Virtual reality, presence, and attitude change: Empirical evidence from tourism

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HIGHLIGHTS
- Sense of presence during VR leads to positive attitude change toward destination.
- The effect of presence on enjoyment of VR confirms VR as a hedonic experience.
- Change in attitude leads to visit intention, confirming the persuasiveness of VR.
- VR is more persuasive when virtual environment conveys its situated affordances.

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ABSTRACT
The rapid development of virtual reality (VR) technology offers opportunities for a widespread consumption of VR tourism content. It also presents challenges to better understand the effectiveness of VR experience in inducing more favorable attitude toward tourism destinations and shaping visitation intention. Based on two studies, one conducted in Hong Kong with 202 participants and another in the United Kingdom with 724 participants, this research identified several positive consequences of the sense of presence in VR experiences. First, the feeling of being in the virtual environment increases enjoyment of VR experiences. Second, the heightened feeling of being there results in stronger liking and preference in the destination. Third, positive attitude change leads to a higher level of visitation intention. Therefore, this study provides empirical evidence to confirm the effectiveness of VR in shaping consumers’ attitude and behavior.

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1. Introduction

One of the important technological developments expected to greatly impact the tourism industry today is virtual reality (VR). Recent innovation in VR platforms, devices, and content production tools allows for VR to evolve from a niche technology mainly enjoyed within the gaming communities into the realm of everyday experiences. The availability of low-cost VR viewers such as Google Cardboard and the abundance of tourism-related VR content make it easier for anyone to experience virtual tours of cities and tourism attractions from anywhere in the world. Therefore, VR today offers unbounded potentials for mass virtual visitation to actual tourism destinations. The discussions on the roles of VR in tourism and hospitality management and marketing have been found in tourism literature since the past three decades (e.g., Cheong, 1995; Dewailly, 1999; Gutten-tag, 2010; Huang, Backman, Backman, & Chang, 2016; Williams & Hobson, 1995). With its unique ability to simulate intricate, real-life situations and contexts (Diemer, Alpers, Peperkorn, Shiban, & Mühlberger, 2015), VR has been touted as a substitute to actual travel (Cheong, 1995; Sussmann & Vanhengan, 2000), which can be beneficial for the management of protected areas such as vulnerable natural and cultural heritage sites where limiting the number of tourists or restricting visitations is desirable. In this case, the use of VR is considered a positive contribution to environmental sustainability (Dewailly, 1999). Studies also suggest
VR as a powerful tourism marketing tool (Huang et al., 2016; Williams & Hobson, 1995; Williams, 2006) as it is able 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. However, these studies are conceptual in nature, offering the potential benefits of VR applications in the tourism industry. Lacking, though, is theory-driven and evidence-based research to support these suggested potentials.

Research in psychology has sought to explain the reason behind the effectiveness of VR in shaping attitudinal and behavioral responses to virtual stimuli (Schemuele, Van Der Straaten, Krijn, & Van Der Mast, 2001), most of these have focused on the concept of presence. VR provides an environment where users can retrieve information in multi-sensory modalities, including visual, auditory, and kinaesthetic, enabling users to perceive realistic representation of the environment it portrays (Slater & Usoh, 1993). Further, VR environment offers situated affordances (Schemuele et al., 2001), action-supportive information on what users can do with the environment. For example, to a human, the grounds afford walking. Therefore, users’ perception of the VR environment is dependent on possible actions. This perception leads to the sense of being “present” in or “transported” to the virtual environment (Lombard & Ditton, 1997; Schemuele et al., 2001; Slater, 1999; Zahorik & Jenison, 1998). The essence of travel and tourism experience is tourists’ encounters with the destination environments, the “realities” of others. Tourists are tempted by the allure of places and landscapes; some mainly driven by desire to experience the visual sensations of distant territories (Steenjacobsen, 2001), others by the deeper meaning behind interacting with the sociocultural aspects of tourism destinations (Gibson, 2009). Drawing from Zahorik and Jenison (1998), successfully supporting actions such as sightseeing in a virtual tourism destination will lead users to perceive a sense of presence, of him/herself as being in the destination. Consequently, presence explains the effectiveness of VR as substitute to and/or simulation of travel.

Empirical evidence from various fields of studies, including in education, healthcare, entertainment, retailing, etc., demonstrate that VR experience leads to positive attitudinal and behavioral outcomes, such as consumer learning of products (Suh & Lee, 2005), brand recognition, product recall, and memory of experiences (Kim & Biocca, 1997; Mania & Chalmers, 2001). These outcomes are suggested as the results of presence (Schemuele et al., 2001). However, these studies, as well as VR studies in tourism context (e.g., Huang et al., 2016), mainly dealt with simulated virtual worlds, such as a virtual office, a virtual seminar room, and 3D tourism attractions, where resemblances to real places were rather coincidental. Theoretically, researching VR experience in tourism (what this study encapsulates) will provide a better understanding of presence in VR experiences that involve virtual depictions of real environments, where possible actions, such as navigation and sightseeing, resemble (are often indistinguishable from) actual consumption. Thus, it will lead to better conceptualization of the roles of VR experience in shaping attitude towards actual consumption. From a managerial point of view, understanding how travel consumers respond to various VR stimuli, the attitudinal consequences of “having been” in a destination, is of practical importance as destination managers are increasingly faced with strategic decisions to invest in various technology platforms and modalities. Therefore, this study aims to address the identified research gap in VR research in tourism context to address the aforementioned theoretical and managerial challenges. Specifically, the goal of this study is to investigate the sense of presence during a virtual walkthrough of a tourism destination and how presence influences post-VR attitude change toward the destination. Two studies were conducted to achieve this research goal. Study 1 was conducted with 202 participants in Hong Kong using VR street view of Tokyo, Japan, viewed with Google Cardboard or VR video of Porto, Portugal, viewed with Samsung Gear VR. Study 2 was conducted in the United Kingdom with 724 participants using 360-degree VR videos of Lake District National Park, United Kingdom, viewed with Samsung Gear VR.

2. Virtual reality and tourism

Since its early conception, VR has been described as a computer-simulated environment with and within which people interact (Diemer et al., 2015; Schemuele et al., 2001). Using VR devices, a user can experience the virtual environment as if he or she was part of it. The virtual environment is modified in real time as the device senses user’s reactions and motions, allowing him or her to perceive a vivid mental representation of the environment, creating the illusion of interacting with and being immersed in the virtual world (Wirth et al., 2007). Table 1 presents an overview of VR technologies and their advantages within the tourism context. There are two kinds of established or commonly used headsets for VR, with numerous technical options within those two types. The first type includes untethered headphones (also referred to as mobile VR). These are headsets that work based on using a mobile device as a display. This can sometimes present a limitation due to the mobile devices processing power and limited ability to process real-time 3D content. The major benefits of these mobile-based systems are cost and uptake; many people already have a mobile device that is capable of displaying VR content to some degree (Byond, 2016). Examples of untethered or mobile VR headsets include Samsung Gear VR, Google Cardboard, and Google Daydream. The second common type is a tethered device, whereby the headsets contain a display alongside internal and/or external sensors to track the position of the user. These tethered headsets will usually require a personal computer (PC) to process the graphics and, thus, the user is attached to the PC via a cable. This usually allows for superior quality graphics as well as real-time tracking and interaction. Established examples include the HTC Vive, Oculus Rift, and OSVR (Byond, 2016).

Recently, a number of scholars explored the benefits of VR within the tourism context. From the tourists’ point of view, the main benefits of VR include enhancement of tourism experiences (Bonetti, Warnaby, & Quinn, 2018; Moorhouse, tom Dieck, & Jung, 2018); facilitation of immersive, engaging, social, and entertaining experiences (e.g. Castro et al., 2017; Guttentag, 2010; Jung, Lee, Chung, & tom Dieck, 2018; Tromp, 2017), as well as the potential to provide accessible tourism for all (Guttentag, 2010; Williams & Hobson, 1995). From the perspective of businesses and destinations adopting VR, factors such as marketing and promotions, sales and distribution (Gibson & O’Rawe, 2018; Huang et al., 2016; Moorhouse et al., 2018; Williams & Hobson, 1995), additional revenue generation (Radde, 2017; Tromp, 2017), as well as sustainability and the preservation of heritage (Guttentag, 2010; Williams & Hobson, 1995) were identified as the benefits of VR. A full summary of previously explored benefits of VR is presented in Table 1.

3. Defining and measuring presence in virtual reality

The key concept that explains the effectiveness of VR in various use contexts is presence. Presence is defined in literature as the psychological state where a user is feeling lost or immersed in the mediated environment, the degree to which he or she feels physically “present” in a virtual environment (Schubert, Friedmann, & Regenbrecht, 2001; Slater & Steed, 2000; Slater & Usoh, 1993; Slater & Wilbur, 1997; Steuer, 1992). Lee (2004) defines presence as a psychological state in which the virtuality (artificiality) of an
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