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RESEARCH ARTICLE

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# Enhancing visit intention in heritage tourism: The role of object-based and existential authenticity in non-immersive virtual reality heritage experiences

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## Abstract

Virtual reality (VR) plays a relevant role in the tourism sector, specifically in experiences of remote attractions. The influence of VR experiences on tourist experiential factors such as authenticity and satisfaction has attracted limited attention. This paper investigates the role of object-based and existential authenticity in non-immersive virtual heritage tours. A theoretically driven model was tested on data from 2085 individuals who visited "Su Nuraxi" UNESCO site (Italy). Findings indicate that object-based authenticity influences affective response, which predicts satisfaction, attachment to VR and visit intention. Existential authenticity influences both cognitive and affective dimensions, which affect attachment to VR, satisfaction and visit intention.

**KEYWORDS**
existential authenticity, heritage tourism, non-immersive VR, object-based authenticity, virtual reality

## 1 | INTRODUCTION

In the last decades, virtual reality (VR) has become one of the most prominent innovations in the tourism industry, providing tourism operators with cutting-edge media to enhance the customer experience, while giving tourists the opportunity to have an early and easy access to experiences of a destination or site (e.g., Buonincontri & Marasco, 2017; Guttentag, 2010; Lin et al., 2020). VR tourism can be defined as a "virtual representation of an actual attraction, destination, or visitor experience that is designed as a prelude to visitation or to extend previous experiences of consumers" (Kim, Lee, et al., 2020, p. 70). In the context of cultural and heritage tourism, VR technologies are recognized to play a relevant role across the whole visitor experience, and to positively influence visitors' satisfaction and loyalty in the post-trip phase (e.g., Beck et al., 2019; Cheng et al., 2014; Lin et al., 2020). This is because VR applications represent an opportunity to remove physical barriers and reduce distances, thus enhancing accessibility, and facilitating tourists' interactions with heritage sites and destinations before their visit (e.g., Tom Dieck & Jung, 2018). Recently, both immersive and non-immersive VR technologies have been successfully applied in heritage tourism, enabling individuals to virtually visit distant heritage sites, museums and art collections from their homes (e.g., Guttentag, 2010). This is specifically relevant for heritage sites that are located in remote or rural areas and, even more importantly, in these current times, as the COVID-19 pandemic has significantly reduced tourist flows and visitation by local residents. To further understand and provide improved visitor experiences through VR, it is important to investigate how characteristics of a VR experience can increase satisfaction with the experience and loyalty for the place (Wei et al., 2019; Wu et al., 2019). Moreover, most existing studies on tourism and VR have considered experiences that are immersive and involve the use of VR gear. Since very few studies have focused on VR tourism experiences through non-immersive technologies, which are easier to use and less costly compared to immersive

gear (Pleyers & Poncin, 2020), further research is needed to investigate their role in providing a satisfactory environment for visitor experiences.

When implemented in a heritage tourism context, VR technologies have been argued to provide tourists with unique and authentic experiences (Jin et al., 2020; Tsai, 2020). While authenticity has been widely recognized to have the potential to affect visitors' satisfaction and behavior in heritage tourism in-person experiences (Fu, 2019; Yu et al., 2020), a limited number of studies investigated whether the authenticity conveyed by VR, specifically through non-immersive representations of a heritage site, can also have a meaningful impact on tourist satisfaction and behavioral intentions (Mehraliyev et al., 2021). Kim, Lee, et al. (2020) successfully used the stimulus-organism-response (SOR) model by Mehrabian and Russell (1974) and measured authenticity to predict cultural VR experiences. However, the application of this model by Kim, Lee, et al. (2020) measures authenticity as a one-dimensional antecedent, even though authenticity is increasingly conceived as a multi-dimensional concept that can be related to the genuineness of an object, or to the individual's subjective existence, both in real and digital experiences (Canavan & McCamley, 2021; Castéran & Roederer, 2013; Kolar & Zabkar, 2010; Sedmak & Mihalič, 2008; Steiner & Reisinger, 2006; Wang, 1999).

Beyond the notion of authenticity, previous studies adopting similar approaches also did not include and measure user satisfaction as an outcome of VR experiences, despite satisfaction being considered as an essential predictor of behavioral intentions in both on-line and off-line tourism experiences (Choi et al., 2018; Hudson et al., 2019). In this context, several questions remain unanswered, namely: RQ1) What is the relationship between perceived object-based and existential authenticity in VR heritage tourism? RQ2) Does authenticity influence cognitive and affective responses of VR heritage visitors, and how? RQ3) How do cognitive and affective responses to VR heritage tourism experiences interact with each other, and how do these responses influence users' attachment to VR technologies, satisfaction and intention to visit the site?

This study was therefore carried out to fill these research gaps by investigating which factors elicit users' satisfaction with non-immersive VR experiences, and willingness to visit the heritage site in person. In particular, the present research chooses and extends the SOR model as the most suitable framework to understand the role of perceived existential and object-based authenticity, and of affective and cognitive responses to the experience, in influencing visitors' attachment to VR, their satisfaction and intention to visit the site. By doing this, the present paper intends to offer insights from a theoretical perspective, expanding existing knowledge on the range of responses and behavioral intentions that non-immersive VR technologies can convey to potential visitors through experiencing heritage tourism sites virtually. The results of this research also benefit developers of VR tourism content and site managers and marketers who are looking for innovative ways to effectively promote their heritage attraction and stimulate future cultural tourists' flows. Specifically, the present paper provides direct knowledge on the elements, and on their interactions, on which to focus in the design of non-immersive VR experiences of heritage sites.

## 2 | LITERATURE REVIEW

### 2.1 | VR and authenticity in cultural and heritage tourism

Virtual reality has been described as a computer-generated world that represents a real or artificial world (Guttentag, 2010), where individuals can inhabit life-like situations and environments (Diemer et al., 2015; Loureiro, Guerreiro, et al., 2020), with or without the use of wearable devices (Wei, 2019). Since the early 1990s, VR technologies have also been implemented in the tourism industry, especially in attractions, historical collections, heritage sites and museums (Hudson et al., 2019), to provide tourists with novel and immersive experiences (Loureiro, Guerreiro, et al., 2020). Many cultural and heritage attractions have particularly extended their experience portfolio by adding VR applications to enhance the tourist experience before, after and during the visit (Errichiello et al., 2019).

VR has been recognized as a powerful tool to enhance the heritage experience and is considered complementary (and not a substitute) of real travel experiences (e.g., Mura et al., 2017). In this vein, recent academic literature has started to analyze the implication of VR technologies for cultural tourists' experiences (Beck et al., 2019; Kim, Lee, et al., 2020; Lee, Jung, et al., 2020; Lin et al., 2020), demonstrating that VR provides tourist cultural experiences with added value, novelty, immersion and personalization (Errichiello et al., 2019). Further, recent studies highlighted the important role of VR in promoting cultural and heritage sites (Marasco et al., 2018; Tussyadiah et al., 2017), providing potential tourists with detailed information to reduce associated risks and to make more informed decisions when visiting in person (Lee, Jung, et al., 2020). Since tourists were demonstrated to be more prone to use VR applications to experience museums or cultural attractions before their visit (e.g., Buhalis & Law, 2008; Lee, Jung, et al., 2020), the factors persuading VR tourists to visit the site have been particularly examined. For example, Kim, Bonn, et al. (2017) found that experiences mediated by technologies and perceived as authentic by tourists led to satisfaction and positive behavioral intentions. The positive impact of authenticity on satisfaction, specifically in VR tourism experiences, was also found by Yung and Khoo-Lattimore (2019). Additionally, Kim, Lee, et al. (2020) demonstrated that the more VR is perceived as authentic, the more individuals also have a positive affective and cognitive response, in turn leading to higher attachment to VR and positive intention to visit. However, the studies discussed above on the antecedent role of authenticity in VR experiences have considered the construct as one dimensional, even though the tourism literature has delved into such concept, and established that it is a multi-faceted construct that can refer to characteristics of objects, or to the individual state of being (Fu, 2019; Kolar & Zabkar, 2010; Wang, 1999; Yu et al., 2020).

## 2.2 | Research model and hypotheses

The present paper utilizes a theoretical model developed by Kim, Lee, et al. (2020) to explore VR immersive experiences in tourism. This model was based on the SOR theory framework, and is hereby extended, as it considers and measures authenticity as a construct consisting of two variables (i.e., object-based authenticity and existential authenticity, which are discussed in the following section) and representing antecedents of the visitors' cognitive and affective response, which in turn directly determine specific outcomes, such as attachment to VR, satisfaction and visit intention, also discussed below. In the following subsections, the conceptual framework is discussed by presenting each dimension and related developed hypothesis.

### 2.2.1 | Objective and existential authenticity

Authenticity is defined as "tourists' enjoyment and perceptions of how genuine their experiences are" (Kolar & Zabkar, 2010, p. 655), and is differentiated in existential authenticity and objective authenticity (Wang, 1999). Specifically, objective authenticity refers to tourists' perceptions valuing the genuineness or accurate representation of observable things such as architectural features, artifacts or rituals, while existential authenticity is related to tourists' subjective feelings and a state of being which is activated from experiences that convey an enhanced sense of connection and self-expression (Steiner & Reisinger, 2006; Stepchenkova & Belyaeva, 2021; Zhou et al., 2013). Virtual environments not only allow visitors to access a representation of reproduced objects which could be perceived as genuine or accurate, but to also deeply interact with the environment and with the experience of the environment, going beyond the corporeality of the experience (Mura et al., 2017). As such, Damjanov and Crouch (2019) highlighted that the authenticity conveyed in VR tourism relates to the construction or aura of objects, and mainly to the visitors' activity, sense of presence and mediated experience. In the realm of cultural tourism real experiences, existing studies adopted different approaches toward the concept of authenticity, and supported that object-based authenticity positively influences existential authenticity (Kolar & Zabkar, 2010; Yi et al., 2017, 2018; Zhou et al., 2013), while Park et al.'s (2019) results contradicted this relation. With contrasting results, this relation has also never been tested in VR heritage tourism, which forms the basis for the following hypothesis:

> **H1.** Object-based authenticity positively influences existential authenticity.

In the context of tourist experiences, authenticity is widely recognized to be directly associated with novelty (Cohen, 1988; Mitas & Bastiaansen, 2018). Chang et al. (2014) found that novelty directed impacted the cognitive response of theme park visitors. As such, authenticity is argued to positively affect cognitive responses of travelers, as it can stimulate cognition through novelty, and also reduce tourists' risk perception in the pre-purchase phase (Liang et al., 2018; Zhu, 2012). Existing studies also found that perceived authenticity positively affects tourists' satisfaction and cognitive response in terms of loyalty and intention to visit (Ramkissoon & Uysal, 2011; Robinson & Clifford, 2012), which could also translate into visiting the destination where the heritage site is located (e.g., Fu, 2019).

Several existing studies set in cultural heritage sites maintain that higher levels of authenticity are positively related to positive cognitive responses: the more the tourists perceive the environment, the local lifestyle and the overall visitor experience as authentic, the more they manifest positive cognitive responses, in terms of behavioral intentions and loyalty (Steiner & Reisinger, 2006; Wang, 1999; Yi et al., 2017). Similarly, Fu (2019) found that the authenticity conveyed in heritage tourism positively affects cognitive loyalty. In this vein, tourists' future behavior can also be affected by experiencing existential and objective authenticity at the destination or attraction, suggesting that authenticity influences the visitors' thoughts and cognitive sphere (Kim, Bonn, et al., 2017; Zhou et al., 2013). In fact, authenticity was found to positively and directly influence cognitive response in VR tourism experiences (Lin & Wang, 2012; Yung & Khoo-Lattimore, 2019). More recently, Stepchenkova and Belyaeva (2021) found that both existential and object-based authenticity affect future behavior of museum visitors, advancing that authenticity is also closely related to cognitive responses in cultural heritage contexts. These results form the bases of the following hypotheses:

> **H2.** Object-based authenticity positively influences cognitive response.

> **H3.** Existential authenticity positively influences cognitive response.

Kim, Lee, et al. (2020) framework and SOR model considered affective responses as a second-order factor, composed by three sub-dimensions: enjoyment, emotional involvement and flow state. Both objective and existential authenticity have been discussed as emotionally-based constructs, which affect visitors' feelings and emotional state, and even lead to a sense of enjoyment and wellbeing (Damjanov & Crouch, 2019; Jang et al., 2012; Kim, Song, et al., 2020; Kolar & Zabkar, 2010; Zhou et al., 2013). Kolar and Zabkar (2010) demonstrated that high levels of perceived existential and objective authenticity lead to an enhanced sense of enjoyment and well-being in the context of cultural heritage tourism experiences. Together with cognitive responses, authenticity is therefore able to impact affective responses of visitors in heritage settings (Fu, 2019). Further, with regard to cultural tourism experiences, Kim, Lee, et al. (2020) suggested that authenticity may influence tourists' flow. Similarly, flow was reported to be positively affected by both existential and object-based authenticity in Zhang et al.'s (2019) study on liminal experiences and in Mura et al.'s (2017) study on virtual tourism. Based on these previous findings, the present study postulates the following hypotheses:

> **H4.** Object-based authenticity positively influences affective response.

**H5.** Existential authenticity positively influences affective response.

### 2.2.2 | Cognitive response

Cognitive response has been considered, since the early years of marketing theory, as a fundamental variable to understand how consumers respond to a stimulus (e.g., advertising or other product/service-related information; Oliver, 1980; Wirtz et al., 2000). Research in psychology, marketing and tourism demonstrated that cognitive responses also affect a consumer's emotional state, place attachment, satisfaction and behavioral intentions (Bagozzi, 1992; Dillard & Peck, 2000; Lazarus, 1991; Loureiro, Guerreiro, et al., 2021; Romero et al., 2021; Wakefield & Blodgett, 1999; Zheng et al., 2019). In the restaurant sector, Ladhari et al. (2008) and Kim and Moon (2009) found that cognitive response to service quality leads to positive emotions. Similar findings were reported by Vittersø et al. (2000) and by Loureiro, Guerreiro, et al. (2021), who confirmed the relationship between cognitive and affective responses in the context of museums experiences and VR stores with background music. When visiting a tourism attraction, cognitive responses to the experience were also found to affect an individual's emotional state, place attachment, satisfaction and behavioral intentions (Lazarus, 1991; Zheng et al., 2019). Similarly, in restaurant sector, cognitive and emotional states were found to positively affect the intention to visit (Romero et al., 2021). These relations were also supported by studies on experiences of VR environments and on the use of VR for marketing destinations, with cognitive responses to VR, such as perceived usefulness and ease of use, directly related to enjoyment and visit intentions (Huang et al., 2016), and sense of presence leading to positive attitudes toward the destination (Marasco et al., 2018; Tussyadiah et al., 2018), corroborating the idea that visitors' cognitive response is associated with emotional and affective response, and with behavioral intentions.

Cognitive response to VR is directly related to perceived enjoyment of the technology, and to intentions to visit the represented site or destination (Huang et al., 2016; Li & Chen, 2019; Marasco et al., 2018). Wei et al. (2019) also found a direct relation between VR cognitive aspects and overall satisfaction, visit intention and intention to recommend, in the context of theme park visitors' experiences. Kim, Lee, et al. (2020) found that cognitive response significantly influenced affective response, attachment to VR and visit intention. The present study proposes the following hypotheses in the context of non-immersive VR heritage experiences:

**H6.** Cognitive response positively influences affective response.

**H7.** Cognitive response positively influences attachment to VR.

**H8.** Cognitive response positively influences satisfaction.

**H9.** Cognitive response positively influences visit intention.

### 2.2.3 | Affective response

As discussed above, the present framework considers affective response as a second order factor, composed by three dimensions: enjoyment, emotional involvement and flow state (Kim, Lee, et al., 2020).

Enjoyment is defined as the perception of fun derived from an experience through technological devices (Venkatesh, 2000), in line with studies on VR technology and experiences, which considered the level of perceived enjoyment as a fundamental component of the overall VR tourism experience (e.g., Huang et al., 2013). More recently, enjoyment was proposed as explanatory variable of tourist satisfaction, and was found to have a mediated effect on visit intention the destination (Jang & Park, 2019; Tussyadiah et al., 2018).

Emotional involvement refers to an experience generating profound feelings and thus keeping the individual engaged (Sonnemans & Frijda, 1995), and is considered an important dimension when analyzing experiences conveyed by technology (Kim, Lee, et al., 2020). Prayag and Ryan (2012) found that personal and emotional involvement directly and positively affects place attachment, while Lin et al.'s (2020) study revealed that the more emotional involvement in terms of nostalgia generated by the heritage experience, the more visitors are willing to visit the destination. Moreover, existing literature has established that attachment to VR is affected by the ability of the technology to satisfy the visitors' needs, by their perceptions and emotional responses during the experience (Wu & Cheng, 2018).

Flow refers to the level of immersion and psychological state of an individual who is deeply involved in a specific activity (Bose, 2008; Csikszentmihalyi, 1990), and such state has been measured as explanatory variable of technology-mediated experiences (Animesh et al., 2011), especially in VR environments requiring the user's feeling of immersion (Hoffman & Novak, 2009). More recently, flow has been applied to tourism experiences, and discussed as an important experiential attribute in determining tourists' satisfaction and loyalty (Kim & Thapa, 2018; Zhang et al., 2019). However, this dimension has been considered by very few studies in cultural tourism contexts (Zhang et al., 2019). Building on these premises, and considering affective response to encompass these constructs, the present research tests the following hypotheses:

**H10.** Affective response positively influences attachment to VR.

**H11.** Affective response positively influences satisfaction.

**H12.** Affective response positively influences visit intention.

### 2.2.4 | VR attachment, satisfaction and intention to visit

Place attachment describes how visitors become emotionally connected with a place and identify themselves with the setting (Ramkissoon & Mavondo, 2015; Woosnam et al., 2018). Similarly, VR attachment is defined as the degree of personal connection that an individual establishes toward the VR activity (Hidalgo & Hernández, 2001). In tourism literature, attachment is considered a predictor of satisfaction and both intention to visit and to recommend (Hosany et al., 2017; Loureiro, Japutra, et al., 2021; Prayag & Ryan, 2012). Satisfaction is defined as the overall evaluation made toward the experience compared to individual expectations (Oliver, 1980), while visit intention is hereby defined as an individual's intention to visit a tourism site that has been visited virtually (Kim, Lee, et al., 2020). Wu et al. (2019) found that attachment to VR positively and directly affected satisfaction and behavioral intentions with the experience of VR, which were also supported in the context of hotel experiences (Wu & Cheng, 2018). These relationships are further supported by Loureiro, Japutra, et al. (2021), who found that attachment with intelligent voice assistant is positively associated with the relationship quality, satisfaction and trust in the hospitality domain. While Kim, Lee, et al. (2020) also found that VR attachment affects visit intention, their research did not investigate whether VR attachment influences tourists' satisfaction with the experience. To further explore these potential outcomes of VR heritage tourism, the present study tests the following hypotheses:

**H13.** VR attachment positively influences satisfaction.

**H14.** VR attachment positively influences visit intention.

Finally, satisfaction has been found to be a significant driver of visitors' behavioral intentions by both extant tourism literature (e.g., Akhoondnejad, 2016; Prayag & Ryan, 2012; Ramires et al., 2018) and studies on VR experiences (Hudson et al., 2019; Lee, Jung, et al., 2020). As such, the present study tests this relationship in the context of non-immersive VR visits of heritage sites:

**H15.** Satisfaction positively influences visit intention.

## 3 | METHODOLOGY

### 3.1 | Research setting

"Su Nuraxi" site, located in the Barumini municipality in Sardinia (Italy), was selected as the research setting of the study. It is one the most representative archeological Nuragic sites, of one of the most ancient and developed civilizations of the Bronze Age. Su Nuraxi has been recognized as a UNESCO World Site in 1997. According to its management, it has experienced a significant increase in visitors' numbers, which steadily rose from 66,609 visitors in 2010 to 97,462 visitors in 2019, with an intake composed by international visitors (60%) and local residents (40%). In 2020, as a consequence of COVID-19 on tourism flows to Sardinia, visit numbers to the site have plummeted to 26,544. At the time of the data collection, the site could only be visited in a non-immersive VR platform, on the website: http://virtualarchaeology.sardegnacultura.it/index.php/it/.

For the study purpose, a survey was created based on the existing literature discussed above. First, respondents were asked to confirm that they had completed the VR tour guided of Su Nuraxi site. Respondents were then asked to assess their level of agreement with a list of items devoted to measure the nine dimensions included in the utilized model, on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree) (See Appendix 1). The visitor's perceived authenticity was measured through eight items, three of which measuring object-based authenticity and five measuring existential authenticity (Kolar & Zabkar, 2010; Zhou et al., 2013). These items were drawn upon consumer-based models developed to measure authenticity in cultural tourism contexts, since these separate dimensions have not yet been tested in VR-mediated experiences. The visitors' cognitive response, and their enjoyment, were each assessed through four items (from Chang et al., 2014; Kim, Lee, et al., 2020; Kim & Ko, 2019; Tussyadiah et al., 2018). Emotional involvement consisted of three items (from Holsapple & Wu, 2007; Kim, Lee, et al., 2020) and flow was measured through four items (Huang et al., 2016; Kim & Ko, 2019; Kim, Lee, et al., 2017). To measure the visitors' attachment to VR, three items were used (from Wu & Cheng, 2018). Visitors' satisfaction involved three items (Kim & Ko, 2019; Wu et al., 2019), and the respondents' intention to visit the site in person was measured through four items (Kim, Lee, et al., 2020; Tussyadiah et al., 2018). Socio-demographic information about visitors was also collected.

The survey was first developed in English language and back translated in Italian. This procedure allowed us to ascertain the content of the translated version, and was pre-tested on 30 Italians, in order to minimize language biases. The survey was administered online using a snowball sampling technique to easily identify and access respondents, and to collect data from individuals residing across different geographical areas despite COVID-19 travel restrictions. The snowball sampling process was initiated sending an email invitation to a list of 2000 contacts of Italians. The recruited individuals were asked to first visit the website http://virtualarchaeology.sardegnacultura.it/index.php/it/ to complete the virtual visit of "Su Nuraxi," and to then immediately complete the online survey, thus minimizing temporal bias and cognitive dissonance (Wattanacharoensil & La-ornual, 2019). All participants were informed about the confidentiality of the survey and that the collected data would be used exclusively for academic research purposes and analysis. The visit was provided with non-immersive VR, which displays virtual content on a large device, such as a personal computer or laptop (Pleyers & Poncin, 2020). The data collection started in September 2020 and ended in November 2020. At the end of the collection period, 2216 questionnaires were collected, 2085 of which were completely filled and used for the analysis.

## 4 | RESULTS

### 4.1 | Profile of the respondents

The survey respondents were mostly females (60.7%), aged under 30 (51.9%) or between 31 and 50 (28.8%), with a high school degree (60.8%) or master degree (22.5%), students (30.5%) or employees (24.3%), mostly single (36.0%) or engaged (28.0%). For 43.3% of respondents, this was the first experience with VR. 68.5% had never visited Su Nuraxi site in real life (Table 1).

### 4.2 | Reliability of the measures

Measures' reliability was assessed in order to verify stability and consistency of the items. Cronbach's coefficients were higher than 0.7 (Nunnally, 1994), the corrected item-to total correlation was higher than the critical value of 0.30, and the alpha if item deleted index was lower than alpha for each item related to the measured dimension (Bearden et al., 2001; Table 2).

### 4.3 | Confirmatory factor analysis

Confirmatory factor analysis (CFA) with Amos (version 24) and ML estimator were used to assess the convergent and discriminant validity (Table 2). The model fit indexes ($\chi 2 = 5387.563$, $p < 0.001$; $\chi 2/df = 428$; CFI = 0.925; IFI = 0.925; NFI = 0.919; RFI = 0.906; TLI = 0.913; RMSEA = 0.075; GFI = 0.923; AGFI = 0.909; SRMR = 0.0581) indicated a good fit of the model (Bollen, 1989; Hoyle, 1995). Further, the model reached parsimonious levels as indicated by a parsimony goodness-of-fit index (PGFI) of 0.863 and parsimony normally fit indexes (PNFI) of 0.793, which were both over the limit of 0.5 (Zhou et al., 2013). Construct loading were higher than the critical limit of 0.50 and confirmed the validity of the items included in the analysis. Further, all the composite reliability values (CR) were higher than the limit of 0.70 (Bagozzi & Yi, 1988; Hair et al., 2010), confirming good reliability for all nine constructs. In order to test the construct validity, convergent validity was confirmed, with AVE values greater than 0.5 (Fornell & Larcker, 1981; Hair et al., 2010).

Discriminant validity of the measures was also confirmed with the Fornell & Larcker, 1981 criterion, as AVE indexes for each construct were higher than the squared correlation between the constructs itself (Bagozzi et al., 1991) (Table 3).

In order to reduce common method bias in the data treatment, the present study adopted Harman's single factor test by applying a single factor exploratory factor analysis with SPSS (Version 21). Such analysis showed that the one factor only explains 28.50% of total variance. A CFA of the single factor model was then tested, and results showed that the single factor model was not appropriate ($\chi 2 = 4234.442$, $p < 0.001$; CFI = 0.391; RMSEA = 0.175), indicating that common method bias did not represent an issue for this study.

**TABLE 1** Socio-demographic characteristics of the sample

| | | | |
|---|---|---|---|
| *Gender* | | *Occupation* | |
| M | 39.3 | Employed | 24.3 |
| F | 60.7 | Executive/manager | 2.0 |
| *Age* | | Freelance | 5.8 |
| 18–30 | 51.9 | Retired | 9.6 |
| 31–40 | 14.3 | Occasional worker | 3.4 |
| 41–50 | 14.5 | Unemployed | 5.7 |
| 51–60 | 14.2 | Student | 30.5 |
| 61–70 | 4.5 | Other | 18.7 |
| over 70 | 0.6 | *Marital status* | |
| *Education* | | Single | 36.0 |
| Primary school | 1.1 | Engaged | 28.0 |
| Middle school | 11.5 | De facto | 4.9 |
| High school | 60.8 | Married | 26.8 |
| Bachelor degree | 22.5 | Separated/divorced | 3.1 |
| PhD/master | 2.3 | Widowed/widow | 1.2 |
| Other | 1.8 | *First time using VR* | |
| *Have you ever visited the Nuraxi site in real life?* | | Yes | 43.3 |
| Yes | 31.5 | No | 56.7 |
| No | 68.5 | | |

### 4.4 | Hypotheses identification

Building on the CFA results, data were entered on AMOS-SEM in order to verify our research hypotheses (Table 3). The result of SEM analysis confirmed a good fit for the structural model ($\chi 2 = 4873.230$; $p < 0.001$; $\chi 2/df = 384$; CFI = 0.926; IFI = 0.925; NFI = 0.921; RFI = 0.926; TLI = 0.917; RMSEA = 0.073; GFI = 0.899; AGFI = 0.803; SRMR = 0.0578; Bollen, 1989; Hoyle, 1995). Further, the variance inflation factor was calculated for each independent variable and showed values from 1.243 to 4.901, confirming that multicollinearity is not present for the independent variables (Hair et al., 2010).

Results on the proposed hypotheses are reported in Table 4 and in Figure 1. H1 and all hypotheses from H3 to H15 were supported, while H2 was not supported. Specifically, Object-based authenticity was found to directly affect Existential authenticity (H1: $\beta = 0.736$, $t = 34.555$, $p < 0.001$), and Affective response (H4: $\beta = 0.136$, $t = 7.253$, $p < 0.001$), but did not affect cognitive response (H2: $\beta = 0.034$, $t = 1.350$, $p > 0.05$). Existential authenticity directly influenced cognitive response (H3: $\beta = 0.890$, $t = 25.084$, $p < 0.001$) and affective response (H5: $\beta = 0.198$, $t = 5.901$, $p < 0.001$). Cognitive response was found to influence affective response (H6: $\beta = 0.211$, $t = 24.386$, $p < 0.001$), attachment to VR (H7: $\beta = 0.544$, $t = 5.666$, $p < 0.001$), Satisfaction (H8: $\beta = 0.867$, $t = 10.865$, $p < 0.001$) and visit intention (H9: $\beta = 0.280$, $t = 3.341$, $p < 0.001$).

**TABLE 2** CFA results

| | Loadings | Alpha | Alpha if item deleted | Item-to-total | T-values | Smc (r2) | Cr | Ave |
|---|---|---|---|---|---|---|---|---|
| OBJECT-BASED (OBJ) | | 0.913 | | | | | 0.91 | 0.78 |
| OBJ1 | 0.882 | | 0.873 | 0.828 | | 0.778 | | |
| OBJ2 | 0.874 | | 0.874 | 0.827 | 54.112 | 0.763 | | |
| OBJ3 | 0.890 | | 0.878 | 0.822 | 55.852 | 0.793 | | |
| EXISTENTIAL (EXI) | | 0.922 | | | | | 0.92 | 0.71 |
| EXI1 | 0.855 | | 0.906 | 0.793 | | 0.732 | | |
| EXI2 | 0.871 | | 0.899 | 0.829 | 52.722 | 0.759 | | |
| EXI3 | 0.806 | | 0.910 | 0.774 | 46.080 | 0.65 | | |
| EXI4 | 0.836 | | 0.905 | 0.797 | 48.999 | 0.699 | | |
| EXI5 | 0.835 | | 0.903 | 0.808 | 48.942 | 0.698 | | |
| COGNITIVE RESPONSE (COG) | | 0.811 | | | | | 0.83 | 0.63 |
| COG1 | 0.848 | | 0.628 | 0.607 | | 0.719 | | |
| COG2 | 0.857 | | 0.635 | 0.619 | 44.180 | 0.735 | | |
| COG3 | 0.668 | | 0.616 | 0.613 | 32.508 | 0.446 | | |
| ENJOYMENT (ENJ) | | 0.934 | | | | | 0.94 | 0.79 |
| ENJ1 | 0.912 | | 0.910 | 0.859 | | 0.833 | | |
| ENJ2 | 0.927 | | 0.902 | 0.883 | 72.375 | 0.860 | | |
| ENJ3 | 0.869 | | 0.914 | 0.844 | 60.790 | 0.755 | | |
| ENJ4 | 0.842 | | 0.930 | 0.800 | 56.558 | 0.710 | | |
| EMOTIONAL INVOLVEMENT (EMO) | | 0.903 | | | | | 0.9 | 0.75 |
| EMO1 | 0.869 | | 0.808 | 0.859 | | 0.756 | | |
| EMO2 | 0.872 | | 0.821 | 0.850 | 55.392 | 0.760 | | |
| EMO3 | 0.870 | | 0.794 | 0.873 | 55.087 | 0.756 | | |
| FLOW | | 0.911 | | | | | 0.91 | 0.71 |
| FLOW1 | 0.914 | | 0.876 | 0.821 | | 0.835 | | |
| FLOW2 | 0.842 | | 0.894 | 0.771 | 56.164 | 0.709 | | |
| FLOW3 | 0.822 | | 0.879 | 0.813 | 53.301 | 0.675 | | |
| FLOW4 | 0.798 | | 0.887 | 0.791 | 50.197 | 0.637 | | |
| ATTACHMENT TO VR (ATT) | | 0.907 | | | | | 0.80 | 0.57 |
| ATT1 | 0.909 | | 0.845 | 0.838 | | 0.826 | | |
| ATT2 | 0.870 | | 0.852 | 0.829 | 56.074 | 0.758 | | |
| ATT3 | 0.847 | | 0.898 | 0.774 | 53.244 | 0.717 | | |
| SATISFACTION (SAT) | | 0.941 | | | | | 0.94 | 0.84 |
| SAT1 | 0.936 | | 0.902 | 0.894 | | 0.875 | | |
| SAT2 | 0.921 | | 0.913 | 0.877 | 76.014 | 0.849 | | |
| SAT3 | 0.897 | | 0.926 | 0.861 | 70.036 | 0.805 | | |
| VISIT INTENTION (VIS INT) | | 0.889 | | | | | 0.89 | 0.67 |
| VIS INT1 | 0.836 | | 0.849 | 0.780 | | 0.699 | | |
| VIS INT2 | 0.850 | | 0.851 | 0.783 | 45.593 | 0.772 | | |
| VIS INT3 | 0.805 | | 0.861 | 0.754 | 42.33 | 0.648 | | |
| VIS INT4 | 0.795 | | 0.868 | 0.731 | 41.605 | 0.632 | | |

Affective response is a significant predictor of attachment to VR (H10: $\beta = 0.217$, $t = 12.581$, $p < 0.001$), satisfaction (H11: $\beta = 0.053$, $t = 6.102$, $p < 0.001$) and Visit intention (H12: $\beta = 0.462$, $t = 3.132$, $p < 0.01$). Further, VR attachment was found to directly influence Satisfaction (H13: $\beta = 0.081$, $t = 3.277$, $p < 0.01$) and Visit intention (H14: $\beta = 0.413$, $t = 7.792$, $p < 0.001$). Finally, Satisfaction directly influenced Visit intention, even though this relation was confirmed at 95% of probability (H15: $\beta = 0.550$, $t = 1.956$, $p < 0.05$).

**TABLE 3** Discriminant validity test

| Correlation (squared correlation) | OBJ | EXI | COG | ENJ | EMO | FLOW | ATT | SAT |
|---|---|---|---|---|---|---|---|---|
| OBJ | | | | | | | | |
| EXI | 0.736 (0.542) | | | | | | | |
| COG | 0.562 (0.316) | 0.663 (0.440) | | | | | | |
| ENJ | 0.473 (0.224) | 0.707 (0.500) | 0.708 (0.501) | | | | | |
| EMO | 0.459 (0.211) | 0.736 (0.542) | 0.696 (0.484) | 0.736 (0.542) | | | | |
| FLOW | 0.435 (0.189) | 0.716 (0.513) | 0.597 (0.356) | 0.761 (0.579) | 0.748 (0.560) | | | |
| ATT | 0.212 (0.045) | 0.489 (0.239) | 0.303 (0.092) | 0.598 (0.358) | 0.678 (0.460) | 0.662 (0.438) | | |
| SAT | 0.673 (0.453) | 0.873 (0.453) | 0.681 (0.464) | 0.772 (0.596) | 0.774 (0.599) | 0.744 (0.554) | 0.505 (0.255) | |
| VIS INT | 0.451 (0.203) | 0.589 (0.347) | 0.531 (0.282) | 0.517 (0.267) | 0.56 (0.314) | 0.58 (0.366) | 0.527 (0.278) | 0.581 (0.338) |

**TABLE 4** Estimated standardized coefficients

| | | Standardized estimate | *t*-Value | *p*-Value | |
|---|---|---|---|---|---|
| H1 | Object based → Existential | 0.736*** | 34.555 | 0.000 | Supported |
| H2 | Object-based → Cognitive response | 0.034 | 1.350 | 0.177 | Not supported |
| H3 | Existential → Cognitive response | 0.890*** | 25.084 | 0.000 | Supported |
| H4 | Object-based authenticity → Affective response | 0.136*** | 7.253 | 0.000 | Supported |
| H5 | Existential authenticity → Affective response | 0.198*** | 5.901 | 0.000 | Supported |
| H6 | Cognitive response → Affective response. | 0.211*** | 24.386 | 0.000 | Supported |
| H7 | Cognitive response → Attachment to VR | 0.544*** | 5.666 | 0.000 | Supported |
| H8 | Cognitive response → Satisfaction | 0.867*** | 10.865 | 0.000 | Supported |
| H9 | Cognitive response → Visit intention | 0.280*** | 3.341 | 0.000 | Supported |
| H10 | Affective response → Attachment to VR | 0.217*** | 12.581 | 0.000 | Supported |
| H11 | Affective response → Satisfaction | 0.053*** | 6.102 | 0.000 | Supported |
| H12 | Affective response → Visit intention | 0.462** | 3.132 | 0.002 | Supported |
| H13 | Attachment to VR → Satisfaction | 0.081* | 3.277 | 0.001 | Supported |
| H14 | Attachment to VR → Visit intention | 0.413*** | 7.792 | 0.000 | Supported |
| H15 | Satisfaction → Visit intention | 0.550* | 1.956 | 0.050 | Supported |

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

## 4.5 | Mediating effects and control variables

A further analysis of mediations was conducted with AMOS (i.e., bootstrapping method with 1000 subsamples; Table 5). Object-based authenticity had a significant indirect effect on cognitive response ($\beta = 0.655$, $t = 14.232$, $p < 0.001$), affective response ($\beta = 0.145$, $t = 23.766$, $p < 0.001$), attachment to VR ($\beta = 0.447$, $t = 6.453$, $p < 0.001$), satisfaction ($\beta = 0.624$, $t = 6.236$, $p < 0.001$) and intention to visit ($\beta = 0.514$, $t = 12.788$, $p < 0.001$). Existential authenticity indirectly influenced affective response ($\beta = 0.187$, $t = 6.543$, $p < 0.001$), attachment to VR ($\beta = 0.567$, $t = 11.392$, $p < 0.001$), satisfaction ($\beta = 0.835$, $t = 5.441$, $p < 0.001$) and intention to visit ($\beta = 0.590$, $t = 4.566$, $p < 0.001$).

Cognitive response indirectly affected attachment to VR ($\beta = 0.045$, $t = 4.017$, $p < 0.001$), satisfaction ($\beta = 0.055$, $t = 6.373$, $p < 0.001$) and intention to visit ($\beta = 0.347$, $t = 12.924$, $p < 0.001$). Further, affective response had an indirect effect on satisfaction ($\beta = 0.017$, $t = 4.872$, $p < 0.001$) and on intention to visit ($\beta = 0.056$, $t = 6.332$, $p < 0.001$). Finally, attachment to VR had an indirect effect on intention to visit ($\beta = 0.044$, $t = 5.113$, $p < 0.001$).

In order to further verify the research model, socio-demographic information including gender, age, education, occupation and marital status as control variables of the relationship between affective response and intention to visit. Socio-demographic characteristics did not exert any significant effect on outcome variables, and when the

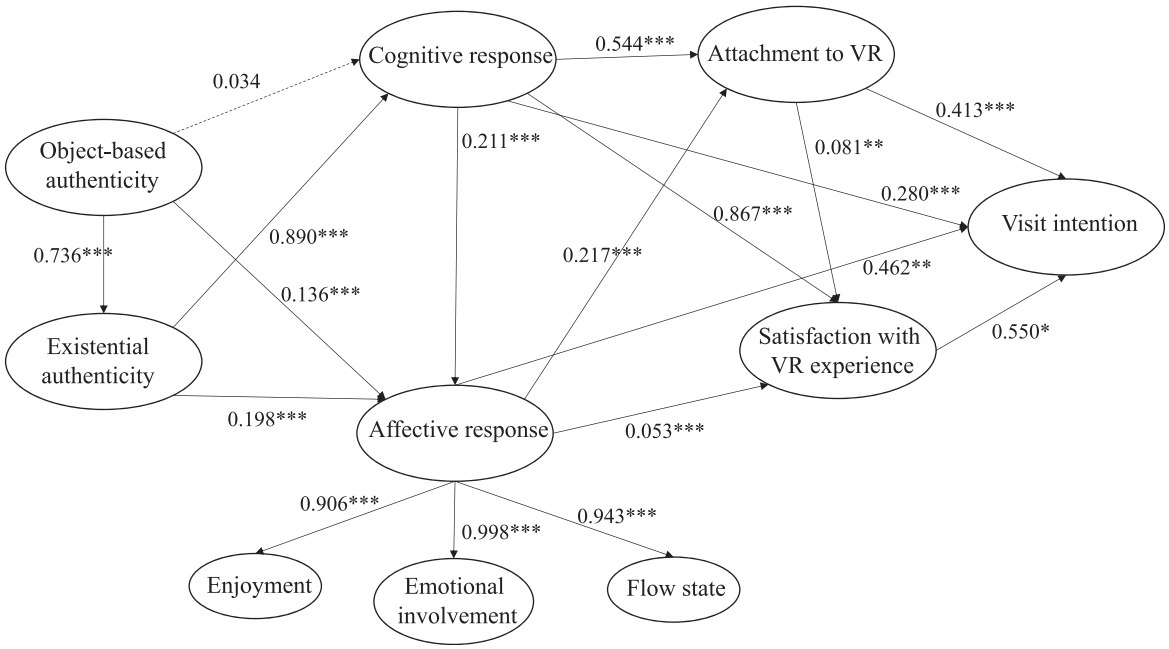


**FIGURE 1** Structural model

**TABLE 5** Estimated mediations

| | Direct effect | Indirect effect | Total effect |
|---|---|---|---|
| Object based → Existential | 0.736*** | | 0.736*** |
| Object-based → Cognitive response | 0.034 | 0.655*** | 0.689*** |
| Existential → Cognitive response | 0.890*** | | 0.890*** |
| Object-based authenticity → Affective response. | 0.136*** | 0.145*** | 0.281*** |
| Existential authenticity → Affective response | 0.198*** | 0.187*** | 0.385*** |
| Existential → Attachment to VR | | 0.567*** | 0.567*** |
| Object based → Attachment to VR | | 0.447*** | 0.447*** |
| Existential → Satisfaction | | 0.835*** | 0.835*** |
| Object based → Satisfaction | | 0.624*** | 0.624*** |
| Existential → Intention to visit | | 0.590*** | 0.590*** |
| Object based → Intention to visit | | 0.514*** | 0.514*** |
| Cognitive response → Affective response. | 0.211*** | | 0.211*** |
| Cognitive response → Attachment to VR | 0.544*** | 0.045*** | 0.589*** |
| Cognitive response → Satisfaction | 0.867*** | 0.055*** | 0.922*** |
| Cognitive response → Intention to visit | 0.280*** | 0.347*** | 0.627*** |
| Affective response → Attachment to VR | 0.217*** | | 0.217*** |
| Affective response → Satisfaction | 0.053*** | 0.017*** | 0.070*** |
| Affective response → Intention to visit | 0.462** | 0.056*** | 0.518*** |
| Attachment to VR → Satisfaction | 0.081** | | 0.081** |
| Attachment to VR → Intention to visit | 0.413*** | 0.044*** | 0.457*** |
| Satisfaction → Intention to visit | 0.550** | | 0.55** |

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

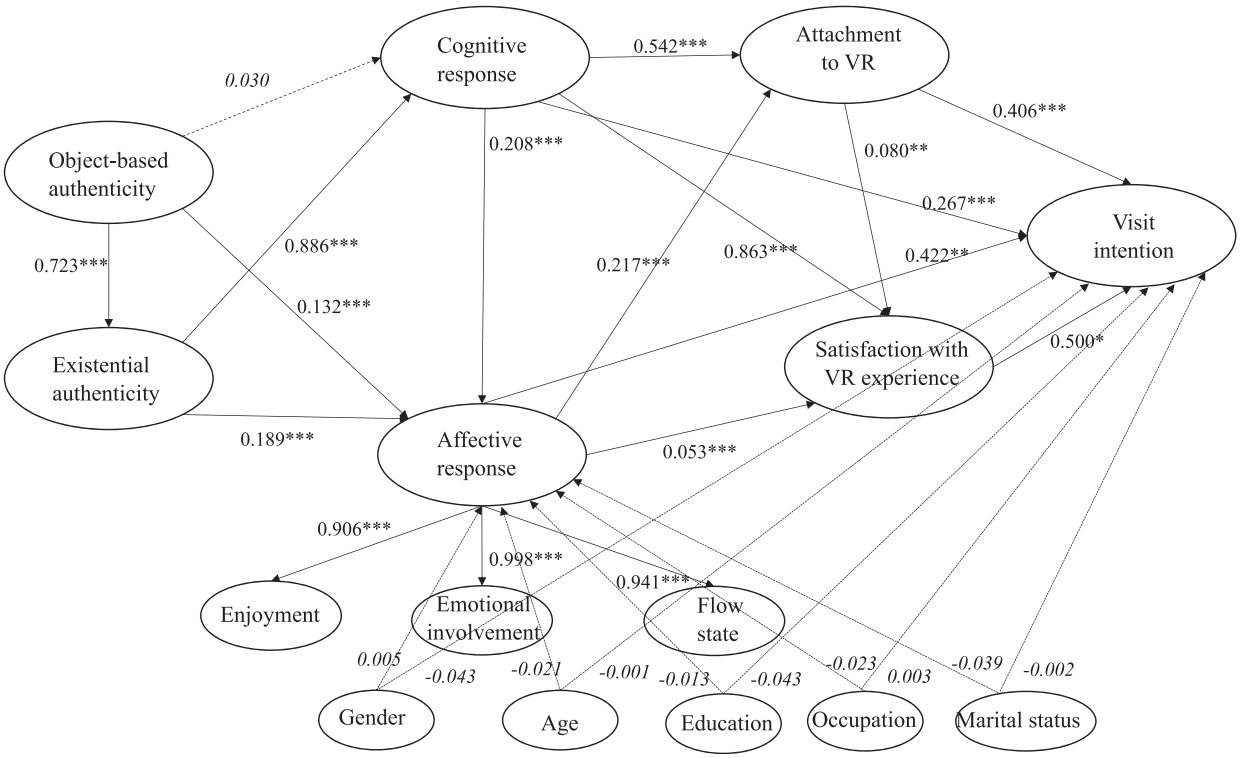


**FIGURE 2** Structural model with control variables

control variables are considered, the results related to the research hypotheses are still supported by the analysis (Figure 2).

## 5 | DISCUSSION AND CONCLUSION

### 5.1 | Discussion

Virtual reality technologies have recently made fast advancements, providing tourism operators with cutting-edge media to enhance the customer experience, while giving tourists the opportunity to have an early and easy access to experiences of a destination or site. Despite the determinant role of perceived authenticity, particularly in heritage tourism, in eliciting tourists' satisfaction and behavioral intentions, very few studies have focused on the role of perceived object-based and existential authenticity in a VR experience. Non-immersive virtual experiences of visiting heritage sites are particularly under-analyzed. The present research was therefore conducted to examine non-immersive VR tourism experiences in a heritage setting, considering the role of perceived existential and object-based authenticity in affecting visitors' responses and experiential outcomes.

Through the SEM analysis, this study addresses three research questions with regards to VR heritage tourism. RQ1 concerns the relationship between object-based and existential authenticity. The study results support the influence of the object-based component of authenticity on the existential component, further contributing to mixed results in research conducted in physical heritage tourism experiences on this relationship (Kolar & Zabkar, 2010; Park et al., 2019; Zhou et al., 2013). Such result highlights the centrality of perceived authenticity in VR tourism experiences, and how both dimensions of authenticity (i.e., object based, and existential authenticity) should be considered (Kolar & Zabkar, 2010).

The examination of RQ2, concerning the influence of authenticity on cognitive and affective responses of VR heritage visitors, uncovers that only existential authenticity strongly and directly affects the visitors' cognitive response. Existential and object-based authenticity both directly influence the visitors' affective response to the experience (e.g., Jang et al., 2012; Kim, Bonn, et al., 2017; Kim, Song, et al., 2020; Kolar & Zabkar, 2010; Mura et al., 2017; Yung & Khoo-Lattimore, 2019).

RQ3 involves the analysis of interactions between cognitive and affective responses of VR heritage visitors, and the impact of these responses on users' attachment to VR technologies, satisfaction, and intention to visit the heritage site. In the present study, cognitive response to an authentic VR experience is revealed to have a fundamental role, not only in directly influencing the visitors' emotional response, but also their attachment to VR, their satisfaction with the VR experience and their intention to visit the heritage site, confirming previous results on experiences of VR (e.g., Loureiro, Guerreiro, et al., 2021) and on general VR tourism (Huang et al., 2016; Manis & Choi, 2019; Marasco et al., 2018; Tussyadiah et al., 2018; Wei

et al., 2019). The important role of visitors' cognitive response to VR experiences, compared to their affective response, also further confirms Kim, Lee, et al. (2020) similar findings.

Satisfaction with the VR experience was the dimension that was influenced the most by the visitors' cognitive response, compared to other outcomes such as attachment to VR or visit intention. While relations between visitors' affective response and VR attachment, satisfaction, and visit intention are mostly significant (Animesh et al., 2011; Jang & Park, 2019; Kim, Lee, et al., 2020; Tussyadiah et al., 2018; Zhang et al., 2019), affective response does not have a strong effect on attachment to VR and satisfaction. On the other hand, the visitors' developed attachment to VR is revealed to lack a relevant effect on satisfaction, but significantly affects visit intention (Kim, Lee, et al., 2020).

Overall, such results highlight the most influential factors of a non-immersive technology mediated experience in determining intention to visit a site in person, when cultural heritage tourism is considered. The full implications of these findings for theory and practice are illustrated below.

## 5.2 | Theoretical contributions

The contribution of the present study lies in understanding the role that the dimensions of authenticity play in virtual tourism experiences in a cultural heritage context, through the application and extension of the SOR model, as conceptual framework. More specifically, this study confirms the existence of a direct impact of object-based authenticity on existential authenticity, which has been so far only examined in real life heritage experiences (e.g., Zhou et al., 2013). Set in a non-immersive VR environment, this result supports that the multidimensional construct of authenticity has a central role in VR tourism experiences, and that both theoretical aspects of authenticity should be further considered in this type of experiences. Further, our study contributes to the existing literature on VR tourism, by demonstrating for the first time that non-immersive VR experiences can also convey authentic experiences, not only through objective elements, but also by eliciting an existential sense of authenticity.

The strong and direct influence of existential authenticity on the visitors' cognitive response demonstrates that the authenticity conveyed by VR experiences goes beyond physical representations, and mainly involves the visitor's subjective experience in the mediated space (Damjanov & Crouch, 2019), which elicits individual cognitive benefits. Together with contributing to consolidate our understanding on relations between perceived authenticity and tourists' responses, this result highlights the importance of VR experiences in conveying the authenticity of cultural heritage attractions, and in turn in stimulating vivid cognitive and emotional responses.

The present study also supports the idea that existential and object-based authenticity should be considered separately in theoretical frameworks aimed at analyzing multiple effects on the overall tourist experience (e.g., Kolar & Zabkar, 2010; Zhou et al., 2013). Moreover, the strong effect of existential authenticity on visitors' cognitive response demonstrates the relevance of visual elements, particularly atmospherics and storytelling contents, in the cognition of visitors when visiting heritage sites through VR. As such, non-immersive virtual technologies have the potential to produce sensorial and authentic environments that significantly affect virtual tourists' response (Pleyers & Poncin, 2020). The visitors' cognitive response to the experience was found to influence their affective response, validating the theoretical link between cognition and affection in VR tourism experiences (Tussyadiah et al., 2018). Overall, this confirms the need for future VR tourism research to analyze both cognitive and affective responses of users, and to consider the influence of these responses in the potential planning and visitation of physical sites (e.g., Kim, Song, et al., 2020).

Further, satisfaction with the VR experience of the site played an important role in predicting potential tourists' intention to visit. This result confirms the importance of measuring satisfaction to better understand VR tourism experiences: the more cognitive response turns into satisfaction, the more VR visitors are willing to personally visit the heritage site in the future. Due to the weak effect of affective response on attachment to VR and satisfaction with the experience, non-immersive technologies may be less able to elicit enjoyment, emotional involvement and flow, and be more effective in stimulating individuals' thoughts and consciousness. This result contributes to building theory on experiences of VR in the tourism field.

The different effects of attachment to VR on satisfaction and visit intention highlight the importance of further investigating these dimensions and their relations as experiential outcomes of VR use in tourism. The relation between satisfaction with VR experience and intention to visit in this study further supports the need to introduce satisfaction as a measure of VR heritage tourism experiences, and contributes to understand its relation with behavioral intentions in technology-mediated experiences (e.g., Choi et al., 2018; Hudson et al., 2019; Lee, Lee, et al., 2020). Finally, the fact that visit intention is more significantly influenced by cognitive response and by VR attachment, than by satisfaction, provides useful insights on the strengths and implications of non-immersive technology when used in tourism. Overall, this study confirms that the SOR model is an effective framework that can help better understand the experiential characteristics and outcomes of digital experiences (e.g., Romero et al., 2021) and VR tourism in different contexts (e.g., Kim, Lee, et al., 2020; Loureiro, Guerreiro, et al., 2021; Pleyers & Poncin, 2020).

## 5.3 | Managerial implications

From a managerial perspective, this research provides useful insights for site managers and destination marketers attempting to increase the effectiveness of their heritage marketing and promotion operations with advanced technology. Non-immersive VR is a purposeful and effective tool for stimulating future cultural tourist flows in safe and creative ways, especially for eliciting intention to visit a heritage site. VR can help build and maintain relationships with target markets,

and consolidate their intentions to physically visit the heritage site as well as its location. This is even more important in current circumstances where corporeal travel is being restricted or considerably reduced by the pandemic. The advantages of non-immersive VR technologies are not restricted to being low cost compared to tools such as wearable devices, but also correspond to providing competitive differentiation by obtaining meaningful responses and shaping the overall experience of the site.

The study results suggest that using VR applications allows to shape means to effectively promote a heritage site's offer remotely, while further eliciting individuals' intention to visit in person through the engaging storytelling and atmospherics of a virtual experience. Non-immersive virtual technologies also have the potential to help practitioners create emotional and authentic experiences that significantly impact the visitors' response and overall experience (Pleyers & Poncin, 2020). "Virtual storytelling" should be especially designed to convey authentic, cultural and historical characteristics of the site and associated identity, heritage, artifacts, symbols and folklore. Since the enjoyment, flow state and emotional involvement produced by the VR experience were found to satisfy and influence the visitors' intention to visit the heritage site, animations, and other elements able to boost affective and cognitive reactions (e.g., game contents), are recommended to be implemented to represent salient features of the heritage site with which users can play and interact. Enhanced storytelling would also increase the visitors' engagement, consciousness and knowledge, which this study found to exert the strongest effect on satisfaction and intention to physically visit the site. In this direction, virtual atmospherics should also be enhanced (e.g., focusing on sounds, images, interactive speech, online gamification) for increased existential authenticity. Local residents, and local celebrities, could also be involved in the contents' production phase, and replace artificial voiceovers for a more emotionally charged description and long-lasting impression of the place.

Given their demonstrated potential to simultaneously shape cognition, affection and attachment, non-immersive VR applications should be directly used as promotion and marketing tools. In this vein, heritage sites managers should cooperate with policy makers, destination marketers and tourism operators in promotion and marketing strategies, to showcase a wider range of local attractions and give detailed and comprehensive notion of the place, through a coordinated use of VR. The present study also provides practitioners with a measurement instrument that can systematically assess where to improve the visitor experience delivered by non-immersive VR platforms, to further target markets, to increase the visitors' satisfaction, and encourage their willingness to visit.

### 5.4 | Limitations and future research

Beside its theoretical contributions and managerial implications, the present study also presents several limitations. First, from a conceptual standpoint, objective and existential authenticity were measured in this study, while other types of authenticity (e.g., interpersonal, constructive) were not included as they were considered not to be applicable to a VR context. The study only involved Italian respondents, and is based on a convenience sample, thus precluding generalizability of results. The respondents appear to be mostly young individuals: future studies could explore VR heritage experience focusing on middle-aged or older respondents. Future studies could repeat the research by considering the same heritage site and widening the geographical representation of the sample. This could also represent an opportunity to check for a potential moderator effect that the geographical distance might have on the respondents' visit intention. Since the present research considered the use of non-immersive VR technology, future studies could examine heritage sites that can be visited both with an immersive and non-immersive platform, so that comparisons can be made on the type of experience delivered by the VR modes of visitations, and related "intensities" and perceived authenticities. Given the size of the utilized conceptual framework, the present paper did not consider additional predictors (e.g., motivations) or consequences (e.g., willingness to pay for virtual visits), which would merit attention in future studies. Future research could also employ different theoretical models (e.g., the Technology Acceptance Model, or the attitude-behavioral relation theory) to include a wider range of dimensions in the analysis of the experience and related outcomes. In line with recent museum-related research (Antón et al., 2019), future studies might investigate the role of object-based and existential authenticity in non-immersive virtual heritage tours, in driving visitors' short-term online behavior, in terms of intensification (i.e., further consuming online content related to the heritage site) and content generation (i.e., posting site-related content on online platforms).

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

Research data are not shared.

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**APPENDIX: Items description X**

| | |
|---|---|
| OBJECT-BASED AUTHENTICITY (OBJ) | |
| OBJ1 | The VR visit exhibits largely contain original objects of the past. |
| OBJ2 | The VR sites I visited has originals, not copies. |
| OBJ3 | This VR site is a truly historical and cultural genuine site. |
| EXISTENTIAL AUTHENTICITY (EXI) | |
| EXI1 | This VR visit gave me a deeper insight into local history and culture. |
| EXI2 | During the VR visit, I felt the related history and culture of this place. |
| EXI3 | My VR visit enriched me as a person. |
| EXI4 | I liked the calm and peaceful atmosphere of the place I visited through VR. |
| EXI5 | I felt connected with human history and civilization. |
| COGNITIVE RESPONSE (COG) | |
| COG1 | I gained knowledge from using the tourism-related VR activity. |
| COG2 | Experiencing the tourism-related VR activity is useful to collect information. |
| COG3 | Experiencing the tourism-related VR activity is beneficial. |
| ENJOYMENT (ENJ) | |
| ENJ1 | The tourism-related VR activity is enjoyable. |
| ENJ2 | The tourism-related VR activity is pleasurable. |
| ENJ3 | The tourism-related VR activity is fun. |
| ENJ4 | The tourism-related VR activity keeps me happy. |
| EMOTIONAL INVOLVEMENT (EMO) | |
| EMO1 | I am completely involved in the tourism-related VR activity. |
| EMO2 | I am deeply impressed by the tourism-related VR activity. |
| EMO3 | I feel total empathy with the tourism-related VR activity. |
| FLOW | |
| FLOW1 | When I am experiencing the tourism-related VR activity, I feel totally captivated. |
| FLOW2 | When I am experiencing the tourism-related VR activity, time seems to pass very quickly. |
| FLOW3 | When I am experiencing the tourism-related VR activity, I forget all concerns. |
| FLOW4 | Experiencing the tourism-related VR activity often makes me forget where I am. |
| ATTACHMENT TO VR (ATT) | |
| ATT1 | Experiencing the tourism-related VR activity is now part of my life. |
| ATT2 | I am attached to experiencing the tourism-related VR activity. |
| ATT3 | Experiencing the tourism-related VR activity is important to me. |
| SATISFACTION (SAT) | |
| SAT1 | I'm satisfied with my visit at this VR site. |
| SAT2 | I'm very happy I had this VR experience. |
| SAT3 | This VR experience has satisfied my expectations. |
| VISIT INTENTION (VIS INT) | |
| VIS INT1 | I am planning to visit the place that I observed in the tourism-related VR activity. |
| VIS INT2 | I intend to visit the place that I saw in the tourism-related VR activity in the near future. |
| VIS INT3 | I am willing to visit the place that I saw in the tourism-related VR activity soon. |
| VIS INT4 | I intend to invest money and time to visit the place that I observed in the VR tourism |