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VR the world: Experimenting with emotion and presence for tourism marketing☆

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ABSTRACT

The concept of presence, ubiquitous in VR research, remains in infancy in tourism literature. Researchers in the field have called for empirical studies into the determinants as well as consequences of presence, particularly in commercial environments. The objective of this study is to investigate the effectiveness of VR as a tourism marketing tool through presence and emotion – an association that has been suggested in cyberpsychology studies. Using a within-subjects experiment method, 72 participants experienced computer-generated, fully synthetic virtual environments of a cruise ship. The experiences were administered via pictures, video, and VR. The findings suggest that VR is significantly more effective than traditional media in evoking positive emotional responses to the stimuli. Theoretical implications include suggestions that fully-interactive synthetic VR may be more effective than 360' VR due to the importance of engagement as a presence determinant. Managerial implications include suggestions to focus on engagement mechanics, rather than chasing photo-realistic VR advancements, for impact on emotional response.

1. Introduction

In a post-COVID-19 world, there is growing importance for innovative use of technology to engage online visitors through web-mediated virtual information, providing vicarious experiences of destinations, garnering interest, and evoking positive emotions toward tourism attractions. One emerging sector of cutting-edge tools is Virtual Reality (VR), a market which is projected to grow from USD 3.7b in 2016 to USD 16.3b in 2022 (Statista, 2016). VR and its ability to visualise spatial depth, unprecedented in traditional media forms, has been heralded as a new invaluable marketing resource which is uniquely suited to communicate intangible experiential products like tourism (Beck et al., 2019; Cheong, 1995; Guttentag, 2010; Hyun & O'Keefe, 2012; Jung et al., 2017; Williams & Hobson, 1995). Whilst the technology has seen growing uptake in the tourism industry, ranging from museums, theme parks, cruises, and destination marketing, research on VR remains nascent. Empirical studies have not yet sufficiently explored how VR affects behavioural intention, leading to various calls for substantive theory-based VR research to bridge the gaps in tourism literature (Beck et al., 2019; Wei, 2019; Yung & Khoo-Lattimore, 2017).

Within limited studies on VR, presence has been the focus because it is the subjective experience of being in an environment, whilst physically being situated in another; a key aspect of the vicarious experience (Witmer & Singer, 1998). Unsurprisingly, researchers have suggested that presence is vital in measuring VR effectiveness (Meehan et al., 2005; Sheridan, 1992; Zeltzer, 1992), but call for future researchers to explore specifically the determinants, of presence (Tussyadiah et al., 2018). Understanding the interplay and combinations of presence determinants has been emphasized as important toward improving efficiency and effectiveness of VR systems across a range of fields (North & North, 2016).

Additionally, calls have been made for more interdisciplinary studies across VR studies on presence (Draper et al., 1998; Lombard & Ditton, 1997) and emotion (Banos et al., 2008; Riva et al., 2016; Villani et al., 2012) for better understanding of the consequences of presence. The absence of research combining presence and emotion in tourism is especially highlighted when juxtaposed against the growing importance of emotion research in tourism marketing (Hazlett & Hazlett, 1999; Li et al., 2016); where researchers have highlighted the importance of emotional experiences as influencers and predictors of tourist

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behavioural intentions in the pre-visit stage (Goossens, 2000; Prayag et al., 2013). Interestingly, whilst their study focused on websites, Hyun and O'Keefe (2012) found that presence was not an influencing variable on the virtual affective image; in contrast to the body of knowledge in cyberpsychology associating presence and emotional response (Baños et al., 2012; Gorini et al., 2010; Riva et al., 2016; Siriaraya & Ang, 2014). This points to the notion of the impact of presence being context dependant and thus, not necessarily transferrable (Schultze, 2010; Thie & van Wijk, 1998); highlighting the need for continued empirical research on the topic.

To address these gaps in literature, the objective of this study is to investigate the effectiveness of VR as a tourism marketing tool through presence and emotion. To do so, the study has three research aims. Firstly, to investigate if VR is more effective than traditional media in a tourism marketing context. Using a within-subjects experiment method, effectiveness will be evaluated through intensity of emotional response, as well as behavioural intention toward the attraction (in this study's context, a cruise). Secondly, this study aims to theoretically explore the effect of presence on emotion and behavioural intention. Lastly, the study aims to investigate the determinants of presence in a tourism marketing context, toward establishing a top-to-bottom framework encompassing the determinants of presence, emotional response, and behavioural intention. These aims are presented through three research questions.

RQ1: Is VR more effective than traditional media in a tourism marketing context?

RQ2: To what extent does presence and its determinants influence emotional response?

RQ3: To what extent does presence and its determinants influence behavioural intention?

2. Literature review

2.1. Virtual reality in tourism marketing

Research has suggested that VR's ability to visualise spatial depth would be its biggest strength, when applied to tourism contexts (Guttentag, 2010). Whether it is in the context of education (Deale, 2013; Huang et al., 2013), marketing (Huang et al., 2016; Pantano & Servidio, 2011; Tussyadiah et al., 2018), cultural heritage (Dueholm & Smed, 2014; tom Dieck & Jung, 2015) or sustainability (Han et al., 2014; Pearlman & Gates, 2010), the technology offers unprecedented novel and interactive avenues for dissemination of information. However, it is in the pre-visit phase that VR's potential has been emphasized (Marasco et al., 2018; Tussyadiah et al., 2016). VR is uniquely placed in the context of tourism marketing, where the goal has been to communicate the intangible features of a product that is largely experiential (Hyun & O'Keefe, 2012). Putting on a VR headset, and being able to interact with and compare different potential destinations, could help consumers make more informed decisions (Cheong, 1995). More importantly, providing travel information to tourists via a rich vicarious destination experience increases the effectiveness of persuading them to visit (Huang et al., 2016).

There has been a growing number of studies examining the impact of VR on the customer purchase journey (Flavián et al., 2019a), attitude and behaviour change toward destinations (Flavián et al., 2019b; Marasco et al., 2018; Tussyadiah et al., 2018), as well as acceptance of VR technology for travel planning (Disztinger et al., 2017; Huang et al., 2016). Based on the limited number and exploratory nature of these empirical studies on VR's role as a marketing tool for tourism sites however (Marasco et al., 2018; Marchiori et al., 2018), gaps in literature remain around various dimensions surrounding consumer behaviour and experience using VR (Beck et al., 2019; Flavián et al., 2019b; Wei, 2019). Beck et al. (2019) further found that not only has the term VR been overused in tourism research, but also that theoretical discussions around VR were still based on notions developed in the 1980s; adding to the calls for research in the area to be more substantive and theory-based (Huang et al., 2016; Yung & Khoo-Lattimore, 2017). This paper attempts to address these calls by exploring VR through the concepts of presence and emotion. The relevant concepts will be expanded in the following sub-sections.

2.2. Presence in virtual reality

In information technology and cyberpsychology research, studies on VR and immersive media, in general, have focused on the constructs of presence (Nunez & Blake, 2001). Presence is widely accepted to be the psychological sense of 'being there' in an environment (in the case of VR, a mediated virtual environment), whilst physically being situated in another (Beck et al., 2019; Schuemie et al., 2001; Schultze, 2010; Slater et al., 1994; Tussyadiah et al., 2018). Ultimately, when a sense of presence in a VE is high enough, the user achieves a perceptual illusion of non-mediation (Bartle, 2007; Lombard & Ditton, 1997). This means the user starts experiencing the VE as an actual, physical place; suspending disbelief, and forgetting that the VE is being viewed through a computer device (Bystrom et al., 1999; Draper et al., 1998; Nicovich, 2017; Sheridan, 1992; Steuer, 1992). A key result of high presence levels, particularly for tourism, is that the user remembers the VE as a place rather than as a set of pictures (Slater et al., 1999). Unsurprisingly, VR tourism researchers have called for future research to focus on the concept of presence (Beck et al., 2019; Tussyadiah et al., 2018).

Researchers have continually debated presence as a concept and its related methods and measurements (see Draper et al., 1998; Nash et al., 2000; Schubert, 2009; Slater, 1999; Witmer & Singer, 1998). Nash et al. (2000)'s review of studies on presence and performance in VEs found that a majority of research findings were non-conclusive, with preliminary issues of establishing validity, reliability, and standardized measures of presence. As a result, despite a rapidly growing body of research, the effects of an individual's sense of presence in VEs on their real-world performance remains relatively unknown (Stevens & Kincaid, 2015). Calls have been made for more correlative studies of objective and subjective measures (Draper et al., 1998; Lombard & Ditton, 1997), and studies of performance measures and contributing factors (Nash et al., 2000).

Perhaps the fragmentation of presence research outside tourism explains the scarcity of empirical testing utilising the concept within tourism. To date, despite the ubiquity of presence in ICT-based VR research, only three studies in tourism have focused on presence (see Hyun & O'Keefe, 2012; Lepouras & Vassilakis, 2004; Tussyadiah et al., 2018). Both Lepouras and Vassilakis (2004) and Hyun and O'Keefe (2012) would now be classified as non-immersive VR, due to their VEs being on a conventional (computer) screen. Beck et al. (2019) classified the third study (Tussyadiah et al., 2018) as using a low-immersion VR headset (Google Cardboard). This means that at the time of writing, there are not yet any empirical VR studies in tourism focusing on the concept of presence using fully interactive VR equipment, such as the Oculus Rift or HTC Vive, which both allow manipulation and control of the VE through joysticks. The use of fully synthetic interaction-focused VEs also remain absent. More importantly, despite ICT-based VR research focusing on the determinants of presence, this approach has been absent in tourism.

Understanding the different configurations and combinations of the determinants of presence is important for improving interface design and user experience, toward improving efficiency and effectiveness of immersive VE systems across a range of fields (North & North, 2016). Several reviews of presence and performance in virtual environments have broadly categorised determinants of presence into three variables – immersion, ecological validity, and engagement (Bystrom et al., 1999; Lombard & Ditton, 1997; Schuemie et al., 2001; Schultze, 2010; Sun et al., 2015). Immersion, engagement, and ecological validity will be individually expanded on and their trade-offs compared below. Due to the fragmented research on presence, terminology of the presence

determinants have sometimes varied as shown in the following paragraphs.

Immersion (or spatial presence) has commonly been defined as the quantifiable features and specifications influencing the stimulation of the user's senses, coupled with minimisation of real world stimuli (Bailenson et al., 2008; Bystrom et al., 1999; Lombard & Ditton, 1997; Nash et al., 2000; Nunez & Blake, 2001). These features include quantifiable specifications such as display resolution (number of pixels in each dimension), image quality (perceived image degradation), field of view (extent of observable world seen), and motion-tracking (replication of user motion from real world to virtual environment). Li et al. (2002)'s study on advertising digital video cameras found that higher immersion of virtual 3D enhanced presence; and to varying degrees, positively influenced product knowledge, brand attitude and purchase intention of consumers.

Ecological validity (or sensory fidelity) is generally defined as the degree to which the VE accurately represents the real world (Bystrom et al., 1999; Lombard & Ditton, 1997; Nash et al., 2000). Research has suggested that presence tends to increase as the fidelity of a reproduction or simulation of the physical world increases (Lessiter et al., 2001). These include visual cues such as shadows, texture, spatial depth, or self-representation (Bystrom et al., 1999; Nash et al., 2000) or behavioural cues such as social and cultural cues, object response to manipulation, navigation, auditory representation, and consistency (Nash et al., 2000; Schultze, 2010; Shafer et al., 2014). The degree to which these cues mimic the real world influences the degree of presence (Lombard & Ditton, 1997).

Engagement has been cited as a particularly important determinant for presence (Lessiter et al., 2001; Schuemie et al., 2001; Witmer & Singer, 1998). The more the user thinks, feels, and acts in the VE, and the more unrelated stimuli are inhibited within the real world, the higher sense of presence (Sas & O'Hare, 2003; Witmer & Singer, 1998). Busselle and Bilandzic (2008) described engagement as "shifting the centre of the user's experience from the actual world into the fictional world, experiencing the VE 'from the inside'" (p. 272). Interactivity has been shown to be a key feature leading to engagement (Shafer et al., 2014; Steuer, 1992). Giving the user a role as an active participant in the experience has been shown to increase feelings of presence (Piccione et al., 2019). For instance, Lessiter et al. (2001) found that the ability to physically control and manipulate aspects of the displayed environment, even with unsophisticated devices, enhanced the sense of presence. More recently, Bogicevic et al. (2019) reinforced the notion that the high interactivity of VR environments was important in inducing presence; supporting Flavián et al. (2019a)'s suggestion that high interactivity through control and manipulation offered by VR HMDs with haptic devices was associated with higher perceptual presence for the user.

Whilst it is clear that immersion, ecological validity, and engagement are necessary conditions for presence, it has been continually emphasized that the impact and interplay of the determinants are context-dependant (Li et al., 2002; Schultze, 2010). For instance, too much immersion and vividness in education settings have been found to be distracting, lowering students engagement with learning tasks (Lim et al., 2006). In contrast, ecological validity was found to be associated with higher sense of presence and higher anxiety in interview training scenarios, even with lower levels of immersion (Villani et al., 2012). For engagement, researchers have both suggested that engagement should come to the forefront (Chertoff et al., 2008), as well as cautioning that too much interactivity might end up being distracting to purchase-related activities (Cho et al., 2002) or students' learning outcomes within VEs (Loureiro Krassmann et al., 2020). Also, whilst negative effects (ie. Headache, eyestrain, tiredness, nausea) is less related to the above three presence determinants, research has shown an inverse relationship between presence and simulator sickness (or cybersickness) (Lessiter et al., 2001; Witmer & Singer, 1998), a relatively common negative side-effect from VR experiences due to sensory-mismatch (Mazloumi Gavgani et al., 2018). These studies encapsulate the complexity of establishing presence, where the influence and interplay of different determinants vary according to differing situations. Again, highlighting the need and calls for continued research into better understanding of how VR characteristics interrelate when situated in a tourism marketing context (ie. Tussyadiah et al., 2018).

When comparing modern VR and traditional media, using a head-mounted device (HMD) gives the user visual, audio, motion tracking, and far larger field-of-view. Crucially, HMDs also block out the real world, an instrumental aspect of providing isolation and sustaining user immersion in the VE (Witmer & Singer, 1998). The ability to simulate spatial depth, which has repeatedly been postulated as VR's biggest strength (Guttentag, 2010), also allows more accurate representation of the real world within the VE. Lastly, VR allows for more natural control interfaces, leading to higher levels of manipulation, interactivity, and involvement within the experience compared to traditional media (Shafer et al., 2014). In Flavián et al. (2019a)'s vertex of modern media devices, they posited that VR HMDs with haptic devices provided the highest sense of behavioural interactivity (control and manipulation) alongside presence. Therefore, it can be suggested that sense of presence using VR will be higher when compared to traditional media (videos and pictures).

H1. Sense of Presence using VR is higher compared to traditional media.

2.3. Presence, emotion, intention

There has been increasing emphasis on the importance of emotional experiences as influencers of tourist behavioural intentions in the pre-visit stage (Li et al., 2016; Prayag et al., 2013). In the travel planning stage, positive emotions have been shown to play a pivotal role in tourists' destination selection (Bastiaansen et al., 2018; Walters et al., 2012). Early research posited that VR would intensify emotional responses and resulting behavioural intentions, stating the importance of future research in the area (Goossens, 2000). More recently, although not focused on presence, studies have suggested VR's ability to evoke more intense emotional responses (Rainoldi et al., 2018). Griffin et al. (2017) found that using VR for destination promotion generated more positive emotions toward the destination. Whilst their results were preliminary, they suggested that this could be an indicator of VR being beneficial to destination marketers. In assessing the effectiveness of VR as a tourism marketing tool, it would be logical to explore the relationship between presence and its ability to intensify positive emotional reactions; answering the call for further research on the effect of commercial VR content in inducing positive emotion in comparison to non-immersive media (Pallavicini et al., 2020). Thus far, it can be suggested that positive emotional response will be higher when using VR compared to traditional media, and consequently behavioural intention toward to attraction will be higher compared to traditional media as well.

H2. Positive emotional response will be higher when using VR compared to traditional media.

H3. Behavioural intention toward the tourism product will be higher when using VR compared to traditional media.

Correlations between presence and emotional response using VR contexts have been reported in various contexts, particularly in cyberpsychology research. Research has shown that users experiencing a higher level of presence are more prone to reporting more intense negative emotions in negative VEs and more intense positive emotions in positive VEs (Riva et al., 2007; Schuemie et al., 2001). In virtual height simulations to stimulate fear, higher presence was found to be significantly correlated to higher fear responses in participants (Meehan et al., 2005). Similar results were found in a study on eating disorders, where higher presence levels generated more intense anxiety responses; concluding that VR was more effective than traditional media in treating

the disorder (Gorini et al., 2010). VEs have also been found to be effective to induce positive emotional responses for the elderly, where Baños et al. (2012) found significant increases in joy alongside high levels of presence. Similarly, Siriaraya and Ang (2014) found that the higher presence in fully interactive 3D virtual worlds were able to better provide stimulation, engagement, and reminiscence to people with dementia, leading to positive emotions. Therefore, it can be suggested that higher sense of presence has a positive effect on emotional response. Based on the above discussions, it is important to investigate the effects of the presence determinants on emotional response as well.

H4. Sense of Presence has a positive effect on Emotional Response to the stimuli experience.

H4a. Spatial Presence has a positive effect on Emotional Response to the stimuli experience.

H4b. Ecological Validity has a positive effect on Emotional Response to the stimuli experience.

H4c. Engagement has a positive effect on Emotional Response to the stimuli experience.

H4d. Negative Effects has a negative effect on Emotional Response to the stimuli experience.

In bringing the concepts together, previous research suggests that higher sense of presence from using VR will generate more intense emotional responses. Destination marketing materials are designed to evoke positive emotions, with the goal of influencing potential travellers to visit the destination. A key result of high presence levels, particularly for tourism, is that the user remembers the VE as a place rather than as a set of pictures (Slater et al., 1999). Studies have shown that through higher levels of presence, users remember vividly what they experienced on a destination website, leading to positively influencing intention to visit the destination (Choi et al., 2016). Therefore, also expanding on explaining H3, it can be suggested that higher sense of presence has a positive effect on behavioural intentions toward the attraction.

H5. Sense of Presence has a positive effect on post-stimuli behavioural intentions toward the attraction

H5a. Spatial Presence has a positive effect on post-stimuli behavioural intentions toward the attraction.

H5b. Ecological Validity has a positive effect on post-stimuli behavioural intentions toward the attraction.

H5c. Engagement has a positive effect on post-stimuli behavioural intentions toward the attraction.

H5d. Negative Effects have a negative effect on post-stimuli behavioural intentions toward the attraction

Lastly, as discussed earlier, it has been established that positive emotional responses to marketing stimuli, have been highlighted as influencers of behavioural intention in the pre-visit, or travel planning stage (Goossens, 2000; Li et al., 2016; Prayag et al., 2013). Therefore, it can be suggested that positive emotional response to the stimuli experience has a positive effect on behavioural intention.

H6. Positive emotional response to the stimuli experience has a positive effect on behavioural intentions toward the attraction.

3. Research design

The main goal of this study is to assess the effects of VR on emotion, and subsequently behavioural intention toward visiting the attraction; and to evaluate if sense of presence using VR is higher compared to traditional media. From a pragmatist paradigm, a within-subjects experiment was utilised across three conditions: VR, pictures, and video. In within-subjects experiments, all participants experience all experiment conditions as opposed to cross-sectional designs that test for differences in reactions between participants. This will allow comparison of relative differences in participant reaction to the stimuli and overcome the differences among participants in reporting of the measurement items (Meehan et al., 2005). Having each participant act as their own control is an effective and valuable method (Mandryk et al., 2006). The within-subjects design is also known as the most internally valid research design in the social sciences (Bastiaansen et al., 2018); as well as enhancing the statistical power of tests even with a small sample (Villani et al., 2012).

3.1. Study setting

The study was conducted using marketing material from the Majestic Princess cruise ship in three different mediums, developed by Digital Frontier. Photographs and videos from the marketing mix were viewed on a 27-inch desktop monitor. A 3D fully interactive VR experience was viewed through the HTC Vive headset. Users were able to navigate the top deck of the cruise ship, moving freely using HTC controllers. The VR experience featured motion tracking with six degrees of freedom. 2 Base Stations (plastic cubes housing laser-based positional tracking systems) tracked the position of the headset as well as controllers to allow users to move forward/backward, left/right, up/down, yaw (normal axis), pitch (transverse axis), and roll (longitudinal axis). These user movements were reflected in real-time in the virtual environment. The length of each exposure was between 2 and 3 min. All stimuli, including the pictures and videos, were computer-generated based on blueprints from Princess Cruises. The developed materials were used in 2017 to promote the Majestic Princess prior to the build completion of the cruise ship (https://www.youtube.com/watch?v=eAgxVceLsqo). There was no audio component in any of the materials.

- Condition A: 29 Pictures.
- Condition B: Video used in marketing mix (2 min 45 s).
- Condition C: Virtual Reality experience (stopped at 3 min).

3.2. Measurement items

Presence. The questionnaire used to measure presence was the ITC Sense of Presence Inventory (ITC-SOPI) created by Lessiter et al. (2001). The ITC-SOPI has been extensively used in presence studies in ICT (Riva et al., 2007; Villani et al., 2012), psychology (Banos et al., 2004), advertising (Li et al., 2002), and video games (Shafer et al., 2014). Particularly suited to studies measuring presence across different media platforms (Schuemie et al., 2001), the 44-item questionnaire considers four variables: spatial presence, engagement, ecological validity/naturalness, and negative effects. All questions are rated on a five-point Likert scale (strongly disagree to strongly agree). Background information is also collected regarding age, occupation, gender, level of computer experience, prior usage and knowledge of 3D images and VR, education, and level of film production knowledge.

Emotion. The Self-Assessment Manikin (SAM) was used to measure emotion (arousal-valence) (Bradley & Lang, 1994; Lang et al., 1997; Russell, 1980). The SAM affective rating system is a graphic figure depicting values along the dimensions of valence and arousal. Participants rate their valence and arousal on a scale of 1–9 corresponding to how closely they feel to the depicted graphic figure above the ratings. In the valence dimension, the figure ranges from a frowning, unhappy figure (1) to smiling, happy figure (9). In the arousal dimension, the figure ranges from a relaxed, sleepy figure (1) to an excited, wide-eyed figure (9).

Behavioural Intention. Intention to visit the cruise, recommend the cruise, and recommend stimuli experience were measured on 3-item scales using a 5-point Likert-type scale. Pre-travel intention to visit items are adapted from studies on destination image (Agapito et al., 2013; Hahm & Wang, 2011) as well as similar studies on VR and

destination marketing (Griffin et al., 2017; Marchiori et al., 2018; Tussyadiah et al., 2018). Intention to recommend destination and stimuli experience items were adapted from studies linking destination image and behavioural intention (Hosany & Martin, 2012; Hosany & Prayag, 2013; Prayag et al., 2013, 2016).

3.3. Sampling

A criterion non-probability sampling was used. VR selection criteria means the experiments were limited to participants who were ambulatory, able to use stereopsis, no history of epilepsy or seizure, not overly prone to motion sickness, and in a usual good state of physical fitness at the time of the experiment. For the purposes of this study, the criterion for age was between 18 and 35 years old (millennials) for two reasons. Primarily, millennials have been highlighted as being important to cruise industry growth (Le & Arcodia, 2018). The Cruise Lines International Association (CLIA) 2018 Outlook Report identified this group as a growing market segment that continues to gain traction in an industry traditionally appealing to an older demographic (CLIA, 2017). The same report recommended leveraging technological innovations to reach the millennial market. Secondly, millennials have been identified as a key market segment in VR adoption and interest (GreenlightVR, 2015); with industry reports showing interest as well as willingness to spend on VR being highest in the age groups of 25–34 followed by 18–24 (Boland, 2017). This is unsurprising as the millennial generation, otherwise labelled "digital natives", when compared to older age groups has been shown to have higher personal innovativeness, often leading to higher usage intention (and to a certain extent even expectation) for innovative technologies such as VR (Hur et al., 2017; Labovitz & Hubbard, 2020). Having participants who are more likely to be familiar with technology and VR, will also help reduce the orienting effect, which is when participants have physiological responses to novelty (Andreassi, 1995). In summary, the targeted population was potential millennial cruisers.

3.4. Data collection

Following a pilot test in January 2019 on 10 participants, the data was collected from August 2019 to October 2019 in several VR-equipped offices based in South East Queensland, Australia. Participants were recruited through a combination of word-of-mouth, social media, posters, as well as university email newsletters. Vouchers worth AUD10 were awarded as incentives to each participant. Each participant was invited to an office at a pre-arranged time. The experiment procedure was as follows:

- Each participant read and signed an information sheet as well as a consent form. Demographic characteristics of the participants and their prior experience with VR and technology was collected.
- To reduce order effects, the order in which participants experience the pictures, video and VR was randomized (S. Li et al., 2016; Riva et al., 2007). There were six possible sequences: A-B-C, A-C-B, B-A-C, B-C-A, C-A-B, and C-B-A.
- The participant experienced their first stimuli (3 min).
- A questionnaire including all measurement items was administered immediately following the conclusion of stimuli exposure.
- The participant experienced their second stimuli (3 min), then completed another identical questionnaire. This was then repeated for the third and final stimuli (3 min), after which a third and final questionnaire followed.
- Data collection took 30–45 min per participant.

2.9. Data analysis

Preliminary data cleaning and analysis was conducted in SPSS v25.0. Questions B6 & B23 were not included in the analysis as per the ITC-SOPI guide for stimuli with no characters present. Arousal and Valence were transformed to 5-point scales. After reliability testing on presence items (all 4 variables with $\alpha > 0.83$), One-way repeated-measure ANOVA investigated the differences between all three conditions (VR, pictures, videos) for all variables (presence, valence, arousal, intention). Repeated-measure ANOVA is a common popular approach with studies utilising similar research instruments (ITC-SOPI, SAM) alongside a within-subjects experiment approach (Gorini et al., 2010; Li et al., 2016; Riva et al., 2007; Villani et al., 2012). As one of the assumptions needed to perform repeated measures ANOVA is categorical with three or more levels, this study was a good fit, with results measured and compared across three conditions. Post-hoc analysis with Bonferroni correction was used, as seen in multiple studies using the ITC-SOPI (Gorini et al., 2010; Villani et al., 2012) or SAM (Li et al., 2016). Pearson correlation was used to test correlation between variables. Finally, Multiple Regression Analysis tested the relationships between the variables.

4. Results

4.1. Respondents profile

At the time of completion, the results of 216 questionnaires (72 experiments x 3 conditions) were coded for analysis. For reference, similar studies using within-subject experiments on presence consequences completed analysis with participants numbering: 14 (Vora et al., 2002), 20 (Villani et al., 2012), 30 (Gorini et al., 2010), 61 (Riva et al., 2007), 78 (Sun et al., 2015).

Table 1 provides the demographic profile of the sample. Participants in the study were slightly skewed to females in terms of gender (59% female). The average age of the respondents was 26 (SD = 4.79), with a median age of 25 – all falling within the age criterion. Majority were students (51.4%), followed by academics which included lecturers, tutors, and researchers (23.6%), entrepreneurs or self-employed (13.9%), and employees such as baristas, marketing executives, and mechanics (11.1%). Most respondents had achieved an undergraduate degree (66.7%) or a diploma-equivalent (15.3%). Prior VR usage was relatively balanced (51.4% no). Majority of the participants had either no (47.2%) or basic (43.1%) knowledge of how VR systems work.

Table 1
Respondents profile.

		n	Percentage
Gender			
	Male	29	40.3
	Female	43	59.7
Education			
	High School	6	8.3
	Diploma	11	15.3
	Undergraduate Degree	48	66.7
	Postgraduate Degree	7	9.7
Occupation			
	Student	37	51.4
	Academic	17	23.6
	Entrepreneur/Self-employed	10	13.9
	Employee	8	11.1
Prior VR Usage			
	No	37	51.4
	Yes	35	48.6
Knowledge of VR systems (how it works)			
	None	34	47.2
	Basic	31	43.1
	Intermediate	5	6.9
	Expert	2	2.8
	Mean (SD)	**Median**	**Range**
Age	26.1 (4.8)	25	18.0–35.0

4.2. One-Way Repeated Measure ANOVA

Table 2 presents results from the One-Way Repeated Measures ANOVA. Fig. 1 presents the participants' self-reported presence responses to the three stimuli. There were statistically significant changes in spatial presence over the three stimuli $F(1.67, 118.72) = 178.11$, $p < .001$, $\eta p^2 = 0.72$. Post-hoc analysis with Bonferonni adjustment showed spatial presence for VR ($M = 3.78$, $SD = 0.73$) was significantly higher ($p < .001$) than pictures ($M = 2.20$, $SD = 1.04$) and videos ($M = 2.35$, $SD = 1.03$). Engagement was similar, $F(2, 142) = 92.37$, $p < .001$, $\eta p^2 = 0.57$. Engagement for VR ($M = 4.10$, $SD = 0.70$) was significantly higher ($p < .001$) compared to pictures ($M = 2.81$, $SD = 0.96$) and videos ($M = 2.98$, $SD = 1.01$). Ecological Validity also showed the same result, $F(1.85, 131.49) = 49.77$, $p < .001$, $\eta p^2 = 0.41$. VR ($M = 3.93$, $SD = 0.78$) was significantly higher ($p < .001$) compared to pictures ($M = 3.01$, $SD = 1.06$) and videos ($M = 2.99$, $SD = 0.99$). Similarly, for negative effects, $F(2, 142) = 22.56$, $p < .001$, $\eta p^2 = 0.24$. VR ($M = 2.41$, $SD = 0.68$) was significantly higher compared to pictures ($M = 1.75$, $SD = 0.68$, $p < .001$) and videos ($M = 2.1$, $SD = 0.84$, $p = .015$). These results support H1.

For emotional response (Fig. 2), there was statistically significant changes in Arousal $F(2, 142) = 53.03$, $p < .001$, $\eta p^2 = 0.43$ as well as Valence $F(2, 142) = 55.32$, $p < .001$, $\eta p^2 = 0.44$ over the three stimuli. Post-hoc analysis showed Arousal for VR ($M = 4.28$, $SD = 0.88$) was significantly higher ($p < .001$) compared to videos ($M = 3.19$, $SD = 1.09$) and pictures ($M = 3.12$, $SD = 1.05$). Similarly, for valence/pleasure, VR ($M = 4.48$, $SD = 0.57$) was significantly higher ($p < .001$) compared to videos ($M = 3.63$, $SD = 0.92$) and pictures ($M = 3.58$, $SD = 0.95$), supporting H2.

There were statistically significant changes across all intention variables (Fig. 3). Intention to visit $F(2, 142) = 18.61$, $p < .001$, $\eta p^2 = 0.21$, Intention to recommend the cruise $F(2, 142) = 22.55$, $p < .001$, $\eta p^2 = 0.24$, Intention to recommend stimuli $F(2, 142) = 46.70$, $p < .001$, $\eta p^2 = 0.40$, and Interest in the Majestic Princess $F(2, 142) = 30.93$, $p < .001$, $\eta p^2 = 0.30$. Post-hoc analysis showed Intention to visit for VR ($M = 3.76$, $SD = 1.06$) was significantly higher ($p < .001$) compared to pictures ($M = 3.17$, $SD = 1.21$) and videos ($M = 3.37$, $SD = 1.02$). Results were similar across intention to recommend cruise ($p < .001$) – VR ($M = 3.90$, $SD = 1.01$), Video ($M = 3.35$, $SD = 1.10$), Pictures ($M = 3.25$, $SD = 1.17$), intention to recommend stimuli ($p < .001$) – VR ($M = 4.31$, $SD = 0.85$), Videos ($M = 3.38$, $SD = 1.08$), Pictures ($M = 3.26$, $SD = 1.15$) and interest in the Majestic Princess ($p < .001$) – VR ($M = 4.21$, $SD = 0.79$), Video ($M = 3.57$, $SD = 0.88$), Pictures ($M = 3.48$, $SD = 0.86$). Results support H3.

Table 2
One-way repeated measures ANOVA.

	Wilks Lambda	Mauchlys	Sphericity Assumed/Huynh-Feldt
Spatial Presence	$F_{2,70} = 119.508^{**}$	17.437**	$F_{1.672,118.724} = 178.108^{**}$
Engagement	$F_{2,70} = 71.561^{**}$	5.420	$F_{2,142} = 92.368^{**}$
Ecological Validity	$F_{2,70} = 40.458^{**}$	7.884*	$F_{1.852,131.485} = 49.773^{**}$
Negative Effects	$F_{2,70} = 26.085^{**}$	3.507	$F_{2,142} = 22.561^{**}$
Valence	$F_{2,70} = 56.166^{**}$	0.510	$F_{2,142} = 55.324^{**}$
Arousal	$F_{2,70} = 43.331^{**}$	3.082	$F_{2,142} = 53.025^{**}$
Interest	$F_{2,70} = 30.690^{**}$	5.682	$F_{2,142} = 30.925^{**}$
Intention to Visit	$F_{2,70} = 17.068^{**}$	5.764	$F_{2,142} = 18.607^{**}$
Recommend Cruise	$F_{2,70} = 20.952^{**}$	0.530	$F_{2,142} = 22.554^{**}$
Recommend Stimuli	$F_{2,70} = 49.080^{**}$	4.484	$F_{2,142} = 46.704^{**}$

** = significant at 1%.
* = significant at 5%.

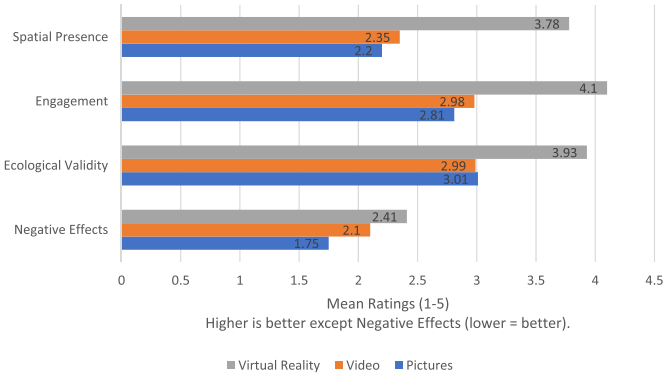

Fig. 1. One-Way ANOVA results for mean of Presence Variables.

4.3. Pearson Correlation

As seen in Table 3, there was statistically significant ($p < .001$), strong positive correlation across the board between Spatial Presence, Engagement, and Ecological Validity for Valence, Arousal, Interest, Intention to Visit, Intention to Recommend Cruise, and Intention to Recommend the Stimuli. Table 4 shows that there was statistically significant ($p < .001$), strong positive correlation between the emotion variables (valence and arousal), and Interest in the Majestic Princess, Intention to Visit, Intention to Recommend the Cruise, and Intention to Recommend the Stimuli.

4.4. Multiple linear regression analysis

Tables 5 and 6 report the model summary of multiple regression. The multiple regression model with the presence variables (Table 5) was statistically significant across the board. In particular analysis on arousal produced $R^2 = 0.728$, $F(4, 211) = 141.50$, $p < .001$ and valence produced $R^2 = 0.700$, $F(4,211) = 123.10$, $p < .001$. The presence variables explaining 72.8% and 70% of the variability of arousal and valence respectively, supporting H4. In terms of intention, intention to recommend the stimuli produced $R^2 = 0.631$, $F(4, 211) = 90.34$, $p < .001$, and intention to visit produced the lowest result, $R^2 = 0.449$, $F(4, 211) = 42.99$, $p < .001$. The presence variables explaining 44.9% of the variability in intention to visit supporting H5.

Finally, the relationship existing between emotion, intention, and presence variables was investigated. Tables 7 and 8 show the results of multiple linear regression analysis between the presence variables, emotion variables, and intention. In particular, engagement showed a statistically significant ($p < .001$) positive relationship as an independent variable across the board. Valence ($\beta = .874$) and intention to recommend stimuli ($\beta = 0.745$) had the strongest relationships. As expected, negative effects showed a statistically significant ($p < .05$), negative relationship as an independent variable for arousal and valence. Spatial Presence showed a statistically significant ($p < .001$) positive relationship as an independent variable predicting arousal. In line with previous research, arousal and valence both showed statistically significant positive relationships in predicting intention across the board, supporting H6. A summary of hypothesis testing is shown in Table 9.

5. Discussion

The primary hypothesis of this study was that the higher sense of

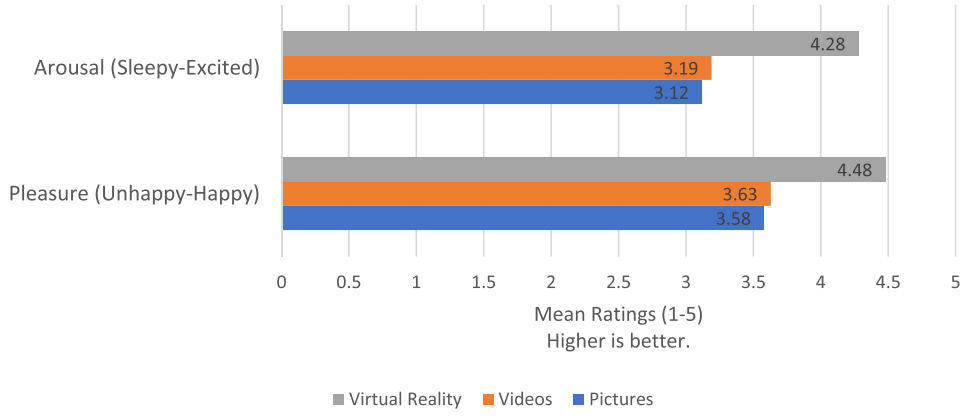

Fig. 2. One-way repeated ANOVA results for mean of Arousal and Valence responses.

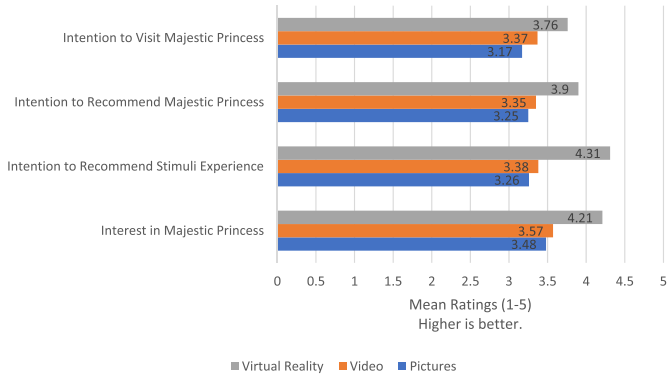

Fig. 3. One-way repeated ANOVA results for mean of Intention responses to the 3 stimuli.

presence from a VR experience would lead to positive consequences in terms of emotional response, leading to an increase in terms of behavioural intention toward the cruise. Through within-subject experiments across VR, video, and pictures, findings confirm H1: presence levels were significantly higher for VR when compared to video and pictures of the same cruise ship experience. Findings for emotional response followed suit, with arousal and valence response both being significantly higher after exposure to VR when compared to videos and pictures (H2). Finally, findings for interest in cruise, intention to visit, intention to recommend the cruise, and intention to recommend stimuli were also significantly higher (H3), the biggest difference in mean being intention to recommend the stimuli experience. Although previous studies suggest the efficacy of VR as a marketing tool in influencing destination visit intention (Flavián et al., 2019b; Griffin et al., 2017; Marasco et al., 2018; Tussyadiah et al., 2016, 2018), this is the first study to empirically conclude that presence is stronger in VR compared to traditional media, and that these higher levels of presence in VR affect emotion and intention more positively than traditional media. This study is also the first to extend the stimulus to include fully interactive VR with 6 degrees-of-freedom (6DOF).

Similar to Griffin et al. (2017)'s preliminary study, the findings also showed that intention to recommend the stimuli was highest in terms of behavioural intention. This suggests that even for participants who had no intention to visit the cruise, they still intended to spread word of mouth about the VR cruise experience. Particularly with a millennial sample as well as the cruise context, the significant result in intention to visit the cruise after experiencing the VR stimuli (H3) was relatively surprising. Although millennials are an important growing segment in the cruise industry (CLIA, 2017; Le & Arcodia, 2018), going on a cruise is still a polarising travel decision for most. Additionally, general interest in the Majestic Princess showed a significant increase after the VR experience as well. These results suggest that cruise industry marketers could benefit from adding VR to their marketing mix, particularly in targeting a younger demographic post-COVID. An indirect side effect of adopting VR could be participants viewing the brand as being more innovative as a differentiator.

The findings also confirm the hypothesis (H2) of virtual reality eliciting more intensive positive emotions in comparison to non-immersive media such as video and pictures. Where previous studies did not compare between stimuli (Marasco et al., 2018; Marchiori et al., 2018), the experiment design in this study showed statistically significant increase in emotional response when using VR, compared to the other two non-immersive media. Previous research, particularly in cyberpsychology have suggested VR being able to elicit more intense negative emotions such as anxiety or fear (ie. Gorini et al., 2010; Riva et al., 2016; Villani et al., 2012). This study extends that to show that the same effect can apply for positive emotions, as well as in a marketing context. On a lesser note, the importance of evoking strong positive

Table 4
Correlation between emotion and intention.

Item	Interest	Intention to Visit	Recommend Cruise	Recommend Stimuli
Valence	.738[a]	.646[a]	.707[a]	.742[a]
Arousal	.710[a]	.582[a]	.639[a]	.719[a]

*. Correlation is significant at the 0.05 level (2-tailed).
[a] Correlation is significant at the 0.01 level (2-tailed).

Table 3
Correlation between presence, emotion, and intention.

Item	Valence	Arousal	Interest	Intention to Visit	Recommend Cruise	Recommend Stimuli
Spatial Presence	.738[a]	.794[a]	.689[a]	.624[a]	.676[a]	.708[a]
Engagement	.831[a]	.838[a]	.753[a]	.658[a]	.722[a]	.790[a]
Ecological Validity	.663[a]	.697[a]	.639[a]	.550[a]	.623[a]	.665[a]
Negative Effects	.043	.031	.077	.221[a]	.142[b]	.041

[a] Correlation is significant at the 0.01 level (2-tailed).
[b] Correlation is significant at the 0.05 level (2-tailed).

Table 5
Model Summary of multiple regression between emotion and presence factors.

Dependent variable	Predictors	R	R square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
Arousal	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.853	.728	.723	.59851	$F_{4,211}$ = 141.498	.000
Valence	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.837	.700	.694	1.02544	$F_{4,211}$ = 123.096	.000
Interest	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.756	.571	.563	.59583	$F_{4,211}$ = 70.211	.000
Visit	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.670	.449	.439	.84089	$F_{4,211}$ = 42.986	.000
Recommend Cruise	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.726	.527	.518	.78071	$F_{4,211}$ = 58.817	.000
Recommend Stimuli	Engagement, Spatial Presence, Ecological Validity, Negative Effects	.795	.631	.624	.69337	$F_{4,211}$ = 90.335	.000

Table 6
Model Summary of multiple regression between emotion and intention.

Dependent variable	Predictors	R	R square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
Interest	Arousal, Valence	.759	.577	.573	.58912	$F_{2,213}$ = 145.055	.000
Visit	Arousal, Valence	.652	.425	.419	.85508	$F_{2,213}$ = 78.672	.000
Recommend Cruise	Arousal, Valence	.714	.510	.505	.79122	$F_{2,213}$ = 110.741	.000
Recommend Stimuli	Arousal, Valence	.765	.586	.582	.73139	$F_{2,213}$ = 150.692	.000

Table 7
Coefficients of linear regression between Emotion and Presence Factors.

		Unstandardized		Standardized		
Dependent variable	Independent variable	B	Std. error	Beta	t	Sig.
Arousal	Engagement	.655	.095	.613	6.875	.000
	Spatial Presence	.305	.085	.318	3.581	.000
	Ecological Validity	-.052	.072	-.047	-.724	.470
	Negative Effects	-.198	.053	-.142	−3.723	.000
Valence	Engagement	.762	.082	.874	9.337	.000
	Spatial Presence	.027	.073	.035	.376	.707
	Ecological Validity	-.065	.061	-.073	−1.061	.290
	Negative Effects	-.107	.045	-.095	−2.364	.019
Interest	Engagement	.553	.095	.653	5.828	.000
	Spatial Presence	.06	.085	.079	.704	.482
	Ecological Validity	.039	.071	.045	.55	.583
	Negative Effects	-.054	.053	-.049	−1.023	.308
Visit	Engagement	.568	.134	.539	4.244	.000
	Spatial Presence	.086	.120	.091	.719	.473
	Ecological Validity	.026	.101	.024	.261	.795
	Negative Effects	.153	.075	.111	2.047	.042
Recommend Cruise	Engagement	.595	.124	.563	4.788	.000
	Spatial Presence	.099	.111	.105	.892	.373
	Ecological Validity	.081	.094	.075	.871	.385
	Negative Effects	.028	.069	.021	.408	.683
Recommend Stimuli	Engagement	.793	.110	.745	7.180	.000
	Spatial Presence	.029	.099	.030	.290	.772
	Ecological Validity	.041	.083	.037	.490	.625
	Negative Effects	-.119	.061	-.086	−1.941	.054

Table 8
Coefficients of multiple regression between Emotion and Intention.

		Unstandardized		Standardized		
Dependent variable	Independent variable	B	Std. error	Beta	t	Sig.
Interest	Arousal	.250	.062	.316	4.010	.000
	Valence	.464	.077	.477	6.052	.000
Visit	Arousal	.151	.091	.153	1.668	.097
	Valence	.629	.111	.520	5.653	.000
Recommend Cruise	Arousal	.173	.084	.175	2.056	.041
	Valence	.683	.103	.563	6.637	.000
Recommend Stimuli	Arousal	.333	.078	.335	4.297	.000
	Valence	.567	.095	.465	5.965	.000

Table 9
Hypothesis testing.

Hypothesis	Support for Hypothesis
H1: Presence in VR > Traditional Media	Supported
H2: Positive Emotional Response using VR > Traditional Media	Supported
H3: Behavioural Intention using VR > Traditional Media	Supported
H4: Presence → Emotional Response	Supported
H4a: Spatial Presence → Emotional Response	Supported
H4b: Ecological Validity → Emotional Response	Not Supported
H4c: Engagement → Emotional Response	Supported
H4d: Negative Effects → Emotional Response	Supported
H5: Presence → Behavioural Intention	Supported
H5a: Spatial Presence → Behavioural Intention	Not Supported
H5b: Ecological Validity → Behavioural Intention	Not Supported
H5c: Engagement → Behavioural Intention	Supported
H5d: Negative Effects → Behavioural Intention	Not Supported
H6: Emotional Response → Behavioural Intention	Supported

emotions for destination marketers to elicit behavioural intention is also unsurprisingly confirmed (H6) in the findings above. Where this association has been well proven in existing destination marketing research (Bastiaansen et al., 2018; Prayag et al., 2016), it further propels the

suggestion of VR as a significant addition to the marketing mix.

Theoretically, results of this study support the hypothesis (H4) that higher presence levels through the use of VR compared to traditional non-immersive media are associated with more intensive emotional responses (Banos et al., 2008; Pallavicini et al., 2020; Riva et al., 2007). In extension, the findings confirmed engagement (H4c, H5c) in particular to be a significant predictor for emotional arousal and valence. The interactivity and control that participants had through using VR appeared to be a differentiating factor in eliciting higher levels of not only intention but emotional response as well. Participants could look at what they wanted, when they wanted, and how they wanted to. The importance of involvement and interactivity for marketing purposes is not new (Choi et al., 2016; Wei, 2019). However, the findings from this study highlight the potential of the unprecedented involvement and engagement that VR offers.

The significance of engagement as a presence factor may also explain findings of non-significant emotional response differences in previous studies comparing VR to traditional media (ie. Beck & Egger, 2018). The differentiator could be the levels of interactivity that different VR platforms offer. Beck et al. (2019) defined fully-immersive VR to include 360-degree real-life captured content. In this study, the VR experience included 6DOF in addition to full navigational control for the user; providing a further layer of engagement compared to VR stimuli using 360-degree captured content which is relatively passive in terms of interactivity. When set in the context of the non-significance of ecological validity and to a certain extent immersion (H5a), it suggests that engagement mechanics, more so than photo-realism or sensory stimulation should be the priority in the destination marketing context to positively influence presence and consequently emotional response. This finding supports earlier suggestions that engagement would become the primary determinant as photo-realism and realistic sensations start to offer diminishing results in establishing presence (Chertoff et al., 2008). Certainly, future research manipulating the individual presence variables could provide more insight, particularly in experiments that compare fully synthetic VR (which sacrifices photo-realism for interactivity) and 360-degree filmed VR (which sacrifices interactivity for photo-realism).

The non-significance of ecological validity (H4b, H5b) could be explained by the identical content (fully synthetic computer-generated) that was used across all stimuli. Whilst participants experienced the content through different devices, the actual content was identical in terms of textures. For instance, the swimming pool would have had the same behavioural and visual cues (i.e. shadows, textures, consistency, degree of 'realness'), whether participants were looking at it through VR, pictures, or videos. Future research comparing synthetic VR to real-world photos or videos from the same marketing mix could provide interesting insights. Depending on the quality and targeted outcome of the VE, the contrast between a photograph of a 'real' bedroom and a digital re-creation of the same bedroom may contribute to differing importance and significance of ecological validity in establishing presence. The non-significance of negative effects (H5d) could also be a cue for future researchers to experiment with time. As the participants were limited to 3 min in the VR experience, it may not have been long enough to trigger any potential negative effects such as headaches, eyestrain, motion sickness, dizziness and tiredness; all examples of negative effects which have been shown to inversely affect presence (Witmer & Singer, 1998).

6. Conclusion

6.1. Theoretical implications

This study offers several theoretical implications and contributions. From a theoretical perspective, this study contributes by addressing the call for further research into the determinants of presence in a tourism context (Tussyadiah et al., 2018). Where previous research has focused on the consequences of presence, this study is the first to highlight empirically the importance of particularly engagement as a presence determinant, confirming Yung et al. (2020)'s top-to-bottom framework to explore the presence-emotion-intention concept. This provides various avenues for future researchers to manipulate presence variables to move the research focus beyond comparing VR to non-immersive media; instead, focusing on VR-specific or presence-specific concepts by comparing the different VR platforms. In particular, this study emphasises the notion of presence determinants and impacts not being transferrable across contexts (Schultze, 2010; Stevens & Kincaid, 2015; Thie & van Wijk, 1998). The emphasis on the importance of engagement in this study is in contrast to previous presence research in advertising (van Berlo et al., 2020), education (Loureiro Krassmann et al., 2020), and even tourism (Cho et al., 2002) finding engagement to negatively influence intended outcomes such as brand memory or transfer of leaning. On a lesser note, the results from the current study support and extend previous research on the consequences of presence to a cruise marketing context; in doing so also contributing to the growing body of knowledge of VR being an effective marketing tool in terms of influencing behavioural intention.

Additionally, it addresses the call for research on the effect of commercial virtual reality content in inducing positive emotion in comparison to non-immersive media (Pallavicini et al., 2020). Where past research has shown the association between higher presence and intensity of emotional response (ie. Gorini et al., 2010; Riva et al., 2016; Villani et al., 2012), this study contributes by advancing that concept, being the first to explore the association for positive emotional responses. The results provide evidence of the importance of higher presence levels as a positive influencer to emotional response and behavioural intention.

Methodologically, where previous research has utilised 360-degree real-life captured content VR (see Beck et al. (2019)'s state-of-the-art review on VR in tourism literature), this study, through the use of a fully-synthetic computer-generated VR experience, provides evidence suggesting that there are potentially significant differences between the different types of VR platforms. In particular, the levels of interactivity, involvement and most importantly, control over the experience that this study's fully-synthetic wired HMD experience offered users concurs with Flavián et al. (2019a)'s suggestions of the association between perceptual presence and level of control and manipulation that fully interactive VR HMDs with 6DOF feature. When combined with a VE prioritising user engagement, this finding challenges Beck and Egger (2018)'s suggestion that the type of VR system (non-immersive or fully-immersive) would not be a factor on emotional response. As discussed above, alongside a within-subjects experiment approach, the absence of interactivity-focused VEs and fully-immersive VR HMDs potentially provides explanations into past non-significant results when comparing VR to non-immersive media.

6.2. Managerial implications

From a managerial point of view, this research is useful for destination marketers in defining their marketing mix, particularly in the pre-travel phase of a post-covid19 landscape. As shown in the results, introducing VR into the marketing mix, especially for attraction-based travel such as a cruise ship, could provide another level of effectiveness in terms of influencing behavioural intention on top of existing non-immersive tools. Organisations introducing VR ahead of competitors could also result in elevating the brand to be seen as a market leader or innovator, generating interest in markets where they might not have been able to otherwise (such as millennials). In introducing VR, marketers should also place particular importance on the engagement mechanics ahead of photo-realism or sensory stimulation (such as sound and smell). Allowing users more involvement, interactivity, and control over their experiences should be the primary priority when developing the VR environment, since this positively influences not only emotional

response and intention to visit, but even for those who do not plan to visit, intention to spread word of mouth about the VR experience itself as well. For marketers and developers, this could mean investing in a fully-interactive VR experience over the 360-degree real-life captured content that has been used so far. More importantly, this could also mean that designers of VR content can reduce the costly need to race toward the most advanced VR systems. Rather, focusing their resources on mechanics that elicit emotional responses, perhaps through engaging human computer interaction psychologists as suggested by Pallavicini et al. (2020). These insights provide opportunities for tourism marketers to introduce VR, with better understanding of the emphasis to be relayed to their virtual experience developers. Better understanding of the trade-off between features also provides better budget optimisation for DMOs; undoubtedly a key factor in re-starting the tourism industry post-pandemic.

6.3. Limitations and future research directions

Despite the contributions, this study has some limitations, which should be addressed in future research. First, as a result of the data collection procedure, the proportion of female participants is larger than male participants, with all participants also being younger than 35 and half the participants being students. This may generate some concern in terms of representativeness of the results. Whilst the millennial age group as a target market for this study was deliberate as a target market for the industry partner in this study, there is some concern regarding the representativeness of the results. Future studies applying this model in different contexts can be replicated with a more representative sample. It would be interesting to see the difference in results for an older demographic. Second, certainly the effect of novelty has to be taken into account. Whilst half of the participants had prior experiences using VR, the amazement of using the technology in a cruise tourism setting could account for the significant results. With more cruise industry marketing adopting VR and the increase of VR's widespread adoption in general, results could be different as excitement wanes. As shown in the discussion, this novelty currently plays a role in differentiating the cruise brand as an innovator, generating brand interest. Future research done when VR is more widespread may provide differing insights. Third, it is important to note that the results and discussions are based on self-reported data on emotional responses. In the current study, the logistics prevented the use of psychophysiological measures, as the movement of participants when using VR introduced too much interference into the readings. Future research, particularly with the ongoing development of more portable VR equipment alongside more mobile psychophysiological measurement equipment, could adopt more psychophysiological measures such as skin conductance and EEG in addition to questionnaires in order to bridge the objective and subjective measurement of emotion, eliminating potential bias.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jhtm.2020.11.009.

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