Virtual Reality and Attitudes toward Tourism Destinations*

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Abstract

Recent developments in Virtual Reality (VR) technology present a tremendous opportunity for the tourism industry. This research aims to better understand how the VR experience may influence travel decision making by investigating spatial presence in VR environments and its impact on attitudes toward tourism destinations. Based on a study involving virtual walkthrough of tourism destinations with 202 participants, two dimensions of spatial presence were identified: being somewhere other than the actual environment and self-location in a VR environment. The analysis revealed that users' attention allocation to VR environments contributed significantly to spatial presence. It was also found that spatial presence positively affects post VR attitude change toward tourism destinations, indicating the persuasiveness of VR. No significant differences were found across VR stimuli (devices) and across prior visitation.

Keywords: virtual reality; spatial presence; attitude change; virtual tourism; non-travel.

1 Introduction

Virtual reality (VR) is touted to be one of the important contemporary technological developments to greatly impact the tourism industry. While VR has been around since the late 1960s, recent developments in VR platforms, devices, and hypermedia content production tools have allowed for the technology to emerge from the shadows into the realm of everyday experiences. The (potential) roles of VR in tourism management and marketing have been discussed in tourism literature (e.g., Cheong, 1995; Dewailly, 1999; Guttentag, 2010; Huang et al., 2016; Williams & Hobson, 1995). VR has been suggested as a substitute for travel and tourism products (i.e., a substitution for actual visitation) (Cheong, 1995), making it beneficial for the management of protected

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areas, such as natural and cultural heritage sites (i.e., to limit the number of tourists or restrict visitation), and, thus, a positive contributor to sustainability (Dewailly, 1999). Recent innovations in VR offer unbounded potential for mass virtual visitation to actual tourism destinations. The availability of low cost VR devices and the abundance of tourism-related VR content make it easier for people to experience virtual tours of tourist cities and attractions. Studies also argue that VR is a powerful tourism marketing tool (Huang, et al., 2016; Williams & Hobson, 1995; Williams, 2006). It provides marketers opportunities to offer more compelling imagery of tourism destinations to potential tourists by giving them a sense of what it is like to be there, a "try before you buy" experience.

As VR provides an environment in which users can retrieve information via multi-sensory (e.g., visual, auditory and kinaesthetic) modalities, users are able to perceive realistic representation of the environment it portrays (Slater & Usoh, 1993). Consequently, the immersive nature of the VR experience has been identified as a means to facilitate consumer learning of products (Suh & Lee, 2005), increase brand recognition, product recall, and memory of experiences (Kim & Biocca, 1997; Mania & Chalmers, 2001), and generate positive attitude and behavioural responses. Importantly, an immersive VR experience allows users to perceive a sense of being in the virtual environment, a perception of presence (Slater & Usoh, 1993; Steuer, 1992), which is key to the effectiveness of persuasive VR content. Indeed, literature in VR has focused on theorizing presence and conceptualizing its determinants, correlates, covariates, and consequences in various contexts, such as in education, healthcare, entertainment, retailing, etc. (e.g., Burke, 1996; Mania & Chalmers, 2001; Steuer, 1992). However, these studies, as well as VR studies in tourism context (e.g., Huang et al., 2016), mainly dealt with simulated virtual worlds where resemblances to real places were coincidental (e.g., virtual seminar room, 3D tourism attractions).

From a theoretical point of view, researching VR experience with actual tourism destinations will provide: (1) a better understanding of presence in VR experiences involving virtual depictions of real environments where possible actions resemble actual consumption (e.g., sightseeing) and (2) a conceptualization of the role of the VR experience in shaping attitudes toward actual consumption (i.e., visitation). From a managerial point of view, as destinations are faced with strategic decisions about

investment in different VR platforms and modalities, understanding how travel consumers respond to various VR stimuli (i.e., attitudinal consequences of "having been" to a destination) is of practical importance. Therefore, the aim of this study is to investigate the perceived spatial presence during a virtual walkthrough of a tourism destination and how it influences users' attitude toward the destination.

2 Theoretical Foundation

The discussion of the persuasiveness of VR experiences is centred on presence theory. Presence is understood as the psychological state in which media users feel lost or immersed in the mediated environment; the degree to which users feel that they are somewhere other than the actual environment (Slater & Usoh, 1993). As VR environments facilitate sensory and motor engagement (e.g., moving head allows changes in point of view, walking or haptic feedback enables navigation in VR environment), they allow users to perceive vivid mental representations of the mediated spaces (e.g., tourist cities) and, thus, enhance the feeling of embodiment (Wirth et al., 2007). Slater, Usoh, and Steed (1994) used a navigation metaphor of presence in virtual environment, which includes the user's sense of being there and the locality of the virtual environment. Using the transportation metaphor, Kim and Biocca (1997) operationalized presence as having two dimensions: arrival (i.e., a feeling of being present in the mediated environment) and departure (i.e., a feeling of separation from the physical environment). Finally, Wirth et al. (2007) associated spatial presence with two dimensions: self-location (i.e., the feeling of being located in mediated environments) and, in most cases, perceived action possibilities. Recent studies apply the aforementioned definitions of presence in various contexts (e.g., Weibel, et al., 2015; Leonardis, 2014). This study defines presence as the users' perception of self-location in a VR environment and separation from the actual environment.

Previous studies have identified various factors that contribute to spatial presence, including those associated with the users. Spatial ability, which is an individual's ability to produce vivid spatial images in his/her mind, has been suggested as an important factor influencing spatial presence. For example, when presented with a blueprint of a building, individuals with higher spatial ability will be able to imagine the structure of the building easily. Wirth et al. (2007) argue that spatial ability may contribute to the formation of spatial representation of the mediated

environment in VR experiences. That is, users with higher spatial visual imagery may find it easier to imagine the VR environment and fill in missing spatial information from their memory (Wirth et al., 2007). Therefore, it can be suggested that users' spatial ability contributes to the feeling of presence in the VR environment.

H1: Spatial Ability has a positive effect on sense of Presence during the VR experience.

Another important user factor contributing to presence is (user-controlled) attention during the VR experience. In order for users to interact with VR environments, they must allocate sufficient attentional resources to objects and events within the VR environments (Bystrom, Barfield, & Hendrix, 1999; Draper, Kaber, & Usher, 1998). Wirth et al. (2007) suggest that only those who pay attention to the VR environment will experience spatial presence. That is, a greater allocation of attentional resources to the VR environment will bring about a higher sense of presence (Bystrom, Barfield, & Hendrix, 1999; Weibel et al., 2015); distractions to users' attention to the VR environments will diminish the feeling of presence (Draper, Kaber, & Usher, 1998).

H2: Attention Allocation has a positive effect on sense of Presence during VR experience.

Research has shown that sense of presence in the VR environment has positive consequences on user behaviour. Indeed, the key propositions and findings in VR research suggest that an enhanced sense of reality with VR generates positive effects on attitude, belief, and intention (Kim & Biocca, 1997; Suh & Lee, 2005). For example, Klein (2003) identified that (tele)presence positively influences consumer attitude towards products advertised in computer-mediated environments. In the context of tourism, Hyun and O'Keefe (2012) found that (tele)presence via web-mediated information directly leads to positive virtual destination image. Therefore, it can be suggested that a higher sense of presence in the VR environment will result in positive attitude toward tourism destinations.

H3: Sense of Presence during the VR experience has a positive effect on Post VR Attitude Change toward destination.

Literature has also explored the role of media affordance in facilitating presence and its consequences. Wirth et al. (2007) suggest that users respond to highly immersive technology with strong feelings of spatial presence. VR environments that synchronously stimulate several sensory

channels (e.g., visual, auditory, haptic) are more likely to cause users to feel that they are in the mediated environment (Wirth et al., 2007). For example, Ruddle, Payne, and Jones (1999) identified differences between users navigating VR environments using helmet-mounted displays and those using desktop displays, in that the more natural interaction with the helmet-mounted display results in more accurate space orientation. Therefore, it can be suggested that different immersive capabilities of VR devices (e.g., head-mounted Samsung Gear VR vs. hand-held Google Cardboard) and the stimuli they presented (e.g., street view vs. realistic video), which influence the nature of user interaction, will result in different degrees of presence and, in turn, attitude change toward destinations.

H4: The sense of Presence during the VR experience will vary according to different types of VR stimuli.

H5: The degree of Post VR Attitude Change will vary according to different types of VR stimuli.

Users' prior experience with tourism destinations (i.e., prior visitation) plays a role in VR experience of the destinations. Memory of first-hand experiences with the actual environment (i.e., prior knowledge of the space) can serve as a reference in perceiving the mental representation of the VR environment, which will influence the sense of spatial presence during the VR experience. Therefore, it is expected that the sense of presence and, consequently, attitude change toward tourism destination after VR experience will vary between users who have visited the destination and those who have not.

H6: The sense of Presence during the VR experience will vary according to Prior Visitation to destination.

H7: The degree of Post VR Attitude Change will vary according to Prior Visitation to destination.

3 Method

A questionnaire was developed to test the hypothesized relationships between Spatial Ability, Attention Allocation, Spatial Presence, and post VR Attitude Change. In order to measure Spatial Presence, presence scales from SUS questionnaire (Slater, Usoh, & Steed, 1994), telepresence (Kim & Biocca, 1997), and MEC Spatial Presence Questionnaire (MEC-SPQ; Vorderer et al., 2004) were included (a total

of 22 items). Spatial Ability (four items) and Attention Allocation (four items) were measured using MEC-SPQ (Vorderer et al., 2004). These were measured using a 5-point Likert-type scale with Strongly Disagree – Strongly Agree anchored statements. The scale for Post VR Attitude Change targeted perceived changes in liking, preference, and interest in the destination (from 1 – "Much Weaker" to 5 – "Much Stronger").

Recent studies have found that the younger the customers, the more likely they are to be interested in VR (eMarketer, 2015; Global Web Index, 2016). To represent the group of customers who are highly likely to experience and be influenced by VR, undergraduate and graduate students were invited to participate in the study. In order to ground this research in the context of personal use of VR, existing VR applications and personal VR devices were used. Participants with Apple iOS smartphones were asked to download the Cardboard app and use Google Cardboard VR viewer to visit Tokyo, Japan (i.e., street view stimuli). Others were asked to use Samsung Gear VR (with a Samsung smartphone) to experience Porto, Portugal (i.e., video stimuli). After the VR experience, all participants were asked to complete the questionnaire online. In order to test the hypotheses, data were analysed using factor analysis and analysis of variance (ANOVA).

4 Findings

A total of 202 participants completed the questionnaire. The majority of participants are between the ages of 18 and 24 (97%), female (80%), and have a 4-Year University Degree (76%). Most participants (N = 136; 67%) used Google Cardboard, and most had never visited the destination portrayed in the VR experience (N = 144; 71%).

Dimensions of Presence. Factor analysis was performed to identify the dimensions of presence during the VR experience. As presented in Table 1, two dimensions were identified, each with four items, explaining 80% of variance in the data. These factors were labelled as Departure and Self-Location. The factor loadings of all items are higher than .80. Cronbach's alpha values for both factors are higher than .90, indicating internal consistency of the factors. The first factor, Departure, reflects the state of mind of respondents during the VR experience, whereby the sense of being in the VR environment was stronger than being in the actual environment. This is consistent with the concept of spatial presence as "being there" (i.e., destination) as opposed to "being here" (i.e.,

experiment room) (Kim & Biocca, 1997; Slater, Usoh, & Steed, 1994). Self-Location represents the sensing of presence and actions of self in the VR environment, which is consistent with MEC-SPQ's (Vorderer et al., 2004) self-location scale. None of the items representing Locality (Slater, Usoh, & Steed, 1994) or Possible Actions (Vorderer et al., 2004) emerged as meaningful factors; items were eliminated due to cross-loadings or low factor loadings.

Table 1. Dimensions of Presence

Presence	Factor Loading	Eigen-value	Cum. %	Alpha
Factor 1: Departure		3.260	40.752	.922
During the VR experience, the sense of being in VR environment was stronger than being elsewhere.	.894			
During the VR experience, there were times when I felt I was actually there.	.831			
During the VR experience, I felt the sense of being there.	.830			
During the VR experience, I often thought to myself that I was actually there.	.827			
Factor 2: Self-Location		3.172	80.403	.912
It seemed as though I actually took part in the action (sightseeing).	.860			
I felt like I was actually in the VR environment.	.855			
I felt as though I was physically present in the VR environment.	.821			
It was as though my location had shifted into the VR environment.	.800			

Factors Influencing Presence. Two-way, between-subjects ANOVAs were performed to assess the effects of Attention Allocation and Spatial Ability (as covariates), as well as Types of VR Stimuli (i.e., Google Cardboard/Tokyo vs. Samsung Gear VR/Porto), Prior Visitation (visited vs. never visited), and interaction between Types of VR Stimuli and Prior Visitation on Departure and Self-Location. As illustrated in Table 2, the results revealed the significant influence of Attention Allocation on Departure (Effect Size = .288, p = .000; R^2 = .319). However, the other factors were not significant. It can be suggested that the higher the level of attention devoted to the VR experience, the greater the extent of perceived departure from the physical environment. Fig. 1 illustrates the estimated marginal means of Departure with different Types of VR Stimuli and Prior Visitation. Even though there are mean differences between these groups (i.e., respondents using Samsung Gear VR

reporting higher presence, especially among those who had never visited the destination), these differences are not statistically significant.

Table 2. Between-Subjects Effects on Departure

	Type III Sum of Squares	df	Mean Square	F	Sig.	Effect Size
Corrected Model	62.951	5	12.590	18.199	.000	.319
Intercept	1.677	1	1.677	2.245	.121	.012
Attention Allocation	54.273	1	54.273	78.450	.000	.288
Spatial Ability	1.310	1	1.310	1.894	.170	.010
Device/Stimuli	.951	1	.951	1.374	.243	.007
Prior Visitation	.000	1	.000	.982	.982	.000
Device X Prior Visitation	.106	1	.106	.154	.695	.001
Error	134.211	194	464			
Total	2078.563	200				
Corrected Total	156.090	199				

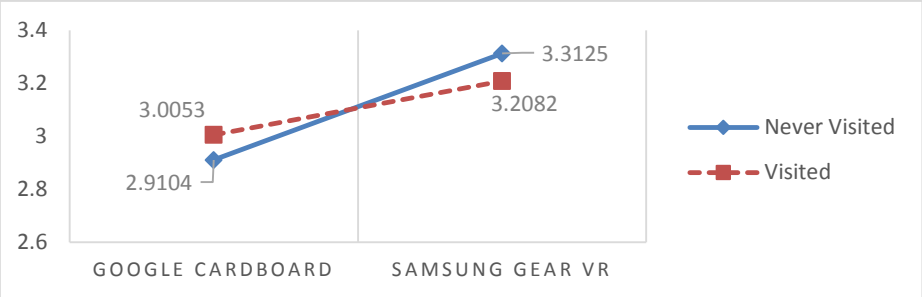

Fig. 1. Estimated Marginal Means of Departure
Note: Covariates are evaluated at: Attention Allocation = 3.575, Spatial Ability = 3.243

Table 3 presents the results of a two-way, between-subjects ANOVA to identify the effects of Attention Allocation, Spatial Ability, Types of VR Stimuli, and Prior Visitation on Self-Location. The results revealed the significant influences of Attention Allocation on Self-Location (Effect Size = .410, p = .000; R^2 = .423). However, the other factors were not significant. Similar to the other dimension of presence, it can be suggested that when respondents are focusing their attention during the VR experience, they are more likely to feel a stronger sense of locating the self in the VR environment. Fig. 2 illustrates the estimated marginal means of Self-Location with different Types of VR Stimuli and Prior Visitation. It can be observed that among those who had never visited the destination, the use of Samsung Gear VR yielded higher level of

perceived self-location. However, the mean difference is not statistically significant.

Table 3. Between-Subjects Effects on Self-Location

	Type III Sum of Squares	df	Mean Square	F	Sig.	Effect Size
Corrected Model	66.023	5	13.205	28.442	.000	.423
Intercept	2.560	1	2.560	5.515	.020	.028
Attention Allocation	62.575	1	62.575	134.783	.000	.410
Spatial Ability	.642	1	.642	1.382	.241	.007
Device/Stimuli	.055	1	.055	.008	.731	.001
Prior Visitation	.294	1	.294	.633	.427	.003
Device X Prior Visitation	.045	1	.045	.097	.756	.000
Error	90.067	194	464			
Total	2351.174	200				
Corrected Total	156.090	199				

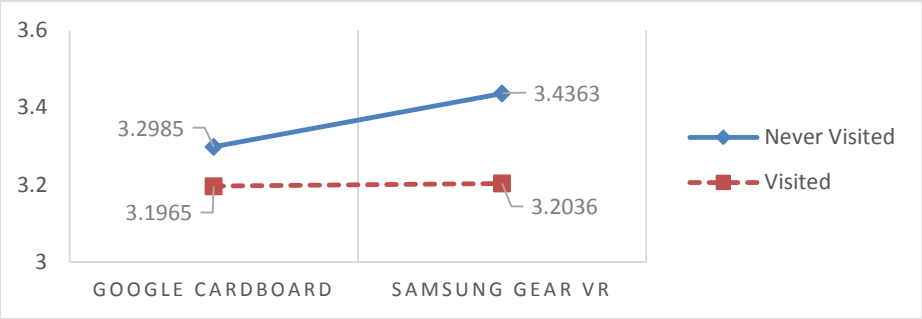

Fig. 2. Estimated Marginal Means of Self-Location
Note: Covariates are evaluated at: Attention Allocation = 3.575, Spatial Ability = 3.243

Presence Influence on Attitude Change. A two-way, between-subjects ANOVA was also performed to test the influence of Departure and Self-Location on post-VR Attitude Change toward a destination. The effects of Types of VR Stimuli and Prior Visitation were also estimated (see Table 4). Significant influences of Departure (Effect Size = .022, p = .035) and Self-Location (Effect Size = .039, p = .006) were identified (R2 = .184), even though the effect sizes are small. Other factors are not significant. It can be suggested that spatial presence contributes to positive attitude change toward tourism destinations. Fig. 3 presents the estimated marginal means of Attitude Change with different Types of VR Stimuli and Prior Visitation. It can be observed that among those who have visited the destination, post VR attitude change was more

prominent in those using Samsung Gear VR, especially among those who had visited the destinations.

Table 4. Between-Subjects Effects on Post-VR Attitude Change

	Type III Sum of Squares	df	Mean Square	F	Sig.	Effect Size
Corrected Model	11.675	5	2.335	8.815	.000	.184
Intercept	79.628	1	79.628	300.611	.000	.605
Presence: Departure	1.190	1	1.190	4.492	.035	.022
Presence: Self-Location	2.079	1	2.079	7.850	.006	.039
Device/Stimuli	.651	1	.651	2.456	.119	.012
Prior Visitation	.009	1	.009	.034	.853	.000
Device X Prior Visitation	.166	1	.166	.627	.429	.003
Error	51.918	196	265			
Total	2606.222	202				
Corrected Total	63.593	201				

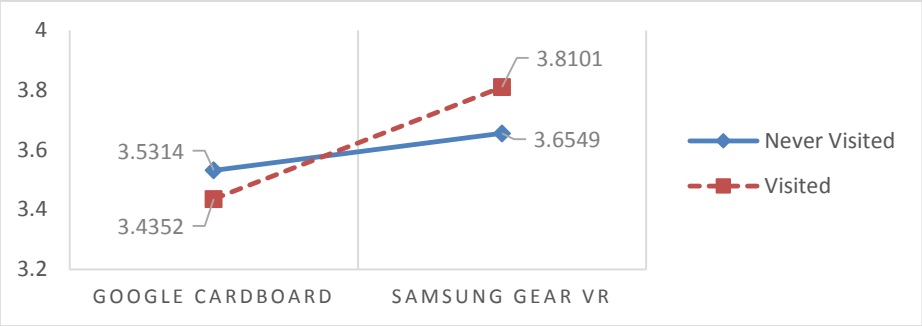

Fig. 3. Estimated Marginal Means of Post-VR Attitude Change
Note: Covariates are evaluated at: Departure = 3.063, Self-Location = 3.313

5 Conclusion

The technological drive for VR experiences, characterised by the development of VR platforms and devices for convenient personal use, indicates great potential for widespread consumption of VR tourism content. Destination marketers and managers are faced with challenges in making strategic investment decisions to leverage VR technology to influence consumers' travel decisions. This development also presents research challenges to better understand the effectiveness of VR in shaping consumer attitudes toward tourism destinations. In order to answer these challenges, this study investigates spatial presence in the VR experience involving virtual walkthrough of actual tourism destinations using personal devices (smartphones and VR viewers). It

was found that the sense of being there (i.e., spatial presence) was significantly influenced by attention allocation (*H2* was supported); the more the users allocated attentional resources to the VR environment during the experience, the higher the degree of spatial presence (consistent with Bystrom, Barfield, & Hendrix, 1999; Draper, Kaber, & Usher, 1998; Wirth et al., 2007). This indicates that in order for VR users to achieve higher spatial presence, regardless of their spatial ability, it is imperative to eliminate any distractions that would prevent users from allocating sufficient attention to objects or events in the VR environment. These distractions can originate from the content (e.g., disappearing objects as users move forward), user experience (e.g., hovering buttons in a supposedly natural environment), or the devices used (e.g., seeing the floor during a virtual walkthrough).

Importantly, it was identified that spatial presence contributes positively to attitude change toward destinations (*H3* was supported); a higher sense of spatial presence leads to stronger interest and liking toward the destinations. This confirms the effectiveness of the VR experience for marketing. While there are differences in terms of spatial presence and attitude change across different devices (Samsung Gear VR yielding higher degree of spatial presence and attitude change), the differences are not statistically significant. This indicates that the use of low cost, less sophisticated devices such as Google Cardboard still results in comparable experiences and responses to more sophisticated ones. However, this could also result from statistical representativeness issue due to the small number of Samsung Gear VR users who had visited the destination before.

This study contributes to a better understanding of spatial presence, its determinants, and its consequences on user attitudes in experiences involving depictions of real tourism destinations. This study provides empirical support to literature suggesting the potential role of VR in tourism marketing and management. Importantly, it provides theoretical explanation for the effectiveness of VR in influencing users' response to marketing stimuli, which is helpful for destination marketers justifying investment in VR. However, the results of this study are limited by the characteristics of the participants, a group dominated by young, female consumers. Future research should include a wider range of participants and devices/stimuli to test the generalizability of the findings.

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