Physiological and Self-Report Methods to the Measurement of Emotion: Insights for Tourism Marketing

Mrs Arghavan Hadinejad[1]

A/Professor Brent D. Moyle[2]

Dr Anna Kralj[1]

Professor Noel Scott[1]

[1]*Griffith Institute for Tourism, Griffith University, Gold Coast, QLD, 4222, Australia*

[2]*USC Business, University of the Sunshine Coast, Sunshine Coast, Australia*

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Abstract

There is strong growth in research on tourist emotion, with a substantial scholarly debate emerging surrounding approaches to measurement. Recently objective physiological methods for measurement of emotion have been applied in the tourism field. However, there are few studies which explore the benefits and limitations of applying physiological and self-report methods to measure emotions. This research aims to compare and contrast physiological and self-report methods to assess emotional responses to tourism marketing stimuli where music was manipulated. This research assessed emotional responses from 37 participants to three tourism advertisements of Iran using four key methods; specifically, FaceReader™, skin conductance, self-report surveys and post hoc interviews. This research found that the light rhythmic music tends to evoke positive emotions and a higher level of emotional arousal in participants than does the traditional Iranian music or a video without music. Physiological and self-report measures of emotional arousal were inconsistent, but both techniques found similar results for assessing the valence of emotions. Thus, results highlight the importance of applying physiological techniques in combination with self-report surveys and post hoc interviews to provide a better and more accurate understanding of emotional experiences.

Keywords: FaceReader™, Skin conductance, Self-Report, Tourism Marketing

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Introduction

Tourism advertising plays a significant role in shaping potential visitors' mental images of a destination (Morgan & Pritchard, 2012). Tourism marketers utilise advertisements to position a brand against its competitors and hence influence destination selection (Singh & Hu, 2012). Emotional responses evoked by advertisement are predictors of positive attitudes and intention to purchase (Niazi, Ghani, & Aziz, 2012). The extant tourism literature overwhelmingly uses self-report surveys to measure emotional responses to marketing stimuli (Chiou, Lin, & Perng, 2011). Such self-report methods evaluate cognitive and affective responses based on recollected emotional experiences (Robinson & Clore, 2002). Self-report measurement of emotional valence (positive or negative) and arousal (activation) is simple and inexpensive but allows retrospective reflection which may not be representative of the emotions experienced (Li, Scott & Walters, 2015).

In response to mounting criticism surrounding the use of self-report surveys as the sole measure of emotion, an emerging body of knowledge highlights the potential objectivity of physiological measurement approaches, used to record emotion in real-time (Li, Walters, Packer, & Scott, 2018; Hetland, Vittersø, Fagermo, Øvervoll, & Dahl, 2016; Stadler, Jepson, & Wood, 2018; Picard, 2010; Wilhelm & Grossman, 2010; Bagozzi, Gopinath, & Nyer, 1999; Healey & Picard, 2005). Increasingly, scholars are becoming aware that physiological techniques can be used in combination with existing self-report measures to explore elicitation of emotion in advertisements, and the marketing and the tourism fields more broadly (Kim & Fesenmaier, 2015). Connected to this, there have been a growing emergence of studies in tourism that adopted physiological technologies (e.g. Brodien Hapairai, Walters, & Li, 2018; Shoval, Schvimer, & Tamir, 2018; Scott, Green, & Fairley, 2016; Wang & Sparks, 2016; Li, Huang, & Christianson, 2016; Babakhani, Ritchie, & Dolnicar, 2017). The efficacy of

physiological technologies in measuring emotions such as skin conductance, facial electromyography, and FaceReader™ has been assessed in tourism studies; however, scholars note more research is required in this area (Hetland, Vittersø, Wie, Kjelstrup, Mittner, & Dahl, 2018; Kim, Kim, & Bolls, 2014; Li, Walters, Packer, & Scott, 2018). Despite the rapid adoption of physiological techniques in tourism studies, there has been limited research which compares, contrasts and critically examines the application of physiological and self-report methods to measure emotions.

Accordingly, this study uses physiological and self-report methods in an experimental design to assess the emotional responses to tourism videos where music was manipulated. This research employs FaceReader™, skin conductance, a self-report questionnaire and post hoc interview methods to collect data from 37 participants. The results allow the benefits and limitations of applying physiological techniques and self-report measurement of emotions to be compared. This research provides future scholars with insight into each technique and how to overcome the potential limitations of physiological technologies.

Literature Review

Emotional phenomena have been studied across human history and there is no common consensus on their definition (Solomon, 1993). Keltner and Gross (1999, p. 468) define emotion as "episodic, relatively short-term, biologically based patterns of perception, experience, physiology, action, and communication that occur in response to special physical and social challenges and opportunities". In contrast, other scholars have sought to define emotion as "non-instrumental behaviours and non-instrumental features of behaviour, physiological changes, and evaluative, subject-related experiences, as evoked by external or internal events" (Frijda, 1986, p. 4).

Researchers in the marketing and tourism fields use two main categories to describe emotions, the basic and dimensional approaches (Hadinejad, Moyle, Scott, & Kralj, 2018). The basic approach proposes six or more basic emotions including

happiness, sadness, anger, fear, disgust, and surprise. Psychological scales such as Differential Emotions Scale (DES), Circular Model of Emotion, and the Consumption Emotions Set (CES) are used to measure basic emotions (Li et al., 2015). DES identifies 10 basic emotions, the Circular model of emotion recognizes eight emotions and the CES defines 16 emotions (Ma, 2013). While the basic approach can identify the type of emotion, it cannot measure the dimension of emotional responses.

The dimensional approach differentiates emotions on two dimensions, valence and arousal (Shen & Morris, 2016). The dimensional approach includes the circumplex (Watson & Tellegen, 1985), the pleasure-arousal-dominance (P-A-D) (Russell, 1980) and the positive affect negative affect schedule (PANAS) (Watson, Clark, & Tellegen, 1988) models. While the dimensional approach is more popular in the advertising literature (Li et al., 2018), previous tourism scholars have applied both approaches which provide a better understanding of the type, intensity and valence of emotions experienced (e.g. Mura, 2010; Tucker, 2009; Hadinejad et al., 2018; Hetland et al., 2016; Brodien Hapairai et al., 2018).

There is another approach to measure emotional responses, experience sampling method (ESM), which is common in psychology (Cutler, Carmichael, & Doherty, 2014). ESM captures real-time emotional experiences over time (Hektner, Schmidt, & Csikszentmihalyi, 2007). This method applies self-reports to investigate individuals' experiences throughout a given time period (Courvoisier, Eid, & Lischetzke, 2012). However, there are few studies in tourism which apply ESM to examine real-time experiences (Birenboim, Reinau, Shoval, & Harder, 2015). ESM requires collecting data in a natural real-world environment over a specific period of time (Quinlan Cutler, Doherty, & Carmichael, 2018).

Selecting an appropriate method for the measurement of emotion is critical to collecting reliable and valid data. The self-report methods depend heavily on recollected emotions, which may not be representative of an individual's emotional responses

(Robinson & Clore, 2002; Hadinejad et al., 2018; Mauss & Robinson, 2009; Hetland et al., 2018). Firstly, the time between when emotions are elicited and when participants report them leads to recall inaccuracy. Self-report data are also subject to cognitive bias and tend to reinforce positive self-description (Brodien Hapairai et al., 2018). Moreover, a self-report survey cannot measure emotions continuously in real time such as when respondents are exposed to video stimuli (Li et al., 2018) as they are subconscious and non-discrete (Poels & Dewitte, 2006). Emotions have a dynamic architecture and those from a particular recalled moment seldom can be reported (Scherer, 2009). Emotional responses evoked by commercials are usually short-lived (Mano, 1996) and thus self-report surveys may not be able to report affective reactions accurately. In response to the criticism against the self-report measurements of emotions, researchers have turned to physiological techniques to assess emotional responses.

There are a number of physiological techniques available for use as alternatives to the self-report measurement of emotion. These include facial electromyography (EMG), electro-dermal analysis (EDA), and Facial Action Coding System (FACS) (Chittaro & Sioni, 2014; Li et al., 2018; Kreibig, 2010). EMG measures the electrical impulses involved in the contraction of the facial muscle (Mauss & Robinson, 2009) but can only measure the valence of emotions (Bolls, Lang, & Potter, 2001). Skin conductance, which is a tool to measure EDA, is an effective technique to assess emotions (Khalfa, Isabelle, Jean-Pierre, & Manon, 2002). When respondents are exposed to a stimulus, activation of their autonomic nervous system leads to sweat gland activity and a resultant change in skin conductivity (Grabe, Lang, Zhou, & Bolls, 2000). Thus, changes in skin conductance indicate an individual's level of arousal towards the stimulus (Kroeber-Riel, 1979).

The FACS is used to capture changes in facial expressions and hence identify the basic emotions expressed (Kline, Neumann, Hall, & Capito, 2017). FaceReader™ is a FACS software tool used to identify facial expressions and is used for measurement of

emotions elicited in response to a marketing stimulus (Kayser, 2017). FaceReader™ allows continuous measurement of six basic emotions; happiness, sadness, anger, fear, disgust, and surprise (plus neutral), as well as emotional arousal and valence (Zaman & Shrimpton-Smith, 2006).

The effect of music on emotions

There is an intricate connection between music and a listener's emotional responses. Music is used as an element in advertising to affect emotional responses (Gorn, 1982) and an advertisement with music evokes higher levels of emotional responses compared to the same advertisement without music (Morris & Boone, 1998). Exciting music leads to higher emotional arousal in respondents as measured via their skin conductance and heart rate (Zimny & Weidenfeller, 1963). Tourist businesses can use background music to increase emotional arousal and customers' behavioural intentions (Ryu & Jang, 2007) and enhances their experience (Pan, Su, & Chiang, 2008; Jang, Liu, & Namkung, 2011; Kemp, Williams, Min, & Chen, 2019). Music is used in tourism advertisements to influence or change an individual's perceptions of a destination (Pan & Hanusch, 2011). Typically, the effect of music on emotions is measured via self-report questionnaires, and there is limited research examining emotional responses to music applying physiological and self-report measures. Further, few empirical studies have explored emotional responses elicited in response to advertising stimuli where music is manipulated, especially utilising objective physiological measures in combination with self-report measures (Malone, McCabe, & Smith, 2014). This study has the following two key research objectives:

1. Examine and compare the emotions elicited in response to different types of music of advertising stimuli using FaceReader™, skin conductance, self-report surveys and post hoc interviews;
2. Assess the benefits and limitations of applying physiological and self-report methods to measure emotions;

Methodology

Stimuli development. To create the manipulations required, the authors created three versions of the same 'mock' video advertisement designed to encourage travel to Iran. All used the same imagery but one used light rhythmic music, one used traditional Iranian music and one stimulus was without any music. Iran was chosen so prior tourism experience or knowledge about the destination advertisement did not influence respondents. The video imagery (for the tourism advertisement) was created and evaluated using an expert review process. The first author interviewed Iranian tourism experts in both academia (six participants) and industry (seven participants) in Iran in April 2017 to collect images for use in tourism advertising. This led to a decision to use images from leading tourism photographers and segments of existing tourism videos. The first author approached several leading Iranian photographers who had won prizes for work displayed in tourism exhibitions. As a result, 40 images were selected in four types: historical monuments, tourists in Iran, nature, and food. In addition, Iranian tourism experts provided 20 videos which showed tourist attractions in Iran and the daily life of Iranians. Two rounds of focus group and Delphi panel were conducted to identify the images and video segments which created emotional arousal, positive emotions and had the potential to affect tourist attitude (Niazi et al., 2012). The methods used for the Delphi panel and focus groups were similar to prior studies (Miller, 2001; Vernon, Essex, Pinder, & Curry, 2003).

An eDelphi method (Cole, Donohoe, & Stellefson, 2013) was used to obtain a consensus among a group of experts on the images to be included in the tourism advertisement in August 2017 (Okoli & Pawlowski, 2004). Delphi panels usually include 10 to 20 members as few new ideas are generated in a homogenous group when the size exceeds 30 participants (Pollard & Pollard, 2004). Initially, due to the possible low response rate, 54 industry practitioners and tourism marketing scholars from Iran and Australia were targeted. The first author (based in Australia) emailed the eDelphi

participants and invited them to participate in a short online survey to select images of Iran. Survey participants were asked to select three images which made them feel excited, joy, wonder, amazed, happy or inspired them to visit Iran. These emotions were selected as a result of a discussion with four tourism marketing experts at an Australian university. As a result of the first round of eDelphi, 41 experts responded and selected 20 images. The experts also recommended that images of tourists in Iran be removed to allow more space to show Iran as a potential tourism destination.

17 experts responded in the second eDelphi round conducted in September 2017 and nine images showing historical monuments, nature, and food were selected to be included in the tourism advertisement. In addition, experts suggested the inclusion of images of local communities and their daily life. For example, one member mentioned that "Actually hospitality is the first thing that tourists feel it...the soul of hospitality is rooted in the local communities and their culture....So, it is better to add one section for local communities". Accordingly, two focus groups were conducted aimed to identify segments of existing videos which create emotional arousal and positive emotions and illustrate the life of local communities.

The key aim of a focus group is to provide rich information not available from one-on-one interviews (Rabiee, 2004). The number of participants in a focus group varies from six to eight members (Krueger & Casey, 2014). The authors approached nine tourism marketing experts from an Australian university to participate in the focus group. In the first round in September 2017, five experts agreed to participate and selected six videos which created emotional responses. A second focus group was conducted in the same month with three experts in order to select specific segments of these videos to be included in the advertisement. The participants in the second focus group selected 87 seconds of material to be included in the video.

As a result, nine images and 87 seconds of videos were combined to create a tourism video of Iran. In addition, the focus group participants identified two types of

emotional music in the existing videos, one traditional Iranian and one light rhythmic music. The Iranian music was a traditional female vocal which experts described as peaceful and calming. The light rhythmic instrumental music had no vocal component and was from the movie Paperman (Collar, n. d.). The video, created in October 2017, takes the perspective of a solo female traveller to Iran and includes images of tourist attractions, nature, food and the daily life of Iranians. The video starts with an aerial view as a plane is landing in Iran and then shows the female tourist visiting different places and taking photos. The video ends by showing a blink of a Persian cat's eye. Three versions of the same video, ninety seconds in length, were created, one video with light rhythmic music (Video1), one with traditional Iranian vocal (Video 2), and the third without music (Video 3).

Participants. 43 Australians (26 females and 17 males) recruited using convenience sampling and were invited to participate in laboratory research undertaken in an Australian University in November and December 2017. Participants were screened and included if they were Australian by birth or had lived in Australia for more than 18 years (to exclude those who were under 18). Data collection with physiological measurements is complicated and time-consuming, and such small samples are common in studies using physiological techniques (e.g. Gakhal & Senior, 2008; Somervuori & Ravaja, 2013). Of the 43 participants, six respondents were "non-respondents", having artefacts such as poor contact of electrodes or deflections in their EDA readings (Braithwaite, Watson, Jones, & Rowe, 2013), so their data were discarded. As a result, the data from 37 participants were used (21 females and 16 males). 35 of the respondents were aged between 18 and 64 and two respondents were above 65 years old. None of the participants had watched the travel videos of Iran or travelled to the country before. Potential issues due to the laboratory setting and proportion of females and males that might affect the results are discussed in the conclusions section.

Measures

I. *Skin conductance.* A Biopac™ hardware (transmitter), Biopac™ data logger and AcqKnowledge® (psychophysiological software) were used for skin conductance data collection and subsequent analysis. In order to collect skin conductance data, the researchers attached two standard electrodes to the index and middle fingertips of the non-dominant hand of each participant to allow them to use a computer mouse with their dominant hand (Birk, Opitz, & Urry, 2017; Senior, Russell, Gazzaniga, & Raessens, 2006). The electrodes were connected to a transmitter which sent skin conductance readings to a Biopac™ data logger. The sampling rate for skin conductance data collection was 2000Hz. The researchers allowed five minutes between attaching the electrodes on participants' fingers and collecting data to check the quality of skin conductance data (Braithwaite et al., 2013). In addition, participants were given a minimum of two minutes between each advertisement to relax and avoid any "carryover" effect (Li et al., 2018).

II. FaceReader™. For FaceReader™ data collection, as suggested by previous research, participants were asked to sit in front of a window providing natural light for better detection of facial movements (Hetland et al., 2016). Participants wearing thick frame glasses were asked to take them off for better analysis of their facial expressions. The participants were asked if they could see the screen clearly without any problems to avoid any potential influence of poor vision on the results. Participants' facial movements were captured using a webcam and FaceReader™ was used to analyse the data.

III. *Self-report survey and post-hoc interview.* After watching each stimulus, participants were asked to complete the Self-Assessment Manikin (SAM) (Lang, 1980) indicating their valence and arousal levels. This was followed by a brief interview in which participants were asked to explain how they felt while watching each advertisement.

IV. *Procedure.* Upon entering the lab, the author provided participants with an introduction to the experiment procedure. The order of the videos was randomized to

avoid order effects. Advertising stimuli presentation, data collection, and analysis were controlled from a computer and laptop running FaceReader™ and AcqKnowledge®. The participants viewed the videos and then completed the surveys and post-hoc interviews. This procedure took around 20 to 30 minutes per participant.

V. *Data analysis.* The researchers calibrated FaceReader™ data obtained from each participant and then exported data as a video analysis detailed log. A video analysis detailed log is a text file containing information about a participant's emotional arousal, valence, and facial expressions, as well as gender, age, and ethnicity. This log data was exported to an excel sheet for further analysis. Since FaceReader™ provides a reading every decisecond, the researchers aggregated and averaged data across one second interval. That said, ninety data points for each advertising stimulus were provided (1 s intervals). The mean score for the three advertisements (per person) was calculated for FaceReader™ emotional arousal and valence. In addition, moment-to-moment emotional arousal and valence analysis were obtained based on the z-score to analyse fluctuations of emotion. The z-score is used to average and standardize data across time to identify spikes in physiological measures (Biocca, David, & West, 1994). For skin conductance analysis, two common indicators of phasic skin conductance data namely the frequency and amplitude of skin conductance response (SCR) were calculated (Boucsein, 2012; Braithwaite et al., 2013). The frequency of SCR refers to the rate of change in electrical conductivity of skin (number of peaks). SCR amplitude refers to the magnitude of the peaks during the period of measurement. This analysis was conducted within AcqKnowledge® software. FaceReader™ data, the frequency of SCRs and SCR amplitude as well as questionnaire data were exported to SPSS for further analysis. In particular, analysis of variance (ANOVA) was used to assess the differences among the three videos in terms of creating emotional responses.

Results

SCR frequency and amplitude

Table 1 illustrates the frequency and amplitude of SCR indicating participants' emotional arousal towards the videos. In order to find the significant differences in SCR frequency and amplitude between the three videos (within subject comparison), a post hoc test for repeated measures ANOVA was conducted. The results of a multivariate test indicated that there are statistically significant differences between the three videos in terms of SCR frequency and amplitude ($p<0.001$). While Video 1 is not significantly different from Video 2 ($p>0.05$) in SCR frequency and amplitude, both videos are significantly different from Video 3 ($p<0.05$). This result indicates that the light rhythmic music and female vocal are correlated with greater SCR frequency and amplitude compared to an advertising stimulus without music.

Table 1. A summary of SCR frequency and amplitude findings

	SCR frequency (Mean)	ANOVA results (SCR frequency)	P-value	SCR amplitude (Mean)	ANOVA results (SCR amplitude)	P-value
Video 1	3.6	Video 1> Video 2	p>0.05	0.6	Video 1> Video 2	p>0.05
Video 2	3	Video 2> Video 3	p<0.05	0.5	Video 2> Video 3	p<0.05
Video 3	0.8	Video 1 > Video 3	p<0.05	0.02	Video 1 > Video 3	p<0.05
Multivariate test	NA	Wilks'Lambda=0.540, F (2, 35) =14.88, η2 =0.46	p<0.001	NA	Wilks'Lambda=0.637, F (2, 35) =9.95, η2 =0.36	p<0.001

*NA= not applicable

FaceReader™ emotional arousal and valence

Table 2 presents emotional arousal and valence from FaceReader™. A post hoc test for repeated measures ANOVA was conducted to find the significant differences in emotional arousal and valence between the three videos (within subject comparison). The results of a multivariate test for emotional arousal and valence indicated that there was a statistically significant difference between the three videos ($p<0.001$). Emotional arousal results revealed that Video 1 was significantly greater than Video 2 which was significantly greater than Video 3 ($p<0.001$). This result shows that the light rhythmic music is associated with a higher level of emotional arousal in participants than the traditional Iranian music or no music. The findings from valence measures indicated that Video 1 was significantly greater than Video 2 and Video 3 based on the valence of

emotion ($p<0.001$). However, the results demonstrated that Video 2 is not significantly different from Video 3 in positive emotion measures ($p>0.001$). This finding shows that the tourism advertisement with light rhythmic music is associated with greater positive emotions in participants.

Table 2. A summary of emotional arousal and valence from FaceReader™

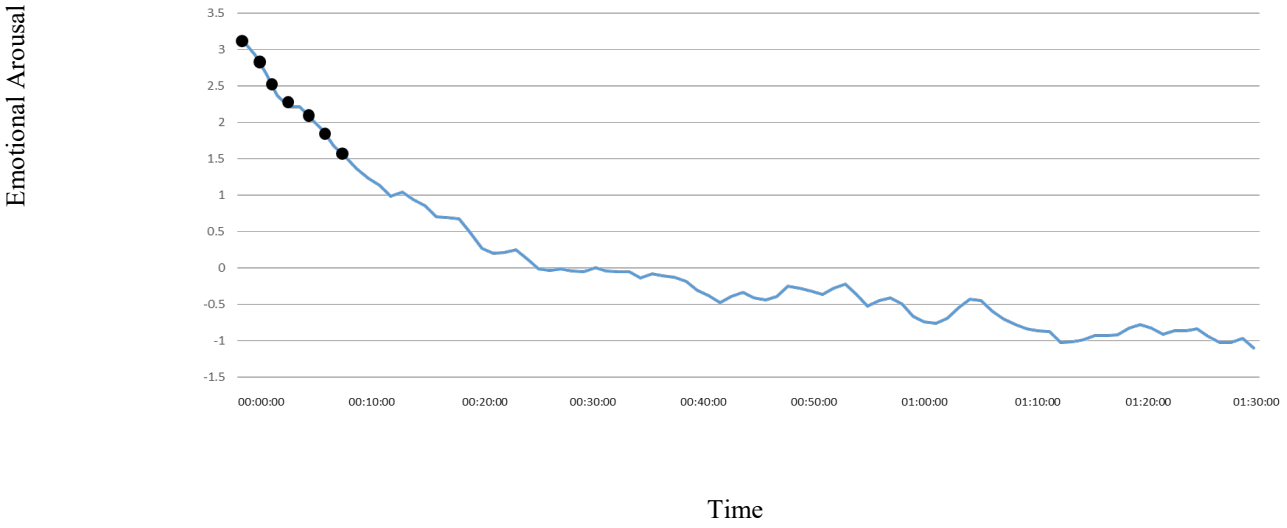
	Emotional arousal (Mean)	ANOVA results (Emotional arousal)	P-value	Valence (Mean)	ANOVA results (Valence)	P-value
Video 1	0.5	Video 1> Video 2	p<0.001	0.3	Video 1> Video 2	p<0.001
Video 2	0.3	Video 2> Video 3	p<0.001	0.1	Video 2> Video 3	p>0.001
Video 3	01	Video 1 > Video 3	p<0.001	0.1	Video 1 > Video 3	p<0.001
Multivariate test	NA	Wilks'Lambda=0.016, F (2, 35) =1045.835, η2 =0.98	p<0.001	NA	Wilks'Lambda=0.048, F (2, 35) =348.26, η2 =0.95	p<0.001

*NA= not applicable

Aggregate results (all participants) of moment-to-moment emotional arousal and valence data of Video 1 is shown in Figure 1. Participants' real-time emotional arousal and valence obtained from FaceReader™ were standardized based on a z-score. Only the z-scores greater than 1.96 were identified as peaks (Biocca et al., 1994) and these are highlighted in Figure 1. Real-time emotional arousal in Figure 1(a) indicates seven peaks (black spots) at the beginning of the advertisement (00:00-00:07) where aerial views of tourist attractions of Iran are shown. Participants described these moments as: "I really enjoyed the patterns and designs in the architecture", "It was nice to see some glimpses of Iranian culture" and "intrigued by the culture". Figure 1(a) illustrates that participants' emotional arousal declines through the video. Figure 1(b); however, indicates greater fluctuations in participants' positive valance level. While the moment-to-moment valence data indicates constant fluctuations, there are six pleasant peaks. The first two peaks occurred in the first five seconds of the advertisement, in which aerial views of tourist attractions of Iran were shown. The second four peaks occurred between 01:27-01:30 and coincided with images of nature and the final Persian cat eye's blink. Participants explained their thoughts in regards to the nature images as "quite attractive",

and the eye blink as “the winking cat at end made me smile - thought it was a smart finish”, and “I noticed that animal (cat) as funny”.

(a)



(b)

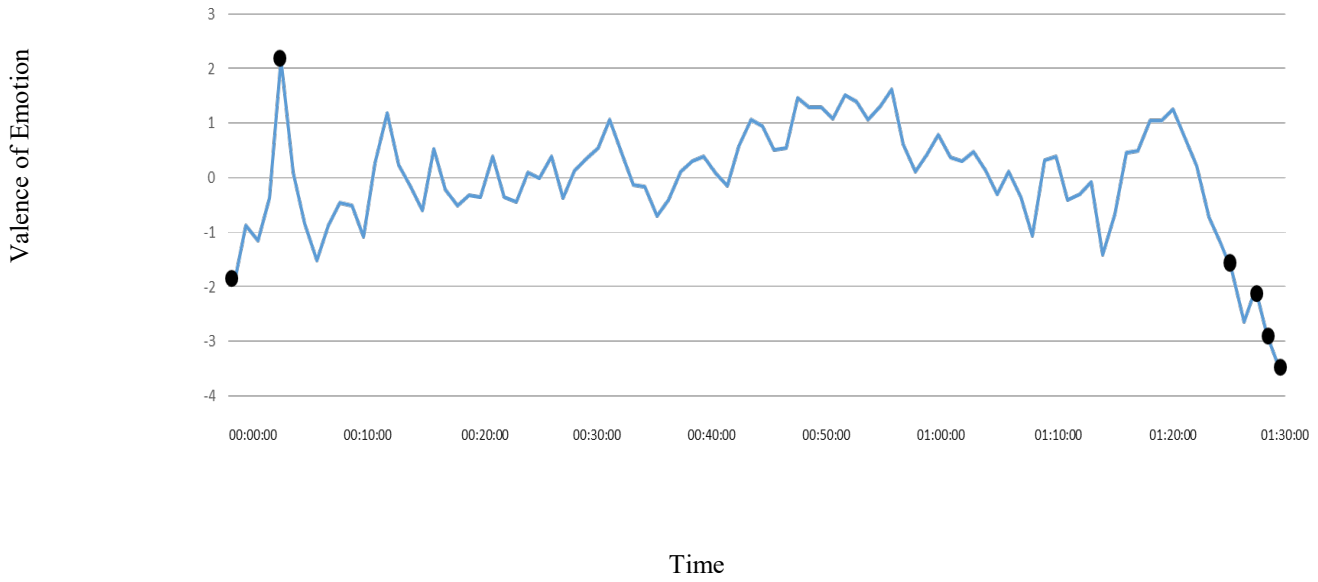


Figure 1. Moment-to-moment FaceReader^{TM} data (z-score) for Video 1 (N=37).

Emotional arousal and valence in self-report measures

Participants' self-reported emotional responses are presented in Table 3. The ANOVA with repeated measures results indicated that the three videos are significantly different from each other in terms of emotional arousal and valence ($p<0.001$). The results of post hoc tests showed that Video 1 created significantly higher levels of arousal in participants compared to Video 2 which generated higher arousal than Video 3 ($p<0.05$). This result shows that the light rhythmic music is associated with higher emotional arousal, consistent with the FaceReader™ findings. Pairwise comparisons also indicated that Video 1 created significantly more positive valence compared to Video 2 and Video 3 ($p<0.001$). However, the results indicated that Video 2 is not statistically significant different from Video 3 in creating positive emotion ($p>0.001$). Together these results show that the tourism advertisement with the light rhythmic music is associated with greater positive emotions, a finding which is consistent with FaceReader™ findings.

Table 3. A summary of emotional arousal and valence from self-report surveys

	Emotional arousal (Mean)	ANOVA results (Emotional arousal)	P-value	Valence (Mean)	ANOVA results (Valence)	P-value
Video 1	3.1	Video 1> Video 2	$p<0.05$	4.1	Video 1> Video 2	$p<0.001$
Video 2	2.1	Video 2> Video 3	$p<0.05$	3.4	Video 2> Video 3	$p>0.001$
Video 3	1.5	Video 1 > Video 3	$p<0.05$	3.2	Video 1 > Video 3	$p<0.001$
Multivariate test	NA	Wilks'Lambda=0.221, $F(2, 35)=61.58$, $\eta 2=0.78$	$p<0.001$	NA	Wilks'Lambda=0.442, $F(2, 35)=22.13$, $\eta 2=0.56$	$p<0.001$

*NA= not applicable

Emotional responses in post hoc interview

The findings from self-report surveys are consistent with the post hoc interviews which were recorded, transcribed and the emotional words and feelings towards the videos were coded (positive, negative and neutral) (Jennings, 2001). Post hoc interviews revealed that participants used terms such as "positive emotion', "happy", "appreciation", "joy", "peace", and "content" to describe how they felt when they watched Video 1 with 16% of emotional words negative. Participants described Video 2

as “a bit anti-climactic”, “fairly neutral”, or “a bit happy” with 30% of emotional words negative. Participants reported 57% of their emotional words negative for Video 3 using terms like “depressing”, “a little sad”, or “not very happy”. Participants reported their emotional experiences such as “the pics are awesome, wanting us to visit these places” or “the food component was especially tempting” in response to the first half of the video showing images of food and tourist attractions in Iran. In addition, participants reported responses such as “it looked like people were having fun” or “The people look quite attractive” and “liked the people. They seemed friendly” in response to the image of the daily life of Iranians in the second half of the video.

Discussion

This research aims to compare the benefits and limitations of different emotion measurements through conducting an experiment to assess emotional responses to music manipulation. The findings of skin conductance indicated that participants reacted similarly to the two types of music (light rhythmic music and female vocal) in terms of SCR frequency and amplitude; however, they showed less emotional arousal in response to the advertising stimulus without music. This finding is consistent with prior literature, which suggests that advertising stimuli with music evoke greater emotional arousal compared to an advertisement without music (Morris & Boone, 1998). Music can provide a peripheral cue that affects individuals’ emotions (Pan, & Hanusch, 2011), confirming the results of this research. While the results of skin conductance indicated similar level of emotional responses towards the two types of music, prior scholarly inquiry suggests that physiological responses are affected by the types of music (Shahabi & Moghimi, 2016). However, FaceReader™ and self-report surveys showed higher levels of emotional arousal for the light rhythmic music compared to traditional Iranian music. Similar concerns regarding the discrepancy between skin conductance and self-report findings were raised in previous research (Grabe et al., 2000). This finding provides significant implications for tourism practitioners as they need to design the

executional cues (affective features) of stimuli in a way to influence potential visitors' emotions and accordingly their attitude and decision making procedure (Amar, Droulers, & Legohérel, 2017; Yoo & MacInnis, 2005).

FaceReader™ showed that light rhythmic music tends to evoke positive emotions and a higher level of emotional arousal in participants than does the traditional Iranian music or no music which is consistent with self-report results. This finding confirms prior research showing that the type of music affects emotional responses (Van Den Bosch, Salimpoor, & Zatorre, 2013). The findings also confirm that variations in musical styles result in different emotional reactions in participants (Zander, 2006). Prior research suggests that different musical structures such as rhythm and tempo tend to affect physiological responses like valence of emotions and emotional arousal (Gomez & Danuser, 2007), confirming the findings of the current research. Australian participants' positive emotional arousal towards the light rhythmic music provides implications for Iran tourism marketers for the design of marketing stimuli for this particular market.

Participants' real-time emotional arousal and valence data obtained from FaceReader™ illustrate that emotional arousal declined along the video. The light rhythmic music generated positive emotions throughout but these were not of high intensity in the second half of the video. The first half of the video shows the solo female traveller visiting different parts of Iran and several static images of food and tourist attractions are presented, while the second half of the video includes segments showing the daily life of Iranians. According to the interviews, images of food and tourist attractions created more arousal, while the daily life of Iranians generated less arousal but still positive emotions. This suggests that Iran tourism managers need to include images of local communities, tourism attractions, and food in future marketing stimuli with Australians as a target market.

The advantages and disadvantages of each data collection technique, the type of analysis available in each method and directions to overcome the limitations of each approach, specifically for physiological technologies are discussed below.

Skin conductance. Skin conductance measures participants' level of emotional arousal (Hadinejad et al., 2018) and allows the researcher to obtain objective and real-time emotional responses. Data collected shows the fluctuation of emotional arousal during an experiment. This technology also provides information on SCR frequency (the number of arousal peaks) and amplitude (the magnitude of emotional arousal) (Brodien Hapairai et al., 2018). The researcher can export the raw data to an excel sheet for further analysis in other programs such as Excel, SPSS, AMOS or PLS.

However, there are several issues in using the skin conductance technique. One issue notes that women usually have cold fingers, especially in the early morning. Skin conductance works based on sweat gland activation and thus cold fingers make women non-respondents. The best time to collect data is between 10 am and 1 pm. Food consumption (like lunch and coffee) can also affect participants' skin conductivity (Quinlan, Lane, & Aspinall, 1997). Another limitation of skin conductance is the standard size of electrodes. Men usually have thicker fingers compared to women which makes it hard to attach the electrodes to their fingers. The authors used adhesive tape to ensure the electrodes were fully attached to males' fingertips. The electrodes need to be attached to the non-dominant hand of participants and thus causes difficulties for left-handed respondents, especially when they need to use a computer mouse with their right hand. Skin conductance is also sensitive to room temperature (Braithwaite et al., 2013). Also, any physical activity during an experiment, like running or hiking a mountain, affects the accuracy of results. The authors collected data in a laboratory setting while participants were seated in front of a screen in a normal temperature to minimise this problem. Skin conductance only measures emotional arousal and thus is not able to provide information on valence or basic emotions experienced (Figner & Murphy, 2010).

The laboratory environment may affect the natural reactions of participants, so they might over or under emphasise their emotions. Researchers also usually collect data from a small sample size due to the complexity of skin conductance techniques (Li et al., 2018).

FaceReader™. This technique allows the researcher to identify six basic emotions; happiness, sadness, anger, fear, disgust, and surprise plus neutral, based on software running a neural network algorithm (Zaman & Shrimpton-Smith, 2006). In addition, FaceReader™ software detects emotional arousal and valence from facial muscle movements (Terzis, Moridis, & Economides, 2013). Therefore, this technique supports both basic and dimensional approaches. FaceReader™ can address the criticism of self-report methods by measuring real-time emotional responses and tracks the fluctuation of emotional arousal and valence during an experiment. In addition, FaceReader™ software can indicate the percentage of each basic emotion and whether the eyes and mouth are open or closed and whether the eyebrows are raised, neutral or lowered. FaceReader™ also provides information on expression intensity (level of basic emotions) and subject characteristics such as gender, age, and ethnicity. The software also provides a dynamic overview of gaze direction (whether participants look forward or left and right - which means they are distracted). The software can report on emotional arousal and valence based on a pleasant and active axis similar to the circumplex model of affect. It can also provide cross-group comparisons.

While FaceReader™ allows the researcher to compare and contrast the findings with reported emotional responses in surveys and interviews, there are some issues that scholars need to consider while applying this method. FaceReader™ is sensitive to light condition. To minimise this issue, the authors asked participants to sit in front of a window with natural light (Hetland et al., 2016). In addition, thick and dark-frame glasses can reduce the accuracy of results (Hadinejad et al., 2018). To overcome this problem, the authors asked participants wearing dark frame glasses (only five) to take them off. The accuracy of results also depends on the quality of cameras capturing facial

movements. Another limitation of FaceReader™ is it provides an incomplete display of emotional arousal and valence diagrams if the experiment is longer than one minute. A diagram of the whole experiment is possible by exporting raw data to an excel sheet. In addition, the software provides data point every decisecond. Since the fluctuation of emotions is usually reported in one second intervals, it is necessary to aggregate and average data which is time-consuming.

Furthermore, some participants look angry or sad by nature. To control this issue, researchers need to calibrate facial expression by asking a participant to show a neutral face at the beginning of each experiment. FaceReader™ is not trained to work with children (below 3) and the data collected from East-Asian participants is not completely accurate. Given data collection with FaceReader™ is complicated and time-consuming, small samples are common. Similar to other lab-based studies, participants might feel they are being assessed and thus the procedure might affect their natural reactions.

Self-report survey. Unlike physiological techniques which require a considerable amount of money to buy the technology, questionnaires are inexpensive. Furthermore, while collecting data with physiological technologies are time-consuming and complex, questionnaires are simple and take less time to administer (Li et al., 2015). In addition, surveys are easy to understand for participants. Researchers can collect data from a large sample size using questionnaires. Questionnaires allow researchers to collect information on the type and dimension of emotions in line with both basic and dimensional approaches. Through capturing emotional responses via surveys, researchers are not in direct contact with participants and thus do not affect their natural reactions.

However, questionnaires collect remembered emotions which might be distorted and non-representative of actual emotions experienced (Hetland et al., 2018). In order to overcome this issue, the authors collected data right after each experiment to measure the most remembered emotions. In addition, questionnaires do not allow researchers to

obtain objective and real-time emotions. Unlike FaceReader™ and skin conductance, questionnaires are unable to accurately measure the level of arousal. In addition, surveys cannot track the fluctuation of emotions, i.e. moment-to-moment data, during an experiment. According to Kim and Fesenmaier (2015), "having a feeling is not the same as being aware of it". That said, participants might not be fully aware of their emotions. For example, participants might not be able to distinguish between positive and negative surprise.

Interview. Interviews provide a deep understanding of participants' emotional responses. It allows participants to explain their emotional experiences in details. Unlike surveys and physiological technologies which only capture emotional responses and do not allow the researcher to understand what triggered a particular type or intensity of emotion, interviews explain the reasons why a respondent feels a particular type of emotion at a particular time of the experiment.

Nonetheless, interviews are time-consuming (Zins, 2000), especially when combined with other measurements of emotions. That said, when emotional responses of participants are measured by different physiological tools and then they are asked to complete a survey, participants might be tired and thus do not provide a detailed explanation of their emotions. Besides to collecting data via interview, transcribing, coding and reporting findings are time-consuming and costly. The authors interviewed the participants and asked them to provide their answers in a box at the end of the survey to make the interpretation process easier. Another issue with the interview is that the whole procedure is prone to interviewer's bias.

The benefits and limitations of each approach are presented in Table 4.

Table 4. Benefits and limitations of FaceReader™, skin conductance, self-report and interview (findings of current research)

	Benefits	Limitations
FaceReader™	• Identifies six basic emotions (plus neutral) • Detects valence of emotion • Ascertains emotional arousal • Provides objective data in real time	• Sensitive to light condition • Sensitive to thick and dark frame glasses • Might affect natural reactions of respondents

	• Tracks the fluctuation of emotional arousal and pleasure during the experiment • Provides results of the analysis available after each experiment • Analyses data within the software • Allows the researcher to export data in a text format for a more detailed analysis • Allows the researcher to compare the findings with the reported emotional arousal and valence in surveys	• Depends on the quality of cameras • Incomplete display of the analysis of experiments longer than one minute in the software • Exports raw data per decisecond and the researcher needs to aggregate and average data across one second interval • The researcher needs to calibrate each respondent's facial expression by asking each respondent to show a neutral face at the beginning of experiment • Not suitable for measuring emotions of children and East-Asians
Skin conductance	• Measures objective and real-time emotional arousal • Provides information on SCR frequency and amplitude (the number of peaks of emotions during an experiment as well as their magnitude) • Allows the researcher to export raw data in an excel sheet for a more detailed analysis • Allows the researcher to compare the findings with the reported emotional arousal in surveys	• It causes difficulties on left handed respondents if they need to use a computer mouse with their right hand to fill in a questionnaire • Women usually have cold fingers specially in the morning which makes them non-respondents • Men usually have thicker fingers compared to women which makes it hard to attach the electrodes to their fingers • Sensitive to room temperature • Might affect the natural reactions of respondents • Only provides information on emotional arousal, not valence
Self-report	• Easy to understand for respondents • Simple and inexpensive to administer • Takes less time to measure emotions compared to other techniques • Can collect data on type and dimensions of emotion • Can collect data from a large sample size • Does not affect the natural reactions of participants	• Retrospective reflection of emotions which might be distorted and non-representative of actual emotions experienced • Unable to capture respondents' emotional intensity accurately (level of arousal) • Unable to measure real-time emotions • Unable to capture moment-to-moment emotions • Respondents might not be fully aware of the type of emotions they are experiencing (e.g. positive or negative surprise)
Interview	• Provides a deep understanding of respondents' emotional experiences • Allows the researcher to find the reason why a respondent feels a particular type of emotion at a particular time of the experiment	• Is time-consuming • Transcribing, coding and reporting are costly • Prone to interviewer's bias

Conclusion

The present study found that music can be a powerful elicitor of emotions (Baumgartner, Esslen, & Jäncke, 2006), thus providing valuable feedback for tourism managers for the design of advertising stimuli. In addition, this research provides practical implications for destination managers regarding the content to be included in

an advertising stimulus. This research concluded that physiological techniques provide an objective measurement of emotions and self-report approaches explain the reason for emotional experiences. Thus, a combination of both methods needs to be applied to have a better and more accurate understanding of emotional responses. Due to the lack of objective techniques to measure emotions (Bastiaansen et al., 2016), this research contributes to the tourism literature by its novel application of physiological tools, FaceReader™ and skin conductance, to analyse emotions elicited from tourism advertisements. This paper adds value to the tourism literature by investigating the role of advertisement with music in evoking emotions compared to advertising stimulus without music. This manuscript also sheds lights on the different emotional responses towards the light rhythmic music and traditional Iranian music in tourism advertisement. This research contributes to tourism studies by providing the benefits and limitations of applying physiological techniques and self-reports to measure emotions. This research also adds to knowledge in tourism through discussing the type of analysis available in each method and providing directions to overcome the limitations of each technique.

However, there are some limitations with the current research. For instance, Australian participants' positive emotional arousal might be due to their familiarity with the type of music which was not explored in the current research. Therefore, future scholars can assess the role of familiarity with the type of music in affecting emotional responses. In this study, there was a discrepancy between the findings of skin conductance and self-report measures. It might be due to the effect of demographic factors of respondents (Grabe et al., 2000), which could be a potential field of investigation for future scholars. Future research could assess other nationalities' emotional responses towards Iran tourism advertising stimuli applying physiological measures. It would be beneficial if future research could replicate this study in a natural environment applying bigger samples. There was an imbalance of females and males in this study which might create a sample bias. Therefore, future research could address

this issue by applying a gender-balanced sample. This research only measured the effect of music on emotional responses using physiological measures. Future research also needs to explore the effect of consequences of emotions such as attitudes towards a destination. Future scholarly inquiry can apply alternative approaches to the measurement of real-time emotional experiences such as ESM (Hektner et al., 2007) to address the criticism against the existing physiological and self-report methods.

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