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RESEARCH ARTICLE

Embodiment, immersion, and enjoyment in virtual reality marketing experiences

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Abstract

This experiential marketing study examines the effects of body position and embodiment in shaping consumer intentions mediated by immersion and enjoyment during a virtual reality experience. After a qualitative study ($n = 13$) aimed at understanding what, in a virtual reality experience, motivates individuals to want to consume the promoted offer, we conducted a quantitative study ($n = 300$), using a partial least squares structural equation model. Our experimental context placed the users in the role of a kayaker discovering Antarctica via a virtual reality head-mounted device. The results confirm the positive relationships implied by the conceptual model underpinning the research. The embodiment felt by the users has positive effects on immersion and enjoyment, which in turn positively shape the user-consumer's intention to discover the destination for real. This study brings theoretical contributions that provide a clearer definition of embodiment in an experiential context. This study also provides professionals with guidance on the choice of virtual reality system contexts and experiential factors to stimulate positive behavioral intentions, in this case to discover a place for real.

KEYWORDS

customer experience, embodiment, enjoyment, experiential marketing, immersion, purchase intention, virtual reality

1 | INTRODUCTION

Virtual reality is viewed as the most immersive digital technology (Mishra et al., 2021) and continues to grow as a mainstream media tool (Alcañiz et al., 2019), offering a diverse range of applications in everyday life for both professional and domestic uses (Slater & Sanchez-Vives, 2016). For instance, major brands such as Nike or Coca-Cola have recently made huge investments in virtual-marketplace worlds and metaverses that require the use of a virtual reality head-mounted display. These virtual reality experiences aim to reinvent the consumption experience. Virtual reality is an immersive

technology that enables users to access a virtual environment or metaverse for an interactive, multisensory, real-time experience (Mishra et al., 2021). Metaverses are networked immersive virtual spaces (from social platforms to video games and commercial worlds) in which users can embody an avatar and interact with virtual users and objects through natural gestures.

Recent research has emphasized the positive effects of virtual reality on behavioral intentions such as purchase decisions and willingness to pay (Wen & Leung, 2021). Virtual reality experiences stimulate customer purchase intentions (Hilken, Chylinski, et al., 2022), particularly in the context of tourist destinations. However, studies on

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the influence of virtual reality on tourism and destination engagement remain rare (Flavián et al., 2020; Leveau, Camus, et al., 2022; Pasanen et al., 2019).

Although there is a vast literature on the influence of embodiment on enjoyment, few studies examine the impact of interactions with the body on individuals' reactions (Flavián et al., 2021). In virtual reality experiences, embodying an avatar is made possible by embodiment induction (e.g., motion, attention, relaxation, Roth and Latoschik, 2020). These authors argued that accurate response to the user's movement (e.g., of body, face, and eye motion) fosters the perception of presence (Roth and Latoschik, 2020). Interactions stimulate people's proprioceptive senses, especially through their body position (Spanlang et al., 2014), and (pseudo)natural gestures, like a natural body position, enhance the virtual reality user's cognitive engagement (Foloppe et al., 2018), which leads to embodiment (Spanlang et al., 2014). Despite the importance of the motor relationship that develops between the virtual and the real body (Wen & Leung, 2021), the scholarship has paid little attention to cognitive and emotional effects resulting from virtual reality experiences, although in experiential marketing, these effects are crucial role for designing an offer that can drive greater purchase intention.

Here, to address this gap, we designed this study to show the positive influence of embodiment on behavioral intentions by bringing together a psychological variable (immersion) and an affective variable (enjoyment) in a tourism marketing context. We analyze the role of embodiment in a comprehensive decision-making model. Virtual reality experiences are generally viewed as mere emotional triggers (Flavián et al., 2021), but they mobilize cognition and can shape the decision process towards an experiential offer (Wen & Leung, 2021). Research models on virtual reality experiences usually study the place of (tele-)presence or flow (Kim & Ko, 2019) but rarely examine the role of body position, embodiment, or immersion (Kilteni et al., 2012). Here we formulate the following research question: how can the body position and embodiment felt by users during a virtual reality experience reinforce behavioral intentions toward an experiential offer?

Here we designed an experiment using virtual reality applications, whereas previous research in the tourism field has only focused on 360-degree virtual reality videos. Our purpose was to understand how the virtual reality experience can create engagement with the tourism destination. We conducted an empirical study ($n = 300$; Table 1) and used a partial least squares structural equation model to focus on the effects of experiential factors on psychological, affective, and behavioral variables during a Virtual reality experience in which participants explored a virtualized Antarctica. Furthermore, we conducted a qualitative study ($n = 13$; Appendix A) analyzing only the behavioral intentions of individuals to capture the actual motivations and decision-making processes of consumers that would lead them to choose a destination following a virtual consumption experience. There were several limitations to the experiment, as it took place at a festival where factors tied to the ambient atmosphere (e.g., presence of noise and an audience) were likely to negatively

affect participant concentration levels, and so we focused on the proprioceptive sense only.

The results confirm some positive relationships implied by the conceptual model underpinning the research. We find that during virtual reality experiences, immersion and enjoyment significantly mediate the relationship between embodiment and the intention to discover the destination for real. However, a natural body position strengthens the influence of embodiment on immersion and on enjoyment. We highlight new theoretical insights for marketing in terms of embodiment and body position and how these factors influence behavioral intentions. We propose a framework for the concept of embodiment, and we clarify the definition of embodiment proposed by Kilteni et al. (2012) in an experiential context occurring in virtual reality. Finally, we provide professionals with guidance on ways to stimulate positive behavioral intentions toward tourist destinations discovered during a virtual experience (Hilken, Keeling, et al., 2022; Hosany et al., 2022; Pala et al., 2022).

The paper is organized as follows. First, we define our conceptual framework and the research model, and we present the methodology used to test the hypotheses. We then report and discuss the results, and then conclude but outlining the contributions and limitations of this work presented here, and avenues for future research.

2 | LITERATURE REVIEW

2.1 | Development of immersive technologies and their applications in marketing

The rise of virtual reality provides ideal ground for brands to place their offers by proposing playful, original, and pleasant experiences in which consumers embody the protagonist's role and can interact in real time with their whole body in the virtual world (Roth and Latoschik, 2020). As in video games, users can experience virtual reality as engaged players rather than mere spectators; the simple effect of presence turns into a form of total immersion (Rubio-Tamayo et al., 2017). A virtual reality experience induces emotions and engages human senses, and thus stimulates greater mental imagination (S. J. Barnes, 2011).

Virtual reality head-mounted device has started to become more affordable, which has increased consumer sales and consequently increased consumer interest in virtual reality experiences. Virtual reality experiences can mark users in a positive way, by "creating a stronger and more memorable impression on consumers" (S. J. Barnes, 2011, p. 12) in experiential marketing contexts. Metaverses thus represent a strong new opportunity to promote and sell products and services. There has been a recent surge in marketing research on virtual reality experiences, particularly for tourism offers (Hopf et al., 2020; Marasco et al., 2018; Pasanen et al., 2019), and studies show that understanding customers is fundamental to attract them to the promoted destination (Pesonen & Pasanen, 2017). Table 1 summarizes tourism marketing research that has analyzed the

TABLE 1 Studies using virtual reality in tourism marketing experiments since 2016.

Reference	Destination	Methodology	Findings
Huang et al. (2016)	Kenya	Maasai Mara region of Kenya via a 3D virtual world. A total of 186 participants.	3D virtual worlds to attract potential online and real-world tourists
Tussyadiah et al. (2018)	Hong Kong and the United Kingdom	360-degree virtual reality video. A total of 202 participants for Hong Kong and 724 for the United Kingdom.	Virtual reality experiences increase enjoyment and attitude (preference) toward the destination, as well as intention to travel there
Marasco et al. (2018)	Napoli (Italy)	360-degree virtual reality video at Fontanelle Cemetery. A total of 433 participants.	Perceived visual appeal and the emotional engagement due to the Virtual reality experience has a positive impact on intentions to visit the destination
Pasanen et al. (2019)	Finland	360-degree virtual reality video filmed in eastern Finland's Ruuna nature tourism area. A total of 221 participants.	The virtual reality experience arouses positive feelings towards and interest in nature tourism in Finland
Flavián et al. (2019a)	Grand Canyon (USA)	360-degree virtual reality video whitewater rafting in the Grand Canyon. A total of 202 participants.	Virtual reality head-mounted device generates more immersion, higher sensory stimulation, more engagement, and higher behavioral intentions toward the destination
Hashish (2019)	El Minya (Egypt)	Experimental trial using a 360-degree virtual reality video of pharaonic monuments. A total of 341 participants.	Interactivity positively influences telepresence and the image of the destination, as well as intentions to visit and learn more about the destination
Hopf et al. (2020)	Costa Rica	Physiological measures (heart rate and skin conductance) and a questionnaire after a 360-degree virtual reality video experience combined with fragrance diffusion. A total of 64 participants.	Olfactory and tactile stimuli used as multisensory cues in a virtual reality experience enhance the user's sense of presence and intention to recommend a destination
Flavián et al. (2021)	Cliffs of Moher (Ireland) and Venice (Italy)	A total of 263 participants randomly assigned to each 360-degree virtual reality video	Multisensory virtual reality experiences enhance affective and behavioral reactions toward destinations
Leveau and Camus (2023)	Antarctica	Virtual reality application. A total of 300 participants kayaking in Antarctica via real-time sensorimotor interactions.	Virtual reality-enabled natural body position enhances cognitive, affective, and behavioral reactions to the destination

effects of virtual reality experiences on consumers' cognitive and emotional reactions and intentions to visit the destination for real.

Virtual reality experiences help to create “a memorable experience” and “well-being” (Hosany et al., 2022, p. 1662, 1664), as well as “attachment” (Pala et al., 2022, p. 487) toward and intention to visit the destination. The research summarized in Table 1 shows that virtual reality experiences have positive effects on enjoyment (Tussyadiah et al., 2018), telepresence, immersion (Flavián et al., 2019a), and on intention to visit the destination (Huang et al., 2016). However, the cited studies examined these effects using 360-degree virtual reality videos rather than virtual reality applications. Hopf et al. (2020) show that human sensory stimuli enhance feelings of immersion and behavioral intentions. When people are interactively engaged, it is their proprioceptive senses that are stimulated. The human senses (vision, hearing, haptics, etc.) stimulated during a virtual reality experience, and chiefly particularly proprioception and body position, increase the sensation of embodiment (Galvan Debarba et al., 2017).

Here we set out to determine the extent to which sensorimotor interactions can create a feeling of embodiment that has positive effects on user perception of the virtual reality experience. We investigate the role of embodiment in the tourist-consumer's cognition, emotions, attitudes, and behaviors.

2.2 | Embodiment

To embody means “to enter into the flesh.” Embodiment is a concept currently used in virtual reality and user perception research (Galvan Debarba et al., 2017; Roth & Latoschik, 2020). Kilteni et al. (2012) assert that users feel that the virtual body is theirs when its motor properties are perceived as identical to their real body. During a virtual reality experience, the user steps into the virtual person's “skin” and plays the lead role. Embodiment translates a feeling of fusion between the human body and the virtual body, which are thus felt to form the same entity (Tussyadiah et al., 2017).

The feeling of embodiment is composed of three dimensions: “agency,” “ownership,” and “self-localization” (Roth and Latoschik, 2020). Agency corresponds to the coordination between the intention expected by people through their bodily actions and the effective responses manifested in the metaverse. The more that movements performed in the real sphere correspond to those observed and reproduced in the virtual sphere, the greater the agency experienced by users (Roth and Latoschik, 2020). Ownership corresponds to users attributing the virtual body to their own body, which can even go as far as feeling real bodily sensations in response to what happens to the virtual body in the metaverse (Roth and Latoschik, 2020). Ownership is like a mental transfer in which people become aware of their bodily reactions to sensory stimulation. Self-localization concerns experiences with a representation of the virtual self, that is, where the virtual body is visible because the user embodies their character through an avatar (objective view).

In virtual reality experiences, embodied avatars have an impact “on real-life experience [...] that often reached beyond real-life conditions” (Nagy & Koles, 2014, p. 1130). People engaged in a virtual reality experience transpose their personality traits to the avatar (Belisle & Bodur, 2010) as if they inhabited it (Gonzalez-Franco and Peck, 2018), and this effect is further enhanced by sensorimotor interaction mechanisms (Galvan Debarba et al., 2017). However, despite this established knowledge, there is still a lack of empirical research on the impact and cognitive effects of embodiment on the sensorimotor interactions and mechanisms involved and how they go on to shape consumer behavioral intentions.

2.3 | Immersion

This technological embodiment (Flavián et al., 2019a) and proprioceptive feeling related to engagement in the metaverse and the multisensory stimulation in response to movement are the factors that create user immersion (Gonzalez-Franco and Peck, 2018), which can then lead people into perceptual immersion (Gorisse et al., 2018) or psychological immersion (Dwivedi et al., 2023). Virtual reality can thus enable physical immersion (Marasco et al., 2018) and psychological immersion (Flavián et al., 2019a) that together can engage consumers in the offer (Pasanen et al., 2019).

Virtual reality research has tended to examine the place of (tele-)presence or flow (Kim & Ko, 2019; Roth & Latoschik, 2020) in the individual experience, but has rarely looked at the role of body position, embodiment, or immersion (Kilteni et al., 2012; Spanlang et al., 2014).

According to Brown and Cairns (2004), there are three levels of psychological immersion: engagement, absorption, and total immersion. Engagement refers to interacting with the experience offered in the virtual environment. Absorption corresponds to a psychological state experienced by the manifestation of effective concentration during an activity and the ability to continue holding attention on stimuli during the activity (Brown & Cairns, 2004). These authors argue that absorption corresponds to direct attention to and for a given experience. The final level—total immersion—is reached when players

become totally engaged and in sync with their avatars, lose track of time and their physical surroundings (Dwivedi et al., 2023; Lavoie & Main, 2019). This “total immersion” level should be assimilated to flow, as the players are totally engaged and focused on the activities and tasks to be performed in the experience (Dwivedi et al., 2023). Although flow is characterized by nine dimensions, it can be achieved without all dimensions being simultaneously required (Lavoie & Main, 2019). As flow could occur in specific conditions, the first two levels—engagement and absorption—can already serve as valuable signals of real interest in the offer presented. Thus, the immersion is more suitable than flow for our experimentation stage using a virtual reality experience. Thus, studying the emergence and effects of immersion seems more relevant than (tele-)presence or flow to a virtual reality marketing experience.

The feeling of presence results from people's sensory integration into an environment (Gonzalez-Franco and Peck, 2018), which may not require physical interactions nor effort (Tussiyadiah et al., 2017), whereas immersion requires mental effort from people engaged in the activity and is intended to be a dynamic process that evolves over time (Dwivedi et al., 2023).

Here we examine immersion as a synonym for mental engagement and cognitive absorption in the activity to measure the attractiveness and interest of a virtual reality experience for consumers.

2.4 | Enjoyment

Experiments with virtual reality experiences have empirically proven that consumers feel enjoyment and satisfaction (Pasanen et al., 2019). In the marketing scholarship, the virtual consumption experience is characterized as an engaging and affective mental state (Mishra et al., 2021). Virtual reality offers a pleasurable experience (Huang et al., 2016) that has positive impacts on consumer attitudes and makes them want to buy the offer staged in the experience (Marasco et al., 2018). By providing pleasant experiences, virtual reality influences users' affect, creating a preference for the offer or the brand promoted by the virtual environment (S. Barnes, 2016). In addition, the process of acting as a protagonist in the metaverse creates an emotion-rich experience and increases positive perception and behavioral intentions towards the promoted offer (e.g., Maille et al., 2020). According to Liu et al. (2023), interact with the offer stimulates enjoyment, while the virtual experience stimulates the intention to purchase the discovered products. Finally, virtual reality experiences may generate positive emotions due to the fact that the interactive human–virtual environment relationship stimulates human senses (Flavián et al., 2020).

3 | RESEARCH HYPOTHESES AND CONCEPTUAL FRAMEWORK

Virtual reality-enabled interactions tend to mirror real-world situations. This makes it possible to facilitate understanding of the interaction systems at play in the metaverse and then to transpose

them identically to a real space (Spanlang et al., 2014). It also makes it possible to affect the perception of really embodying the virtual character, through natural behavior that does not require prior knowledge of how to use virtual reality head-mounted device (Gorisse et al., 2018). The more the virtual reality-world body movements become natural (i.e., identical to real-world gestures), the stronger the embodiment, due to the mental illusion created by the realism of the simulation and to how faithfully the virtual body reproduces real-world body (Kilteni et al., 2012).

Virtual reality experiences using natural sensorimotor interactions lead users to psychological immersion (Flavián et al., 2019a) and reinforce their feeling of embodiment (Gorisse et al., 2018). Thus, the embodiment felt by users in the metaverse leads to psychological immersion (Gonzalez-Franco and Peck, 2018) in the sense engagement and mental absorption (Brown and Cairns, 2004).

Furthermore, virtual reality generates affective reactions and positive effects, such as enjoyment (Pasanen et al., 2019). Several studies show that virtual reality provides hedonic experiences that spark enjoyment (Marasco et al., 2018), and felt embodiment further reinforces felt enjoyment (Krishna & Schwarz, 2014). Thus, our first hypothesis is:

H1: *In a virtual reality experience, the embodiment felt has a positive effect on immersion (H_{1a}) and enjoyment (H_{1b}).*

In virtual reality experiences, the immersion felt leads to positive behavioral intentions for an offer (Shin, 2019), particularly for a destination discovered in a virtual environment (Papagiannidis et al., 2013). We thus formulate the following second hypothesis:

H2: *In a virtual reality experience, the immersion felt has a positive effect on intention to visit the destination for real.*

Virtual reality provides a hedonic experience (Marasco et al., 2018). The positive affect induced by the virtual reality experience positively influences users' intention and induced preference for the offer staged in the experience, and particularly for a virtual visit to a tourist destination (Leveau, 2022). We thus posit the following third hypothesis:

H3: *In a virtual reality experience, enjoyment has a positive effect on intention to visit the destination for real.*

Moreover, there is evidence to suggest that there is a relationship between immersion and enjoyment in the virtual reality experience. The psychological immersion resulting from the virtual experience has a positive influence on the enjoyment experienced by the users (Flavián et al., 2019a). Virtual reality produces emotions that have the effect of cognitively engaging users (Brown & Cairns, 2004) and/or drawing them into mental absorption (Flavián et al., 2019b). Therefore, assuming a mutually reciprocal relationship between immersion and enjoyment, we posit a fourth hypothesis:

H4: *The virtual reality experience involves a positive reciprocal relationship between immersion and enjoyment.*

In this study, we consider the position of the body as a moderating variable that has effects on both embodiment and behavioral intentions. In the marketing scholarship, the concept of embodiment has been examined by researching how links between language and body movements influence consumer behavior towards the promoted offer (Krishna & Schwarz, 2014). In the virtual reality experience, the feeling of embodiment depends on the very nature of its relationship with the virtual body located in the virtual space (Gonzalez-Franco & Peck, 2018). According to Gonzalez-Franco and Peck (2018, p. 2), "the location of the avatar relative to its own body affects illusions of embodiment," which thus implies that being in the same position as the body virtual leads to a more meaningful sense of embodiment. Finally, embodiment may also be further amplified through an appropriate adaptation of the posture of the real body with the virtual body when the sensory stimuli and dynamically evolving sensorimotor interactions are faithfully and realistically reproduced (Spanlang et al., 2014). In addition, the multisensory interactions offered by virtual reality technology influence the embodiment felt (Roth and Latoschik, 2020) and can lead consumers towards positive behavioral intentions (Flavián et al., 2020; Tussyadiah et al., 2018). This takes us to our fifth and sixth hypotheses:

H5: *In a virtual reality experience, a natural position (sitting) positively modulates the effects of embodiment on immersion (H_{5a}) and enjoyment (H_{5b}) compared to a less natural position (standing).*

H6: *In a virtual reality experience, a natural position (sitting) positively modulates the effects of immersion (H_{6a}) and enjoyment (H_{6b}) on intention to visit the destination for real.*

Figure 1 gives a visual illustration of the theoretical model proposed in this study.

4 | METHODOLOGY

4.1 | Data collection

To test these hypotheses, 300 participants in a virtual reality experience carried out using the Meta Quest 2 virtual reality head-mounted device answered a questionnaire (Appendix B). The virtual reality experience took place at the *Geekfest* event in Angers, France, and data collection followed a between-subjects study design (i.e., only one experimental case per participant). The convenience sample was focused on individuals who were old enough to travel and able to finance the offer (i.e., a trip) with their own income. We sought to ensure a fair distribution in terms of population diversity for each experimental group. Table 2 gives descriptive data on the sample of respondents.

χ^2 and Fisher tests (SPSS v26) were used to check the subsample for homogeneity on gender, occupation, age, and education. Based

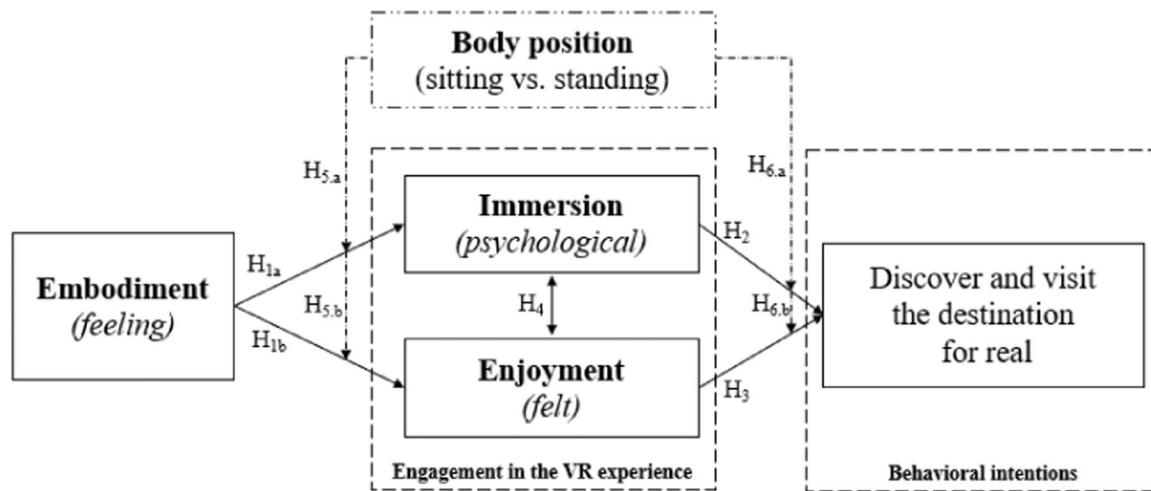


FIGURE 1 Theoretical model.

TABLE 2 Description of the sample and comparison of subsamples.

	Standing	Sitting	Total	χ^2 (F)	dof	p Value
	150	150	300			
Gender				1.979	1	0.159
Female	63.5%	60.0%	58.8%			
Male	36.5%	40.0%	41.2%			
Occupation				5.753	7	0.569
White-collar worker	11.5%	23.6%	19.2%			
Blue-collar worker	0.0%	7.3%	4.6%			
Entrepreneur	1.9%	1.8%	1.8%			
Retired	0.0%	1.8%	1.2%			
Unemployed	0.0%	1.8%	0.3%			
Executive	23.1%	18.2%	21.3%			
Middle manager	30.8%	23.6%	19.2%			
Student	32.7%	21.8%	32.3%			
Age	37	37	34	(0.117)	1	0.050
Education				6.936	3	0.733
High school diploma or	15.4%	34.5%	28.7%			
Bachelor's degree	36.5%	34.5%	36.9%			
Master's degree	28.8%	25.5%	26.8%			
>Master's degree	19.2%	5.5%	7.6%			

Note: p Value: Significant at: *** $p < 0.001$; ** $p < 0.01$; and * $p < 0.05$.

Abbreviations: dof, degree of liberty; F, Fisher test; χ^2 , Pearson's χ^2 test.

on the test outcomes, we concluded that the sample was normalized. Balanced treatments, corresponding to an identical number of observations per experimental group, provide more robust results (Sawilowsky & Blair, 1992). Here, the two experimental units were both composed of 150 participants, and we also had at least 30 respondents per experimental cell (Suh & Lee, 2005).

4.2 | Study setting

The experience selected for our experiment is entitled "National Geographic Explore VR." The proposed experience, which lasts 10 min, takes place in Antarctica, where the user is immersed to discover the fauna, flora, and landscapes of the destination by



Screen capture of the virtual environment



Participant seated in the kayak

FIGURE 2 Experimental setup.

climbing into a virtual kayak to embody an explorer kayaking between icebergs.

We previously ran a pretest phase that demonstrated that this virtual reality experience is a reliable application for peacefully discovering a destination, and that it also has outstanding graphic quality integrating all the audiovisual dimensions and sensorimotor interactions required for the experiment. Using a between-subjects approach, participants were randomly assigned to one of the position-related conditions, that is, either sitting or standing. Figure 2 shows the experimental setup, with a screen capture and one participant seated. The virtual reality application lets users complete the experience either sitting (which is the natural position for kayaking) or standing (a far less natural position for kayaking). Participants have the option to sit in an inflatable kayak for greater comfort. In total, 150 (50%) users were seated, and 150 (50%) remained standing.

4.3 | Measurements

The research hypotheses were measured via a questionnaire using a 7-point Likert scale, ranging from strongly disagree to strongly agree. We adapted scales previously validated in the literature. The instrument used to measure embodiment was designed by Roth and Latoschik (2020), who developed it to measure a user's sense of embodiment in a virtual environment and particularly during a virtual reality experience. Here, users had a first-person view, which is the most frequently used view in virtual reality (Gorisse et al., 2018). As users do not see their virtual body, we kept the agency and ownership dimensions but not the self-localization dimension (that is missing with a subjective view).

The instrument used to measure immersion was designed by Fornerino et al. (2008). It is a one-dimensional scale composed of six items, initially developed to measure the degree of immersion during cinematographic experiences, that we adapted here to our virtual reality context.

The instrument used to measure enjoyment was designed by Delignières and Pérez (1998). It is a one-dimensional scale composed of 10 items, originally designed to “propose a psychometrically valid tool for the evaluation of perceived enjoyment during the practice of physical and sporting activities” (p. 7), that we selected here because the experience is completed entirely as a kayaking activity.

Finally, to measure intention to visit the destination for real, we used the scale proposed by Bigné et al. (2001). Following a virtual experience, this mono-item scale accurately measures users' interest in and intention of going to the destination for real.

Before analyzing the data set, we first ran a principal component analysis (PCA) using SPSS (v26), a confirmatory factor analysis (CFA), and discriminant validity checks by comparing the average variance extracted, using XISTAT (v2018). Table 3 presents the results obtained after the pretest phase.

After performing the PCA, we removed one item from the immersion and enjoyment scales. We kept all items to measure embodiment. The CFA showed that Cronbach's alpha (α) and Dillon-Goldstein's rho (ρ) values, and Kaiser-Meyer-Olkin's (KMO) indexes (Kaiser & Rice, 1974) were all above the 0.7 level. In addition, average variance extracted (AVE) values are above the recommended 0.5 level for discriminant validity (Fornell & Larcker, 1981).

4.4 | Qualitative study

With respect to behavioral intentions, we wanted to know more about the respondents who expressed an intention to visit the site after the virtual reality experience, as behavioral intentions can be viewed as the main antecedent of actual behaviors (see Casaló et al., 2017). We therefore conducted 30-min interviews with 13 participants in the empirical study (see Appendix A), and then manually coded each interview (Bardin, 2013).

5 | RESULTS

5.1 | Direct effects with the partial least squares approach

First, we carried out a regression analysis in keeping with structural equation modeling based on the partial least squares approach (Wold, 1985) to highlight the relationships between independent variables and one or more dependent variables. The estimation component approach offered by partial least squares is particularly suitable for formative factors and for complex research models (Hair

TABLE 3 Questionnaire and validation scale.

Measurement scale	λ	KMO	Sig.	α	ρ	AVE
<i>Embodiment</i>						
Emb1	0.645	0.839	0.000	0.859	0.896	0.516
Emb2	0.687					
Emb3	0.690					
Emb4	0.702					
Emb5	0.834					
Emb6	0.831					
Emb7	0.636					
Emb8	0.696					
<i>Immersion</i>						
Imm1	0.731	0.844	0.000	0.828	0.881	0.596
Imm2	0.791					
Imm3	0.806					
Imm4	0.753					
Imm5	0.778					
<i>Enjoyment</i>						
Enj1	0.785	0.909	0.000	0.920	0.938	0.625
Enj2	0.822					
Enj3	0.719					
Enj4	0.731					
Enj5	0.848					
Enj6	0.839					
Enj7	0.787					
Enj8	0.788					
Enj9	0.789					

Abbreviations: AVE, average variance extracted KMO, Kaiser-Meyer-Olkin index; Sig., significance in Bartlett's test sphericity; α , Cronbach's alpha; ρ , Dillon-Goldstein's rho; λ , factorial loadings.

et al., 2010). The approach involves examining a handful of indicators to highlight the significance of the results. First, the path coefficient (β) measures the direction (positive or negative) and strength of the relationship between the independent and the dependent variables. The closer path coefficient tends to 1, the stronger and more positive the relationship (Hair et al., 2018). Next, the coefficient of determination (R^2) measures the strength of the relationship based on the variance of an endogenous construct under the effect of the independent variables. Lastly, the effect size (f^2) evaluates the impact of the effect (from weak to strong) of an explanatory variable on the variable to be explained.

For the structural model, all the hypotheses were supported ($p < 0.05$; Table 4). Embodiment positively influences immersion (H_{1a}) and enjoyment (H_{1b}), and accounts for 31.9% of immersion with a strong effect size ($f^2 > 0.35$; Hair et al., 2018) and 22.6% of

enjoyment with a moderate effect size ($f^2 > 0.15$). These effects in turn influence behavioral intentions (H_2 and H_3), even if the strength of their relationships is weaker. We also observed a significant and strong ($R^2 > 0.35$; Chin, 1998) reciprocal effect between immersion and enjoyment (H_4).

5.2 | Impact of body position as moderator variable

When the moderating variables are qualitative and the independent and dependent variables are quantitative, the recommended method is a multigroup analysis with structural equation modeling (Chin, 2005). A multigroup analysis test involves comparing the resampled values between several groups in line with the tested conditions of the moderating variable.

We used the multigroup analysis in XISTAT to measure the influence of the qualitative moderating variable (body position) using the partial least squares-multigroup analysis test proposed by Henseler et al. (2009). A multigroup analysis has the advantage of being simple and robust (Chin, 2003; Hair et al., 2018) and gives more reliable results than other comparison tests when the sample is of moderate size. The test first calculates the regression coefficients of each group, and then the difference is evaluated using a significance test following a normal law. Thus, to support the hypothesis, the p value has to be below the significance threshold ($p < 0.05$). The recommended minimum number of resamples is 100 (Tenenhaus et al., 2005). For this study, we ran 5000 simulations to gain a very robustly representative estimate.

Results from the multigroup analysis test (Table 5) showed that body position modulates the relationship of embodiment with immersion (H_{5a}) and enjoyment felt (H_{5b}). The positive direction of the effect ($\neq \beta$ sit vs. β stand > 0) confirms that the virtual reality experience has greater effect when it is practiced in the natural position for the real activity than in an unnatural position. Hypothesis H_5 is supported. However, body position does not modulate the relationship of immersion (H_{6a}) and enjoyment (H_{6b}) with intention to visit the destination for real ($p > 0$). Hypothesis H_6 is therefore rejected.

5.3 | Qualitative study: Comments from interviewees

We provide a few verbatim comments from the interviewees regarding their virtual reality experience. These kinds of virtual reality experiences "could increase or create" (A.1) "a desire to go there" ($n = 6$), meaning to go to "the place" (A.2) presented through this "real, proactive visit" (A.3). This would enable me to live for real the "exploration and discovery" (A.4). "Following this virtual visit, I would definitely want to go there one day" (A.6). For some participants, this experience "confirmed my desire to discover this place" (A.6), as "it magnified it" (A.7) and "reinforced my desire to discover, in real life, the destination" (A.5).

TABLE 4 Partial least squares results—XISTAT (v2018).

Effects (hypotheses)	R^2	β	SE	t	Pr > t	f^2	Result
Embodiment → Immersion (H_{1a})	0.319	0.565	0.048	11.82	***	0.468	Supported
Embodiment → Enjoyment (H_{1b})	0.226	0.475	0.051	9.32	***	0.291	Supported
Immersion → Visit intention (H_2)	0.077	0.161	0.063	2.56	0.011(*)	0.022	Supported
Enjoyment → Visit intention (H_3)	0.077	0.162	0.063	2.57	0.011(*)	0.022	Supported
Immersion ↔ Enjoyment (H_4)	0.373	0.262	0.052	5.02	***	0.085	Supported

Note: Pr > |t|: significant at: *** $p < 0.001$; ** $p < 0.01$; and * $p < 0.05$.

Abbreviations: R^2 , Pearson's correlation coefficient; SE, standard error; t, Student's t test; β , regression coefficient (path coefficient).

TABLE 5 Moderation effect results—XISTAT (v2018).

Body position effect on	p Value	β sit vs. β stand	/	Result
Embodiment and Immersion (H_{5a})	0.0160(*)	0.647 vs. 0.421	0.226	Supported
Embodiment and Enjoyment (H_{5b})	***	0.612 vs. 0.332	0.280	Supported
Immersion and Intention to visit (H_{6a})	0.830	0.117 vs. 0.072	0.045	Rejected
Enjoyment and Intention to visit (H_{6b})	0.118	0.392 vs. 0.090	0.302	Rejected

Note: p Value significant at: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; β : regression coefficients (path coefficient).

Regarding the experiment, virtual reality enables us to better “represent what the destination was” (A.2) and to discover a place “before going there” (A.6), to “program the visits and the trip” (A.6). As a marketing tool, virtual reality “enables you to see, [...] to realize, to take the first step” (A.8), to have “a foretaste, to be able to travel, to be able to project yourself easily by discovering the fauna, the flora, the sounds” (A.9), and “to have started the trip. It's that link that helps you buy” (A.10) for real. This immersive tool “is much more selling. For the buyer, it pushes more to buy and arouses curiosity” (A.9) or it could become another channel through which “I would buy a book as I usually do” (A.11). Thus, virtual reality proves to be a marketing tool that helps with better decision making, as the participants feel like an “actor among actors” (A.12) or even “the actor” (A.9; A.13). The analysis of the qualitative study provides concrete understanding of the motivations and decision-making process of consumers in relation to the intention to visit the destination they wish.

6 | DISCUSSION AND CONCLUSION

6.1 | Discussion

Our research question addresses the influence of embodiment and body position on virtual reality immersion and enjoyment and on the virtual reality users' behavioral intentions. The quantitative study conducted with a sample of 300 people finds that immersion and enjoyment positively mediate the relationship between embodiment and behavioral intentions. Nevertheless, although performing the

virtual activity in a natural body position significantly moderates the effect of embodiment on immersion and enjoyment, it did not significantly moderate the relationship of immersion and enjoyment with intention to discover the destination for real.

First, the positive effect of embodiment on immersion and enjoyment confirms several previous studies on tourist destinations (Flavián et al., 2019a) and shopping environments (Hilken, Chylinski, et al., 2022). Next, the positive effect of immersion and enjoyment on users' behavioral intentions confirms the findings of recent research, that is, that positive emotions (Kim and Ko, 2019) and “high levels of psychological engagement positively influence behavioral engagement” (Flavián et al., 2020, p. 6) for services (Huang et al., 2016; Tussyadiah et al., 2018) and products (Alcañiz et al., 2019). Concerning effect of enjoyment as a mediator between embodiment and behavioral intentions, our data supports this hypothesis even though this mediation effect is not supported by Flavián et al. (2020). Our results also confirm that there is a link between immersion and enjoyment (Diemer et al., 2015). This reciprocity effect has attracted scant attention (Fornerino et al., 2008), unlike the issue of whether enjoyment is an outcome of immersion or immersion is an outcome of enjoyment (Flavián et al., 2020).

Our original viewpoint on the relations between the core concepts characterizing the research model adopted here thus enriches and informs the marketing literature on experiential contexts in virtual reality. Our results demonstrate that the consumption experience can only have positive cognitive, emotional, and conative effects if potential customers live the experience as (relatively) real.

Regarding the results for body position, we observe that (pseudo) real interactions influence the relationship of embodiment with

immersion and enjoyment, which confirms previous studies (Flavián et al., 2020; Leveau, 2022). However, a natural body position is not sufficient to increase behavioral intentions, unlike immersion and emotion that were also generated when users completed the virtual reality experience in unnatural body positions. Early marketing scholarship suggests that a natural body position during virtual reality experiences has a positive effect on behavioral intentions (Krishna & Schwarz, 2014). In view of our results, which are not entirely consistent with these postulates, we suggest that further research is warranted to better understand to what extent body position influences behavioral intentions and in what types of consumption experience (e.g., virtual reality experience vs. traditional online experience). Giving the ongoing expansion of virtual reality experiences, these findings reinforce the need to carefully examine the decision-making process during sensory experiences.

6.2 | Theoretical implications

First, the study shows the positive relationship between a natural body position and embodiment and between embodiment and immersion and enjoyment.

Krishna and Schwarz (2014, p. 1) showed that sensory and motor stimulation of the body are like “a language” and are key determinants in consumer “judgment and decision-making.” Our study demonstrates that a body position that is similar in the virtual reality experience to the body position in the real situation moderates the consumers' cognition, affects, and behavioral intentions towards the offer. Sitting in the same position as in the real activity has a positive effect on users' perceptions of the virtual reality experience. Previous research on Virtual reality experiences has compared virtual reality situations to non-virtual reality situations (e.g., virtual reality head-mounted device vs. desktop computer and mobile phone; Flavián et al., 2021), but has never compared the moderating effects of variable body positions during the virtual reality experience. The positive effects of embodiment on behavioral intentions confirms that virtual reality enables a “try-before-you-buy experience” (Tussyadiah et al., 2018, p. 141). Our results further support recent findings on the influence of technological embodiment on behavioral engagement (Flavián et al., 2021) and the influence of embodied cognition on purchasing behavior (Wen & Leung, 2021). Moreover, instead of considering the emotional variable as a single mediator of the impact of the embodiment on behavioral engagement, our research recasts the emotional variable (enjoyment) as a central factor in the model, as feeling embodiment can drive behavioral intentions, and at the same time as a variable that is interconnected with immersion. These results confirm previous research on virtual reality experiences showing that cognition and enjoyment play a main role in positively engaging customers in the destination and stimulating their intention to visit the place discovered in real life (Pala et al., 2022).

The definition of embodiment given by Kiltner et al. (2012) focuses on the technological dimension, whereas here we clarify the

cognitive dimension of embodiment in an experiential context. For these authors, embodiment, characterized by agency and possession, focuses on the perceptual dimension related to the synchronization of real movements in the virtual environment. This effect is confirmed by our work. However, the psychological transposition of the user into his virtual body intrinsically depends on the experiential context. Here we demonstrate that body position affords a more realistic projection and thus drives engagement with the virtual body. Thus, “embodying” refers to a physical dimension to feel coordinated with the avatar, but also a psychological and mental dimension that elicits the engagement inherent to corporealization (Flavián et al., 2020). Figure 3 gives a schematic depiction of the process leading to the feeling of embodiment during virtual reality experiences.

We thus propose the following redefinition of embodiment in an experiential context: “The feeling of embodiment is induced by the mental and physical perception and engagement resulting from the coherence of sensorimotor stimulation (visual, auditory and proprioceptive, natural physical and bodily interactions, etc.) with experiential components (realism of the activity, gamification techniques, etc.) that affects users cognitively, emotionally, and conatively.”

The framework of this study could be used for future studies on offers concerning products and services. For both kinds of offers, research has confirmed the positive effect of virtual reality in triggering purchase intention (Papagiannidis et al., 2013) because the buyer perceives the offer as real (Branca et al., 2023). This study demonstrates that participating and acting in a context that is identical to a real situation provides improved understanding of the offer.

There is ample marketing scholarship on websites (S. J. Barnes, 2011), comparisons of the technologies used for virtual reality (Flavián et al., 2019b) and passive virtual reality experiences with 360-degree videos (Marasco et al., 2018), but few studies have investigated a virtual reality application for experiences taking place in the metaverse. Virtual reality universes are a very recent development and have only really emerged now that virtual reality tools have become more democratized, but they are already totally transforming consumers' virtual experiences. Our study shows that virtual reality experiences can induce consumer appeal for living a pleasant experience away from the regular place of purchase but involving the same interactions as in the real merchant universe.

6.3 | Managerial implications

From a managerial point of view, this study underlines to the experiential factors (body interactions) that positively influence users' felt embodiment in the metaverse and therefore the effectiveness and efficiency of the commercial offer. The key asset of virtual reality is that it creates a paradigm in which the user becomes an agent-protagonist who can take enjoyment from the experience (Hilken, Keeling, et al., 2022; Leveau, Camus, et al., 2022).

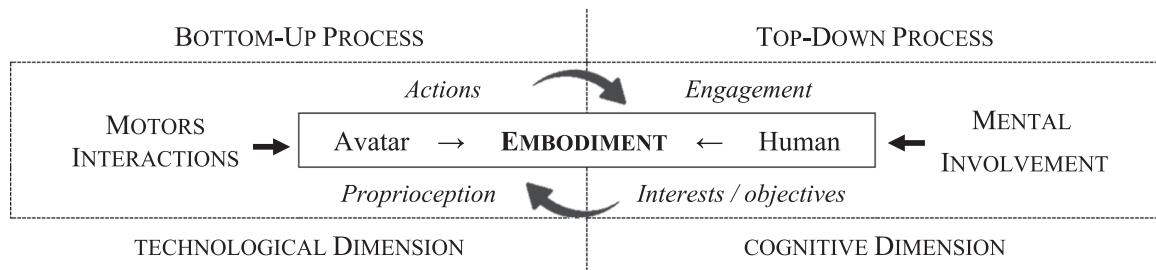


FIGURE 3 The process of feeling embodiment during virtual reality experiences.

Virtual reality provides original, varied, and fun experiences that have a positive influence on behavioral responses to the offer (Hosany et al., 2022).

Based on our results, we recommend that marketing engineers and developers of experiential contexts in virtual reality aim to enable users to use, play, and interact with their body to feel embodiment. Flavián et al. (2020) showed that managers need to reinforce technological embodiment in virtual reality experiences to generate successful customer experiences in the hotel industry. It is important to give consumers the sensation of physically experiencing the offer (Papagiannidis et al., 2013) as a true pre-experience (Tussyadiah et al., 2018). Our findings show that the feeling of embodiment fosters both psychological (immersion) and emotional (enjoyment) variables, and that there is a positive relationship between these variables. Professionals and researchers need to consider both immersion and enjoyment and immersion–enjoyment interactions when constructing a virtual reality experience in tourism. A pre-experience in virtual reality lays the ground for potential customers to develop positive behavioral intentions toward the offer until they actually purchase it (Pala et al., 2022), particularly in tourism where “products are difficult to evaluate before they are experienced” (Flavián et al., 2020, p. 6). In this sense, for virtual reality applications that enable users to embody an avatar, we recommend those that are geared to generate a (quasi)real experience, as they lead to more effective decision-making (Wen and Leung, 2021) and positively influence the impact of embodiment on immersion and enjoyment.

Our study shows empirically that a natural position of the body may be enough to make these effects valid. Tourism professionals should communicate strongly on the realism of the experience that consumers can live with their virtual reality devices, and the fact that the experience is lived from a comfortable position. Being physically engaged and interacting with the offer is synonymous with greater embodiment and “provides greater comfort in decision-making” (Hilken, Chylinski, et al., 2022, p. 498) by providing engagement with the true, or nearly true, attributes of the offer. Finally, we advise public authorities to develop virtual reality legislation that protects (virtual and physical) objects and people, as there is currently no legislation governing experiences within metaverses. A bad experience due to bad practices could turn potential customers away from virtual reality experiences and damage the brand image of the organizations offering them.

6.4 | Limitations and avenues for future research

This study carries several limitations. First, it examined one destination only. Experiments should be done with other destinations in the future. Moreover, in our empirical study, we did not use sensory stimuli. Recent studies have investigated the effects of sensory cues in virtual environments, such as ambient scent (Flavián et al., 2021), taste (Chen et al., 2020), and multisensory stimuli (Hopf et al., 2020). Future studies need to add sensory conditions that more immersively reproduce the experiential context, such as the sensation of cold that users would expect to feel in Antarctica, particularly as temperature is easy to manipulate in an enclosed room.

Second, virtual reality offers increased experimental control and proven ecological validity (Parsons, 2015a, 2015b). In the behavioral sciences, the ecological dimension is paramount to validate the study of variables and interpret results. According to Minderer et al. (2016, p. 324), virtual reality combines “the best of both worlds,” as it is possible to control the set of variables in the metaverse, by placing the subject in a context that mirrors a real situation or even that completely merges with reality, while avoiding unwanted contingencies (Coleman et al., 2019). For this reason, virtual reality is increasingly being adopted by researchers in cognitive and behavioral sciences and in management sciences (de Regt et al., 2021; Griffin et al., 2022).

The data collection conditions during the festival were not always ideal. Despite using individual headphones in an attempt to isolate the participants from outside noise, the surrounding noise may have interfered with people’s level of concentration. Moreover, knowing they were being observed by the passing public may have modified their natural behavior. These factors could contaminate the measurements made. Consequently, for a replication of virtual reality experiences, we suggest that researchers conduct a laboratory experiment that would better enable users to remain confident and adopt a perfectly natural posture, and thus produce more accurate results enabling a sharper interpretation of what they mean.

Third, perceived enjoyment is a subjective measure that is exposed to certain biases, such as biases related to social desirability. Future research needs to provide reliable physiological measurements, recorded in situ.

Fourth, any measurement of people’s behavioral intentions warrants caution and perspective. At the end of the virtual reality

experience, excitement linked to various factors or to the context may prompt people to voice their intention to buy the product or service, but intention to purchase a trip, in this case an expensive and logistically complex trip to Antarctica, does not represent the actual act of purchase that may or may not ensure. The complementary qualitative study conducted here with participants who claimed that they wanted to visit and experience the destination in real life, enables us to understand and analyze the motivations and factual reasons that would lead them towards the act of purchase. However, this still does not validate an actual purchase, especially for a trip, as the decision process requires prior reflection, comparison with other destinations, and extend planning in terms of availability and budget.

Nevertheless, with rapidly evolving multisensory interfaces for virtual reality experiences (e.g., taste, touch, smell) (Flavián et al., 2021; Hilken, Chylinski, et al., 2022), future studies need to continue to assess how these innovations will impact consumers' behavioral intentions and feelings towards tourist destinations.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

- Alcañiz, M., Bigné, E., & Guixeres, J. (2019). Virtual reality in marketing: A framework, review, and research agenda. *Frontiers in Psychology*, 10(1530), 1–15.
- Bardin, L. (2013). *L'analyse de contenu*. Presses Universitaires de France.
- Barnes, S. (2016). Understanding virtual reality in marketing: Nature, implications and potential. *SSRN Electronic Journal*, 1–51.
- Barnes, S. J. (2011). Understanding use continuance in virtual worlds: Empirical test of a research model. *Information & Management*, 48, 313–319.
- Belisle, J. F., & Bodur, H. O. (2010). Avatars as information: Perception of consumers based on their avatars in virtual worlds. *Psychology & Marketing*, 27, 741–765.
- Bigné, J. E., Sánchez, M. I., & Sánchez, J. (2001). Tourism image, evaluation variables and after purchase behaviour: Inter-relationship. *Tourism Management*, 22(6), 607–616.
- Branca, G., Resciniti, R., & Loureiro, S. M. C. (2023). Virtual is so real! consumers' evaluation of product packaging in virtual reality. *Psychology & Marketing*, 40, 596–609.
- Brown, E., & Cairns, P. (2004). A grounded investigation of game immersion. *CHI EA, Extended Abstracts on Human Factors in Computing Systems, Vienna, Austria*, 1297–1300.
- Casaló, L. V., Flavián, C., & Ibáñez-Sánchez, S. (2017). Understanding consumer interaction on Instagram: The role of satisfaction, hedonism, and content characteristics. *Cyberpsychology, Behavior and Social Networking*, 20(6), 369–375.
- Chen, Y., Huang, A. X., Faber, I., Makransky, G., & Perez-Cueto, F. J. A. (2020). Assessing the influence of visual-taste congruency on perceived sweetness and product liking in immersive VR. *Foods*, 9(4), 465.
- Chin, W. W. (1998). Modern methods for business research. In G. A. Marcoulides (Ed.), *The partial Least Squares approach for structural equation modelling* (pp. 295–336). Lawrence Erlbaum Associates.
- Chin, W. W. (2005). Bootstrap cross-validation indices for PLS path model assessment. In: T. Aluja, et al. (Eds.), *Evaluation of PLS models, Proceedings of the PLS'06 International Symposium* (pp. 43–55). Barcelona.
- Chin, W. W. (2003). A permutation procedure for multi-group comparison of PLS models. In M. Vilares, M. Tenenhaus, P. Coelho, V. Esposito Vinzi, & A. Morineau (Eds.), *PLS and related methods* (Vol. 2003, pp. 33–43). Decisia.
- Coleman, B., Marion, S., Rizzo, A., Turnbull, J., & Noltz, A. (2019). Virtual reality assessment of classroom-related attention: An ecologically relevant approach to evaluating the effectiveness of working memory training. *Frontiers in Psychology*, 10(1851), 1–9.
- Delignières, D., & Pérez, D. (1998). Le plaisir perçu dans la pratique des APS: Élaboration d'un outil d'évaluation. *STAPS*, 45, 7–18.
- de Regt, A., Plangger, K., & Barnes, S. J. (2021). Virtual reality marketing and customer advocacy: Transforming experiences from story-telling to story-doing. *Journal of Business Research*, 136, 513–522.
- Diemer, J., Alpers, G. W., Peperkorn, H. M., Shibani, Y., & Muhlberger, A. (2015). The impact of perception and presence on emotional reactions: A review of research in virtual reality. *Frontiers in Psychology*, 6(26), 1–9.
- Dwivedi, Y. K., Hughes, L., Wang, Y., Alalwan, A. A., Ahn, S. J. G., Balakrishnan, J., Barta, S., Belk, R., Buhalis, D., Dutot, V., Felix, R., Filieri, R., Flavián, C., Gustafsson, A., Hinsch, C., Hollensen, S., Jain, V., Kim, J., Krishen, A. S., ... Wirtz, J. (2023). Metaverse marketing: How the metaverse will shape the future of consumer research and practice. *Psychology & Marketing*, 40, 750–776.
- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019a). Integrating virtual reality devices into the body: Effects of technological embodiment on customer engagement and behavioral intentions toward the destination. *Journal of Travel & Tourism Marketing*, 36(7), 1–17.
- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019b). The impact of virtual, augmented and mixed reality technologies on the customer experience. *Journal of Business Research*, 100, 547–560.
- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2020). Impacts of technological embodiment through virtual reality on potential guests' emotions and engagement. *Journal of Hospitality Marketing & Management*, 30(3), 1–20.
- Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2021). The influence of scent on virtual reality experiences: The role of aroma-content congruence. *Journal of Business Research*, 123, 289–301.
- Foloppe, D. A., Richard, P., Yamaguchi, T., Etcharry-Bouyx, F., & Allain, P. (2018). The potential of virtual reality-based training to enhance the functional autonomy of Alzheimer's disease patients in cooking activities: A single case study. *Neuropsychological rehabilitation*, 28(5), 709–733.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50.
- Fornerino, M., Helme-Guizon, A., & Gotteland, D. (2008). Movie consumption experience and immersion: Impact on satisfaction. *Recherche et Applications en Marketing (English Edition)*, 23(3), 93–110.
- Galvan Debarba, H., Bovet, S., Salomon, R., Blanke, O., Herbelin, B., & Boulic, R. (2017). Characterizing first and third person viewpoints and their alternation for embodied interaction in virtual reality. *PLoS One*, 12(12), e0190109.
- Gonzalez-Franco, M., & Peck, T. C. (2018). Avatar embodiment. Towards a standardized questionnaire. *Frontiers in Robotics and AI*, 5(74), 1–9.

- Gorisse, G., Christmann, O., & Richir, S. (2018). De la présence à l'incarnation: Proposition d'un méta-modèle pour la réalité virtuelle. *Interfaces Numériques*, 7, 94–114.
- Griffin, T., Guttentag, D., Lee, S. H., Giberson, J., & Dimanche, F. (2022). Is VR always better for destination marketing? Comparing different media and styles. *Journal of Vacation Marketing*, 29(1), 119–140.
- Hair, J. F., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis* (7th ed.). Pearson Prentice Hall.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). *Advanced issues in Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage.
- Hashish, Y. (2019). Les effets de l'expérience de téléprésence sur internet sur les émotions, les attitudes et les intentions comportementales des touristes: le cas du tourisme domestique en Égypte. *Doctoral thesis*. MRM, University of Montpellier.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling. *Advances in International Marketing*, 20, 277–320.
- Hilken, T., Chylinski, M., Keeling, D. I., Heller, J., de Ruyter, K., & Mahr, D. (2022). How to strategically choose or combine augmented and virtual reality for improved online experiential retailing. *Psychology & Marketing*, 39(3), 495–507.
- Hilken, T., Keeling, D. I., Chylinski, M., de Ruyter, K., Golf Papez, M., Heller, J., Mahr, D., & Alimamy, S. (2022). Disrupting marketing realities: A research agenda for investigating the psychological mechanisms of next-generation experiences with reality-enhancing technologies. *Psychology & Marketing*, 39, 1660–1671.
- Hopf, J., Scholl, M., Neuhofer, B., & Egger, R. (2020). Exploring the impact of multisensory VR on travel recommendation: A presence perspective. In J. Neidhardt & W. Worndl (Eds.), *Information and communication technologies in tourism 2020* (pp. 169–180). Springer.
- Hosany, S., Sthapit, E., & Björk, P. (2022). Memorable tourism experience: A review and research agenda. *Psychology & Marketing*, 39, 1467–1486.
- Huang, Y. C., Backman, K. F., Backman, S. J., & Chang, L. L. (2016). Exploring the implications of virtual reality technology in tourism marketing: An integrated research framework. *International Journal of Tourism Research*, 18(2), 116–128.
- Kaiser, H. F., & Rice, J. (1974). Little jiffy, mark IV. *Educational and Psychological Measurement*, 34(1), 111–117.
- Kilteni, K., Groten, R., & Slater, M. (2012). The sense of embodiment in virtual reality. *Presence: Teleoperators and Virtual Environments*, 21(4), 373–387.
- Kim, D., & Ko, Y. J. (2019). The impact of virtual reality (VR) technology on sport spectators' flow experience and satisfaction. *Computers in Human Behavior*, 93, 346–356.
- Krishna, A., & Schwarz, N. (2014). Sensory marketing, embodiment, and grounded cognition: A review and introduction. *Journal of Consumer Psychology*, 24(2), 159–168.
- Lavoie, R., & Main, K. (2019). Consumer microflow experiences. *Psychology & Marketing*, 36, 1133–1142.
- Leveau, P.-H. (2022). Déterminants et Effets de l'Incarnation et du Plaisir lors d'Expériences en RV sur le Comportement du Consommateur, 21th Colloque of Digital Marketing. Panthéon-Sorbonne.
- Leveau, P.-H., & Camus, S. (2023). Influence of embodiment on consumers' behavioral intentions during a virtual reality experience. *TTRA Europe 2023 conference « Rethinking innovative tourism strategies in uncertain times »*, Dijon, France.
- Leveau, P.-H., Camus, S., & Richard, P. (2022). Le Rôle de l'Incarnation et de la Position du Corps lors d'Expériences Touristiques en Réalité Virtuelle sur le Comportement du Consommateur. *38th International congress of AFM (Association Française de Marketing)*. Tunis, Tunisia, May 18–20, 2022.
- Liu, W., Wu, F., & Awan, T. M. (2023). Does product touch affect consumer attitude toward a product? Meta-analysis of effect sizes, moderators, and mediators. *Psychology & Marketing*, 40, 674–689.
- Maille, V., Morrin, M., & Reynolds-McIlain, R. (2020). On the other hand: Enhancing promotional effectiveness with haptic cues. *Journal of Marketing Research*, 57(1), 100–117.
- Marasco, A., Buonincontri, P., van Niekerk, M., Orlowski, M., & Okumus, F. (2018). Exploring the role of next-generation virtual technologies in destination marketing. *Journal of Destination Marketing & Management*, 9, 138–148.
- Minderer, M., Harvey, C. D., Donato, F., & Moser, E. I. (2016). Virtual reality explored. *Nature*, 533(7603), 324–325.
- Mishra, A., Shukla, A., Rana, N. P., & Dwivedi, Y. K. (2021). From "touch" to a "multisensory" experience: The impact of technology interface and product type on consumer responses. *Psychology & Marketing*, 38, 385–396.
- Nagy, P., & Koles, B. (2014). My avatar and her beloved possession: Characteristics of attachment to virtual objects. *Psychology & Marketing*, 31, 1122–1135.
- Pala, E., Kapitan, S., & van Esch, P. (2022). Simulated satiation through reality-enhancing technology. *Psychology & Marketing*, 39(3), 483–494.
- Papagiannidis, S., Pantano, E., See-To, E. W. K., & Bourlakis, M. (2013). Modelling the determinants of a simulated experience in a virtual retail store and users' product purchasing intentions. *Journal of Marketing Management*, 29(13-14), 1462–1492.
- Parsons, T. D. (2015a). Virtual reality for enhanced ecological validity and experimental control in the clinical, affective and social neurosciences. *Frontiers in Human Neuroscience*, 9(660), 1–19.
- Parsons, T. D. (2015b). Virtual reality for enhanced ecological validity and experimental control in the clinical, affective and social neurosciences. *Frontiers in Human Neuroscience*, 9(660), 1662–5161.
- Pasanen, K., Pesonen, J., Murphy, J., Heinonen, J., & Mikkonen, J. (2019). Comparing tablet and virtual reality glasses for watching nature tourism videos. *Information and Communication Technologies in Tourism* (pp. 120–131). Springer.
- Pesonen, J., & Pasanen, K. (2017). A closer look at tourist information search behaviour when travelling abroad: What is the role of online marketing in choice of destination? In R. Schegg & B. Stangl (Eds.), *Information and communication technologies in tourism 2017*. Springer.
- Roth, D., & Latoschik, M. E. (2020). Construction of the virtual embodiment questionnaire (VEQ). *IEEE Transactions on Visualization and Computer Graphics*, 26(12), 3546–3556.
- Rubio-Tamayo, J., Gertrudix Barrio, M., & García García, F. (2017). Immersive environments and virtual reality: Systematic review and advances in communication, interaction and simulation. *Multimodal Technologies and Interaction*, 1(4), 21.
- Sawilowsky, S. S., & Blair, R. C. (1992). A more realistic look at the robustness and type II error properties of the t test to departures from population normality. *Psychological Bulletin*, 111, 352–360.
- Shin, D. (2019). How does immersion work in augmented reality games? A user-centric view of immersion and engagement. *Information, Communication & Society*, 22(9), 1212–1229.
- Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI*, 3(74), 1–47.
- Spanlang, B., Normand, J. M., Borland, D., Kilteni, K., Giannopoulos, E., Pombo, A., González-Franco, M., Pérez-Marcos, D., Arroyo-Palacios, J., Muncunill, X. N., & Slater, M. (2014). How to build an embodiment lab: Achieving body representation illusions in virtual reality. *Frontiers in Robotics and AI*, 1(9), 1–22.
- Suh, K., & Lee, Y. E. (2005). The effects of virtual reality on consumer learning: An empirical investigation. *MIS Quarterly*, 29(4), 673–697.
- Tenenhaus, M., Esposito Vinci, V., Chatelin, Y. M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics and Data Analysis*, 28, 159–205.

- Tussyadiah, I. P., Jung, T., & tom Dieck, M. C. (2017). Embodiment of wearable augmented reality technology in tourism experiences. *Journal of Travel Research*, 57(4), 1–37.
- Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management*, 66, 140–154.
- Wen, H., & Leung, X. Y. (2021). Virtual wine tours and wine tasting: The influence of offline and online embodiment integration on wine purchase decisions. *Tourism Management*, 83, 104250.
- Wold, H. O. A. (1985). Partial Least Squares. In S. Kotz & N. L. Johnson (Eds.), *Encyclopedia of statistical sciences* (Vol. 6, pp. 581–591). Wiley.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

Table A1

TABLE A1 Detailed profiles of the interviewees.

Respondent	Gender	Age	Education	Occupation
A.1	F	18–20	High school diploma	Student
A.2	F	20–29	Bachelor's degree	Student
A.3	F	20–29	Bachelor's degree	Student
A.4	F	20–29	Master's degree	Middle manager
A.5	F	50–59	Master's degree	Executive
A.6	M	30–39	Master's degree	Middle manager
A.7	F	20–29	Bachelor's degree	Student
A.8	F	20–29	>Master's degree	Student
A.9	F	30–39	Master's degree	Executive
A.10	F	20–29	Master's degree	Student
A.11	F	30–39	Master's degree	Student
A.12	F	40–49	>Master's degree	Executive
A.13	M	30–39	>Master's degree	Executive

APPENDIX B

The questionnaire

Please rate from 1 (strongly disagree) to 7 (strongly agree) the extent to which you agree with the following sentences in relation to your Antarctica discovery experience with virtual reality.

Embodiment (Roth & Latoschik, 2020):

The movements of the virtual body felt like they were my movements.

I felt as if I was controlling the movements of the virtual body.

I felt as if I was causing the movements of the virtual body.

The movements of the virtual body were in sync with my own movements.

It felt like the virtual body was my body.

It felt like the virtual body parts were my body parts.

The virtual body felt like a human body.

It felt like the virtual body belonged to me.

Immersion (Fornerino et al., 2008):

Virtual reality created a new world that suddenly disappeared at the end of the experience.

During the experience, my body was in the real world, but my mind was in the virtual world.

This experience made me forget the realities of the outside world.

During the experience, what had happened before the experience or what would happen after it no longer mattered.

This virtual reality experience made me forget my immediate environment.

At times, I lost awareness of my surroundings.

Enjoyment (Delignières & Pérez, 1998):

I really enjoyed this experience.

It's a pleasant experience.

This experience is great fun.

The experience is dynamic (energizing).

The experience made me happy.

The experience is very exciting (invigorating).

The experience changed my mind.

Doing this experience fully satisfied me.

The experience makes me feel like I really achieved something.

The experience has given me a lot of things.

Intention to visit the destination for real (Bigné et al., 2001):

I would like to discover and visit this destination for real.