (Chae et al., 2015). Appiah (2006) found for example, that in the case of internet advertising, respondents were more favourable to audio-video testimonials than either text or picture testimonials or no testimonials. Tussyadiah and Fesenmaier (2009) find that online shared videos can are beneficial as they not only provide a stimulus for mental pleasure but act as a narrative transportation “providing access to foreign landscapes and socioscapes”. Campaigns that are more sensory or use multimedia (videos or interactive displays) will have greater impact though this maybe cultural (Tavassoli and Lee, 2003). There is a need to understand choice of media and its role on consumer behaviour.

3.1 Destination image research and non-conscious research on images

With some exceptions, most empirical research on the destination image supports the premise it consists primarily of two components: cognitive and affective (Crompton, 1979). However, Michael et al. (2018) argued that the framework used by Gartner (1993), who extended Crompton’s (1979) model to include a conative component, provided a more refined explanation of the interrelation between the core constituents of the destination image. Agapito et al.’s (2013) study on tourists to Lagos and Algarve provided empirical evidence supporting Gartner (1993), their Algarve study contributed to a stronger theory of the destination image, developing how tourist images are hierarchically interrelated.

Baloglu and Brinberg (1997) were of the opinion that focusing only on the cognitive component is not appropriate for the study of the destination image and can result in measurement issues, as “the meaning of a place is not entirely determined by its physical properties” (Ward and Russel, 1981, p. 123). Other studies that have used both affective and cognitive components in evaluating the destination image include Baloglu and McCleary (1999), Mackay and Fesenmaier (2000) and Uysal et al. (2000). Most studies in tourism, with the exception of a few such as Agapito et al. (2013) and Michael et al. (2018) have focused only on two components, namely the cognitive and affective. Further, Courbet and Fourquet-Courbet (2014) state that recent research into the influence of advertising and marketing communication has experienced a significant increase in the number of publications dealing with non-conscious psychological processing; thus, both cognitive and affective (emotions) have a major role to play and be researched in destination image.

The reasons that have been attributed for this rise in research dealing with psychological processing methods, include a growing number of communication media, in particular, internet sites and television channels (with the immense growth of cable television), for example, web banners, television sponsorship and product placement in movies, which make low-attention quickly forgotten exposures more frequent (Courbet and Fourquet-Courbet, 2014). For example, Kim et al. (2014), used psychophysiological measures to determine how individuals process two types of advertising communications video and high-imagery audio advertisements concerning mental imagery processing.

Gawronska and Houwer (2014) stress the need for implicit measures over explicit measures such as self-reporting; hence, neuroscience techniques in marketing research
provide deeper insights into unconscious thoughts and behaviour. Further, Courbet and Fourquet-Courbet (2014) found that there has been significant progress in research in social and cognitive psychology that uses implicit measures; this proves that an important part of the psychological activity involved in thinking, judgements, feelings and behaviours is unconscious. This study is innovative the tourism field, in that it uses neuroscience techniques to better understand the processes of the non-conscious influence of marketing communications and their memory, attitudinal and behavioural effects.

Kim et al. (2014) were the first group of researchers to conduct experiments using psychophysiological measures for cognitive and emotional processing, on respondents while they watched destination advertisements. They concluded that because of the wide range of narrative and visual communications commonly used by the tourism industry, travel organizations and organizations within the industry must study how tourists perceive and respond to their advertisements (Kim et al., 2014). The application of neurophysiological methods as adjuvant instruments to behavioural data in marketing research is not entirely new, but has reached the media in the last decade thanks to the use of new imaging methods such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG), as well as the special influence that brain images have on non-neuroscientists (Plassmann et al., 2012; Javor et al., 2013). Hallmark studies include early work by McClure et al. (2004), who demonstrated that specific memory-related neural activity occurred when brand images affected the experienced utility of soft drinks. Further, Knutson et al. (2007) demonstrated that the responses of the brain’s basal ganglia to images of products predicted actual product choice 8-12 s prior to the actual choice and the subjective experience of making a choice. These and other studies have clearly demonstrated that early subconscious brain responses to images of brands and products are related to evaluation, preference and choice. Cognitive, affective and conative dimensions are important for brand engagement and impact brand usage and self-brand connection (Hollebeek et al., 2014). Self-brand connection is the extent to which individuals have incorporated [a focal] brand(s) into their self-concept (Escalas 2004). Study on hashtags find they overlap cognitive and affective components during times of political crisis (Papacharissi and de Fatima Oliveira, 2012).

There are no known studies in tourism on the impact of images, words and videos on cognitive and affective responses. The few studies from neuromarketing show that cognitive load is higher with multimedia because of the fact they may have different capacities of visual and verbal working memory (Plass et al., 2003). Stylidis, et al. (2017) find that the affective component has a higher influence on overall destination image and future behavior.

Tourism researchers are arguably missing the dynamic, performative and communication-dependent character of attitudes by reducing their assessment to tables of means derived from Likert-scale responses (Crang, 1997; Moore and Oaksford, 2002). The relevance of memory research to tourism studies is under appreciated (Braasch, 2008). Working memory, which lasts for only about 30 s without conscious repetition of information, involves the human capacity to attend to auditory and verbal information as well as to visual and spatial material. Enhancing tourism researchers’ familiarity with developments in the study of working memory might assist work on such subjects as the learning of skills, the use of technology and mobile recommender systems and the recall of immediate information relevant to rapid decision making (Gretzel and Yoo, 2008). The multisensory encoding of memories is a rich part of brain-based psychology research on memory. Ethnographic and recall studies could exploit tourists’ recall of taste, sounds and smells more directly (Jacobsen, 2008).
At the broadest level, memory research and studies of the experience economy need to develop not just a short-term relationship but also a long-lasting and mutually engaging affair. Kahneman (2011) claimed that “tourism is about helping people construct stories and collect memories”. More than 37 years ago, Cohen (1979) argued for a four-pronged approach to the study of tourism, built on stressing an emic, processual, contextual and comparative agenda. It is possible to renovate these touchstones for the consideration of tourism studies, at least in the area of considering the behaviour and experience of tourists as informed by psychology inquiry. According to Pearce and Packer (2013), emic views are genuinely driven from the participants’ full frame of reference, and etic perspectives proceed from the researchers’ imposed categories and assessments. Tourism research might benefit from a greater use of emic approaches, which would allow a deeper investigation of the ways tourists see their experiences.

Marschall (2012) states that tourism and memory most obviously intersect in the niche area of tourism, where, for example, historical sites and preserved artefacts, embodiments of collective memory, are commodified to attract tourists. Further, she mentions that the nexus between tourism and memory, both in its individual and collective expressions, is complex and multifaceted. The investigation of this nexus is a neglected field of research that deserves more scholarly attention and a search for useful theoretical frameworks. Such frameworks emerge not from the realm of concrete everyday experience but in the circulation of more collectively held images.

4. Bridging the gap in studying tourism using novel neuroscience methods

DMOs have a great practical need to identify the features of advertising messages that can most effectively persuade consumers to visit a destination. For measuring the effectiveness of messages, numerous advertising and communication studies have established viewers’ attitudes on responses to imagery evoked in advertisements (e.g. Harben and Kim, 2010). Most advertising scholars have investigated results accruing after exposure to ads (Barnes, 2010). Although some advertising scholars are beginning to investigate these mental processes, no efforts using psychophysiological measures have been undertaken in the context of tourism advertisements—a field particularly dependent on imagery-laden advertisements. As a result, the crucial psychological mechanics that bring about mental effects from destination advertising remain unknown, claims have been made that processes occurring inside the brain have not been examined, and this gap needs to be closed. Wilson and Grant (2013) highlight that fact that marketing theory needs to evolve to reflect the lens through which it is viewed.

In Kim et al. (2014), study video ads (i.e. the combination of motion picture and text that evoke mental images) are compared to high-imagery audio ads (i.e. solely audio) with set instructions given to participants to form mental images during exposure to ads) in terms of mental-imagery processing. In the study, the researchers simultaneously measured respondents’ heart rates, skin conductance and self-report data to explore how media messages persuade potential tourists. Processes occurring inside the brain that heretofore have not been examined in the context of tourism advertisements will be investigated in this present study.

The destination study by Kotsi et al. (2018) investigated the UAE’s need for place branding; they suggest that future research should look at alternative research methodologies such as neuromarketing to understand place attachment through represented visuals and audio signals, as this would cut across language barriers. As Wilson (2012: 6) iterates, Islamic marketing can look at:
A multi-layered, dynamic and three-dimensional phenomenon of Muslim and non-Muslim stakeholder engagement, which can be understood by considering the creation of explicit and/or implicit signalling cultural artefacts – facilitated by marketing.

Although traditional research methods are highly valuable for understanding conscious and narrative elements of destination branding and travel choices, emerging disciplines such as neuromarketing provide valuable insights into the direct and unconscious responses of consumers.

According to Kotsi et al. (2018), the inclusion of neuromarketing in tourism studies would yield two contributions to the understanding of destination branding. First, neuromarketing is a theoretical framework that provides researchers with a novel understanding of consumer attention, emotion, cognition and motivation, and it would allow researchers to gain a more comprehensive understanding of conscious and unconscious drivers of destination branding. Second, it provides a new toolbox (or novel tools to go into an existing toolbox) with which researchers can assess unconscious emotional and cognitive responses with an unparalleled granularity, which would allow a precise understanding of how these responses unfold over time underneath consciousness. Thus, there is a need for ways to assess conscious and unconscious responses in destination branding and a deeper understanding of consumers’ brand association processes for destinations (Kotsi et al., 2018). This is all the more important in studying Islamic marketing, as it is deeply rooted in culture, its communication (Wilson, 2012) and its interpretation. This present study presents an approach in which state-of-the-art neuroscience tools and analyses have been used to study emotional and cognitive “gut responses” as well as related characteristics of destination image responses.

5. Unconscious emotional and cognitive responses to destination images

Recent advances in cognitive and affective neuroscience have provided new tools and models for the study of unconscious emotional and cognitive responses and understanding human thought and action. This has led to the recent emergence of multidisciplinary efforts, going under such headings as “neuroeconomics” and “neuromarketing”. These approaches hold out the promise of an unparalleled approach to understanding and measuring unconscious drivers of human decision making. Indeed, early studies demonstrated this feasibility. For example, McClure et al. (2004), found that brands imbue value to an otherwise anonymous soft drink by recruiting key memory structures of the brain. Even more tellingly, Knutson et al. (2007) reported that the brain already responds during product perception and, seconds before actual and experienced volitional choice, predicts actual choice, suggesting that unconscious brain processes occurring during product viewing had a significant impact on actual choice. Together, these and many subsequent studies have demonstrated that unconscious brain processes may supersede or create conscious preferences and choices.

Beyond providing a toolbox and empirical evidence for unconscious decision processes, applied neuroscience offers a novel take on our understanding of preference and choice. Recent theoretical contributions have changed the way that we understand human decision making in various contexts, including how values are perceived, represented, remembered and affect decision processes (Plassmann et al., 2012). Indeed, several studies have shown that even when participants report making only random choices, brain responses show a clear learning effect that systematically biases choices, supporting the notion that the brain contains at least two parallel motivation systems, one unconscious and one conscious. In the behavioural economics literature, these have been referred to as System 1 and System 2, respectively (Gardner et al., 2012). In the neuroscience literature, the valuation of options
shows a similar distinction between an unconscious “wanting” system and a conscious “liking” system (Berridge, 2009).

The inclusion of neuroscience in the study of different forms of human decision making has made substantial contributions to our ability to measure, understand and predict choice behaviours, including in emerging new disciplines such as neuromarketing and consumer neuroscience (Morin, 2011). By the same token, the study of consumer perception, preference and choice of travel destinations – reasonably categorized as consumption behaviours – should include theoretical consideration and empirical study of the unconscious emotional and cognitive processes underlying destination choices. However, this has been woefully lacking. To understand how direct and unconscious emotional and cognitive responses underlie travel destination preferences, we conducted an applied neuroscience study using hardware-enabled eye tracking and neuroimaging techniques.

6. Methodology

This neuromarketing study on destination image investigates the third source of image formation, that is, the “demand side”, the image receivers, in particular local citizens Tasci and Gartner (2007), of the United Arab Emirates (UAE) referred to as Emiratis. UAE is a Muslim country, part of the GCC and home to one of the top global cities – Dubai. UAE has 200 nationalities residing in the country and only 15 per cent of the population is local. Emiratis are themselves active travelers. This paper uses neuromarketing to identify what images Emiratis more responsive. The limitations of this paper are that Emiratis maybe more homogenous in their practice than in other countries and the cultural relevance of some of the symbols may be more context specific or shaped by media than by religion. Kotsi et al. (2018) stress in their study, the need to designing destination brand studies using a local perspective. In their study, Braun et al. (2013) highlighted that residents play three key roles in place branding:

1. through their characteristics and behaviour;
2. as ambassadors for the place giving credibility communications on place; and
3. as citizens and voters who are vital for the political legitimization of place branding.

Stylidis, et al. (2017) encourage researchers to investigate local residents as a group when conducting destination image studies, as they feel that tourism research has not yet developed in terms of predicting the overall destination image of local residents.

The participants were recruited through a message board aneived the required sample size for a study of this type. Thirty Emirati (nationals of the UAE) participants, consisting of equal numbers of males and females (15) were recruited and signed an informed consent. Some of them were full time students at a local University, some were working full time and part-time students.

Each participant was positioned in front of an eye tracker and computer screen, and brain-scanning equipment was mounted; then, each participant underwent eye-tracking and neuroimaging calibration procedures. We used a Tobii T60XL eye tracker and an ABM X-10 EEG brain scanner, both running iMotions v5.1 in a Windows 7 environment. Eye-tracking calibration was done with a nine-point fixation test and the EEG calibration was done using functional localizer tests based on the ABM B-ALERT calibration process. This calibration procedure allows reliable tracking of emotional and cognitive responses over time.
To better understand consumers’ unconscious responses to possible travel destinations, we ran a $3 \times 5$ factorial design, with the factors being stimulus type (images, printed names and videos) and travel destination (Dubai, Abu Dhabi, Hong Kong, NY and London). These locations – Dubai, Abu Dhabi and London are familiar destinations (London – www.souqalmal.com/financial-education/ae-en/5-popular-holiday-destinations-for-uae-nationals/). Hong Kong and New York were chosen because of their knowledge of the cities but also to see contrasts in behaviour. The students were business student so they have an idea of the potential of these cities as economic gateways and also understand the tourism pull. The images chosen for the experiment were the most popular from the internet. Iconic images and culture were chosen. The videos came from the latest destination campaigns.

Each participant was presented several images and videos from travel destinations. Each stimulus (videos, images, and place names for each city) was presented for 8 s with a randomly jittered inter-stimulus interval of 1-2 s. The destination images and videos were pre-selected as the most representative of each city, based on a collective agreement by three independent raters. Each place name was also created as independent stimuli, using Times New Roman black text on white background. After the test, all participants underwent a survey, which assessed their conscious preferences and destination associations. The still images of travel destinations included the following:

- **Abu Dhabi**: Three still images – Abu Dhabi Falconary, Sheikh Zayed Mosque and Camel Trekking.
- **Dubai**: Five still images – New Year fireworks in Dubai, Burj Khalifa, Burj Al Arab, Dubai Creek with people on Abras and HH Sheikh Mohammed bin Rashid Al Maktoum.
- **Hong Kong**: Two still images of Hong Kong was used – Its famous night skyline and Temple Street.
- **London**: Two images of the Big Ben and famous Harrods.
- **New York**: One image and video each of The Statue of Liberty, and Times Square were the images shown to respondents.
- **Singapore**: Three images shown – its famous outdoor restaurants, Merlion statue at Merlion Park and shopping at Pagoda Street.

This allowed us to analyse the main effects of media type and destination separately, as well as possible interaction effects. In this context, this study is the first in tourism research to use neuroscience equipment to study unconscious emotional and cognitive responses.

Below are links to some of the travel and tourism related websites that were used in the experiments:

- [www.youtube.com/watch?v=17tVhX0AdAg](www.youtube.com/watch?v=17tVhX0AdAg)
- [www.youtube.com/watch?v=NLmzO_oN4pY&index=2&list=PLI22ogTfqzcq1TJLRMsK-yW-PIGHIDIF1](www.youtube.com/watch?v=NLmzO_oN4pY&index=2&list=PLI22ogTfqzcq1TJLRMsK-yW-PIGHIDIF1)
- [www.youtube.com/watch?v=PteWqZsuzaE](www.youtube.com/watch?v=PteWqZsuzaE)

All data were integrated and synchronized using the iMotions biometric platform, pre-processed using R v3.2.1 ([www.r-project.org](www.r-project.org)) and analysed using JMP v11.02 ([www.jmp.com](www.jmp.com)) running on Mac OS X v.10.11 ([www.apple.com](www.apple.com)). After pre-processing, EEG data were transformed into selected NeuroMetric scores, including Emotional Arousal, Emotional Motivation and Cognitive Load. Each participant’s benchmark was used as a calibration file upon which EEG data were normalized to scores ranging from zero (minimum) to one.
Emotional Arousal is a bivalent score that shows peak values for highly positive and highly negative events and low scores for neutral emotions. Thus, Emotional Arousal denotes emotional intensity but does not contain information on the actual direction of the emotional response (Gilet and Jallais, 2011). Below Figure 1 shows what elements of the study are being tested.

Emotional Motivation relates to the direction of emotional responses; scores higher than 0.5 indicate positive scores and “approach motivation” (Gilet and Jallais, 2011). Conversely, scores lower than 0.5 denote negative emotional responses and “avoidance motivation”. Together, the arousal and motivation scores provide a two-dimensional score for emotional responses. Finally, Cognitive Load is a working memory metric, indicating the amount of information being held at any one moment (Baddeley, 1992). The higher the Cognitive Load score, the more information is contained in working memory. Scores up to 0.65 are indicative of processing within capacity, while scores that exceed 0.7 are indicative of information overload. In the present context, brief exposures to images, words and videos generate immediate associations and cognitive responses (in addition to emotional responses), and here a higher Cognitive Load scores can be seen as indicative of a higher degree of associations.

7. Results
7.1 Emotional responses
It was found that emotional arousal was affected by the type of stimuli and the destination of interest. The overall model was highly significant ($R^2 = 0.277, p < 0.0001$) and had effects as shown below (Table I). There was a main effect of destination, where New York showed the strongest emotional response, followed by Dubai, London, Hong Kong and Abu Dhabi (Figure 4). There was also a general effect of media type, where videos, in general, produced the strongest responses, followed by images, and then words had the lowest responses. Finally, there was an interaction effect between destination city and stimulus type. We found that the strongest emotional arousal was found for videos of New York and that the lowest emotional response was for the word “Dubai” compared to all other videos, images

![Figure 1. An overview of the metrics from eye-tracking and neuroimaging. Visual attention is derived from quantifying visual fixations as assessed by eye-tracking. Emotional measures are based on two dimensions, arousal (intensity) and motivation (direction), while cognitive load is a measure of working memory demand.](image-url)
and place names of the other cities. These results demonstrate that emotional arousal, the intensity of emotional responses is driven by main effects of destination and media type and that some emotional responses are specifically high or low for specific media.

For many cities the highest emotional arousal response was found for videos (e.g. New York and London) whereas other cities this difference was more even or even different (e.g. Abu Dhabi, Hong Kong). Bars represent mean arousal score, whiskers denote 95 per cent confidence interval.

7.2 Emotional motivation

The differences in Motivation – the direction of emotional responses – were less pronounced than those for Arousal, but had the main effect of media type: videos were slightly more motivating than images and words. Importantly, items from Dubai demonstrated the highest Motivation response, significantly higher than other places, such as Abu Dhabi, Hong Kong and New York, but similar to London (Table II and Figure 5). We found no interaction effect, or at best a trend effect; this suggests that Motivation responses do not change according to media channel (images, videos or words). Taken together, this demonstrates that there are significant differences with respect to emotional motivation and direction in how consumers respond to different places. Although there was a main effect of media type, the lack of interaction effect between media and place suggests that consumers respond to certain places in the same way regardless of media type.

An Arousal and Motivation Matrix (Figure 6) allows us to pinpoint the nature of the differences between each place and better visualize and understand how different places relate to each other. In general, all scores higher than 0.5 on the x-axis (Motivation) indicate a more positive emotional response, and thus an “approach” motivation. Conversely, scores

**Notes:** Results on city and stimulus effects: LEFT: There were significant differences on emotional arousal between different cities, where New York produced the strongest emotional arousal and Abu Dhabi produced the lowest arousal. RIGHT: Significant differences were also found for stimulus type, where videos created the highest arousal, followed by images and then words. Bars denote the mean score, whiskers represent 95 per cent confidence interval.
lower than 0.5 tentatively indicate negative emotions and an “avoidance” motivation. For Arousal, on the y-axis, a higher score denotes a higher arousal.

The Arousal–Motivation Matrix shows how different scores are related to each other. In general, higher Motivation is indicative of higher engagement and interest, and higher arousal is an amplification of this. As this plot shows, destination scores depend on the type of stimuli that are being used. For example, Dubai scores high on Motivation for videos and words but not for images. This suggests, for example, that place-branding communication is particularly strong for Dubai.

### 7.3 Cognitive load

We find significant differences in Cognitive Load among regions and among communication types/channels. Here, we find that Dubai is among the top scorers, with a high Cognitive Load, similar to New York, beaten only by Abu Dhabi (Figure 7). Among channels, words are the most mentally taxing (high Cognitive Load) whereas videos are the least taxing.

<table>
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<th>DF</th>
<th>F Ratio</th>
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**Table I.** EEG Data for Emotional response

**Figure 3.** Mean arousal versus region

**Notes:** Interaction effect between destination and stimulus type. For many cities the highest emotional arousal response was found for videos (e.g. New York and London) whereas other cities this difference was more even or even different (e.g. Abu Dhabi, Hong Kong). Bars represent mean arousal score, whiskers denote 95 per cent confidence interval.
Figure 7. If Cognitive Load indicates the number and spread of associations, this suggests that Dubai and New York are the cities that generate the greatest number of associations and for which words generate the most associations. A high cognitive load is indicative of cognitive processing and mental taxation. Too low of a score (e.g. below 0.4) is indicative of dullness and even boredom, whereas scores that are too high (typically above 0.7) are indicative of mental stress and information overload. The scores given here are indications that people have mental processes and associations that differ among destinations. The actual contents of these associations should be explored in subsequent studies.

There is also an interaction effect, in which we see that Cognitive Load is particularly high for the word Dubai and particularly low for images from Hong Kong. This suggests that people’s immediate and unconscious cognitive responses and associations are different for different travel destinations. This is a general effect, but it also demonstrates that particular destinations are more mentally taxing when presented via one channel.

**Table II.**

<table>
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<th>Source</th>
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**Notes:** Differences in frontal asymmetry (“motivation”) scores between cities and stimulus type. *LEFT:* Significant differences in motivation responses are found between cities where Dubai scores highest and Abu Dhabi lowest. *RIGHT:* Differences on motivation between stimulus type, where the highest score is for videos. Bars represent mean value, whiskers represent 95 per cent confidence interval.
8. Summary and discussion

To the best of our knowledge, this is the first applied neuroscience study in tourism research. We have laid out a feasible approach for how eye tracking and brain scanning can be used to better understand the underlying unconscious emotional and cognitive processes that affect consumer thought and action. Although it is a feasible study, beyond this, we identify key differences in emotional response profiles to key urban travel destinations. In the emotional domain, we see that different destinations may have high levels of motivation response (such as Dubai), whereas others may produce high emotional arousal (such as New York). While the nature of these emotional responses differ, it is likely that they would also manifest as overt behavioural preferences and choices. Indeed, several lines of research have
demonstrated that both arousal (Groeppel-Klein, 2005) and motivation (Ravaja et al., 2012) are highly related to actual purchasing decisions (Coan and Allen, 2003).

Second, we identify general emotional and cognitive differences between the channels through which travel destinations are presented. Words about and names of travel destinations cause higher cognitive loads, which may not be surprising, given the greater associative load that words have than images. Conversely, videos cause the largest increase in emotional responses (most pronounced in arousal, but also found in motivation), suggesting that this medium is more emotionally engaging and positive than other media channels. Emotions play an important role in a range of behaviours, including attention, memory, perception and physical action, and they can be expressed behaviourally, linguistically and physiologically. A long-standing assumption within psychology is that preferential links exist between emotions and mental imagery about other forms of processing (e.g. Conway, 2001; Kane et al., 2001; Holmes et al., 2009).

Of particular interest is the hypothesis that images evoke stronger affective responses than verbal representations. However, as previously noted (Holmes and Mathews, 2005), empirical evidence for this assumption seems surprisingly sparse. In their research experiment, Holmes et al. (2009) predicted that integrating word–picture stimuli using imagery would be associated with greater self-involvement with the stimuli and stronger associations to autobiographical memories. Presumably, the heightened emotion experienced from imagery enhanced evaluative learning. Finally, content analysis showed imagery descriptions to be more strongly emotionally valenced than sentences. This evidence strongly suggests that mental imagery has a more powerful impact on emotion, both in a positive or negative direction, than verbal processing of the same material. The results
described provide the clearest evidence of which we are aware that imagery does indeed have a significantly stronger impact on emotion than verbal processing. Theoretically, it seems plausible that specialized emotional systems might have greater preferential links to brain regions involved in perception and imagery than brain regions subserving other types of representation, such as language, which evolved later (Holmes et al., 2009).

It has become clear that conscious decisions are too demanding to take place with every judgement. Rather, emotional and cognitive brain responses that occur unconsciously have long been known to have a role in conscious preference and actual choice. The present study and the context provided here suggest that decisions on travel destination have an unconscious component and a direct component that may drive or affect overt preference and actual choice. Indeed, in the context of the type of decision we often consider travel choice to be, namely, a deliberate, conscious process, and these findings imply a subconscious component that warrants further study. This reinforces the argument put forward by Wilson and Liu (2011) that there are limits on how far brand managers can push more emotionally led brand messages and when promoting Islamic brands, there is a need to understand the target audience and the type of Islamic brand.

In future multidisciplinary studies, we see at least two broad trends. On the one hand, studies rooted in tourism research should seek to map out the relative impact and role that unconscious processes have in determining the consumer journey in making choices of travel destination. Here, understanding the relative role of attention, emotion and cognition in driving choice is likely to affect the theories, models and understanding of tourism research.

On the other hand, neuroscience research can consider tourism behaviours as valid vehicles for typified behaviours that can be used to understand the workings of the brain. Destination images are multifaceted phenomena that refer to a common target: the destination. Thus, tourism research may indeed be a suitable field for understanding the brain bases of complex preference formation and choice. Various researchers have found that a destination image is typically measured using cognitive, affective and behavioural components, and further stated that the cognitive image component of a destination was found to have a significant positive effect on the affective image component and overall destination image (Stylidis et al., 2017). Therefore, this research which has introduced brain scanning can be used to better understand the underlying unconscious emotional and cognitive processes that affect consumer thought and action. An understanding of what goes on in the human unconscious mind is very important for destination marketers, this can help in the integrated marketing communication process to create a destination image and brand.

Finally, before any new concepts or fields such as neurotourism are founded, we urge that this paper, an attempt to understand specific mental processes in human tourism behaviours, be taken into account. We have found no need to invoke special concepts or append any prefix to anything to describe these efforts. Indeed, we suggest that in the types of processes shown in tourism behaviours and unconscious emotional and cognitive responses are natural processes that need to be studied and understood, not as special cases, but embedded as natural parts of tourism research. After all, because this field concerns human behaviour, it encompasses these unconscious processes as naturally occurring, valid targets, which are perhaps more predictive of actual choice and action than overt, conscious and narrated responses.

References


Holmes, E.A., Lang, T.J. and Shah, D. (2009), “Developing interpretation bias modification as a “cognitive vaccine” for depressed mood: Imagining positive events makes you feel better


Emotional and cognitive responses

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Further reading


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