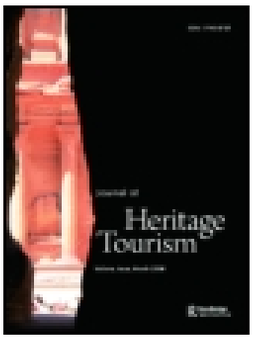

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Effects of heritage on destination image: multi-method research based on an appraisal approach to emotional response in-situ

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ABSTRACT

The research objective is to test the effects of heritage on the Tourist Destination Image formation. A multi-method quantitative approach applying surveys and neuromarketing were applied. Three different surveys were carried out in three different moments of the touristic visit to measure the heritage impact on the dynamics of destination image. Furthermore, a neuromarketing experiment using electroencephalogram and virtual reality were carried out to measure the emotional and cognitive responses to heritage and their effects on the TDI formation. Results show, either the surveys or the neuromarketing experiment, a clear emotional response to heritage that, indeed, has a positive effect in the cultural destination image. The conclusion suggests a line of research for the development and improvement of TDI models for cultural destinations which would incorporate the in situ emotional response in an appraisal approach to emotions.

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Cultural tourism; tourist destination image; cognitive-emotional dimensions; appraisal approach to emotions; emotional response in situ; neuromarketing

Introduction

Studies of tourist image that have been published in the last decades corroborate the importance in marketing of tourist destination image formation (see Chon, 1990; Morgan & Pritchard, 1998; Baloglu & McCleary, 1999a; Beerli & Martin, 2005; Rodríguez del Bosque & San Martín, 2008; Prayag et al., 2017; Hosany et al., 2017). These consequences or implications show its importance as a study of marketing as well as its potential for improving marketing management, based on the measurement of the image and positioning of a tourist destination (Echtner & Ritchie, 1991; Royo-Vela & Serarols, 2005; Royo-Vela, 2009; Stepchenkova & Morrison, 2008). At this point, it seems convenient to call attention to Echtner and Ritchie's opinion (1991, 1993), in considering it necessary to establish conceptual frameworks and more adapted and specific methodologies when undertaking the chore of measuring the image of a destination, given the diversity or heterogeneity that exists in the tourist product. In this sense according to Lai and Li (2012), Tourist Destination Image (henceforth TDI) model conceptualizations may reflect or represent different facets of the TDI reality and therefore these should be complementary rather than competitive.

As an introduction it is worthy to say that cultural and heritage tourism is of great importance in most European countries, especially countries like Portugal, Spain, Italy, France, Germany, Austria, Great Britain, Ireland, Greece among others, where history and pre-Roman, Romanesque, Gothic, and Renaissance and later art and architecture had their presence and subsequent development in

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rural and urban areas. According to Kim et al. (2017), to understand the relationship and effects between culture and tourism is an interesting and necessary research topic. In this line, Galí (2012) pointed out that cultural tourism needs more research to understand how tourists interact with heritage and consequently to identify the main areas that tourism management should consider. Since an important part of the tourist product can be culture and heritage, cultural tourism plays a fundamental role both in the attractiveness of destinations and its image (Huete-Alcocer et al., 2019). Thus, the contribution of cognitive and affective images to the image of a destination can be related to its local heritage (Huete Alcocer & López Ruiz, 2020). Intangible culture as well as the tangible culture such as historical and architectural heritage can increase the cognitive and emotional response, in situ, to a destination and consequently, its image, its attractiveness and its competitiveness (Folgado-Fernández et al., 2017; George, 2017). It can be said that relevant cognitive and emotional variables of the destination image can be intensively generated through the historical, architectural and cultural heritage of cities (Royo-Vela, 2009; Garzón-Paredes & Royo-Vela, 2021). However, more research is needed to clarify the effects of heritage on the visitors' cognitive and emotional responses and those on the image of the heritage destination along the visit.

Logically, because of peculiar aspects of the destination that can be considered as cognitive or emotional, these components seem to be appropriate for measuring that image. In this respect, the TDI components mostly accepted by the academy are two: the cognitive, i.e. functional or tangible items, and the affective or emotional, which includes both, psychological responses and psychological or intangible aspects. These two components, according to academia (see later), work sequentially in forming the image and the emotional component is measured, unlike the cognitive component, using a global and dimensional approach. In this paper, we will use the term and concept of emotions, as different to affections, attitudes, or moods (Bagozzi et al., 1999). A clear definition on what an emotion is does not exist yet. For some theories, emotion is separate from and even precedes cognition, while for others, some cognition is needed for an emotion to occur. According to cognitive theories, some cognitive activity in the form of cognitive response, conscious or unconscious, involving or not conceptual processing, is necessary for an emotion to occur (Lazarus, 1991; Frijda, 1986, 1993). In the appraisal theories of emotions, appraisal or evaluations, estimations of an event or situation elicits emotions. In other words, an emotion results from a cognitive and conscious process in response to a stimulus or event (LeDoux, 2012a, 2012b) and can be diverse and complex in tourist experiences, unlike dimensional and valence approaches applied in tourism research that reduce the set of emotions that can appear in a visitor.

The emotional component is far from being used in tourist destination research when compared to the cognitive one. As Prayag et al. (2017) explain, empirical research in tourism relating to emotional responses and destination image is scarce, while a skewed focus on the cognitive components stands out in the TDI literature (Mak, 2017). Regarding the emotional component and until the work by Hosany and Gilbert (2010), a much less analytical, involving only two or four items and more synthetic or aggregate measurement, only one component is used for both conceptualizing and measuring this dimension. According to Nghiem-Phu (2014) and his literature review on destination image studies, these two or four item scales have been widely applied in destination image research. Furthermore, the emotional scales mostly used in TDI research are reliable and valid, in measuring the TDI emotional dimension a posteriori, after the visit (Hosany et al., 2021) rather than in situ.

For these reasons, this research establishes a research objective to get insights into the dynamics of the image since it may change during the visit in heritage destinations, the structural relationships between the cognitive and emotional - emotional response in-situ to cognitive stimulus - variables of the TDI construct, since this is not clear, the sequence of cognition–emotion and to measure the emotional component in a global and dimensional way, instead of a more analytical approach. Finally, to observe and measure whether heritage elicits an intensive emotional response in the visitor with effects on the image.

The tourist destination image

An important set of studies in tourism marketing literature (Baloglu & Brinberg, 1997; Baloglu & McCleary, 1999a, 1999b; Gallarza et al., 2002; Beerli & Martín, 2004; Royo-Vela, 2006, 2009; Nghiem-Phu, 2014; Mak, 2017) tend to consider that the image is a concept that is generated through cognitive and affective interpretation of the consumer and result from the combination of two components which are closely interrelated. Cognition, which includes perceptions, beliefs, knowledge, thinking, cognitive response that individuals have about the object and its attributes and, emotion, which includes emotions that can be observed through the emotional response towards the first component or towards the destination itself in the same subject.

The relationship between cognitions, emotions and overall image of a tourist destination is as follows: the cognitive component affects the overall image directly and indirectly through the emotional component and, in turn, the emotional component influences the global image (Baloglu & McCleary, 1999a and 1999b; Nghiem-Phu (2014); Mak, 2017; Stylidis et al., 2020). That is, the emotional component mediates between the cognitive component and the overall image in the model based on two dimensions, the cognitive and the emotional. Along with this, as a model of image formation of a destination (Baloglu & McCleary, 1999a; Beerli & Martín, 2004), the image formation depends on antecedents or the stimulus factors that were used, for example, the variety, the number and types of information sources (see Beerli & Martin, 2005), motivations or reasons for the trip, previous experience on the destination and personal characteristics such as gender, age or education level (see Nghiem-Phu (2014)).

Regarding its measurement, Echtner and Ritchie (1991) explain that destination image research depends heavily on quantitative studies using structured questionnaires. The research conducted on the subject allows setting, together with the open-ended question to identify the holistic component, two structured approaches when measuring the image of a destination. Both can, and usually include a closed question to measure the overall image. The first is based on assessment of individuals about a destination using a list of attributes characterizing it. The request for assessment may take place before, during or after the visit (Galí & Donaire, 2006). The second approach has the same basis as the first but also individuals are asked to establish the attribute importance to them.

Lately, post-positivist and phenomenologist approaches to the measurement of the image have appeared in the literature. They have been used to identify organic image using open questions in questionnaires online. Respondents were asked to narrate the image of a destination visited. This approach is proposed as complementary to the usual one as well as a new future research trend (Govers, 2005a, 2005b, 2007). The same can be said about the most recent User Generated Content (UGC) analysis or the analysis of texts and photographs applying content analysis (Marine-Roig & Antón, 2016), machine learning (Arefieva et al., 2021) or data mining (Arabadzhyan et al., 2021) uploaded or written by a tourist in social media such as Airbnb, Facebook, Tripadvisor, Instagram or Flirck (Mariné-Roig, 2017, 2019; Lalicic et al., 2021; Galí & Donaire, 2015; Donaire et al., 2014; Arabadzhyan et al., 2021; Sharifi Shahrezaei et al., 2020; Pan et al., 2014; Kladou & Mavragani, 2015; Zhou, 2014).

However, as it will be verified later, the cognitive and the emotional dimensions, when measured in situ, need not be neither independent/mediating nor sequential. In other words, instead of talking about cognitive and emotional components or two-dimensional image constructs, it would be more precise to talk about a cognitive-emotional dimension. The image would consist of several factors that would agglutinate, logically, variables of cognitive and emotional nature, the latter representing the emotional response in-situ to some cognitive stimuli or events appraisal in the destination as well as a global post visit affection for the destination.

The cognitive component or cognitive/perceptual image of a tourist destination would be generated based on a basket of attributes that correspond to resources, attractions, facilities, infrastructure, cultural and social factors or touristic services supply in general available to the destination (MacCannell, 1976; Stabler, 1995; Alhemoud & Armstrong, 1996). The cognitive component in a

cultural or heritage destination may include the historical and cultural heritage and architectural harmony and aesthetics, cleanness and quietness and complementary tourism infrastructure and services such as retailing commerce, restoration or accommodation (Royo-Vela, 2006). Belonging to the cognitive component, it is worth mentioning the concept of authenticity related to these cultural and heritage destinations. Authenticity plays a direct role in the perceived image construction by visitors, and it is subjective in nature, although based on perception of objective and real heritage entities (Marine-Roig, 2015). The following hypothesis is set (see Figure 1):

H1: the cognitive response to heritage affects positively the heritage destination image

Emotional responses are different from the cognitive or functional attributes, but are directly associated or related, forming the emotions from cognitions in a traditionally accepted, hierarchical or postponed process (Russell & Pratt, 1980; Baloglu & Brinberg, 1997; Baloglu & McCleary, 1999a; Beerli & Martín, 2004; San Martín & Rodríguez, 2008, Nghiem-Phu, 2014). Even though the belief that cognition precedes emotion has been debunked from other fields such as psychology (Zajonc, 1980), neuroscience (LeDoux, 1989), advertising research (Ambler & Burne, 1999) or questioned in a neuromarketing experiment (Garzón-Paredes & Royo-Vela, 2021, p. 2022), the cognitive appraisal of emotions (see Hosany et al., 2021) is the approach that we take in this research on emotional response in situ.

Given the association between cognition and emotion, it is worth separating the two components so it is possible to know which cognitive attributes are the cause or antecedent of a particular emotional response. Moreover, emotions are a prime motivator of purchase behavior (Royo-Vela, 2005) and choice of a particular destination, and may even exert a greater influence on tourist behavior than the cognitive component mentioned above (Baloglu & McCleary, 1999a; Baloglu & McCleary, 1999b; Kim and Yoon 2003; Pan et al., 2014). Huete Alcocer and López Ruiz (2020) and Huete-Alcocer et al. (2019) found in heritage destinations that the affective component is more relevant than the cognitive one in the image formation.

The conceptualization of the affective dimension of tourist destination image is based on the work of Russell on the cognitive structure of affect (Russell, 1980) and his bi-dimensional and bi-polar affect space. This space results in four dimensions representative of eight bipolar affective states (stimulating-boring, pleasant-unpleasant, happy-sad, relaxed-anxious) (Russell, 1980; Russell & Pratt, 1980; Russell et al., 1981). Subsequent work has confirmed that only two dimensions, representing the vertical and horizontal two-dimensional space would be necessary

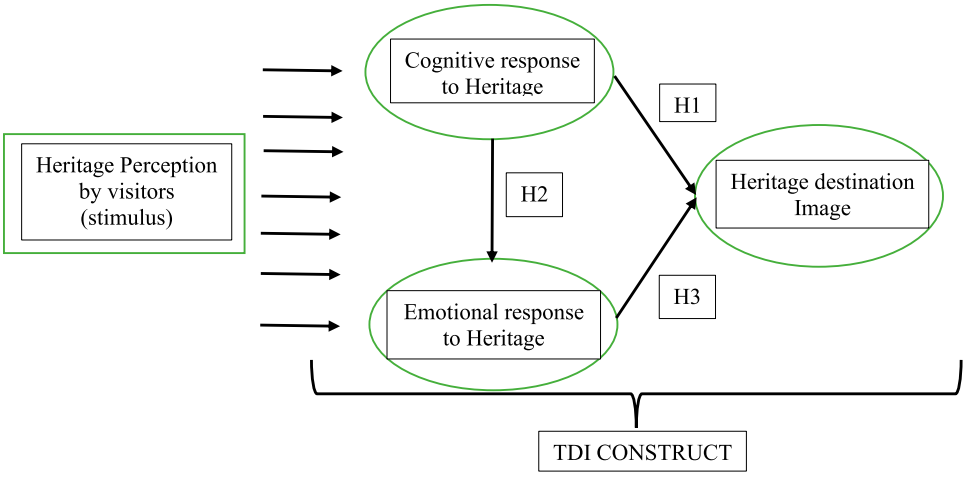

Figure 1. Conceptual framework and hypotheses.

to measure or represent the affective component of the image of a tourist destination – stimulating-boring, pleasant-unpleasant (Walmsley & Jenkins, 1993).

Hosany and Gilbert (2010) realized that the existing proposals from psychology or marketing to measure emotions fail in capturing the variety, complexity and intensity of a visitor's emotional responses towards touristic destinations, which are also very diverse. The result was a three dimensional scale of emotional experiences that measures joy, love and positive surprise, in the form of a 15/items scale representing emotions. The scale was validated again some years later by Hosany et al. (2015).

The dimensional measure of emotions is useful for a posteriori or post visit situation in which a global affection towards the destination may remain or be remembered. However, this oversimplifies the emotional experience within the destination (Hosany & Gilbert, 2010, Hosany, Martin and Woodside, 2021). Tourist destinations are rich in terms of experiential attributes, and the potential to evoke an emotional response is even greater than in other non touristic places (Otto & Ritchie, 1996). As Pan et al. (2014) state regarding tourist destinations, there are emotions such as arousing, exciting, pleasant or relaxing that can be generally associated with some specific destination cognitive attributes generating the affective image. According to Hosany, Martin and Woodside, (2021), researchers should develop context-specific emotional measures and research should attempt to capture in situ (on-site) tourists' emotional responses and compare the results with post-visit global evaluations.

More recently and complementarily to self-reports, the use of psychophysiological techniques allow us to measure in real-time physiological and brain responses to stimulus (Bastiaansen et al., 2018; Royo-Vela & Varga, 2022), such as to identify which scenes in marketing or tourist visual stimulus are most successful in eliciting emotional responses (Li, Scott, and Walters 2014; Moyle et al. 2019). Images evoke stronger affective responses than verbal representations (Ramsoy, Stephens and Kotsi, 2019). Furthermore, as stated by Kim et al. (2014), psychophysiological-measure studies can provide valuable information that simply cannot be derived from conscious introspection or self-reporting. Among these neuromarketing techniques, electroencephalography (EEG) stands out in suitability for researching marketing or tourist stimulus and emotional responses to them (Royo-Vela & Varga, 2022; Luck, 2014). According to Ramsoy et al. (2019), brain scanning can be used to better understand the underlying unconscious emotional and cognitive processes that affect consumer thought and action. Bastiaansen et al. (2018) in researching emotional responses to destination images including popular destination movies as the stimulus, concluded that EEG-based neuromarketing is a valuable tool for evaluating the effectiveness of destination marketing. In later research, Bastiaansen et al. (2022) recorded emotional responses to destination pictures before and after viewing a destination TV commercial from participants' brains using EEG. For the participants who watched the destination TV commercial, emotional responses measured by event-related potentials (ERPs) were larger (larger P2 and LPP) in response to destination pictures viewed after compared to before having watched the TV commercial. This effect was not observed in the control group. In a behavioral version of the same experiment, they did not observe any effects in the self-report data. They concluded that ERP methodology is a useful tool for tourism marketing researchers.

According to Royo-Vela (2006), the emotional response must be considered simultaneously with the cognitive stimulus in measuring both components of the image in-situ, avoiding aggregate or overall emotional components, which is more accurate for post visit and global appraisals. In this measurement, the researcher must take into account sufficiently numerous sets of emotional responses to particular cognitions (Royo-Vela & Sararols, 2007). This approach involves, as discussed above, understanding the destination image construct as dynamic and one-dimensional taking together cognitions and emotional responses in each one of the latent variables in which image can be structured. The following hypotheses are set (see Figure 1):

H2: the cognitive response to heritage generates corresponding emotional responses

H3: the emotional response to heritage affects the heritage destination image. The higher the emotional response to heritage the better the heritage destination image

Methodology

The method used in the present investigation is a multimethod one. Thus, two phases, both quantitative, have been used. The first consists of personal surveys with a structured questionnaire applied to three different samples in the same tourist destination, a monumental city, Girona in Spain. The city of Girona was selected for the following reasons, first, it is a representative city of the model of European monumental cities – medieval, walled, cathedral city, with an important heritage and historical legacy. It clearly responds to the city model of the study area defined in this research, second, it is also a tourist city and, specifically, has cultural tourism. The heritage assets that most visitors perceive are of prime order: Sant Feliu Church, Arabs baths, San Pere Galligants Church, Girona Cathedral, Old Wall, Jew Quarter or Agullana Palace. The second (see below), complementary phase, is to use EEG to measure emotional responses to heritage virtual reality using 360° video. As stated in the literature review section, EEG is a valid tool and complementary to self-reports and multi-item scales, to measure emotional response in tourism.

Population, sampling procedure and sample

The population is composed of tourist and day trippers, with a population frame restricted to Spain. The sampling frame is defined as Spanish tourist or day-trippers who make visits to Girona, in Catalonia, Spain. The sampling procedure is stratified random sampling: stratified probabilistic with allocation proportional to the influx of visitors according to season and gender (at 50%) and final selection by point transect sampling (Thompson, 1992) in the tourist offices (tourist office at the beginning of the visit for the a priori sample and tourist office at the end of the visit for the a posteriori visit) and the Cathedral square (for the in-situ sample). The sample was stratified by gender (45% male–65% female) and months of the year. The sampling procedure was applied along the year 2013 in three periods, low (November, December), middle (March, April, May) and high (July, August, September) tourist seasonality. A final sample of 259, 134 and 264 tourist and day trippers were gathered just before, during or after the visit to the town respectively. The sampling plan can be seen in Figure 2.

Season (% of tourist)/month	A priori sample	In-situ sample	A posteriori sample
High season (54%)	149 (59+90)*	66 (39+27)	145 (64+81)
July	57 (18+39)	25 (9+16)	56 (23+33)
August	62 (28+34)	27 (12+15)	59 (27+32)
September	30 (13+17)	14 (18+6)	30 (14+16)
Mean season (22%)	59 (25+34)	45 (18+27)	67 (29+38)
March	10 (4+6)	8 (2+6)	17 (8+9)
April	20 (9+11)	16 (7+9)	20 (11+9)
May	29 (12+17)	21 (9+12)	30 (10+20)
Low season (24%)	51 (25+26)	23 (16+7)	47 (23+29)
November	26 (15+11)	11 (7+4)	25 (12+13)
December	25 (10+15)	12 (9+3)	27 (11+16)
TOTAL n=642 (100%) (288+354; 45%+65%)	259 (42%+58%)	134 (65%+45%)	249 (46%+54%)

*(men+women)

Figure 2. Planned and executed stratified random sampling procedure and time.

The questionnaire and TDI measurement scales

Tourists and visitors to the tourist destination were surveyed at three different times of the visit. The reference scale used to measure the image of the destination, individual cognitions and emotions, and the global image, is the one proposed by Royo-Vela (2006, 2009) for this type of heritage destination. For measuring the emotional component of the image, when necessary, based on the works by Russell et al. (1981) and Walmsley and Jenkins (1993), 2 bipolar and dimensional items were used (see Table 1). In short, the TDI cognitive-emotional component and the global image is measured using the set of items (see Royo-Vela, 2009) from which *Excultural*, a reliable and valid scale for measuring rural-cultural destinations, was proposed by Royo-Vela (2006). Because of the different moments of the visit and also a different exposition to heritage, the scale items are not the same in the three questionnaires (see Table 1). In the case of the in-situ visit, only two scales have been used. One to measure cognitions and emotions in situ and another to measure the global image. To measure the image a priori, a scale has been used to measure the cognitive dimension, another for the global affective dimension and another for the global image. Finally, to measure the image a posteriori, the longest scale includes the cognitive dimensions and the emotional response in-situ, the scale to measure the global affective dimension, and the scale to measure the global image with a single item. The content of the three questionnaires, including the scales to measure the image, can be consulted in Table 1.

The measurement of the variables has been carried out using interval scales, therefore metric, of seven positions. Both Likert-type scale (cognitive image, cognitive-emotional image, and the global image) and semantic differential (two variables for measuring the global affective component, Walmsley & Jenkins, 1993) were applied. The number of positions was decided based on the information available by the respondent, i.e. his/her interview in-situ and just at the end of the visit made it possible to expand the number of positions on the scales and, therefore, increase the wealth of information obtained. All scales are balanced. A version of the questionnaire including all items was pretested in 12 individuals with heterogeneous characteristics in terms of sex, age and education, and among whom there was only one university professor. As a result of the pre-test of the questionnaire, enriching modifications were made in the final questionnaires.

The second consisted of a neuromarketing experiment using electroencephalography (EEG) and virtual reality. In other words, the research uses electroencephalography to collect data on brain wave responses to stimuli caused by virtual reality operationalized by a 360° video and no interaction with the heritage was possible, only vision. Virtual reality (VR) is a sensory enabling technology that facilitates sensory integration to enhance multisensory digital experiences (Flavián et al., 2021; Yuce et al., 2020). This brain and visual stimulation generated by virtual reality can be measured, i.e. by eye tracking and EEG, and thus identify the impact of stimuli, i.e. historical heritage, on that brain activity (Deng et al., 2020; Jung et al., 2020). Individual experiences with historical heritage displayed in virtual reality have significant effects on the cognitive and emotional dimensions of the virtual heritage experience (Briciu et al., 2020; Choi et al., 2018).

Experimental units

A sample of 25 individuals without neurological abnormalities and randomly selected between the ages of 21 and 60 years was gathered during spring 2018. Before the experiment, each participant had given written consent to sign, and they were informed that participation is optional and that they reserved the right to withdraw at any time (Doborjeh et al., 2018). It is important to mention that the experimental units did not previously know any of the evaluated heritage destinations.

Table 1. Questionnaires' content and variables used in the research.

Questionnaire 1 (Q1) A priori survey $n = 259$	Questionnaire 2 (Q2) In-situ survey $n = 134$	Questionnaire 3 (Q3) A posteriori survey $n = 264$
First time visiting; Frequency of visit; Information sources;	First time visiting; Frequency of visit; Number of monuments visited; Visit length: minutes;	First time visiting; Frequency of visit;
Motives and relevance;		TDI cognitive-emotional scale: 31 items (Royo-Vela, 2009)
TDI cognitive scale: 17 items (Royo-Vela, 2009)	TDI cognitive-emotional scale (cognitive-emotional response to heritage): 15 items (Royo-Vela, 2009)	1.,16., 2., 17., 3., 19., 20., 4., 21., (see Q1 and Q2)
1., (see Q2)		
16. It is a place without environmental or urban pollution,		27. I have not had the feeling of resignation regarding the prices paid,
17. Residents are friendly and hospitable	1. It is a place with rich history and heritage	22., 5., 6., 7., 8., 23., 24., 9. (see Q1 and Q2)
18. The accommodations are rustic, in harmony with the area,	2. I have had the feeling of disconnecting, of being in a different and refreshing place	10., 11., (see Q2)
3., (see Q2)	3. It is a clean and neat place.	28. I have felt well treated and cared for in the stores,
19. The general architecture of the houses is pleasant and harmonic,	4. I have had the sensation of taking a leap into the past, of losing myself among the stones	29. I have felt well treated and cared for in the restaurants
20. It is a place that offers good signage and information facilities that help to enjoy more and make the stay more complete,	5. It is a medieval place, truly ancient	12., (see Q2)
21. It is a place without too many tourists,	6. It has a diversity of monuments	30. It is a place where you can find and buy good crafts and traditional food items,
22. It has a relaxed and calm atmosphere,	7. I had the feeling of living something authentic	31. It is a place where you can taste the local gastronomy with quality,
5., 6., 8., (see Q2)	8. It has emblematic buildings or constructions (cathedral, church, castle, tower, synagogue, abbey, medieval enclosure …)	13., (see Q2)
23. It is a place with museums related to the history, crafts, folklore and culture of the area,	9. I had a feeling of peace and tranquillity	32. The shops are well integrated with the character and idiosyncrasy of the place,
24. It is a place with beauty of the urban complex,	10. It is a place where heritage or historical buildings or constructions are open to the public (ease of access)	33. I have not had a feeling of stupidity, of wasting time, as if I was being scammed,
10., 11., (see Q2)	11. It is a place where the quality of heritage care is seen	14., 26., 15 (see Q1 and TDI emotions scale: 2 items (7 positions semantic differential Boring-Exciting; unpleasant-pleasant)Q2)
25. It is a place where you can walk quietly through the historic complex.	12. I have had the feeling of enriching myself personally or intellectually	
26. It is a place with good attention to tourists and that takes care of the quality of the service	13. I have felt the sensation of renewing, of filling myself with energy	
TDI emotions scale: 2 items (7 positions semantic differential Boring-Exciting; Unpleasant-Pleasant) (Walmsley and Jenkins, 1993)	14. It is a place where you can walk quietly through the historic complex	TDI emotions scale: 2 items (7 positions semantic differential Boring-Exciting; Unpleasant-Pleasant) (Walmsley and Jenkins, 1993)
Global Image: 1 item (Royo-Vela, 2006)	15. I have felt a sense of admiration for past architecture and how it stands the test of time	Global Image: 1 item (Royo-Vela, 2006)
Tourist experience	Global image: 1 item (1-very negative image to 7-very positive image)	Recommendation
Classification variables	Tourist experience	Re-visit Tourist experience Classification variables

Materials and procedure

The data collection procedure was performed in a physiology laboratory equipped with an electroencephalogram LAB-TUTOR (EEG) in a medicine school; virtual reality (VR) goggles; a projector; headphones and an iPhone 6 smartphone. The LAB-TUTOR is a dry EEG (Royo-Vela & Varga, 2022) device with no contamination that may affect brain wave measurement. It has three electrodes, two are located in the frontal lobe, that is to say in the forehead (in the left and right part) and these locations allow us to detect emotional changes (Chew et al., 2016; Gholami Doborjeh et al., 2018; Nomura & Mitsukura, 2015a, 2015b) as well as one in the occipital that is to say in the back of the skull (see Figure 3 and 3) lobe that allows us to do the same in cognitive terms (Candia Rivera, 2016). Therefore, the device is suitable to identify cognitive and emotional waves for the research (Chew et al., 2016). The phone is inserted into a virtual reality device to project videos of

Figure 3. Placing the device and recording data.

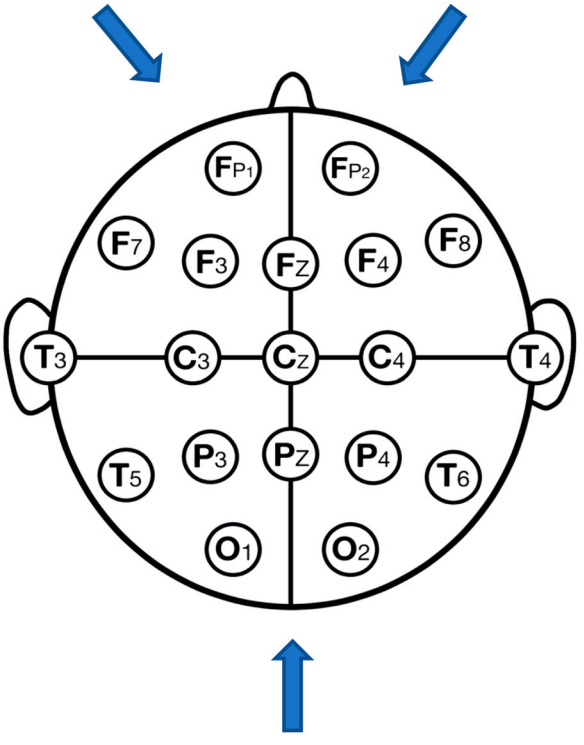

Figure 4. International system 10–20: frontal, central, temporal, parietal, and occipital electrodes placement. The even subscript indicates the right hemisphere while the odd one the left hemisphere. Source: ant neuro [electrode layouts | ANT Neuro (ant-neuro.com)].

tourist sites containing architectural heritage; additionally, a computer records all the data (see Figure 3).

To place electrodes on human skulls, they used the international 10–20 electrode placement system (see Figure 4). It ensures that the electrodes are placed on the same areas of the head in all individuals in the experiment (ant neuro). The nomenclature uses uppercase letters and numerical subscripts. The frontal, central, temporal, parietal and occipital electrodes are recognized with the characters: F, C, T, P and O, respectively. The even subscript indicates the right hemisphere while the odd one the left hemisphere. The channels are identified according to the electrodes that feed it (ant neuro, 2022).

Each person studied is immersed through virtual reality goggles to a sequence of videos of tourist destinations that emulate sites with historical heritage. An electroencephalogram operates in the subject's head, obtaining data directly from the skull. In this way, brain activity and visual stimulation provided by virtual reality can be quantitatively studied to identify the impact of architectural and cultural heritage.

It is known from previous studies that virtual reality significantly influences the emotional and cognitive dimensions of the experience, which facilitates the investigation of the concept (Sirgy & Su, 2000; Choi et al., 2018). The Spanish virtual heritage that was perceived in this experiment is detailed in Table 2 with its respective projection time in the VR devices. All assets represent Spanish heritage located in three famous Spanish cities and were purposively selected. The criteria applied were to be a piece of Spanish historic and architectural heritage easily available on YouTube which belong to architectural categories such as buildings (i.e. Cathedral, Church, Palace, Castle, House), streets and squares (i.e. Town, Armory), doors, facades and arches.

Table 2. Virtual destinations evaluated in the experiment.

	Accumulated time	Heritage Asset	
No.	Starts	Ends	
1	00:00	00:37	Santa Cruz Square (Madrid)
2	00:37	01:39	Madrid Main Square (Madrid)
3	01:39	02:00	Knifemen Arch (Madrid)
4	02:00	02:30	San Miguel Market Doors (Madrid)
5	02:30	03:01	Main Street and Sacramento Church (Madrid)
6	03:01	03:33	Town Square (Madrid)
7	03:33	04:02	Segovia Aqueduct (Segovia)
8	04:02	04:33	Almudena Cathedral (Madrid)
9	04:33	04:59	Armory Square (Madrid)
10	04:59	05:23	Armory Square Lot (Madrid)
11	05:23	05:54	Royal Palace of Madrid (Madrid)
12	05:54	06:19	Center of the East Square (Madrid)
13	06:19	06:50	The Incarnation Monastery (Madrid)
14	06:50	07:21	Ramales Square (Madrid)
15	07:21	07:48	Santiago Little Square (Madrid)
16	07:48	08:15	Adrada Castle (Madrid)
17	08:15	09:15	León Center (León)
18	09:15	10:15	Botín House (Madrid)
19	10:15	11:11	San Isidro Basilic (Madrid)
20	11:11	12:08	Cathedral of León (León)
21	12:08	13:06	Strow Square (Madrid)

Electroencephalogram and waves studied

The EEG is the graphic registry of rhythmic cerebral activity arranged in several timelines known as channels representing the areas of the brain where they were obtained. In other words, using electroencephalography equipment provides a record of rhythmic brain activity. Rhythmic activity is obtained through electrodes placed on the scalp and is electronically amplified. It generates a registry that enables visualization and analysis (Garzón-Paredes & Royo-Vela, 2022). A typical EEG record consists of several strokes arranged in horizontal lines. Each of these corresponds to a channel and the oscillations per unit of time (one second), to different rhythms or brain waves (Astolfi et al., 2008).

The electric brain waves: delta, theta, alpha, beta and gamma, coexist in the brain and vary in frequency according to the amount of electricity generated by a stimulus. This makes it possible to breakdown the waves into high, medium or low frequencies (Astolfi et al., 2008); the more significant the impact achieved by the stimulus in a human, the more electricity will be generated in the brain and the higher the frequency recorded by the electroencephalography equipment.

Table 3. Types of brain wave frequencies captured by the electroencephalogram and their emotional or cognitive interpretation.

Image dimension	Name of the band	Frequency range [Hz]	Detail
	δ (delta)	1–4	Deep sleep
	θ1 (theta low)	4–6	Relaxed
	θ2 (theta high)	6–8	Imaginative relaxed
Emotional image	α1 (low alpha)	8–10	Break, but not sleep,
	α2 (high alpha)	10–12	Relaxing, emotionally pleasant
Cognitive image	β1 (low beta)	12–18	Relaxed, lax, even depressive.
	β2 (medium beta)	18–22	An optimal level of cognition, these waves helps us to be much more receptive
	β3 (high beta)	22–30	Intense
	γ (gamma)	30–40	Challenging to grasp it in electroencephalograms, high cognitive processing, tension, stress, happiness, euphoria.

Source: Adapted from Candia-Rivera (2016, p. 44).

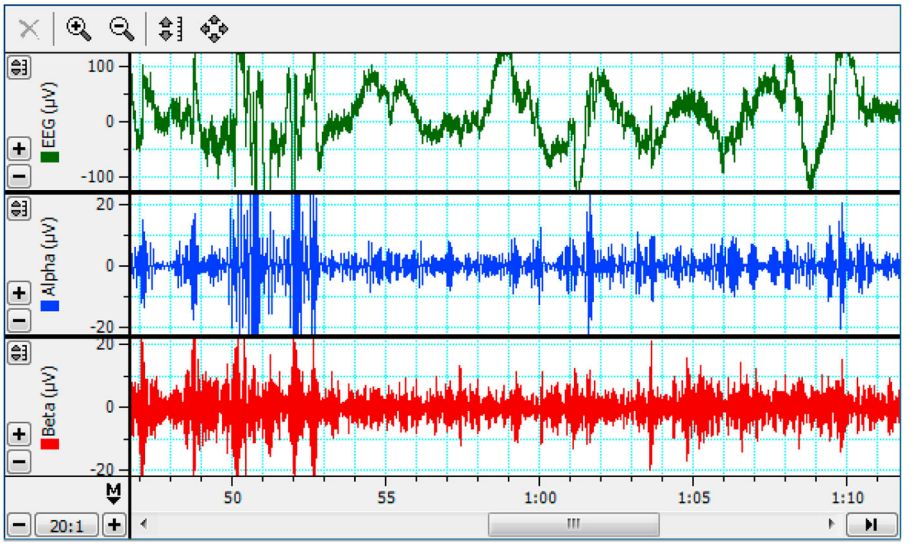

Figure 5. Image of the frequency waves taken from one of the participants in the experiment. A 29-year-old man.

The experiment observed alpha and beta waves, an important characteristic inherent to the behavior of alpha activity, which is the variation that is usually visible in its amplitude. The amplitude is variable with an increase and decrease of the amplitude measured peak to peak or from maximum positivity to maximum negativity. Alpha waves are electromagnetic oscillations in the frequency range of 8–12 Hz and represent emotional responses. Beta waves are in the frequency range of 12–30 Hz as a result of strong neuronal activity (Astolfi et al., 2008; Candia-Rivera, 2016; Wei et al., 2018). These waves represent more complex brain activity related to states of awareness and focus and represent cognitive activity (see Table 3).

Obtaining the metric data

Brain areas and frequency distribution are fundamental in identifying different brain rhythms correctly. The electroencephalogram shows this information in timelines called channels. The combination of several channels and their respective sources create a register known as assembly, which averages the ranges of each type of wave in order to manage data in a simple and straightforward manner (see Figure 5).

To obtain the quantitative data first, the combinations of all channels are taken, alpha from 8 to 12 Hz and beta from 12 to 30 Hz (see Table 3 above). Subsequently, two wave points from each range (alpha and beta) are randomly taken from the combined waveforms (Candia-Rivera, 2016). Information is gathered in this manner to analyze the variables in the system of structural equations. These data are measured in Hertz (Hz symbol).

The structural model is composed of cognition, emotion and global image, the beta points are associated with cognition, the alpha points, with emotion and, the general image is the result of a compound of cognition plus one of emotion; the construct is created with the sum of the average of the alpha and beta waves (see Figure 6). In other words, the metric data of the observable variables in the structural model are taken directly from the participants' brains.

Variables α = Emotion

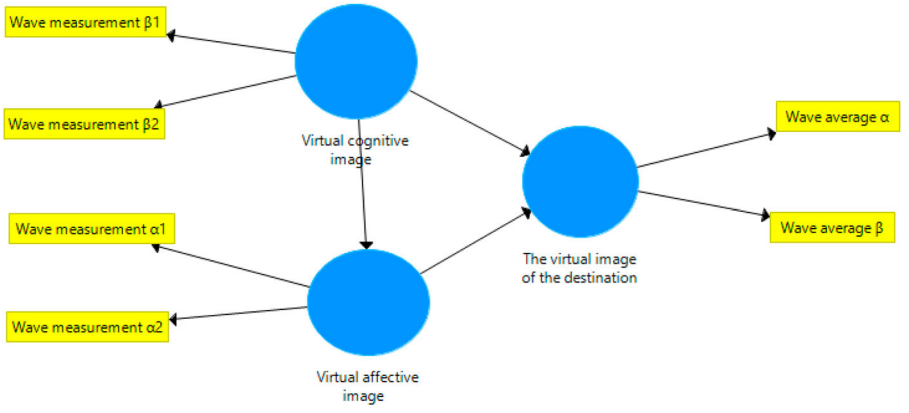

Figure 6. Structural model and calculation of the global image.

Variables β = Cognition

$$\overline{X}\,\alpha + \overline{X}\,\beta = \frac{\sum_{i=1}^{N} \propto}{N} + \frac{\sum_{i=1}^{N} \beta}{N} = image$$

Results analysis and discussion

To test hypotheses 1, 2 and 3, three structural models measuring cognitive and emotional response in-situ, using PLS-SEM, will be analyzed:

Model No. 1. Current TDI model together to an appraisal approach to emotions. The virtual cognitive image is previous and cause the virtual affective image and the virtual image of the heritage destination.

Model No. 2. Emotions are previous and independent to the cognitive stimulus. The virtual emotional image is previous and cause the virtual cognitive image and the virtual image of the heritage destination.

Model No. 3. Emotions and cognitions occur in parallel. The virtual cognitive image and the virtual emotional image creates the image without mediation between them.

The PLS procedure is designed to explain the variance (R^2) of the dependent construct, the image. This procedure is more robust than multiple regressions and appropriate in the presence of possible mediating relations in conditions of small- to medium sample sizes (Chin, 1998). In line with Hair et al. (2012) and Henseler et al. (2015), the data adequacy and minimum sample size for PLS, discriminant and convergent validity and the direct effect coefficient and significance for the formative inner model were analyzed.

In terms of the data, an initial concern relates to the data metrics. PLS can operate with metric and non-metric data. The data from the experiment, brain waves in hertz units, are metric. A second concern is related to the minimum sample size needed. According to Chin's (1998) the minimum sample size that it is needed for this research is 20 units (10 times the largest number of independent factors affecting the dependent one).

Table 4. Discriminant validity models 1, 2 and 3.

		F1	F2	F3
F1.	InS* Virtual cognitive image	.822	N/A	N/A
F2.	InS* Virtual affective image	.447	.820	N/A
F3.	InS Virtual destination Image	.742	.692	.839

Note: *InS* is the acronym for In Situ.

Table 5. Reliability and convergent validity for models 1, 2 and 3.

Factor	Indicator	Load	Weight	*P*-Value	Value t	AVE
F1. INS Virtual affective image	α1		.846	.001	7,038	
	α2		.793	.001	5,401	.673
F2. INS Virtual cognitive image	β1		.871	.001	10,344	.676
	β2		.770	.002	3,050	
F3. Virtual destination image	$\bar{X}\alpha$	.854		.001	6,978	.704
	$\bar{X}\beta$	.824		.001	6,265	

AVE = Average Extracted Variance.

To assess discriminant validity, the Fornell and Larcker (1981) criteria was followed. The results of the discriminant validity analysis must verify that the constructs determined in the model measure a different concept than the rest of the constructs. The variance that the construct shares with their indicators, its extracted variance, is higher than the square of the correlation between that construct and any other (Fornell & Larcker, 1981) that is shared with other constructs. The three models confirm discriminant validity (see Table 4).

Convergent validity between the reflective constructs was assessed by the average extracted variance (AVE). All constructs scored higher than the minimum threshold of .5 (Hair et al., 2012). The AVE is > .67, on all factors which indicates that each factor explains more than half of its variation than the other composing factors. Reliability and convergent validity are also confirmed in all models, the variance between the same constructs shows that they correlate more significantly with their same indicators than the others. Also, for assessing convergent validity a Bootstrapping with 5000 subsamples was applied with no sign change in the resampling which is the most conservative method. All indicators obtained outer loadings higher than .7 (Carmines & Zeller, 1979). Regarding t-values, these are significant, $p < .002$, loads are higher than 0.82 and weights are higher than .77 in all observable variables (see Table 5).

Regarding hypotheses 1, 2 and 3, Table 6 shows results that support hypotheses H1 and H3. Regarding testing of the inner model (see Figure 6), all standardized beta coefficients are significant (see Table 6). Therefore, there is a direct and significant effect of the cognitive response to heritage on the destination image and on the emotional response to heritage. The emotional response has a significant and direct effect on the heritage destination image. The study shows that emotional and cognitive impact of a destination characterized by the heritage and emulated with virtual reality positively influences the image of the virtual destination. The positive emotional and cognitive impact of heritage on the virtual tourist is confirmed. Also, results show, unlike Huete Alcocer and López Ruiz (2020) and Huete-Alcocer et al. (2019) who found that the affective component is more relevant than the cognitive in the image of a heritage destination, the higher effects of the cognitive response on the destination image formation.

Table 6. Hypothesis contrast models 1, 2 and 3.

		Standardized Beta (t-value)		
Hypothesis	M.1	M.2	M.3	
H1	INS Virtual cognitive image –> Virtual destination image	.541 (2887)[b]	.541 (2883)[b]	.542 (2998)[b]
H2	INS Virtual cognitive image –> InS Virtual affective image	.447 (2755)[b]	-------	-----
	INS Virtual affective image –> InS Virtual cognitive image	-------	.447 (2732)[b]	-----
H3	INS Virtual affective image –> Virtual destination image	.450 (2230)[a]	.450 (2245)[a]	.452 (2321)[a]

[a]$p < .05$; [b]$p < .01$.

Table 7. The 2 cognitive-emotional factorial output.

Item	Factor loadings (F1)	Factor loadings (F2)
(var07) I had the feeling of living something authentic	.929	
(var08) It has emblematic buildings or constructions (cathedral, church, castle, tower, synagogue, abbey, medieval enclosure …)	.774	
(var05) It is a medieval place, truly ancient	.738	
(var01) It is a place with rich history and heritage	.587	
(var02) I have had the feeling of disconnecting, of being in a different and refreshing place	.556	
(var15) I have felt a sense of admiration for past architecture and how it stands the test of time	.484	
(var09) I had a feeling of peace and tranquillity		.402
(var11) It is a place where the quality of heritage care is seen		.816
(var14) It is a place where you can walk quietly through the historic complex		.770
(var12) I have had the feeling of enriching myself personally or intellectually		.513
(var03) It is a clean and neat place		.504

Nevertheless, results regarding H2, which states that cognitive response elicits emotional response, are not valid since they show same effects regardless its direction. Because of the method and analysis performed it is not clarified by results neither whether cognitions precede emotions or emotions precede cognitions, nor whether cognitions and emotions occur in parallel. To test H2 and H3 (second part related to the stimulus intensity effects on image, see Tables 7, 8, 10–13), and re-test H1 and H3 (see Tables 9 and 10) data from surveys are used.

As for H2 factorial analysis, correlation analysis and some simple and multiple regression analysis are performed (see Tables 7, 8 and 10). First a FA with *Oblimax* rotation was performed on the in-situ respondents to questionnaire 2 (KMO = .911; $\chi^2_{55} = 645{,}11$, $p < .0001$; EV = 59,38%). Results showed a two-factor solution. The two factors are related to cognitive heritage and emotional response and to tranquillity and cleanliness and emotional response. Both factors are composed of cognitive and emotional variables (see Table 7).

The correlations between both sets of variables show interesting results by allowing a one-to-one correspondence to be established between the cognitive and emotional variables. Thus, in Table 8 it can be seen how the emotion of admiration for past architecture is generated by the rich heritage of the place and its emblematic elements; the emotion of experiencing something authentic is generated by the richness and historical authenticity of its emblematic elements; and the emotion of disconnecting and being in a refreshing and different place is mainly generated by the historical authenticity of the heritage.

Table 8. Heritage cognition-emotion correspondence.

Cognitive heritage and corresponding emotional response	I had the feeling of living something authentic (happy, content, pleasure, satisfied)[b]	I have had the feeling of disconnecting … (deligthed, excited)[b]	I have felt a sense of admiration for past architecture … (astonished, surprised)[b]
It is a place with rich history …	.58[a]	.38[a]	.64[a]
It is a medieval place …	.57[a]	.40[a]	.52[a]
It has emblematic buildings …	.61[a]	.37[a]	.61[a]
Cognitive tranquillity and quietness and corresponding emotional response	I had a feeling of peace and tranquillity *(relaxed, serene, tranquil, pleasure)*[b]	I have had the feeling of enriching myself personally or intellectually *(excited, delighted)*[b]	
It is a place where the quality of heritage care is seen	.37[a]	.50[a]	
It is a place where you can walk quietly …	.52[a]	.43[a]	
It is a clean and neat place	.36[a]	.30[a]	

[a]$p < .01$; [b]human emotions involved.

Table 9. Effects of Cognitive heritage and Emotional Heritage on Global Image.

DV is Global Image	B	Standardized β	t (*p*-value)
Constant	3668	–	7370 ($p < .001$)
Cognitive Heritage	.210	.203	1551 ($p = .123$)
Emotional Heritage	.243	.282	2151 (< .05)

The emotion of peace and tranquillity is generated mainly by the possibility of strolling quietly through the historic and heritage center and the emotion of personal and intellectual enrichment responds to the perception of a sufficiently well-cared-for historical heritage.

From the factorial solution, two new variables were created using data from the in-situ sample. One represents the cognitive component of heritage (Cognitive Heritage) and the other the emotional component of heritage (Emotional Heritage). They have been calculated as the mean of the sets of only cognitive and only emotional variables related to heritage for each individual. These variables are regressed on the global image variable (see Table 9). The results show a significant model ($R^2 = .213$; F = 17,471, $p < .0001$) without high collinearity (tolerance = .355, VIF = 2.82) although, as expected, the correlation between both independent variables is high ($r = .803$). The value of the beta coefficients is similar for both variables, although only the Emotional Heritage variable is significant due to the high correlation between cognition and emotion. These results support H1 and H3.

Table 10 below contains the results of a set of five regression models that were applied in order to see the importance of the cognitive and emotional components of heritage between them and on the image of the destination. Models 1 and 2 show significant effects of heritage-generated cognition and emotion on destination image. These results support again H1 and H3. Although the explanatory capacity of both models is not very different, the effects of heritage cognitions (B = .444) seem to be slightly higher than those of heritage emotions (B = .383) Models 3 and 4 indicate that cognition is more explanatory of emotion than vice versa. The emotional response to heritage also has a significant effect on their cognition, although it does not reach the intensity of the effect of cognition on emotional response. These results support H2. Model 5 shows how both the cognition and emotional response to heritage and the cognition and emotional response to the tranquillity of the historic destination have significant effects on the global image of the tourist destination. The collinearity between both variables is moderate (Tolerance = .489; VIF = 2,046). These results support H1 and H3 again.

Finally, Table 11 below shows models 6 and 7 that explain the effect of the perception of heritage by the in-situ sample, measured as the number of monuments visited or perceived by the visitor, on

Table 10. Interaction between emotional and cognitive heritage and effects on the image.

Independent variable (I)V	MODEL 1 DV is Global Image	MODEL 2 DV is Global Image	MODEL 3 DV is Cognitive Heritage	MODEL 4 DV is Emotional Heritage	MODEL 5 DV is Global Image
Constant	4135 (10,367)[b]	3653 (7,239)[b]	2218 (8,642)[b]	−.064 (−.116, $p = .868$)	3488 (6,967)[b]
Emotional Heritage B	.383		.669		
B t-value	(.445, 5673)[b]		(.803, 15,383)[b]		
Cognitive Heritage B		.444		.965	
βt-value		(.430, 5431)[b]		(.803, 15,383)[b]	
R/R^2	.445/.198	.430/.185		.803/.645	.465/.216
F-value				236,629[b]	17,761[b]
Heritage and Emotion B					.118
β t-value					(.223, 1996)[a]
Tranquillity and Emotion B					.292
β *t*-value					(.279, 2499)[a]

[a]$p<.05$; [b]$p<.001$.

Table 11. Effects of heritage intensity measured as number of monuments perceived.

IV is number of monuments visited	MODEL 6 DV is the Heritage and Emotion factor	MODEL 7 DV is the Tranquillity and Emotion factor
Constant	5665 (43,183)[b]	5853 (54,930)[b]
N° Monuments B	.071 (.229, 2677)[b]	.047 (.189, 2193)[a]
R/R^2	.229/.052	.189/.036
F-value	7169 (.008)	4810 (.030)
Correlation N° of monuments-visit length	.224(.007)	

[a]$p < .05$; [b]$p < .001$.

Table 12. Comparing people emotional response to different intensities of heritage.

Heritage intensity	N	Heritage and Emotion	t-value	Tranquillity and Emotion	t-value
Monuments ≥3	102	6.09	$t_{130} = 3.65$[b]	6.16	$t_{130} = 3.92$[b]
Monuments <3	30	5.53		5.68	
Monuments ≥4	74	6.10	$t_{130} = 2.38$[a]	6.16	$t_{130} = 2.38$[a]
Monuments <4	58	5.79		5,91	

[a]$p < .05$; [b]$p < .001$.

Table 13. Comparing pre and post visit effects of visitors' emotions on the global image.

IV is Emotions measured by 2 bidimensional items	MODEL 8 DV is Global Image A PRIORI	MODEL 9 DV is Global Image A POSTERIORI
Constant	2715 (8979)[a]	2516 (9248)[a]
EMOTIONS B	.589	.631
(β; t-value)	(.583; 11,512)[a]	(.655; 14,032)[a]
R/R^2	.583/.340	.655/.429
F-value	132,536 (.001)	196,060 (.001)

[a]$p < .001$.

the representative factors of heritage and emotional response and tranquillity and emotional response. A greater number of monuments visited means that the tourist or day-tripper has spent more time walking, contemplating, and visiting the historical heritage center ($r = .244$, $p = .01$). Both models are significant and present a significant effect of heritage, measured as the number of monuments visited, on the emotional response to heritage and to the tranquillity and contemplation of the historic center.

A t-test for independent samples comparing people who visited less than 3 or 4 monuments and people who visited 3, 4 or more monuments support the previous results. Comparing people at the 3 monuments level, the test result was significant to both, for the Heritage and emotion and for the Tranquillity and emotion factors. Similar results appear at the 4 monuments level. Again, in both cases there are significant differences between the groups. In other words, when people perceive 3 or less monuments, the emotional response to heritage and tranquillity is significantly lower than those who visited 4 or more monuments (see Table 12). These results confirm again the effects of historical and heritage places on the visitor's positive and active emotional response.

Regarding H3 that also states, 'the higher the emotional response to heritage the better the destination image,' several regressions and a *t*-test were applied. Since the number of monuments perceived increases emotional response to heritage (see Table 12) and emotional response to heritage affects to global image (see Tables 9 and 10) a *t*-test for independent samples was applied to identify differences in the global image between those people who still have not perceived heritage (the a priori group of visitors) and those people who were perceiving heritage (the in-situ group of visitors). To prevent from potential cultural and language disturbing effects

only Spanish people who answered a questionnaire translated to Spanish were involved in the test. Results show a significant difference in the global image mean between these 2 groups, being the global image was better in those people who perceived heritage and had the corresponding emotional response (6.4 versus 6.1, $t_{105} = 2054$; $p < .05$). Then simple regressions, model 8 and 9, were applied to measure the emotions effect on the global image (see Table 13). In this case, the emotional component of the image is measured using the habitual dimensional scale which includes a pair of items. Even though in both cases there is a significant effect of emotions on the global image, the R^2 and the B coefficient are higher in the a posteriori group when compared with the a priori group. These results support H3.

Conclusions

Theoretical contributions

Image is dynamic and changes during the visit as this research has observed by measuring the image in three different moments where exposition to heritage was also different. Based on the literature analyzed, neither the traditionally accepted two-dimensional model of the image of the tourist destination nor the way of measuring its emotional component seem to be the most appropriate or valid (Royo-Vela, 2006; Hosany & Gilbert, 2010). Heritage destinations generate an intense emotional response in the visitor during the visit, that is, in situ, and the dimensional or categorical measures of emotions do not capture either the diversity or the quantity of emotional responses of the visitor in the heritage destination (Hosany et al., 2021). These dimensional and global measures of the emotional component of the image of the tourist destination are more suitable for measuring that emotional component of the image a posteriori, that is, after the visit, where a more integrated measure based on memory is more appropriate or it may work better. Furthermore, the emotional response seems to be a variable with a minimum and a maximum level of effects on the image. Regarding the structural relationships between the cognitive and the emotional components in the TDI construct, unlike the orthodox model presented for decades in the literature (Baloglu & Brinberg, 1997; Baloglu & McCleary, 1999a; Echtner & Ritchie, 1993; Nghiem-Phu, 2014; Tasci et al., 2007), a more integrative, analytical, and evaluative approach in which individual emotional responses to individual cognitions are studied together in different cognitive-emotional factors seem to be more accurate.

As previously found by Bastiaansen et al. (2018), Bastiaansen et al. (2022), Luck, 2014, Li, Scott and Walters, 2014, or Moyle et al. 2017, EEG is a useful tool for measuring emotional responses in tourism research. Similarly, and as found and stated by Deng et al. (2020), Jung et al. (2020), Briciu et al. (2020) or Choi et al. (2018), VR is also an interesting technology that generates emotional response to the virtual tourism experience by the individual. Measurements of cognitive and emotional responses to heritage in situ using virtual reality to emulate the heritage stimulus and electroencephalogram to measure cognitive and emotional responses, show a clear effect of these on the image of the heritage destination. These responses, whether cognitive or emotional, are not unique, but, like found by Pan et al., (2014), Hosany and Gilbert (2010) and Hosany et al. (2021), are numerous, varied and dynamic, confirming the dynamic nature of the image of the heritage destination and in general of the tourist destination, although the latter must be verified in future research. These results have made it possible to verify hypotheses 1 and 2 of the research and again the orthodox model that separates cognition and emotion and considers emotion as a mediating variable between cognition and image or other consequences such as satisfaction. Along these lines, the results also show how both the cognitive component of heritage and the emotional component, measured independently, have significant effects on image and, unlike Huete-Alcocer et al. (2019), that the effect of the cognitive component is higher than the emotional component in the heritage destination image formation.

However, a caveat must be made in this regard. Cognition and emotion, as shown by the continuous measurements of the encephalogram, are not independent at all, quite the contrary. From an appraisal approach to emotions, there is a clear sequential correspondence between cognition and emotion (Lazarus, 1991; Frijda, 1986, 1993; LeDoux, 2012a, 2012b) and therefore it would be more convenient to speak of a one-dimensional model with one or several cognitive-emotional components instead of the two-dimensionality composed of analytical cognition and synthetic emotion Russell and Pratt, 1980; Russell et al., 1981; Walmsley and Jenkins (1993). In this sense, this research has identified at least 2 cognitive-emotional factors associated with the visit to a heritage destination, the substantially heritage and the contemplative. Both factors, heritage and emotional response, and tranquillity and emotional response, had significant effects on the image of the heritage destination. Future research must contrast the existence of these two factors and others of a cognitive-emotional nature that generate the image of the heritage destination. In addition, clear correlations have been found between particular cognitions and also particular emotional responses, although, due to the method used, it has not been possible to establish a one-to-one correspondence between them. Which, on the other hand, does not mean that it does not exist (Pan et al., 2014; Hosany & Gilbert, 2010; and Hosany et al., 2021). The set of emotions representative of the emotional experiences of the visitor in the heritage destination are all positive, both active - excited, delighted, astonished, surprised, happy-, and passive - pleasure, content, relaxed, serene, tranquil, satisfied.

Regarding what comes before, if cognition or emotion, the approach applied in this research is the appraisal, that is, that cognition precedes emotion. Although further research using neuromarketing techniques will be able to objectively establish whether this is effectively this way or it does not always happen this way, opening the door to a change in the direction of this sequence or even to its simultaneity (Zajonc, 1980; LeDoux, 1989; Ambler & Burne, 1999), the results show that, on the one hand, cognition is more explanatory of emotion than vice versa and on the other hand that the emotional response to heritage has a more intense effect on the destination image than the cognitive response to heritage. These results support, albeit partially, hypothesis 3, and, unlike results obtained using the EEG and structural equations, support research by Huete Alcocer and López Ruiz (2020).

Finally, as hypothesis 4 also proposed, the intensity effects of the emotional response to heritage on the image of the heritage destination has also been contrasted. In line with Ramsoy, Stephens and Kotsi (2019), not only are there differences in the intensity of the effect of the emotional component on the image, depending on whether the visitor has been subjected to the cognitive stimulus of heritage. Also, it has been possible to verify that the emotional response to heritage exists and depends on the number of cognitive stimuli to which the visitor is subjected, with an increasing quadratic function, that is, concave, of the emotional response to heritage to the amount of heritage, measured as number of monuments visited. That is, the response increases as heritage elements are perceived until a maximum is reached, at which point the difference in the emotional response is no longer significantly different. In this research, significant differences were measured between those visitors who received stimulation from 2 or fewer monuments, lower baseline, or threshold, and those who received it from 5 or more monuments. These results allow us to propose the existence of a decreasing emotional response where the marginal emotional response from the fifth perceived monument begins to be negative. Regardless of the quantitative effect, indeed, there is also a qualitative one. The quality of the heritage assets in the destination researched are of prime order, as described in the methodology section. The decreasing marginal emotional response hypothesis also needs to be tested in future research.

Limitations and future research

Based on the research results, future research must verify both the dynamic nature of the image of the heritage tourist destination and the diversity and variety of responses that it elicits. Also, it must

contrast the existence of the heritage and emotional response and tranquillity and emotional response factors, as well as others of a cognitive-emotional nature that could generate the image of the heritage destination. Regarding what comes before, cognition or emotion, future research using neuromarketing techniques will be able, on the one hand to objectively observe this matter opening the door to a change in the cognition–emotion sequence or even simultaneous cognitive and emotional responses. On the other hand, state of the art neuromarketing techniques will allow to identify the intensity, type and variety of emotional responses and their correspondence with, also, diverse and varied heritage. In this regard, different architectonic styles, i.e. Romanesque, Gothic, Renaissance, Baroque, Neoclassic, Modernist, may generate a different emotional response. Finally, the decreasing emotional response hypothesis proposed in this paper, also needs further research.

This research is not without limitations. First, the study was limited to one country, and it would be necessary to apply qualitative analysis, scales and constructs in other cultural or heritage destinations in countries such as England, France, Germany or Italy, where the emotional response could be different. Second, the type of emotional responses measured are dimensional, meaning they belong to a specific cognitive-emotional dimension, as the factor analysis put together cognitive stimulus and emotional responses. We were unable to identify the correspondence between a specific stimulus and its response in a precise way. Finally, and regarding the neuromarketing side of this research, the electroencephalogram tool for data gathering can be improved. Counting with state-of-the-art EEG equipment, more specific information about the human brain's reactions to virtual heritage stimuli can be identified. This may allow researchers a better measurement and synchronization between stimulus and responses in real time and determine in a more accurate way, types of stimulus and responses, as well as, at which moments in the video - i.e. specific or particular heritage assets or environments - the emotional and cognitive responses are different or more or less intense.

Managerial implications

The practical implications for tourism managers in this type of destination are clear attending to the level of pollution, noise, massification and fast tourism that exist in most cultural touristic destinations. Considering the effects of the heritage and emotions and the tranquillity and emotions variables on the image, heritage destinations must present or offer the tourist or excursionist a real and authentic experience, according to the ideas by Marine-Roig (2015), and well-cared for heritage wealth, as well as a clean, non-crowded and quiet space that allows contemplation and interaction with the architectural and monumental harmony of the destination.

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References

Alhemoud, A. M., & Armstrong, E. G. (1996). Image of tourism attractions in Kuwait. *Journal of Travel Research*, *34* (4), 76–80. https://doi.org/10.1177/004728759603400413

Ambler, T., & Burne, T. (1999). The impact of affect on memory of advertising. *Journal of Advertising Research*, *39*(1), 25–34.

Ant neuro. (2022). (on line), Electrode layouts | ANT Neuro (ant-neuro.com) accessed (16/09/2022)

Arabadzhyan, A., Figini, P., & Vici, L. (2021). Measuring destination image: A novel approach based on visual data mining. A methodological proposal and an application to European islands. *Journal of Destination Marketing & Management*, *20*(2), 100611. https://doi.org/10.1016/j.jdmm.2021.100611.

Arefieva, V., Egger, R., & Yu, J. (2021). A machine learning approach to cluster destination image on Instagram. *Tourism Management*, *85*(2), 104318. https://doi.org/10.1016/j.tourman.2021.104318.

Astolfi, L., De Vico Fallani, F., Cincotti, F., Mattia, D., Bianchi, L., Marciani, M. G., Salinari, S., Colosimo, A., Tocci, A., Soranzo, R., & Babiloni, F. (2008). Neural basis for brain responses to TV commercials: A high-resolution EEG study. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, *16*(6), 522–531. https://doi.org/10.1109/TNSRE.2008.2009784

Bagozzi, R. P., Gopinath, M., & Nyer, P. U. (1999). The role of emotions in marketing. *Journal of the Academy of Marketing Science*, *27*(2), 184–206. https://doi.org/10.1177/0092070399272005

Baloglu, S., & Brinberg, D. (1997). Affective images of tourism destinations. *Journal of Travel Research*, *35*(4), 11–15. https://doi.org/10.1177/004728759703500402

Baloglu, S., & McCleary, K. W. (1999a). A model of destination image formation. *Annals of Tourism Research*, *26*(4), 868–897. https://doi.org/10.1016/S0160-7383(99)00030-4

Baloglu, S., & McCleary, K. W. (1999b). U.S. International pleasure travelers' images of four Mediterranean destinations: A comparison of visitors and nonvisitors. *Journal of Travel Research*, *38*(2), 144–152. https://doi.org/10.1177/004728759903800207

Bastiaansen, M., Straatman, S., Driessen, E., Mitas, O., Stekelenburg, J., & Wang, L. (2018). My destination in your brain: A novel neuromarketing approach for evaluating the effectiveness of destination marketing. *Journal of Destination Marketing & Management*, *7*(1), 76–88. https://doi.org/10.1016/j.jdmm.2016.09.003.

Bastiaansen, M., Straatman, S., Mitas, O., Stekelenburg, J., & Jansen, S. (2022). Emotion measurement in tourism destination marketing: A comparative electroencephalographic and behavioral study. *Journal of Travel Research*, *61*(2), 252–264. https://doi.org/10.1177/0047287520981149

Beerli, A., & Martin, J. D. (2005). Cómo influyen las fuentes de información en la imagen percibida de los destinos turísticos. *Revista Española de Investigación de Marketing*, *8*(2), 7–34.

Beerli, A., & Martín, J. D. (2004). Factors influencing destination image. *Annals of Tourism Research*, *31*(3), 657–681. https://doi.org/10.1016/j.annals.2004.01.010

Briciu, A., Briciu, V. A., & Kavoura, A. (2020). Evaluating how "smart" Brasov, Romania can be virtually via a mobile application for cultural tourism. *Sustainability*, *12*(13), 5324. https://doi.org/10.3390/su12135324

Candia-Rivera, D A. (2016). *Caracterización de la respuesta emocional ante estímulos visuales en registros electroencefalográficos. Memoria para optar al título de ingeniero civil eléctrico. Santiago de Chile: Facultad de Ciencias Físicas y Matemáticas*.

Carmines, E. G., & Zeller, R. A. (1979). Assessing reliability. *Assessing Reliability: Reliability and Validity Assessment*, *17*, 37–51. https://doi.org/10.4135/9781412985642.n4

Chew, L. H., Teo, J., & Mountstephens, J. (2016). Aesthetic preference recognition of 3D shapes using EEG. *Cognitive Neurodynamics*, *10*(2), 165–173. https://doi.org/10.1007/s11571-015-9363-z

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, *295*(2), 295–336.

Choi, Y., Hickerson, B., & Kerstetter, D. (2018). Understanding the sources of online travel information. *Journal of Travel Research*, *57*(1), 116–128. https://doi.org/10.1177/0047287516683833

Chon, K. S. (1990). The role of destination image in tourism: A review and discussion. *The Tourist Review*, *45*(2), 2–9. https://doi.org/10.1108/eb058040

Deng, Y., Han, S. Y., Li, J., Rong, J., Fan, W., & Sun, T. (2020). The design of tourism product CAD three dimensional modeling system using VR technology. *PLoS ONE*, *15*, e2044205. (12 December)).

Doborjeh, Z. G., Doborjeh, M. G., & Kasabov, N. K. (2018). Attentional bias pattern recognition in spiking neural networks from spatio-temporal EEG data. *Cognitive Computation*, *10*(1), 35–48. https://doi.org/10.1007/s12559-017-9517-x

Donaire, J. A., Camprubí, R., & Galí, N. (2014). Tourist clusters from Flickr travel photography. *Tourism Management Perspectives*, *11*(1), 26–33. https://doi.org/10.1016/j.tmp.2014.02.003.

Echtner, C. M., & Ritchie, B. (1991). The meaning and measurement of destination image. *The Journal of Tourism Studies*, *2*(2), 2–12.

Echtner, C. M., & Ritchie, B. (1993). The measurement of destinations image: An empirical assessment. *Journal of Travel Research*, *31*(4), 3–13. https://doi.org/10.1177/004728759303100402

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2021). The influence of scent on virtual reality experiences: The role of aroma-content congruence. *Journal of Business Research*, *123*(October), 289–301. https://doi.org/10.1016/j.jbusres.2020.09.036

Folgado-Fernández, J. A., Hernández-Mogollón, J. M., & Duarte, P. (2017). Destination image and loyalty development: The impact of tourists' food experiences at gastronomic events. *Scandinavian Journal of Hospitality and Tourism*, *17*(1), 92–110. https://doi.org/10.1080/15022250.2016.1221181

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Frijda, N. H. (1986). *The emotions*. Cambridge University Press.

Frijda, N. H. (1993). The place of appraisal in emotion. *Cognition & Emotion*, *7*(3-4), 357–387. https://doi.org/10.1080/02699939308409193

Galí, N. (2012). Identifying cultural tourism: A theoretical methodological proposal. *Journal of Heritage Tourism*, *7*(1), 45–58. https://doi.org/10.1080/1743873X.2011.632480

Galí, N., & Donaire, J. A. (2006). La imagen percibida por los turistas de la ciudad de Girona. *Estudios Turísticos*, *168*, 123–139.

Galí, N., & Donaire, J. A. (2015). Tourists taking photographs: The long tail in tourists' perceived image of Barcelona. *Current Issues in Tourism*, *18*(9), 893–902. https://doi.org/10.1080/13683500.2015.1037255

Gallarza, M., Gil, I., & Calderon, H. (2002). Destination image. Towards a conceptual framework. *Annals of Tourism Research*, *29*(1), 56–78. https://doi.org/10.1016/S0160-7383(01)00031-7

Garzón-Paredes, A. R., & Royo-Vela, M. (2021). Experimenting through neuromarketing to measure the impact of Spanish cultural heritage. In A. Abreu, D. Liberato, E. A. González, & J. C. Garcia Ojeda (Eds.), *Advances in tourism, technology and systems. ICOTTS 2020. Smart innovation, systems and technologies*, Vol. 209, pp. 380–400. Springer.

Garzón-Paredes, A. R., & Royo-Vela, M. (2022). Deconstructing the emotional and cognitive response to cultural heritage: A virtual reality experiment. In A. Abreu, D. Liberato, & J. C. Garcia Ojeda (Eds.), *Advances in tourism, technology and systems. Smart innovation, systems and technologies*. Vol. 293, pp. 113–133 Springer.

George, R. (2017). Responsible tourism as a strategic marketing tool for improving the negative image of South Africa. *Worldwide Hospitality and Tourism Themes*, *9*(5), 543–554. https://doi.org/10.1108/WHATT-07-2017-0031

Gholami Doborjeh, Z., Doborjeh, M. G., & Kasabov, N. (2018). Attentional bias pattern recognition in spiking neural networks from spatio-temporal EEG data. *Cognitive Computation*, *10*(1), 35–48. https://doi.org/10.1007/s12559-017-9517-x

Govers, R. (2005a). *Virtual tourism destination image: Glocal identities constructed, perceived and experienced*. (No. 69).

Govers, R. (2005b). Virtual tourism destination image: innovating measurement methodologies. *In III International Doctoral Tourism and Leisure Colloquium, edited by M.Vila. Barcelona: ESADE.*

Govers, R., Go, F. M., & Kumar, K. (2007). Virtual destination image a new measurement approach. *Annals of Tourism Research*, *34*(4), 977–997. https://doi.org/10.1016/j.annals.2007.06.001

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414–433. https://doi.org/10.1007/s11747-011-0261-6

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hosany, S., & Gilbert, D. (2010). Measuring tourists' emotional experiences toward hedonic holiday destinations. *Journal of Travel Research*, *49*(4), 513–526. https://doi.org/10.1177/0047287509349267

Hosany, S., Martin, D., & Woodside, A. G. (2021). Emotions in tourism: Theoretical designs, measurements, analytics, and interpretations. *Journal of Travel Research*, *60*(7), 1391–1407. https://doi.org/10.1177/0047287520937079

Hosany, S., Prayag, G., Deesilatham, S., Cauševic, S., & Odeh, K. (2015). Measuring tourists' emotional experiences: Further validation of the destination emotion scale. *Journal of Travel Research*, *54*(4), 482–495. https://doi.org/10.1177/0047287514522878

Hosany, S., Prayag, G., Van Der Veen, R., Huang, S., & Deesilatham, S. (2017). Mediating effects of place attachment and satisfaction on the relationship between tourists' emotions and intention to recommend. *Journal of Travel Research*, *56*(8), 1079–1093. https://doi.org/10.1177/0047287516678088

Huete Alcocer, N., & López Ruiz, V. R. (2020). The role of destination image in tourist satisfaction: The case of a heritage site. *Economic Research-Ekonomska Istraživanja*, *33*(1), 2444–2461. https://doi.org/10.1080/1331677X.2019.1654399

Huete-Alcocer, N., Martinez-Ruiz, M. P., López-Ruiz, V. R., & Izquiedo-Yusta, A. (2019). Archeological tourist destination image formation: Influence of information sources on the cognitive, affective and unique image. *Frontiers in Psychology*, *10*, 2382. https://doi.org/10.3389/fpsyg.2019.02382

Jung, K., Nguyen, V. T., Piscarac, D., & Yoo, S. C. (2020). Meet the virtual jeju dol harubang—The mixed VR/Ar application for cultural immersion in Korea's main heritage. *ISPRS International Journal of Geo-Information*, *9*(6), 367. https://doi.org/10.3390/ijgi9060367

Kim, S., & Yoon, Y. (2003). The hierarchical effects of affective and cognitive components on tourism destination image. *Journal of Travel and Tourism Marketing*, *14*(2), 1–22.

Kim, S. B., Kim, D. Y., & Bolls, P. (2014). Tourist mental-imagery processing: Attention and arousal. *Annals of Tourism Research*, *45*(2), 63–76. https://doi.org/10.1016/j.annals.2013.12.005.

Kim, W. H., Malek, K., Kim, N. J., & Kim, S. H. (2017). Destination personality, destination image, and intent to recommend: The role of gender, age, cultural background, and prior experiences. *Sustainability*, *10*(1), 87. https://doi.org/10.3390/su10010087

Kladou, S., & Mavragani, E. (2015). Assessing destination image: An online marketing approach and the case of TripAdvisor. *Journal of Destination Marketing & Management*, *4*(3), 187–193. https://doi.org/10.1016/j.jdmm.2015.04.003

Lai, K., & Li, Y. (2012). Core-periphery structure of destination image: Concept, evidence and implication. *Annals of Tourism Research*, *39*(3), 1359–1379. https://doi.org/10.1016/j.annals.2012.02.008

Lalicic, L., Marine-Roig, E., Ferrer-Rosell, B., & Martin-Fuentes, E. (2021). Destination image analytics for tourism design: An approach through Airbnb reviews. *Annals of Tourism Research*, *86*(1), 103100. https://doi.org/10.1016/j.annals.2020.103100.

Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford University Press.

LeDoux, (2012a). On fear, emotions and memory: An interview with Dr. Joseph Le Doux. *Brain World*, *4*(1), 56–99.

LeDoux, J. (2012b). Rethinking the emotional brain. *Neuron*, *73*(4), 653–676. https://doi.org/10.1016/j.neuron.2012.02.004

LeDoux, J. E. (1989). Cognitive-emotional interactions in the brain. *Cognition and Emotion*, *3*(July), 267–289. https://doi.org/10.1080/02699938908412709

Li, S., Scott, N., & Walters, G. (2014). *Potential methods for measuring emotion in Chinese tourism advertising. G20 First East-West Dialogue on Tourism and the Chinese Dream*.

Li, S., Scott, N., & Walters, G. (2015). Current and potential methods for measuring emotion in tourism experiences: A review. *Current Issues in Tourism*, *18*(9), 805–827.

Luck, S. J. (2014). *An introduction to the event-related potential technique*. Boston: MIT press.

MacCannell, D. (1976). *The tourist: A New theory of the leisure class*. Macmillan.

Mak, A. H. (2017). Online destination image: Comparing national tourism organisation's and tourists' perspectives. *Tourism Management*, *60*(4), 280–297. https://doi.org/10.1016/j.tourman.2016.12.012.

Marine-Roig, E. (2015). Identity and authenticity in destination image construction. *Anatolia*, *26*(4), 574–587. https://doi.org/10.1080/13032917.2015.1040814

Mariné-Roig, E. (2017). Measuring destination image through travel reviews in search engines. *Sustainability*, *9*(8), 1425. https://doi.org/10.3390/su9081425

Marine-Roig, E. (2019). Destination image analytics through traveller-generated content. *Sustainability*, *11*(12), 3392. https://doi.org/10.3390/su11123392

Marine-Roig, E., & Antón, S. (2016). A detailed method for destination image analysis using user-generated content. *Information Technology & Tourism*, *15*(4), 341–364. https://doi.org/10.1007/s40558-015-0040-1

Morgan, N., & Pritchard, A. (1998). *Tourism promotion and power: Creating images, creating identities*. John Wiley & Sons.

Moyle, B. D., Moyle, C. L., Bec, A., & Scott, N. (2019). The next frontier in tourism emotion research. *Current Issues in Tourism*, *22*(12), 1393–1399.
Nghiêm-Phú, B. (2014). A review of destination image studies from 2008 to 2012. *European Journal of Tourism Research*, *8*(1), 35–65. https://doi.org/10.54055/ejtr.v8i.150
Nomura, T., & Mitsukura, Y. (2015a). EEG-based detection of TV commercials effects. *Procedia Computer Science*, *60*, 131–140. https://doi.org/10.1016/j.procs.2015.08.112
Nomura, T., & Mitsukura, Y. (2015b). *Extraction of unconscious emotions while watching TV commercials*. IECON 2015-41st Annual Conference of the IEEE Industrial Electronics Society, pp. 000368–000373. IEEE.
Otto, J. E., & Ritchie, J. B. (1996). The service experience in tourism. *Tourism Management*, *17*(3), 165–174. https://doi.org/10.1016/0261-5177(96)00003-9
Pan, S., Lee, J., & Tsai, H. (2014). Travel photos: motivations, image dimensions, and affective qualities of places. *Tourism Management*, *40*(1), 59–69. http://doi.org/10-1016/j.tourman.2013.05.007
Prayag, G., Hosany, S., Muskat, B., & Del Chiappa, G. (2017). Understanding the relationships between tourists' emotional experiences, perceived overall image, satisfaction, and intention to recommend. *Journal of Travel Research*, *56*(1), 41–54. https://doi.org/10.1177/0047287515620567
Ramsoy, M. I., Stephens, T., & Kotsi, F. (2019). A study of unconscious emotional and cognitive responses to tourism images using a neuroscience method. *Journal of Islamic Marketing*, *10*(2), 543–564.
Rodríguez del Bosque, I., & San Martín, H. (2008). Tourist satisfaction a cognitive-affective model. *Annals of Tourism Research*, *35*(2), 551–573. https://doi.org/10.1016/j.annals.2008.02.006
Royo-Vela, M. (2005). Emotional and informational content of commercials: Visual and auditory circumplex spaces, product information and their effects on audience evaluation. *Journal of Current Issues & Research in Advertising*, *27*(2), 13–38. https://doi.org/10.1080/10641734.2005.10505179
Royo-Vela, M. (2006). Desarrollo de una escala de medida fiable y valida de la imagen del destino cultural-rural. In *Universidad de Girona, colección diversitas*. Publicacions de la Universitat de Girona.
Royo-Vela, M. (2009). Rural-cultural excursion conceptualization: A local tourism marketing management model based on tourist destination image measurement. *Tourism Management*, *30*(3), 419–428. https://doi.org/10.1016/j.tourman.2008.07.013
Royo-Vela, M., & Sararols, C. (2007). Image measure and formation in rural-cultural tourism: Measuring the emotional dimension based on emotional response *In situ*. *Journal of Tourism & Development*, *7/8*, 101–107.
Royo-Vela, M., & Serarols, C. (2005). El turismo rural-cultural: Un modelo de gestión del marketing turístico a nivel local basado en la medida de la imagen del destino. *Cuadernos de Turismo*, *16*, 197–222.
Royo-Vela, M., & Varga, Á. (2022). Unveiling neuromarketing and its research methodology. *Encyclopedia*, *2*(2), 729–751. https://doi.org/10.3390/encyclopedia2020051
Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161. https://doi.org/10.1037/h0077714
Russell, J. A., & Pratt, G. (1980). A description of the affective quality of environments. *Journal of Personality and Social Psychology*, *38*(2), 311–322. https://doi.org/10.1037/0022-3514.38.2.311
Russell, J. A., Ward, L. M., & Pratt, G. (1981). Affective quality attributed to environments: A factor analytic study. *Environment and Behavior*, *13*(3), 259–288. https://doi.org/10.1177/0013916581133001
San Martín, H., & Rodríguez, I. (2008). Exploring the cognitive–affective nature of destination image and the role of psychological factors in its formation. *Tourism Management*, *29*(2), 263–277. https://doi.org/10.1016/j.tourman.2007.03.012
Sharifi Shahrezaei, F., Shafiee, S., Zahedi, M., & Emadzadeh, M. (2020). Pictorial analysis of photos taken from Isfahan by tourists to choose influential places on improving destination image and to manage it. *Journal of Tourism Planning and Development*, *9*(32), 123–143.
Sirgy, M. J., & Su, S. (2000). Destination image, self-congruity, and travel behavior: Toward an integrative model. *Journal of Travel Research*, *38*(May), 340–352. https://doi.org/10.1177/004728750003800402
Stabler, M. J. (1995). The image of destinations regions: Theoretical and empirical aspects. In *Marketing in tourism industry: The promotion of destination regions* (pp. 133–159). Goodall & Ashworth.
Stepchenkova, S., & Morrison, A. M. (2008). Russia's destination image among American pleasure travelers: Revisiting Echtner and Ritchie. *Tourism Management*, *29*(3), 548–560. https://doi.org/10.1016/j.tourman.2007.06.003
Stylidis, D., Woosnam, K. M., Ivkov, M., & Kim, S. S. (2020). Destination loyalty explained through place attachment, destination familiarity and destination image. *International Journal of Tourism Research*, *22*(5), 604–616. https://doi.org/10.1002/jtr.2359
Tasci, A. D., Gartner, W. C., & Cavusgil, S. T. (2007). Conceptualization and operationalization of destination image. *Journal of Hospitality & Tourism Research*, *31*(2), 194–223. https://doi.org/10.1177/1096348006297290
Thompson, S. K. (1992). *Sampling*. John Wiley & Sons.
Walmsley, D. J., & Jenkins, J. M. (1993). Appraisive images of tourist areas: Application of personal construct. *Australian Geographer*, *24*(2), 1–13. https://doi.org/10.1080/00049189308703083

Wei, Z., Wu, C., Wang, X., Supratak, A., Wang, P., & Guo, Y. (2018). Using support vector machine on EEG for advertisement impact assessment. *Frontiers in Neuroscience (Sec. Neural Technology)*, *12*, 76. https://doi.org/10.3389/fnins.2018.00076

Yuce, A., Arasli, H., Ozturen, A., & Daskin, M. (2020). Feeling the service product closer: Triggering visit intention via virtual reality. *Sustainability*, *12*(16), 6632–6617. https://doi.org/10.3390/su12166632

Zajonc, R. B. (1980). Feeling and thinking: Preferences need not inferences. *American Psychologist*, *35*(February), 151–175. https://doi.org/10.1037/0003-066X.35.2.151

Zhou, L. (2014). Online rural destination images: Tourism and rurality. *Journal of Destination Marketing & Management*, *3*(4), 227–240. https://doi.org/10.1016/j.jdmm.2014.03.002