6-2021

Light at the end of the tunnel: Visitors' virtual reality (versus in-person) attraction site tour-related behavioral intentions during and post-COVID-19

Omar S. Itani
The University of Texas Rio Grande Valley, omar.itani@utrgv.edu

Linda D. Hollebeek

Light at the End of the Tunnel: Visitors' Virtual Reality versus In-Person Attraction Site Tour-Related Behavioral Intentions During and *Post*-COVID-19

Please cites as:

Itani, O. S., & Hollebeek, L. D. (2021). Light at the end of the tunnel: Visitors' virtual reality (versus in-person) attraction site tour-related behavioral intentions during and post-COVID-19. Tourism Management, 84, 104290. https://doi.org/10.1016/j.tourman.2021.104290

Abstract

Consumer behavior is changing as a result of the COVID-19 pandemic, thus compelling attraction sites to find new ways of offering safe tours to visitors. Based on protection motivation theory, we develop and test a model that examines key drivers of visitors' COVID-19-induced social distancing behavior and its effect on their intent to use virtual reality-based (vs. in-person) attraction site tours during and *post*-COVID-19. Our analyses demonstrate that visitor-perceived threat severity, response efficacy, and self-efficacy raise social distancing behavior. In turn, social distancing increases (decreases) visitors' intent to use virtual reality (in-person) tours during the pandemic. We find social distancing to boost visitors' demand for advanced virtual tours and to raise their advocacy intentions. Our results also reveal that social distancing has no effect on potential visitors' intent to use virtual reality vs. in-person tours *post*-the pandemic. We conclude by discussing vital implications that stem from our analyses.

Keywords: COVID-19 pandemic; coronavirus; social distancing; protection motivation theory; tours; attraction sites; virtual reality; consumer intentions.

1. Introduction

The "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) virus that produces COVID-19 has instigated a global pandemic with over 54 million confirmed cases across 191 countries, and a death toll of over 1.3 million[1] (Dong et al., 2020). Due to the pandemic's public health risk, many governments have imposed significant mobility restrictions on their citizens (e.g., lockdown, social distancing, travel bans, quarantine), which are slowing down the world economy (Nicola et al., 2020). In this environment, the tourism sector is experiencing a major impact on its business (Zenker & Kock, 2020). For example, canceled flights, vacant hotels, and closed attraction sites are a common sight in recent months (Gössling et al., 2020), thus putting tourism and travel on hold and yielding substantial employee layoffs and financial loss. Travel restrictions are considered imperative to control the spread of COVID-19 (Niewiadomski, 2020), with many cases being linked to tourist/tour groups (Yang et al., 2020). Countries worst-impacted by the pandemic (e.g., the United States, India, Brazil, Spain, France) tend to be those attracting high tourist numbers (Beech et al., 2020; Statista, 2000).

Given their typically high-contact nature, travel/tourism services have suffered significant loss as a result of COVID-19, and now face an uncertain future. For example, after being temporarily closed during lockdown, attraction sites in some countries are currently rebuilding their clientele. However, many of their visitors' disposable incomes are considerably affected by the pandemic (e.g., through job loss). That is, the 3-4% global tourism growth predicted for 2020 has

[1] https://coronavirus.jhu.edu/map.html (Accessed November 16, 2020).

dramatically shifted to a 20-30% pandemic-induced decline (UNWTO, 2020), with cumulative tourism/travel-related GDP loss amounting to $2.1 trillion (WTTC, 2020). While tourism is vulnerable to crises and disasters (Cró & Martine, 2017; Rosselló et al., 2020), evidence shows its disruption as never before by COVID-19, which is described as an amalgamation of "a natural disaster, a socio-political crisis, an economic crisis, and a tourism demand crisis" (Zenker & Kock, 2020, p. 2). Consequently, there is a need to examine the pandemic's effect on the travel/tourism sector, and to devise ways to convert this disruption into transformative opportunities (Sigala, 2020). At the same time, consumers' travel/tourism-related mindset is shifting, including by avoiding crowded destinations in favor of more remote, tranquil options (Zenker & Kock, 2020). Research is therefore needed to answer the "questions of how the tourism industry can respond to and recover from the crisis" (Gretzel et al., 2020, p. 188).

Given these issues, we explore how attraction sites are adapting to COVID-19-induced social distancing and its expected effect on consumers' intent to purchase virtual reality (VR)-based (vs. in-person) site tours, both during and *post*-the pandemic. While VR has been previously viewed as a threat to the travel/tourism sector (Cheong, 1995), today it offers an important opportunity for attraction sites to overcome the pandemic's challenges. VR, defined as "computer-mediated, interactive environments capable of offering sensory feedback to engage consumers ….and drive desired consumer behaviors" (Hollebeek et al., 2020a, p. 1), is increasingly deployed to create personalized, convenient virtual site visits (e.g., to landmarks, museums, zoos, theaters; Bright, 2020; Herrmann, 2020), particularly during COVID-19.

This study offers the following contributions. First, based on Rogers' (1983) protection motivation theory, we empirically examine how consumers' appraisal of COVID-19, including (a) the perceived severity of its threat and one's perceived susceptibility to contracting the virus, and

(b) their coping appraisal, gauged by response efficacy and self-efficacy, affect consumers' motivation to protect themselves through social distancing. Given its focus on impending health threats and individuals' motivation to self-protect from the threat, protection motivation theory offers a relevant framework in our research context.

Second, we examine the relationship between consumers' social distancing-based protection behavior on their intent to use VR-based (vs. in-person) attraction site tours both *during* and *after* the pandemic. Our rationale is that while COVID-19 currently exerts a disruptive effect on attraction sites in many countries, others are planning to reopen soon. Therefore, investigation of the pandemic's present and future effects on attraction sites is required, in particular for VR-based (vs. in-person) tours, as outlined. By examining the role of social distancing as a self-protective behavior against COVID-19, we illuminate its effect on consumers' intent to visit attraction sites, either in-person or virtually, during and *post*-the pandemic, thus unlocking new insight (Zenker & Kock, 2020).

Third, we explore consumers' VR-based tour needs in terms of VR's technological advancement level, and its effect on their tour-related advocacy intent, or their resolve to recommend a VR-based tour to others (Ozturk & Gogtas, 2016). This is important because consumers' uptake of virtual (vs. in-person) tours is rapidly growing since the pandemic's onset (Debusmann, 2020), which may extend to impact their *future* tour-related intentions. We therefore explore the role of VR-based tours' technological advancement level on consumers' tour-related advocacy intent, which represents a proximal predictor of behavior (Fishbein & Ajzen, 1975).

In section 2, we review relevant literature on protection motivation theory, social distancing, and VR tours, followed by an overview of the hypothesis development in section 3. In sections 4 and 5, we present the methodology and results, respectively. In section 6, we conclude by discussing our results, outlining their implications, and addressing the study's limitations.

2. Theoretical background

2.1. Protection motivation theory

Protection motivation theory, which proposes that individuals' threat- and coping appraisal generate their motivation to protect themselves from perceived health threats (Rippetoe & Rogers, 1987; Rogers, 1983), is widely adopted in the tourism literature (Badu-Baiden et al., 2016; Chen et al., 2020). First, *threat appraisal* comprises (a) *perceived threat severity*, defined as the "beliefs about the significance or magnitude of the threat" (Witte, 1996, p. 320). The higher a perceived threat's severity, the more extensive individuals' self-protection behaviors, and (b) *perceived susceptibility*, defined as "beliefs about one's risk of experiencing the threat" (e.g., by contracting COVID-19; Witte, 1996, p. 320). More susceptible individuals are predicted to engage in a greater range of self-protective measures (Rogers, 1975), including COVID-19-imposed social distancing. Overall, threat appraisal focuses on the threat's nature, its perceived seriousness, and the propensity of it eventuating to affect the individual (Norman et al., 2005).

Second, *coping appraisal* involves the assessment of health-protective behavioral alternatives and responses to avoid the threat and its consequences. It focuses on the effectiveness of the coping response as well as its implementation to impede the threat. Coping responses that help individuals avert the threat yield perceived response- and self-efficacy (Rogers, 1975). *Response efficacy* refers to "beliefs about whether the recommended coping response will be effective in reducing the threat to the individual" (Milne et al., 2000, p. 109). *Self-efficacy* denotes the "individual's beliefs about whether (s)he is able to perform the recommended coping response" (Milne et al., 2000, p. 109). For example, consumers may consider the degree to which social distancing, a coping behavior recommended by health organizations, can reduce their risk of contracting COVID-19 (i.e., response efficacy) and whether they are capable of maintaining their physical distance from others (i.e., self-efficacy).

Threat- and coping appraisals drive individuals' motivational intentions and course(s) of action to protect themselves from the threat. *Protection motivation* is "an intervening variable that arouses, sustains, and directs activity to protect the self from danger" (Conner & Norman, 2005, p. 9). Overall, protection motivation theory posits that individuals' motivation to defend themselves from a threat is a function of the threat's perceived severity, one's own susceptibility to being adversely impacted by the threat, one's self-efficacy in overcoming the threat, and one's perceived efficacy of particular responses to the threat (Rogers, 1975). For example, consumers may be motivated to adapt their behavior by practicing social distancing to protect themselves from COVID-19.

Despite its positive role in curbing the pandemic, social distancing is "the very antithesis of our expectations of the experience of hospitality and tourism" (Baum & Hai, 2020, p. 2). While COVID-19 continues to spread, social distancing has rapidly become the *new normal* that compels consumers globally to stay at home, cancel their planned site visits, and learn about how to stay safe (Chubb, 2020). That is, due to COVID-19, consumers' ability to visit attraction sites has been reduced to an unprecedented degree (Baum & Hai, 2020). Therefore, attraction sites are considering new ways to bring their service to consumers. One such technique is VR technology, which by offering virtual site visits, can instigate the consumer's sense of *being there* (i.e., telepresence; Hollebeek et al., 2020a; Loureiro et al., 2020). VR-based tours therefore exist as an innovative potential means for attraction sites' survival during COVID-19 (Kwok & Koh, 2020). Given the expected lack of medical treatment or remedy for COVID-19 until (mid-) 2021 (Grenfell

& Drew, 2020), attraction sites' adoption of new channels to maintain client demand is key. Before reviewing literature on VR-based tours, we synthesize the budding social distancing literature.

2.2. Social distancing

Social (or physical) distancing is a set of non-pharmaceutical precautions to stop the spread of contagious diseases, including COVID-19, by preserving a physical distance of 1.5-2 meters between individuals and limiting face-to-face encounters (Li & Li, 2020; Hollebeek et al., 2020b). It "is designed to reduce interactions between people in a broader community, in which individuals may be infectious, but have not yet been identified" (Wilder-Smith & Freedman, 2020, p. 2). As COVID-19 is primarily transmitted by respiratory droplets that require physical proximity, social distancing has proven its effectiveness in *flattening the curve* and controlling the epidemic (Wilder-Smith & Freedman, 2020). Likewise, the Center for Disease Control and Prevention posits that social distancing or "limiting face-to-face contact with others is the best way to reduce the spread of … COVID-19."[2] Therefore, in the absence of COVID-19-based medical treatment or vaccine, social distancing remains a major intervention to control its dissemination (Kissler et al., 2020), thus impacting tourism and attraction sites.

Social distancing has proven useful during COVID-19, as it has saved critical care units from being overwhelmed with patients (Ferguson et al., 2020). It has also helped reduce mortality rates, thus yielding monetary savings (Greenstone & Nigam, 2020). Social distancing may need to stay in place until the global population has largely reached immunity, or an effective vaccine and treatment are available (Kissler et al., 2020). During the pandemic, interest in VR-based tours has

[2] https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html (Accessed June 8, 2020).

spiked (Debusmann, 2020), given its capacity to overcome social distancing-imposed mobility- and social restrictions.

Social distancing limits human presence and touch, thus complicating consumers' meaningful tourism experiences. Given social distancing's restriction of conventional face-to-face service interactions (Hollebeek et al., 2020b), tourism businesses globally are rapidly adopting technology-based alternatives (e.g., VR-based tours) to continue their service delivery (Gössling et al., 2020). Given consumers' perceived threat of contracting COVID-19, they are likely to amend their travel plans (Zhang et al., 2020), yielding their expected willingness to adopt VR-based (vs. in-person) tours during the pandemic, as discussed further in the next section.

2.3. Virtual reality-based site tours

While COVID-19 is restricting consumer mobility, technology-mediated service delivery offers a viable alternative, as discussed (Ke et al., 2020; Singh et al., 2020). For example, VR-based tours enable organizations to abide by government-imposed social distancing or lockdown requirements, while still permitting a value-laden consumer experience (Debusmann, 2020).

Prior research has established VR's benefits for management, sales, marketing, distribution, and heritage preservation, to name a few (Gibson & O'Rawe, 2018; Moorhouse et al., 2018). In tourism, VR can be used to create "a virtual environment by the provision of synthetic or 360-degree real life captured content with a capable non-, semi-, or fully-immersive VR system, enabling virtual touristic experiences that stimulate the visual sense and potentially [the user's] `additional [or] other senses … either prior to, during, or after travel" (Beck et al., 2019, p. 591). *Pre*-COVID-19, attraction sites (e.g., museums, theme parks) were increasingly adopting VR technology to innovate their offerings (Jung et al., 2018; Lee et al., 2020) or to offer an enhanced user experience (Bruno et al., 2010). However, during COVID-19, VR technology has become an important platform for tourism businesses to maintain their revenue stream. For example, attraction sites including The Louvre, Guggenheim Museum, Vatican City, Yosemite National Park, and many others are offering virtual tours to locked-down global audiences (Jones, 2020).

VR technology, which provides "computer-mediated interactive environments capable of offering sensory feedback to engage consumers …and drive desired consumer behaviors" (Hollebeek et al., 2020a, p. 1), can be used to foster consumer immersion or telepresence in real time (Guttentag et al., 2010). *Telepresence* refers to a user's perception of actually being in the computer-mediated environment (Cummings & Bailenson, 2016; Jung & Dieck, 2017), which is facilitated by *sensory feedback* that reflects the virtual platform's personalized response to the user's actions (Cowan & Ketron, 2019). VR-based tourism offerings can provide a hedonic (e.g., fun), functional (e.g., learning), or social (e.g., communal) visitor experience (Voss et al., 2003; Lee et al., 2020).

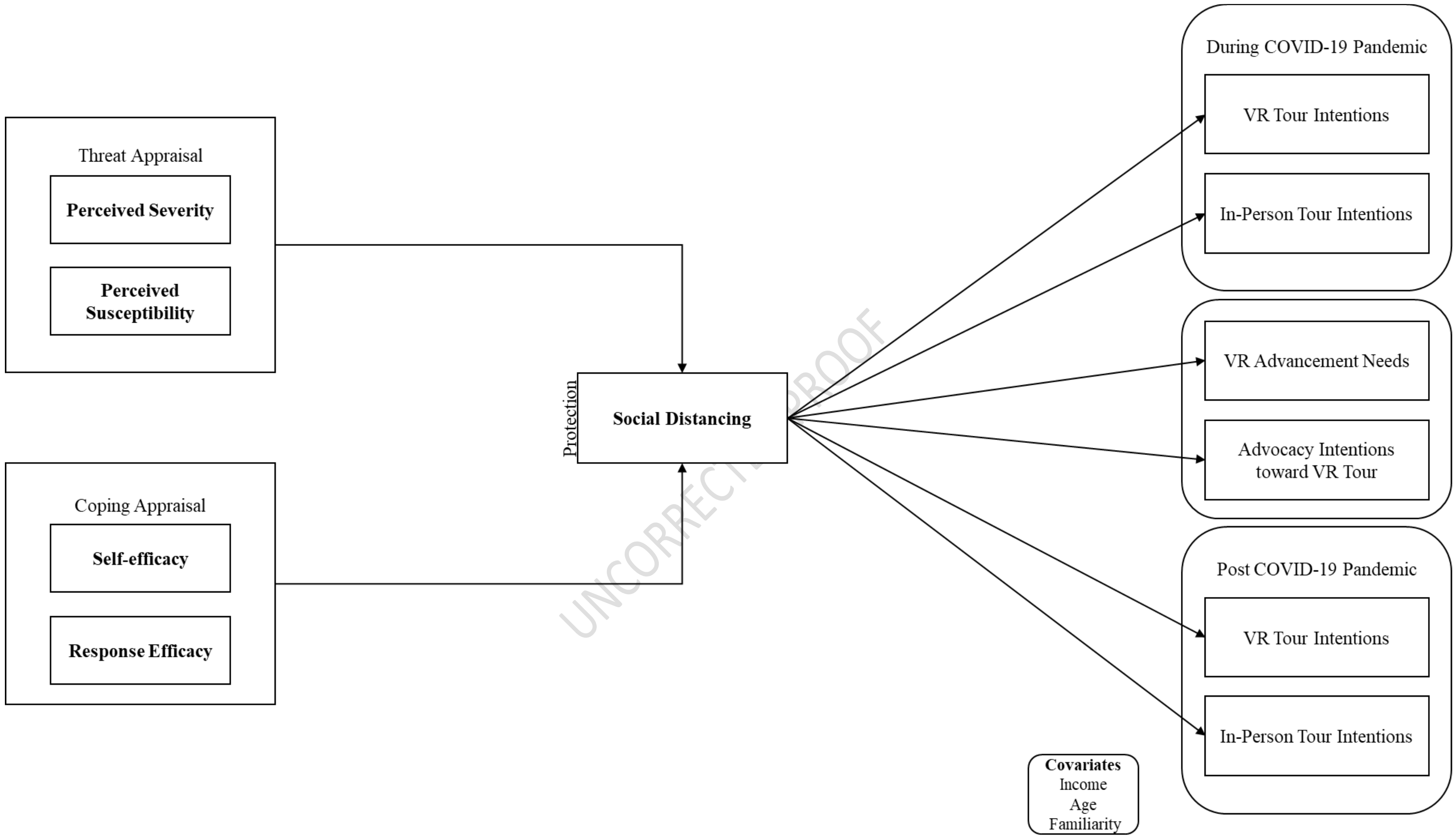
Tourism-based VR's benefits are well-documented in the literature (Bogicevic et al., 2019). For example, VR applications have been shown to boost consumer engagement, including for consumers who are unable to physically visit the site (e.g., due to lacking financial means, physical disability, or COVID-19-imposed lockdown; Moorhouse et al., 2018). Moreover, by allowing geographically-dispersed individuals to interact through a virtual platform, VR-based tours support social interactivity and connectivity (Jung et al., 2018). Given these benefits, many companies are investing in developing such platforms. For example, Google's Heritage on the Edge allows tourists to visit UNESCO World Heritage sites and Amazon Explore provides an interactive virtual experience of visiting historic/cultural sites (Bloom, 2020).

Despite these benefits, VR applications differ with respect to their technological capabilities (Beck et al., 2019). Specifically, more advanced VR platforms (e.g., BNEXT VR Headset, Samsung Galaxy Gear, Oculus Rift) typically generate higher user-perceived telepresence (vs. more basic (e.g., Google Cardboard-based) applications; Hollebeek et al., 2020a; Lee et al., 2020), as discussed further below. We next develop a research model and an associated set of hypotheses for empirical testing.

3. Hypothesis development

Based on our review, we next develop and test a promotion motivation theory-informed model that examines attraction site visitors' threat- and coping appraisal during COVID-19. In particular, we zoom in on consumers' coping response of social distancing and its anticipated effect on their intent to visit an attraction site during- and *post*-the pandemic (see Figure 1).

Figure 1: Model



3.1. Effect of threat- and coping appraisals on social distancing

As discussed, protection motivation theory proposes threat severity and -susceptibility as key threat appraisal facets (Rogers, 1983). While the former represents the seriousness of harm that the threat can cause, the latter addresses one's perceived risk of being affected by the threat. During COVID-19, the pandemic's perceived threat typically correlates positively with the uptake of virus-preventative measures globally (Dryhurst et al., 2020). That is, high perceived threat severity yields elevated self-protection against the impending threat (Floyd et al., 2000; Milne et al., 2000). Similarly, high consumer-perceived susceptibility of contracting the virus will see elevated self-protection (Bengel et al., 1996). Likewise, Harris et al. (2018) identify perceived threat severity and -susceptibility as major drivers of consumers' restaurant avoidance (i.e., protection behavior) after a foodborne illness outbreak. During COVID-19, consumer attitudes toward social distancing vary across individuals (Hollebeek et al., 2020b). For example, those that perceive themselves to be less susceptible to contracting the virus are more likely to adopt looser social distancing practices (Seres et al., 2020). We hypothesize:

H1a: Consumers' perceived severity of COVID-19's threat positively affects their social distancing behavior.

H1b: Consumers' perceived susceptibility to contracting COVID-19 positively affects their social distancing behavior.

Protection motivation theory also identifies the chief coping appraisal dimensions of response efficacy and self-efficacy (Rogers, 1983), as discussed. First, consumers hold personal beliefs about the efficacy of recommended responses against the threat (e.g., social distancing). That is, their perceptions of social distancing's effectiveness as a coping response to combat COVID-19 will vary. Second, self-efficacy reflects consumers' self-perceived ability to effectively perform the recommended coping response of social distancing.

According to meta-analyses conducted by Milne et al. (2000) and Floyd et al. (2000), response efficacy and self-efficacy positively influence individuals' protection behaviors. For example, both response- and self-efficacy are reported as predictors of cancer-related preventive behaviors, including screening and self-examination (Norman et al., 2005). Fisher et al. (2018) further corroborate these results by showing that both response- and self-efficacy favorably affect cruise ship passengers' intent to wash their hands during the norovirus. Therefore, the higher consumers' perceived response efficacy of COVID-19-imposed social distancing and the higher their perceived self-efficacy of performing social distancing, the more motivated they are to protect themselves from the virus through social distancing. We posit:

H2a: Consumers' perceived response efficacy of social distancing positively affects their social distancing behavior.

H2b: Consumers' perceived social distancing self-efficacy positively affects their social distancing behavior.

3.2. Social distancing's effects during the pandemic

Social distancing has revolutionized consumers' activities outside the home and consumer perceptions of these activities (De Vos, 2020). To stay connected to others, consumers are therefore increasingly adopting virtual, technology-based interactions during the pandemic (Hollebeek et al., 2020b). The virus has thus motivated consumers to seek new ways of interacting with businesses to satisfy their needs, thus impacting their consumption patterns.

The tourism value chain is dramatically impacted by COVID-19, as its coping interventions (e.g., social distancing, lockdown) affect the sector's usual operations (Gössling et al., 2020). Therefore, attraction sites are innovating their service delivery modes, including by adopting VR-based site tours, as discussed. VR-based tours allow consumers to virtually visit attraction sites by replicating the site's physical environment (Errichiello et al., 2019), while also overcoming traditional site visit-related issues (e.g., queuing, crowding; Jung & Dieck, 2017). During high COVID-19-imposed uncertainty, virtual site visits allow consumers to cope with the situation, satisfy their visitation needs, and fight boredom (Bright, 2020).

Fisher et al. (2018) report that cruise ship passengers sought to avoid personal contact during a simulated norovirus outbreak. To curtail the virus, passengers were found to avoid crowded areas on board and to minimize touching common surfaces (e.g., buffet area; Wang & Ackerman, 2019). COVID-19 is likely to shift consumers' travel-related mindset, including by evading crowded sites or destinations in favor of more tranquil options (Zenker & Kock, 2020). We posit that during COVID-19, consumers practicing higher levels of social distancing will display a reduced intent to visit an attraction site in-person and instead be more inclined to opt for VR-based site tours. We hypothesize:

H3a: Consumers' adopted social distancing level positively affects their intent to use virtual reality-based attraction site tours during the pandemic.

H3b: Consumers' adopted social distancing level negatively affects their intent to use in-person attraction site tours during the pandemic.

VR tours' technological advancement level is also likely to generate consumers' differing tour evaluations (Hollebeek et al., 2020a). That is, the more advanced the deployed VR technology, the better the consumer's typical tour experience (Wei et al., 2019). Tourism-based VR ranges from non-immersive to fully immersive applications, with limited intention being paid to their differences to date (Beck et al., 2019). We expect more advanced VR systems to boast an elevated capacity to immerse consumers in their high-fidelity site visit and generate telepresence.

Consumers who take social distancing more seriously, in particular, are expected to prefer visiting high (vs. low)-fidelity virtual environments (Thurman & Mattoon, 1994), because while their extensive social distancing behavior largely precludes them from physically visiting attraction sites, they still seek to optimize their virtual visit experience (Hollebeek et al., 2020b). Moreover, consumers practicing high levels of social distancing will also want others to stick to the social distancing protocol, given its optimal outcomes if - and only if - everyone adheres to it. That is, we expect consumers' social distancing level to affect their advocacy intent for social interaction-minimizing, high-fidelity VR tours to others (Itani et al., 2019; Stokburger-Sauer, 2011). We postulate:

H4a: Consumers' adopted social distancing level positively affects their intent to use more advanced virtual reality-based site tours during the pandemic.

H4b: Consumers' adopted social distancing level positively affects their intent to advocate virtual reality-based site tours to others.

3.3. Social distancing's post-pandemic effects

COVID-19 will be around at least until the development of an effective treatment and/or vaccine, which are expected to arrive by mid- to late-2021 (Grenfell & Drew, 2020). Until then, social distancing is expected to retain its precautionary value in combating the virus (Kissler et al., 2020), including for attraction sites (Baum & Hai, 2020). Given these issues, we investigate whether consumers' intent to visit attraction sites, either in-person or virtually, *post*-the pandemic will be affected by the current social distancing protocol. That is, after a period of obligatory social distancing, to what extent may consumers have gotten used to limiting their social interactions, thus affecting their future site tour-related behaviors?

The future availability of medical interventions against COVID-19 will render consumers less reliant on social distancing to stay safe. Therefore, while consumers may retain a level of caution vis-à-vis social interactions in the future, they are expected to practice higher levels of social distancing during (vs. *post*-) the pandemic (i.e., when a cure is available). Consequently, we expect consumers' short- (i.e., during the pandemic) and long-term (i.e., *post*-pandemic) social distancing behavior to differ (Jang & Feng, 2007). We postulate:

> **H5a: The effect of consumers' adopted social distancing level on their intent to use virtual reality-based site tours *post*- (vs. during) the pandemic will be weaker.**
>
> **H5b: The effect of consumers' adopted social distancing level on their intent to use in-person site tours *post*- (vs. during) the pandemic will be weaker.**

4. Methodology

4.1. Research design and sample

We deployed a self-administered, web-based Qualtrics survey to collect our convenience sampling-based data. The respondents were sourced from an online panel of demographically and geographically diverse consumers in the United States, where the travel/tourism sector makes a major contribution to GDP. Participants resided in different states and were thus not restricted to specific U.S.-based areas. The number of confirmed COVID-19 cases and deaths reported in the U.S. also renders it one of the most affected countries by the virus (Dong et al., 2020), demonstrating its relevance for this research.

The survey link was shared with the panel members, who were compensated for their participation. At the start of the survey, respondents were given a definition of VR-based site tours, examples of such tours, and a brief explanation of the technology behind these tours. We also outlined the research objective. The survey proceeded with relevant screening questions (e.g., the request to name a focal attraction site) to ensure the respondents' awareness of and interest in local/international attraction sites. Those who were unable to specify an attraction site were excluded from further participation. This procedure was important since the personalized survey questions referred back to the participant's identified site (e.g., Burj Khalifa, the Colosseum, Eiffel

Tower, French Quarter (New Orleans), Glacier National Park, Independence Hall, The Louvre, Navy Pier, Sydney Opera House, The Zócalo, Walt Disney World Resort, the Vatican Museum).

The respondents also reported on their perceived severity of COVID-19 and their perceived susceptibility to contracting the virus. Further, they were asked to state social distancing's response efficacy and their perceived self-efficacy in implementing social distancing. Moreover, their social distancing behavior during the pandemic, behavioral intentions toward using VR-based (vs. in-person) attraction site tours (*during* and *post*-the pandemic), and their desired VR-based tour's technological advancement level were solicited. Finally, we collected the respondents' familiarity with VR-based tours and their demographic information.

Of the 529 informants who accessed the survey, 181 passed the screening questions and agreed to participate in the study. After dropping a further seven incomplete responses, the final sample included 174 complete responses, yielding an effective 32.8% response rate. Respondents' average age is 40.14 (STD = 11.75). Reported average annual household income is $79,279 (STD = $32,982). For our partial least squares (PLS)-based analyses, we followed the guideline that recommends a sample size exceeding: (1) 10 times the number of indicators of the measure with the larger indicator number, or (2) 10 times the greatest number of structural paths linked to a particular modeled latent construct (Hair et al., 2016). Our sample size is also in line with Cohen's power analysis at 80 % statistical power (Hair et al., 2016). The sample characteristics are summarized in Appendix 1.

4.2. Measures

We measured *threat severity* by adapting Witte's (1996) instrument to capture COVID-19's perceived seriousness. We also gauged consumers' perceived *susceptibility* to contracting COVID-19 by using a four-item measure (Rippetoe & Rogers, 1987; Witte, 1996), and social distancing-based *response efficacy* with a three-item scale (Rippetoe & Rogers, 1987; Witte, 1996; Floyd et al., 2000). Moreover, a three-item *self-efficacy* measure was used to capture respondents' belief about their own ability to apply social distancing (Witte, 1996). Respondents' *social distancing* level was gauged by deploying an eight-item scale assessing respondents' physical distancing behavior, including the extent of their avoidance of public gatherings and crowded places. For all measures, seven-point Likert scales were used, which ranged from 1 (strongly disagree) to 7 (strongly agree). All of our deployed measures were of a reflective nature (Diamantopoulos & Siguaw, 2006).

Participants were then asked to share their intent to visit their named attraction site, both in person and via a VR-based tour during the pandemic. They were also requested to report on their intent to recommend the VR-based site tour to others. Moreover, participants reported on their likelihood of an in-person (vs. VR-based) visit to their named site *after* the pandemic (i.e., when an effective pharmaceutical intervention/vaccine is available). Respondents' reported intent to use these tours was gathered on a five-item measure sourced from existing intention scales (Davis & Warshaw, 1992; Miniard & Cohen, 1981). Seven-point Likert scales were again used to rate our intention measure (1 = *extremely unlikely* to 7 = *extremely likely*).

Consumers' VR-based visit's technological advancement need was measured as follows: "When visiting [named attraction site], if you are choosing between different VR-based site tours, which would you prefer?" (measured on seven-point Likert scales: 1 = *extremely basic* to 7 = *extremely advanced*). We also gauged respondents' familiarity with VR-based site tours by deploying the following single-item measure: "I am familiar with virtual reality-based site tours" (measured on a seven-point Likert scale: 1 = *strongly disagree* to 7 = *strongly agree*). Overall, respondents were relatively familiar with VR-based tours (mean = 5.1).

We included respondents' familiarity with VR-based tours, age, and income as covariates, as these factors can affect respondents' intent to use VR-based and in-person site tours (e.g., Khan et al., 2020). Examination of the skewness and kurtosis statistics indicated that these were within the acceptable range of ± 2 (George & Mallery, 2016). An overview of our measures, items/loadings, skewness, and kurtosis values is offered in Appendix 2.

5. Results

5.1 Reliability and validity

To test our hypotheses, we deployed PLS-based structural equation modeling by using SmartPLS (3.3.2). We conducted PLS path analysis with 5,000 bootstrapped subsamples, which is suitable for studying relatively small sample sizes (Hair et al., 2019). Before examining the path coefficients, the measures' reliability and validity were checked. The outer model's results suggest the measures' adequate internal consistency, with the lowest Cronbach's alpha equaling 0.77, thus exceeding the minimum threshold of .7 (Cronbach, 1951).

We also checked all measures' composite reliability, with the lowest score being (0.85). Further, the items significantly loaded on their respective latent variables ($p < .01$), without any problematic cross-loadings, thus corroborating the measures' convergent validity. We verified discriminant validity by first conducting the heterotrait–monotrait (HTMT) test. The inter-factor HTMT values were below the 0.85 cut-off, offering evidence of discriminant validity (Henseler et al., 2015). To further test discriminant validity, we compared the square root of the average variance extracted (AVE) of the multi-item measures with their respective inter-factor correlations. None of the inter-factor correlations exceeded the square root of the AVE, corroborating discriminant validity. Moreover, all variance inflation factors were below 3, specifying that multicollinearity is not a problem in our data (Hair et al., 2016). Cronbach's alpha, composite reliability, mean, standard deviation, and AVE values are presented in Table 1.

Table 1: Correlations, Reliability, AVE, and descriptive statistics

		1	2	3	4	5	6	7	8	9	10	11	Mean	STD
1	**Social Distancing**	0.84											5.91	1.04
2	**Perceived Severity**	0.57	0.90										5.83	1.11
3	**Perceived Susceptibility**	0.35	0.47	0.80									4.90	1.21
4	**Response Efficacy**	0.61	0.53	0.56	0.85								5.54	0.96
5	**Self-efficacy**	0.63	0.41	0.20	0.61	0.81							5.70	0.91
6	**VR Tour Intentions (D)**	0.45	0.36	0.34	0.32	0.22	0.84						5.35	1.23
7	**In-Person Tour Intentions (D)**	-0.09	-0.02	0.19	-0.08	-0.31	0.33	0.95					4.60	1.94
8	**VR Tour Intentions (P)**	0.19	0.29	0.33	0.30	0.15	0.52	0.31	0.91				5.18	1.30
9	**In-Person Tour Intentions (P)**	0.05	0.01	0.20	0.23	-0.05	0.02	0.17	-0.09	0.86			5.51	1.17
10	**VR Advancement Needs**	0.25	0.24	0.30	0.41	0.27	-0.02	-0.24	-0.29	0.33	°		5.52	1.25
11	**Advocacy Intentions toward VR Tour**	0.35	0.36	0.29	0.47	0.44	0.51	0.05	0.41	0.18	0.42	0.84	5.49	0.86
	Cronbach's Alpha	0.94	0.92	0.81	0.80	0.77	0.90	0.97	0.95	0.92	°	0.86	°	°
	Composite Reliability	0.95	0.94	0.88	0.88	0.85	0.92	0.98	0.96	0.93	°	0.90	°	°
	Average Variance Extracted	0.70	0.81	0.64	0.72	0.66	0.70	0.91	0.82	0.73	°	0.70	°	°

Notes: Correlations are provided below the diagonal; correlations equal to or greater than 0.15 are significant ($p < 0.05$); square root of AVE: refer diagonal; STD = standard deviation; D = During pandemic; P = *Post*-the pandemic; ° not applicable.

5.2. Common method bias

We next conducted common method bias (CMB) testing to ensure this did not undesirably affect our findings. Using Harman's single-factor test, we conducted a one-factor measurement model by using exploratory factor analysis (Podsakoff et al., 2003). The single-factor model explained significantly less than 50% of the observed variance. We also applied the marker factor criterion by examining the respondent's time taken to complete the survey, which is theoretically unrelated to the other modeled factors. The marker variable's addition to the model did not yield any significant change to the attained results. Consequently, we did not find CMB to be of concern in our data.

5.3. Path analysis

To test the model's hypothesized path coefficients, we deployed nonparametric bootstrapping. As an overall measure of model fit, the standardized root mean squared residual (SRMR) was 0.056, thus remaining below the 0.08 threshold (Hu & Bentler, 1999). Our results also offer support for most of our hypotheses, as shown in Table 2.

Table 2: Results

Predictor \ Outcome		During COVID-19				*Post*-COVID-19	
	Social Distancing	VR Tour Intention	In-person Tour Intention	VR Tour Advancement Need	VR Tour Advocacy Intention	VR Tour Intention	In-person Tour Intention
Perceived Severity	$0.35^{*}_{(0.08)}$						
Perceived Susceptibility	$0.04_{(0.07)}$						
Response Efficacy	$0.29^{*}_{(0.06)}$						
Self-Efficacy	$0.33^{*}_{(0.10)}$						
Social Distancing		$0.21^{*}_{(0.07)}$	$-0.33^{*}_{(0.05)}$	$0.22^{*}_{(0.08)}$	$0.23^{*}_{(0.06)}$	$0.03_{(0.08)}$	$0.13_{(0.12)}$
Covariates							
VR Tour Familiarity		$0.48^{*}_{(0.07)}$	$0.21^{*}_{(0.06)}$	$0.10_{(0.09)}$	$0.21^{*}_{(0.06)}$	$0.47^{*}_{(0.08)}$	$-0.27^{*}_{(0.09)}$
Age		$-0.18^{*}_{(0.05)}$	$-0.11^{*}_{(0.05)}$	$-0.19^{*}_{(0.08)}$	$-0.36^{*}_{(0.07)}$	$-0.06_{(0.09)}$	$-0.06_{(0.12)}$
Income		$0.19^{*}_{(0.04)}$	$0.29^{*}_{(0.06)}$	$-0.21^{*}_{(0.08)}$	$-0.01_{(0.09)}$	$0.14^{*}_{(0.06)}$	$0.33^{*}_{(0.07)}$
R^2	0.56	0.55	0.31	0.15	0.32	0.31	0.19

Notes: * Significance level: $p < 0.05$; standard deviations are reported in parentheses.

Two-dimensional threat appraisal was hypothesized to raise consumers' social distancing behavior in the face of COVID-19 (H1a-b). The hypothesized positive effect of perceived threat severity on social distancing (H1a) is supported ($\beta = 0.35$, $p < 0.05$). The results however show that the effect of consumers' perceived susceptibility to contracting the virus on their social distancing behavior (H1b) is nonsignificant ($\beta = 0.04$, $p > 0.1$). Therefore, though H1a is supported, H1b remains unsupported. In H2, consumers' coping appraisal, which includes response- and self-efficacy, is suggested to heighten social distancing behavior. H2a suggests that response efficacy increases social distancing behavior, which is supported ($\beta = 0.29$, $p < 0.05$). Likewise, H2b, which predicts that self-efficacy increases social distancing behavior, is also supported ($\beta = 0.33$, $p < 0.05$). Our full support for H2 therefore suggests that consumers' coping appraisal drives their protective social distancing behavior.

In H3, social distancing is hypothesized to increase (decrease) consumers' intent to visit their named attraction site through VR-based (in-person) tours, respectively, *during* COVID-19. The results reveal that the higher a consumer's exercised social distancing, the greater his/her intent to use VR-based site tours during the pandemic ($\beta = 0.21$, $p < 0.05$), with a corresponding reduced intent to visit the site in-person ($\beta = -0.33$, $p < 0.05$). Thus, H3a-b are supported, suggesting social distancing's important effect on consumers' intent to visit their named attraction site in-person during the pandemic. We also find social distancing to drive the consumer's need for advanced (vs. basic) VR-based site tours ($\beta = 0.22$, $p < 0.05$), supporting H4a. Moreover, the results show that social distancing drives respondents' intent to advocate VR-based site tours to others by nudging them toward these (vs. in-person) tours during the pandemic ($\beta = 0.23$, $p < 0.05$), thus supporting H4b.

H5a suggests that the effect of social distancing on consumers' intent to use VR-based site tours *post*- (vs. during) the pandemic will be weaker. The results show that social distancing during the pandemic has a nonsignificant effect on respondents' intent to use VR-based site tours *post*-the pandemic ($\beta = 0.03$, $p > 0.1$) compared to social distancing's significant effect on respondents' intent to use VR-based tours during-the pandemic ($\beta = 0.21$, $p < 0.05$). The difference between the two effect sizes ($\Delta\beta = 0.18$) is significant ($p < 0.05$). Thus, social distancing's effect on consumers' intent to use VR-based site tours *post*-the pandemic is weaker and nonsignificant (vs. its significant effect during the pandemic), supporting H5a.

H5b stipulates that social distancing's effect on consumers' intent to purchase in-person site tours *post*- (vs. during) the pandemic will be weaker. The results again reveal a nonsignificant effect on consumers' intent to purchase in-person site tours *post*-the pandemic ($\beta = 0.13$, $p > 0.1$) compared to social distancing's significant effect on respondents' intent to purchase these tours during the pandemic ($\beta = -0.33$, $p < 0.05$). The difference between the two effect sizes ($\Delta\beta = 0.46$) is significant ($p < 0.05$). Thus, social distancing's effect on consumers' intent to purchase in-person site tours *post*-the pandemic is weaker (nonsignificant) compared to its significant effect during the pandemic. Hence, the results support H5b.

The findings also show that social distancing's effect on consumers' adoption of VR-based and in-person site tours *post*-the pandemic is nonsignificant. Therefore, though consumers are exercising social distancing during the pandemic, their future intent to purchase future VR-based or in-person site tours is unlikely to be affected by their current social distancing precautions, and they are likely to return to in-person site visits ($\text{mean}_{\text{during pandemic}} = 4.6$; $\text{mean}_{\text{post pandemic}} = 5.51$), as well as to continue taking VR-based site tours ($\text{mean}_{\text{during pandemic}} = 5.35$; $\text{mean}_{\text{post pandemic}} = 5.18$) *post*-the pandemic, as the nonsignificant difference in their respective means suggests.

6. Discussion, implications, and further research

6.1. Discussion

COVID-19 has significantly impacted consumption behavior (e.g., by limiting consumer mobility, imposing social distancing; Baum & Hai, 2020), creating new challenges for attraction sites. Consumers are practicing social distancing by staying at home as much as possible, maintaining a physical distance of 1.5-2 meters from others in the servicescape, and avoiding crowds, which attraction sites need to consider in their service (re)design.

To overcome these challenges, attraction sites are increasingly introducing VR-based (vs. in-person) tours. While the adoption of VR-based tours during the pandemic has intuitive appeal, empirically derived insight into consumer responses to these initiatives remains scant, thus exposing an important research gap explored in this paper. Using protection motivation theory, we investigated the role of consumers' COVID-19-related perceived threat appraisal, which comprises the perceived severity of the pandemic's health threat and one's perceived susceptibility to contracting the virus, on social distancing behavior, both during and after the pandemic. We also examined the role of consumers' virus-related coping appraisal, which comprises self- and response efficacy during and after the pandemic. Moreover, we investigated social distancing's effect on consumers' intent to purchase a VR-based (vs. in-person) site tour during and after the pandemic, consumers' desired VR tour's technological advancement level, and their intent to engage in VR-based (vs. in-person) tour-related advocacy behavior.

Our results reveal COVID-19's relatively high perceived threat severity, leading consumers to practice high levels of protective social distancing during the pandemic. Consumers' perceived response efficacy of government-imposed social distancing was also found to be comparatively high. Moreover, we found consumer-perceived social distancing-related self-efficacy to positively affect their social distancing behavior. These associations are in line with prior research that posits threat severity to raise protection behaviors against infectious diseases (Floyd et al., 2000; Dryhurst et al., 2020). We therefore identify social distancing as an effective COVID-19-related coping mechanism.

Though COVID-19 is viewed as a threat, consumer-perceived susceptibility to contracting the virus was not found to significantly drive social distancing behavior. That is, perceived susceptibility is not significant in driving participants to adopt social distancing to fend off COVID-19. This nonsignificant result suggests that perceived susceptibility exhibits a conflicting pattern of effects on consumers' social distancing-based protection motivation (Norman et al., 2005; Harris et al., 2018), potentially given individuals' perceived modest risk of contracting the virus (e.g., as they are not in a high-risk (e.g., elderly) group).

We also illuminated the future impact of social distancing during the pandemic on consumers' intent to purchase VR-based (vs. in-person) site tours *post*-the pandemic. Our findings suggest that social distancing will not have a lasting effect on consumers' future tour purchase intentions, particularly once an effective COVID-19 treatment or vaccine is available. That is, *post*-the pandemic, consumers will consider both in-person and VR-based site tours, thus countering anecdotal evidence that suggests that social distancing's effect on tourism is here to stay after the pandemic (e.g., Oguz et al., 2020). Based on our findings, we suggest that tourists will switch to alternative, non-social distancing-based protection methods (e.g., vaccine) once available. We therefore envisage that current social distancing-enforced gaps in the tourism sector will largely dissolve *post*-the pandemic, thus offering good news to attraction site- and broader tourism providers. This again suggests that tourism is vulnerable to pandemics and crises (Cró & Martine, 2017; Rosselló et al., 2020 Moreover, our results suggest that consumers' decision-making for

VR-based (vs. in-person) tours remains unaffected by COVID-19-imposed social distancing *post*-the pandemic. In other words, they are then expected to consider *both* VR-based and in-person tours, thus retrieving attraction sites' strategic opportunity for on-site visitation. We next discuss important theoretical implications that arise from our analyses.

6.2. Theoretical implications

We derive the following theoretical implications from our analyses. First, our analyses extend existing protection motivation theory-based insight through its application to COVID-19, by deploying social distancing as the focal protective mechanism. Based on our attained insight, protection motivation theory offers a relevant theoretical frame to inform further COVID-19- or pandemic/crisis-related research, thus unlocking a wealth of avenues for further study. For example, to what extent does our identified positive association of consumers' during-pandemic social distancing behavior on their intent to use VR-based (vs. in-person) tours generalize to other protective behaviors (e.g., frequent hand-washing, use of gloves/face-masks)?

Relatedly, our findings show that the higher a consumer's adopted social distancing level, the greater his/her need for technologically advanced (vs. basic) VR-based site visits during the pandemic. Thus, while those practicing high levels of social distancing seek more advanced VR-based visits during the pandemic, those who adhere less to the social distancing protocol are more likely to opt for basic VR-based tours. This finding suggests that those exhibiting lower threat protection behaviors are likely to continue taking in-person tours for as long as possible leading up to government-imposed social distancing. That is, as these consumers primarily use VR-based site visits to bridge the lockdown period, we expect them to reassume their physical visits soon after social distancing restrictions are lifted (Hollebeek et al., 2020b), thus adding to the existing knowledge stock on protection motivation theory.

Second, though we identify a growing demand for VR-based site tours, our analyses suggest that VR-based visits will not replace on-site visitation in a *post*-pandemic era. Instead, consumers are predicted to consider both VR-based *and* in-person tours once an effective medical intervention for COVID-19 is available. Thus, as these treatments enter the market, alternate theoretical frames may gain prominence to investigate consumers' COVID-19-related behavior, including the theory of planned behavior or regulatory focus theory (e.g., Hollebeek et al. 2020b), thus sparking a plethora of opportunities for further research. Moreover, as VR-based and in-person site visits continue to co-exist *post*-the pandemic, we advise tourism researchers to contemplate their respective optimal design in attraction sites' strategic portfolios, both under regular market conditions and in the face of crisis (Hollebeek et al., 2020b).

6.3. Managerial implications

Our findings also offer a wealth of implications for attraction sites. The results first suggest that attraction sites stand to benefit from offering VR-based tours, allowing them to recuperate at least part of their COVID-19-compromised revenue. We also found that attraction sites planning to reopen during the pandemic (i.e., before the advent of an effective treatment/vaccine) will see lower visitor numbers, which is plausible given the widespread social distancing requirement. Therefore, to improve their rate of visitation during the pandemic, attraction sites are advised to develop and offer VR-based site visits.

Second, we reveal that the more prone consumers are to stick to the social distancing protocol, the greater their demand for more technologically advanced, immersive (vs. basic) VR-based tours during the pandemic (Bogicevic et al., 2020). For example, more advanced VR technology typically allows consumers to navigate the virtual environment using fully immersive applications (Beck et al., 2019). While tourism managers are faced with the dilemma of which VR tools to invest in, we recommend the implementation of more advanced, immersive VR technology (Tussyadiah et al., 2018), which tends to yield more favorable user evaluations and advocacy.

Third, *post*-the pandemic, VR-based site visits offer continued value to visitors, including to those wishing to have a ‘taste’ of the site prior to visiting it in-person, individuals desiring convenient armchair travel, those lacking the (e.g., financial) means to visit a desired (e.g., international) site, or those suffering from (e.g., physical) disabilities (Lin et al., 2020; Tussyadiah et al., 2018; Olya & Han, 2020). VR-based tours are thus able to reach a greater target audience at an improved carbon footprint (i.e., through reduced travel-related pollution), while also allowing infinite potential visitor numbers at any given time, removing wait times (e.g., due to queuing, overcrowding), and being less susceptible to counterfeit entry tickets than in-person tours.

In line with these benefits, visitors are likely to consider *both* in-person and VR-based tours *post*-the pandemic. Thus, while we do not expect VR-based tours to replace traditional site visits, they have an important and growing role in supporting attraction sites’ revenue, both currently and in the future (Kabadayi et al., 2020; Zenker & Kock, 2020). For example, new COVID-19-based VR tour users are likely to continue considering these tours *post*-the pandemic. Attraction site managers are therefore advised to regularly update and innovate their VR-based tours (e.g., as new technological capabilities become available; Hollebeek & Rather, 2019). Given their outlined benefits, other or related sub-sectors (e.g., events, trade-shows, conferences) are also predicted to profit from expanding their service portfolio to include VR-based offerings. In sum, we identify VR-based tours as a powerful tool for attraction site and other tourism providers, both during (e.g., by allowing them to continue to operate) and after the pandemic (e.g., by expanding their reach, preparing for potential future crises; Martínez-Román et al., 2015).

6.4. Limitations and further research

Despite its contributions, this study is also subject to several limitations, from which we derive opportunities for further research. First, we deployed a cross-sectional research design that captures the observed dynamics at a single point in time. It therefore overlooks the development of the modeled associations over time, which could be addressed in future longitudinal research.

Second, our findings are based on convenience sampling-based panel data, thus incurring potential bias and generalizability issues (Malhotra, 2019). Future researchers may therefore wish to adopt probability sampling methods (e.g., simple random sampling) to address this issue. Further, our results are based on a sample size of 174, which, while adequate, would benefit from further expansion in future research (Malhotra, 2019). Moreover, as we only considered VR technology, further researchers may wish to examine other technologies (e.g., augmented/mixed reality) and their potential unique dynamics (Trunfio & Campana, 2020).

Third, we focused on understanding consumers' COVID-19-induced protection behavior to predict their intent to purchase VR-based (vs. in-person) site tours. We therefore did not consider consumers' past behavior, which may correlate with their current/future behavior. Relatedly, we only focused on social distancing as a protective measure against COVID-19, thus overlooking other potential measures (e.g., use of face-masks, sanitization).

Fourth, our data was collected from the United States, thus offering a limited representation of potential COVID-19 dynamics in other parts of the world. We therefore recommend the undertaking of further (empirical) pandemic-related research in/across other countries. Respondents were also requested to provide a focal attraction site that was used in the survey. However, this single-site focus can skew the responses toward site-specific dynamics, which may incur limited *cross*-site generalizability. Therefore, further researchers are advised to study multiple attraction sites to enable *cross*-site assessments. Moreover, it would be beneficial to have respondents experience a specific VR-based tour(s) before gauging their tour-related behavioral intentions.

7. Conclusion

Consumer behavior is shifting as a result of COVID-19, thus requiring attraction sites to identify novel ways of offering safe tours to their visitors. In response to the pandemic's mobility restrictions and social distancing protocol, VR-based site visits offer a viable alternative that allows attraction sites to maintain a revenue stream during the pandemic. Our empirical results show that consumers intend to take VR-based site visits during the pandemic, while considering both VR-based and in-person site visits *post*-the pandemic. Visitors also prefer more advanced (vs. basic) VR-based tours that typically offer a more immersive experience. Based on VR-based tours' manifold outlined benefits, we recommend attraction site managers to offer these during and *post*-the pandemic.

References

Badu-Baiden, F., Adu-Boahen, E., & Otoo, F. (2016). Tourists' response to harassment: A study of international tourists to Ghana. *Anatolia*, *27*(4), 468–479.

Baum, T., & Hai, N. (2020). Hospitality, tourism, human rights and the impact of COVID-19. *International Journal of Contemporary Hospitality Management*, *32*(7), 2397–2407.

Beck, J., Rainoldi, M., & Egger, R. (2019), Virtual reality in tourism: A state-of-the-art review, *Tourism Review*, *74*(3), 586-612.

Beech, H., Ribin, A. J., Kurmanaev, A., & Maclean, R. (2020). The Covid-19 Riddle: Why does the virus wallop some places and spare others? *The New York Times*. Accessed: https://www.nytimes.com/2020/05/03/world/asia/coronavirus-spread-where-why.html?ref=oembed (29 June, 2020).

Bengel, J., Belz-Merk, M., & Farin, E. (1996). The role of risk perception and efficacy cognitions in the prediction of HIV-related preventive behavior and condom use. *Psychology and Health*, *11*(4), 505–525.

Bloom, L. B. (2020). Ranked: The World's 15 Best Virtual Tours To Take During Coronavirus. Accessed: www.forbes.com/sites/laurabegleybloom/2020/04/27/ranked-worlds-15-best-virtual-tours-coronavirus/?sh=576953b26709 (10 November, 2020).

Bogicevic, V., Seo, S., Kandampully, J., Liu, S., & Rudd, N. (2019). Virtual reality presence as a preamble of tourism experience: The role of mental imagery. *Tourism Management*, *74*, 55–64.

Bright, M. (2020). 20 amazing virtual field trips to aquariums, museums and Mars. Accessed: www.cnn.com/2020/04/15/cnn-underscored/virtual-tours-museums-aquariums (13 June, 2020).

Bruno, F., Bruno, S., De Sensi, G., Luchi, M. L., Mancuso, S., & Muzzupappa, M. (2010). From 3D reconstruction to virtual reality: A complete methodology for digital archaeological exhibition. *Journal of Cultural Heritage, 11*(1), 42-49.

Chen, F., Dai, S., Zhu, Y., & Xu, H. (2020). Will concerns for ski tourism promote pro-environmental behaviour? An implication of protection motivation theory. *International Journal of Tourism Research*, *22*(3), 303–313.

Cheong, R. (1995). The virtual threat to travel and tourism. *Tourism Management*, *16*(6), 417–422.

Chubb, H. (2020). Stuck at home? You can visit these 56 world-famous sites, museums, zoos and more for free from your couch. Accessed: www.people.com/travel/stuck-at-home-you-can-visit-these-world-famous-sites-from-your-couch-for-free/ (3 June, 2020).

Conner, M., & Norman, P. (2005). *Predicting Health Behaviour*. McGraw-Hill Education (UK).

Cowan, K., & Ketron, S. (2019). A dual model of product involvement for effective virtual reality: The roles of imagination, co-creation, telepresence, and interactivity. *Journal of Business Research*, *100*, 483–492.

Cró, S., & Martins, A. (2017). Structural breaks in international tourism demand: Are they caused by crises or disasters? *Tourism Management, 63*, 3–9.

Cronbach, L. (1951), Coefficient alpha and the internal structure of tests, *Psychometrika*, *16*(3), 297-334.

Cummings, J. & Bailenson, J. (2016). How immersive is enough? A meta-analysis of the effect of immersive technology on user presence. *Media Psychology, 19*(2), 272-309.

Davis, F., & Warshaw, P. (1992). What do intention scales measure? *Journal of General Psychology, 119*(4), 391–407.

Debusmann, B. (2020). Coronavirus: Is virtual reality tourism about to take off? Accessed: https://www.bbc.com/news/business-54658147 (Oct 30, 2020).

De Vos, J. (2020). The effect of COVID-19 and subsequent social distancing on travel behavior. *Transportation Research Interdisciplinary Perspectives*, *5*, In press, DOI: https://doi.org/10.1016/j.trip.2020.100121.

Diamantopoulos, A. & Siguaw, J. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *British Journal of Management*, *17*(4), 263-282.

Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. *The Lancet Infectious Diseases*, *20*(5), 533–534.

Dryhurst, S., Schneider, C., Kerr, J., Freeman, A., Recchia, G., Van Der Bles, A., Spiegelhalter, D., & Van Der Linden, S. (2020). Risk perceptions of COVID-19 around the world. *Journal of Risk Research*, In press, DOI: https://doi.org/10.1080/13669877.2020.1758193.

Errichiello, L., Micera, R., Atzeni, M., & Del Chiappa, G. (2019). Exploring the implications of wearable virtual reality technology for museum visitors' experience: A cluster analysis. *International Journal of Tourism Research*, *21*(5), 590–605.

Ferguson, N., Laydon, D., Nedjati Gilani, G., Imai, N., Ainslie, K., Baguelin, M., Bhatia, S., Boonyasiri, A., Cucunuba Perez, Z., & Cuomo-Dannenburg, G. (2020). *Report 9: Impact of Non-Pharmaceutical Interventions (NPIs) to Reduce COVID19 Mortality and Healthcare Demand*. Accessed: https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-9-impact-of-npis-on-covid-19/ (9 June, 2020).

Fishbein, M. & Ajzen, I. (1975), *Belief, Attitude, and Behavior*. Addison-Wesley.

Fisher, J., Almanza, B., Behnke, C., Nelson, D., & Neal, J. (2018). Norovirus on cruise ships: Motivation for handwashing? *International Journal of Hospitality Management*, *75*, 10–17.

Floyd, D., Prentice-Dunn, S., & Rogers, R. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, *30*(2), 407–429.

George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 Step-by-Step: A Simple Guide and Reference*. Routledge.

Gibson, A., & O'Rawe, M. (2018). Virtual reality as a travel promotional tool: Insights from a consumer travel fair. In: *Augmented Reality and Virtual Reality*. Springer, 93–107. In T. Jung, & M. tom Dieck (Eds.), Augmented reality and virtual reality (pp. 93-107). Progress in IS. Springer, Cham.

Gössling, S., Scott, D., & Hall, C. (2020). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism*, In press, DOI: https://doi.org/10.1080/09669582.2020.1758708.

Grenfell, R., & Drew, T. (2020). Here's why it's taking so long to develop a vaccine for the new Coronavirus. Accessed: www.sciencealert.com/who-says-a-coronavirus-vaccine-is-18-months-away Science Alert. Archived from the original on 28 February 2020 (5 June, 2020).

Greenstone, M., & Nigam, V. (2020). Does social distancing matter? University of Chicago, Becker Friedman Institute for Economics Working Paper 2020–26.

Gretzel, U., Fuchs, M., Baggio, R., Hoepken, W., Law, R., Neidhardt, J., Pesonen, J., Zanker, M., & Xiang, Z. (2020). e-Tourism beyond COVID-19: A call for transformative research. *Information Technology & Tourism*, *22*(2), 187–203.

Guttentag, D. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management*, *31*(5), 637–651.

Hair J., Hult, G., Ringle, C., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage.

Hair, J., Risher, J., Sarstedt, M., & Ringle, C. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24.

Harris, K., Ali, F., & Ryu, K. (2018). Foodborne illness outbreaks in restaurants and patrons' propensity to return. *International Journal of Contemporary Hospitality Management*, *30*(3), 1273–1292.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135.

Herrmann, M. (2020). Pay a virtual visit to these locations right from your screen. Accessed: www.forbes.com/sites/micheleherrmann/2020/03/29/pay-a-virtual-visit-to-these-locations-right-from-your-screen/#37c07632187e (8 June, 2020).

Hollebeek, L. & Rather, R. (2019). Service innovativeness and tourism customer outcomes. *International Journal of Contemporary Hospitality Management, 31*(11), 4227-4246.

Hollebeek, L., Clark, M., Andreassen, T., Sigurdsson, V., & Smith, D. (2020a). Virtual reality through the customer journey: Framework and propositions. *Journal of Retailing and Consumer Services*, *55*, 102056.

Hollebeek, L., Smith, D., Kasabov, E., Hammedi, W., Warlow, A., & Clark, M. (2020). Customer brand engagement during service lockdown. *Journal of Services Marketing*, In press, DOI: 10.1108/JSM-05-2020-0199.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1-55.

Itani, O.S., Kassar, A., & Loureiro, S. (2019). Value get, value give: The relationships among perceived value, relationship quality, customer engagement, and value consciousness. *International Journal of Hospitality Management*, *80*, 78-90.

Jones, D. (2020). 12 historic sites you can virtually tour from the couch during the Coronavirus Outbreak. Accessed: www.washingtonpost.com/travel/2020/03/18/these-historic-sites-attractions-are-offering-virtual-tours-during-coronavirus-pandemic/ (8 June, 2020).

Jung, T., & Dieck, T. (2017). Augmented reality, virtual reality and 3D printing for the co-creation of value for the visitor experience at cultural heritage places. *Journal of Place Management and Development*, *10*(2), 140–151.

Jung, T., Dieck, T., Rauschnabel, P., Ascenção, M., Tuominen, P., & Moilanen, T. (2018). Functional, hedonic or social? Exploring antecedents and consequences of virtual reality rollercoaster usage. In T. Jung & T. Dieck (Eds.), *Augmented Reality and Virtual Reality: Empowering Human, Place and Business*, Springer International Publishing, 247-258.

Kabadayi, S., O'Connor, G., & Tuzovic, S. (2020). Viewpoint: The impact of coronavirus on service ecosystems as service mega-disruptions. *Journal of Services Marketing*, In press, DOI: https://doi.org/10.1108/JSM-03-2020-0090.

Ke, F., Dai, Z., Dai, C.-P., Pachman, M., Chaulagain, R., & Yuan, X. (2020). Designing virtual agents for simulation-based learning in virtual reality. In *Cognitive and Affective Perspectives on Immersive Technology in Education*. IGI Global, 151-170.

Kissler, S., Tedijanto, C., Lipsitch, M., & Grad, Y. (2020). Social distancing strategies for curbing the COVID-19 epidemic. *MedRxiv*. In press, DOI: https://doi.org/10.1101/2020.03.22.20041079.

Khan, I., Hollebeek, L., Fatma, M., Islam, J., & Riivits-Arkonsuo, I. (2020). Customer experience and commitment in retailing: Does customer age matter? *Journal of Retailing and Consumer Services*, *57*(Nov), 102219.

Kwok, A. O., & Koh, S. G. (2020). COVID-19 and Extended Reality (XR). *Current Issues in Tourism*, 1-6. DOI: https://doi.org/10.1080/13683500.2020.1798896

Lee, H., Jung, T. H., tom Dieck, M. C., & Chung, N. (2020). Experiencing immersive virtual reality in museums. *Information & Management*, *57*(5), 103229.

Li, K., & Li, X. (2020). COVID-19 Pandemic: Social distancing, public policy, and market response. *Public Policy, and Market Response*. In press, DOI: http://dx.doi.org/10.2139/ssrn.3593813.

Lin, L., Huang, S., & Ho, Y. (2020). Could virtual reality effectively market slow travel in a heritage destination? *Tourism Management*, *78*, 104027.

Loureiro, S., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism Management*, *77*, 104028.

Malhotra, N. (2019). *Marketing Research: An Applied Orientation* (7e), Pearson.

Martínez-Román, J., Tamayo, J., Gamero, J., & Romero, J. (2015). Innovativeness and business performances in tourism SMEs. *Annals of Tourism Research*, *54*, 118–135.

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology*, *30*(1), 106–143.

Miniard, P., & Cohen, J. (1981). An examination of the Fishbein-Ajzen behavioral-intentions model’s concepts and measures. *Journal of Experimental Social Psychology*, *17*(3), 309–339.

Moorhouse, N., tom Dieck, M. C., & Jung, T. (2018). Technological innovations transforming the consumer retail experience: A review of literature. In T. Jung, & M. tom Dieck (Eds.), Augmented reality and virtual reality. Progress in is. Springer, cham (pp. 133-143).

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus and COVID-19 pandemic: A review. *International Journal of Surgery*. In press, DOI: https://doi.org/10.1016/j.ijsu.2020.04.018.

Niewiadomski, P. (2020). COVID-19: From temporary de-globalisation to a re-discovery of tourism? *Tourism Geographies*, In press, DOI: https://doi.org/10.1080/14616688.2020.1757749.

Norman, P., Boer, H., & Seydel, E. R. (2005). Protection motivation theory. In: *Predicting Health Behaviour*, McGraw-Hill Education (UK), 81–126.

Oguz, B., Gordon, G., & Cruz, H. (2020). Global tourism and the COVID-19 pandemic. Accessed: https://www.dailysabah.com/opinion/op-ed/global-tourism-and-the-covid-19-pandemic (Nov 7, 2020).

Olya, H. G., & Han, H. (2020). Antecedents of space traveler behavioral intention. *Journal of Travel Research*, *59*(3), 528-544.

Ozturk, U. & Gogtas, H. (2016). Destination attributes, satisfaction, and the cruise visitor’s intent to revisit and recommend, *Tourism Geographies, 18*(2), 194-212.

Podsakoff, P., MacKenzie, S., Lee, J., & Podsakoff, N. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903.

Rippetoe, P., & Rogers, R. (1987). Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. *Journal of Personality and Social Psychology*, *52*(3), 596–604.

Rogers, R. (1975). A protection motivation theory of fear appeals and attitude change1. *The Journal of Psychology*, *91*(1), 93–114.

Rogers, R. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. *Social Psychophysiology: A Sourcebook*, 153–176.

Rosselló, J., Becken, S., & Santana-Gallego, M. (2020). The effects of natural disasters on international tourism: A global analysis. *Tourism Management*, *79*, In press, DOI: https://doi.org/10.1016/j.tourman.2020.104080.

Seres, G., Balleyer, A., Cerutti, N., Danilov, A., Friedrichsen, J., Liu, Y., & Süer, M. (2020). Face masks increase compliance with physical distancing recommendations during the COVID-19 Pandemic. *Argument*, *20*, 44.

Statista (2020). Number and change of coronavirus (COVID-19) cases and deaths among the most impacted countries worldwide, Accessed: https://www.statista.com/statistics/1105264/coronavirus-covid-19-cases-most-affected-countries-worldwide/ (Nov 9, 2020)

Stokburger-Sauer, N. E. (2011). The relevance of visitors' nation brand embeddedness and personality congruence for nation brand identification, visit intentions and advocacy. *Tourism Management*, *32*(6), 1282-1289.

Jang, S., & Feng, R. (2007). Temporal destination revisit intention: The effects of novelty seeking and satisfaction. *Tourism Management*, *28*(2), 580–590.

Sigala, M. (2020). Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research. *Journal of Business Research, 117*, 312–321.

Singh, R., Javaid, M., Kataria, R., Tyagi, M., Haleem, A., & Suman, R. (2020). Significant applications of virtual reality for COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *14*(4), 661–664.

Thurman, R., & Mattoon, J. (1994). Virtual reality: Toward fundamental improvements in simulation-based training. *Educational Technology*, *34*(8), 56–64.

Trunfio, M. & Campana, S. (2020). A visitors' experience model for mixed reality in the museum. *Current Issues in Tourism*, *23*(9), 1053-1058.

Tussyadiah, S., Kausar, D., & Soesilo, P. (2018). The effect of engagement in online social network on susceptibility to influence. *Journal of Hospitality & Tourism Research*, *42*(2), 201–223.

UNWTO (2020). International tourism arrivals could fall by 20-30% in 2020. Accessed: https://www.unwto.org/news/international-tourism-arrivals-could-fall-in-2020 (29 June, 2020).

Voss, K., Spangenberg, E., & Grohmann, B. (2003). Measuring the hedonic and utilitarian dimensions of brand attitude. *Journal of Marketing Research*, *XL*(Aug), 310-320.

Wang, I., & Ackerman, J. (2019). The infectiousness of crowds: Crowding experiences are amplified by pathogen threats. *Personality and Social Psychology Bulletin*, *45*(1), 120–132.

Wei, W., Qi, R., & Zhang, L. (2019). Effects of virtual reality on theme park visitors’ experience and behaviors: A presence perspective. *Tourism Management*, *71*, 282–293.

Wilder-Smith, A., & Freedman, D. (2020). Isolation, quarantine, social distancing and community containment: Pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *Journal of Travel Medicine*, *27*(2), taaa020.

Witte, K. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication*, *1*(4), 317–342.

WTTC. (2020). Corona Virus Brief: April 14 2020. Accessed: https://wttc.org/ (28 June, 2020).

Yang, Y., Zhang, H., & Chen, X. (2020). Coronavirus pandemic and tourism: Dynamic stochastic general equilibrium modeling of infectious disease outbreak. *Annals of Tourism Research*, In press, DOI: https://doi.org/10.1016/j.annals.2020.102913

Zhang, L., Yang, H., Wang, K., Zhan, Y., & Bian, L. (2020). Measuring imported case risk of COVID-19 from inbound international flights---A case study on China. *Journal of Air Transport Management*, *89*, 101918.

Zenker, S., & Kock, F. (2020). The coronavirus pandemic – A critical discussion of a tourism research agenda. *Tourism Management*, *81*, In press, DOI: https://doi.org/10.1016/j.tourman.2020.104164.

Appendix 1: Sample Characteristics

Age (years)	**Frequency**	**Percentage**
18-27	43	24.71
28-37	35	20.11
38-47	53	30.45
48-57	25	14.37
≥ 58	18	10.34
Household Income ($/year)		
25000 – 50000	25	14.37
50001 – 75000	76	43.67
75001 – 100000	42	24.14
≥ 100000	31	17.82
Marital Status		
Married	98	56.32
Never Married	42	24.14
Other	34	19.54
Gender		
Female	83	47.70
Male	91	52.30
Education		
Some college but no degree	12	6.89
College degree	125	71.84
Graduate Degree	37	21.26
Ethnic Background		
Asian/Pacific Islander	12	6.89
Black	23	13.21
Hispanic	31	17.82
White	101	58.05
Other	7	4.02

Appendix 2: Measures and Loadings

Measure	*Loading*		*Skewness*		*Kurtosis*	
Social Distancing						
I currently practice social distancing	0.87		-0.33		0.47	
I follow social distancing precaution to avoid getting COVID-19 pandemic	0.75		-0.65		0.89	
I apply social distancing recommendations in my daily life	0.94		-0.88		1.42	
I don’t gather in group	0.89		-1.31		0.94	
I am avoiding public gatherings	0.63		-0.59		1.3	
I try to keep an appropriate physical distance or space from others	0.92		-0.36		0.67	
I try to do most of my activities (e.g., shop, work, learn) from home when possible	0.86		-1.07		1.43	
I am connecting with other through mobile, digital and virtual options	0.82		-1.06		1.66	
Perceived Severity						
I think COVID-19 pandemic is serious	0.92		-1.05		1.78	
I believe the threat of COVID-19 pandemic is significant	0.94		-0.82		-0.17	
I think that COVID-19 pandemic is of high risk	0.91		-0.31		0.82	
COVID-19 pandemic is harmful	0.83		-0.81		1.42	
Perceived Susceptibility						
There is high probability for someone to contract COVID-19 pandemic	0.90		-0.85		0.52	
I am at risk of getting COVID-19 pandemic	0.76		-0.71		-0.69	
COVID-19 pandemic is highly contagious	0.77		-0.31		-0.83	
It is possible that I will contract COVID-19 pandemic	0.76		-0.60		-0.06	
Response Efficacy						
Recommended response from healthcare authorities works in avoiding COVID-19 pandemic	0.94		-0.41		-0.03	
The response of the accountable authorities and organizations toward COVID-19 pandemic is effective	0.68		-0.58		1.02	
The use of the recommended precaution by the health authorities, will stop COVID-19 pandemic from spreading	0.90		-0.42		-0.78	
Self-efficacy						
I can protect myself from being infected by COVID-19 pandemic by following health authorities’ recommendations	0.87		-0.59		0.78	
I can effectively follow the recommended precaution by the health authorities to avoid getting COVID-19 pandemic	0.74		-0.72		0.09	
Personally, I can deal with COVID-19 pandemic by following the recommended response by the government agencies	0.83		-0.41		-0.86	
Advocacy Intentions toward Virtual Reality Tours						
I would let me friends know about the virtual reality tours offered	0.79		-0.42		-0.40	
I will spread the word around the virtual reality tours offered by the attraction site	0.87		-0.41		-0.18	
I would recommend the virtual reality tours to potential visitors	0.90		-0.29		-0.66	
I will share the benefits of virtual reality tours with others	0.79		-0.07		-0.77	
Familiarity with Virtual Reality Tours						
Overall, I am familiar with virtual reality tours	°		-0.52		-0.81	
Virtual Reality Tour Intentions						
	D	P	D	P	D	P
I intend to try the virtual reality tours provided by the attraction site	0.82	0.92	-0.77	-0.83	-0.07	-0.08

I predict I will use the virtual reality services offered by the attraction site	0.83	0.93	-0.79	-0.67	-0.26	-0.29
I certainly intend to use the virtual reality tours provided by the attraction site	0.90	0.90	-0.91	-0.75	-0.14	0.38
I plan on virtually visiting the attraction site	0.87	0.87	-1.02	-0.69	0.43	-0.31
It is very likely that I will using virtual reality tours to visit the attraction site	0.75	0.92	-0.81	-0.59	0.11	-0.47
In-person Tour Intentions						
	D	P	D	P	D	P
I intend to visit the attraction site	0.97	0.90	-0.64	-0.60	-0.78	-0.45
It is very likely that I will visit the attraction site	0.96	0.89	-0.41	-0.84	-0.31	-0.58
I plan to visit the attraction site	0.94	0.82	-0.53	-0.98	-1.05	0.32
I predict I will be visiting the attraction site	0.93	0.82	-0.45	-0.69	-1.09	-0.60
I certainly intend to go to the attraction site	0.97	0.85	-0.68	-0.82	-0.96	-0.61

Notes: D = During pandemic; P = *Post*-the pandemic; ° not applicable.