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## **Branding in the time of virtual reality: Are virtual store brand perceptions real?**

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## **Abstract**

This research investigates whether consumers display similar brand perceptions between physical and virtual store environments. Specifically, it explores the set of causal relationships through which the virtual store experience affects consumers' perceptions and intentions toward the retailer's brand. The results from an experimental study manipulating the store environment (virtual vs. physical) reveal that individuals exposed to a virtual-reality-based retail environment perceive higher levels of presence than those exposed to a more traditional, physical store environment; moreover, this positive effect does not depend on individuals' technological self-efficacy perceptions. Higher levels of presence positively affect the shopping experience, which then produces a positive change in value perceptions, which ultimately lead to higher patronage intentions and WOM referral. Despite the presence of inattention blindness found in the virtual environment, the results show that such an image transfer from the store environment to patronage intention holds even when individuals cannot correctly recall the store brand.

**Keywords.** Virtual reality; Retailing; Presence; Shopping Experience; Inattention Blindness; Patronage intention

## 1. Introduction

Virtual reality (VR) is the representation of physical objects and spaces through high-definition digital images that allow individuals to be immersed in a fully digital environment simply by wearing a headset (Biocca, 1992). By giving the human brain the illusion of physical presence, individuals can experience places and/or objects as if they were directly interacting with these objects (Dede, 2009). Some seminal studies on the application of VR to retailing have recently shown that in-store behaviors and perceptions can be mimicked very accurately by reconstructing the physical store space through VR (e.g., Cowan & Ketron, 2019; Farah, Ramadan, & Harb, 2017; Pizzi, Scarpi, Pichierri, & Vannucci, 2019; Van Kerrebroeck, Brengman, & Willems, 2017a). In this vein, a recent stream of research has addressed the role of authenticity as a “*psychological state in which virtual objects presented in 3D in a computer-mediated environment are perceived as actual objects in a sensory way*” (Algharabat & Dennis, 2010, p. 101). Accordingly, the authenticity that characterizes the virtual environment has been found to impact the quality of the virtual store experience (Algharabat, Alalwan, Rana, & Dwivedi, 2017) and, consequently, users’ behavioral intentions (Algharabat & Dennis, 2011; Overmars & Poels, 2015). Recent studies have advanced that such authenticity enhances the extent to which consumers experience the products as if they were in a physical store (Algharabat, 2018). Thus, VR can provide deeper insights into the visual salience processes that affect individuals’ decision-making in front of retail shelves, where brand awareness and brand salience play a pivotal role in directing consumers’ attention toward the shelved products (Bigné, Llinares, & Torrecilla, 2016).

Addressing visual salience processes in VR is not a trivial issue: The high level of realism witnessed by previous studies does not guarantee that individuals’ exposure to brands completely

overlaps with their exposure to the physical environment. Indeed, one can argue that VR's immersiveness can favor individuals' recognition of the entire set of marketing stimuli that are typically displayed in a physical store environment (Van Kerrebroeck, Brengman, & Willems, 2017b), thus potentially improving the efficiency of the shopping experience (Serrano, Baños, & Botella, 2016). On the other hand, the greater cognitive efforts required to navigate the virtual space—which individuals are less familiar with compared to the physical environment—might mean that consumers pay less attention to the multiple stimuli displayed in the virtual environment (Vrechopoulos, O'Keefe, Doukidis, & Siomkos, 2004). However, the extant literature has not provided meaningful indications on whether VR favors or hinders people's recognition of the stimuli that characterize the store environment. Accordingly, the present research aims to fill this gap by explicitly investigating whether consumers exhibit a lower or higher level of brand recognition in the virtual channel compared to the physical channel.

Selective attention is a well-rooted phenomenon in the psychological literature. Individuals tend to exhibit an “inattentive blindness” (Simons & Chabris, 1999) toward dynamic events, which leads them to perceive and remember only the focal objects and details of said events. Accordingly, individuals who are exposed to a store environment and its shelved products may pay more attention to the environment than to specific details about the products or brands that have been digitally reconstructed. Nonetheless, previous studies found that individuals are typically able to extract “real” brand perceptions from virtual interactions with brands—for instance, when they are exposed to an advertisement in a VR environment (Van Kerrebroeck et al., 2017b). Moreover, consumers seem to derive value from the escapism and enjoyment that the retailer can provide in the virtual store environment (Shin, 2018). In this regard, Cowan and Ketron (2019) proposed a dual model of product involvement in VR environments that seeks to

explain how consumers develop perceptions and intentions toward product brands during a VR shopping experience. However, the authors' theoretical framework does not encompass whether consumers similarly develop their perceptions and intentions toward the retailer responsible for the overall shopping experience. Accordingly, the present research aims to investigate the process through which the store environment affects consumers' behavioral intentions toward the retailer—namely by addressing the role of VR in shaping the sense of presence in the store and the shopping experience.

Since smart retail channels provide consumers an opportunity to interact with the retailer in different ways (Papagiannidis, Bourlakis, Alamanos, & Dennis, 2017), relating the VR shopping experience with consumers' perceptions and intentions toward the retailer might not be trivial. In fact, it would answer several calls to address the “*fragmented body of existing academic research and limited evidence of practical uses of VR in a retailing context*” (Bonetti et al., 2018, p. 120). Indeed, previous studies have underlined the importance of understanding how the high potential of VR technology in the physical store environment can translate into shoppers' experience with the specific retailer's brand (Farah, Ramadan, & Harb, 2019).

This article aims to fill these gaps by arguing that the immersiveness that characterizes VR technology is capable of affecting the overall customer experience with the retailer—which, in turn, affects consumers' attitudes and intentions toward the retailer. By doing so, the paper attempts to advance scholarly knowledge on the effects that smart technologies exert over store experience (e.g., Foroudi, Gupta, Sivarajah, & Broderick, 2018). Specifically, it suggests that VR can evoke a vivid store experience (Dennis, Brakus, Gupta, & Alamanos, 2014) that transcends the boundaries of the virtual environment. In other words, this research posits that the virtual and physical environments are not separate entities, and that the perceptions developed in a VR store

environment can spill over into real-world brand perceptions. In particular, the present research aims to answer the following research questions: Do consumers exhibit higher or lower levels of store brand recognition in the physical versus virtual store environment (RQ1)? How does the image transfer unfold from the store environment to consumers' perceptions and intentions toward the retailer's brand through consumers' sense of presence in the store environment and shopping experience (RQ2)?

We present and discuss the results of an experimental study that i) empirically tests a multiple moderated mediation model from virtual store environment to patronage intention through store experience and store attitude; ii) analyzes whether individuals are subject to different levels of inattention blindness if they experience the store in a VR versus physical store, and iii) verifies if such selective attention might hinder the image transfer from the virtual store experience to the retailer's brand.

## **2. Theoretical Background**

### *2.1. Store environment and sense of presence*

Presence has been defined as a psychological state in which individuals perceive themselves to be enveloped by, included in, and interacting with a technology-mediated environment that provides a huge stream of stimuli (Tussyadiah, Wang, Hang, & tom Dieck 2018; Witmer & Singer, 1998), including virtual objects that can be interacted with as if they were real (Raptis, Fidas, & Avouris, 2018). This sense of "being there" has been conceptualized by Bystrom, Barfield, and Hendrix (1999) as a function of the immersiveness triggered by the physical characteristics of the technology used to reproduce the virtual environment: the higher the technology's ability to stimulate individuals' immersion in the virtual environment, the higher the sense of presence.



In this vein, VR has been defined as the provision of “*synthetic sensory information that leads to perceptions of environments and their contents as if they were not synthetic*” (Blascovich et al., 2002, p. 105). VR allows users to be immersed in a 3D environment that reflects cues present in the real environment (Papagiannidis, Pantano, See-To, Dennis, & Bourlakis, 2017), while eschewing the overwhelming and uncontrollable number of features that characterize the physical world (Carù & Cova, 2006; Shin, 2018). Scholars have observed this subjectively experienced immersion in different contexts, such as in tourism (where individuals were found to experience high levels of immersion in the VR-reproduced environment; Hudson, Matson-Barkat, Pallamin, & Jegou, 2019; Hyun & O’Keefe, 2012), advertising communication (Van Kerrebroeck, Brengman, & Willelms, 2017b), sports (Kim & Ko, 2019), and even in videogames (Jennett et al., 2008). In general, immersion leads individuals to feel present in a virtual environment and allocate their attention to its objects and events (Schultze & Brooks, 2019; Slater, 1999). Even though prior retailing studies have scarcely documented if and to what extent individuals are able to feel immersed in a VR retail store, previous literature has acknowledged that consumers attend to environmental cues when evaluating a store, believing that these cues offer information about product-related attributes, store experience, and store image (Baker et al., 2002; Bitner, 1992). Accordingly, the store environment may also be an important element in virtual experiences (Vrechopoulos et al., 2004). Indeed, the sense of presence can be triggered by different means that do not imply a technological mediation, such as reading a book, watching a movie or playing a videogame (Coelho, Tichon, Hine, Wallis, & Riva, 2006). While the specific medium may slightly morph the sense of presence, research has found that users’ subjective interpretation of the environment makes the bigger difference (Baños et al., 2004). In this vein, research has shown that VR is a particularly suitable environment for

stimulating presence because it allows users to experience direct responses to their virtual behaviors such as changing position, performing actions, synchronizing audio, and provide haptic information, depending on their location and orientation (Sherman & Craig, 2003).

Drawing on these ideas, we expect that individuals will display higher levels of immersion when exposed to a virtual store environment.

Specifically, we hypothesize the following:

**H1:** VR technology enhances the sense of presence in the store environment.

Beyond the visual cues that underlie a VR setting, the store environment involves other cues that influence consumers' perceived level of presence. As shown by Kotler (1973), the store environment is characterized by different store atmospherics that affect consumers' emotional reactions and shopping behavior (Eroglu, Machleit, & Davis, 2003). Store atmospherics have an impact on the five human senses (sight, sound, smell, touch, and taste) and work jointly to create different ambient conditions (Jalil, Fikry, & Zainuddin, 2016). Those ambient conditions involve features of the store environment, such as temperature, lighting, noise, music, and smell (Bitner, 1992; Jalil et al., 2016). In particular, store auditory stimuli have been found to exert an impact on consumers' in-store behaviors (Mattila & Wirtz, 2001), as such stimuli can enhance people's cognitive processing of the elements that comprise the store environment (Michon, Chebat, & Turley, 2005). Accordingly, we hypothesize that:

**H2:** Auditory stimuli increase the sense of presence in the store environment.

In this regard, prior research has found that the presence and quality of the VR sound system can help individuals feel more immersed in the virtual environment (Gutierrez, Vexo, & Thalmann, 2008). This finding is consistent with previous literature documenting that the various cues comprising the retail store's multi-sensory environment can be positively combined to achieve an optimal level of stimulation (Spence, Puccinelli, Grewal, & Roggeveen, 2014), so long as they are congruent with each other (Helmefalk, & Hulten, 2017). The extant literature has not clearly addressed whether individuals perceive auditory stimuli as more congruent with the visual information in a virtual versus physical store environment. However, given that previous studies found that a combination of high-quality video and audio stimuli maximizes the sense of presence in a VR environment (Wei, Qi, & Zhang 2019), we advance that:

**H3:** Store environment and auditory stimuli will significantly interact, so that individuals' sense of presence will be maximized within a virtual store environment with auditory stimuli.

## *2.2. Presence and in-store shopping experience*

Previous studies have defined experience as an individual response triggered by specific stimuli (Poulsson & Kale, 2004; Schmitt, 1999). In this vein, experience does not describe an affective or emotional state, but rather the evaluations that arise in the presence of a given stimulus (Brakus, Schmitt, & Zarantonello, 2009). In the domain of retail marketing, customer experience has been consistently addressed as a "customer's cognitive, emotional, behavioral, sensorial, and social responses to a firm's offerings during the customer's entire purchase journey" (Lemon & Verhoef, 2016, p. 71). In other words, the concept of customer experience can be conceived as an interaction between the consumer and the experience provider (i.e., the retailer) that encompasses all phases of said customer's decision process (Verhoef et al., 2009).

In this sense, customers play an active role in co-producing the experience through their interactions with retailers (Prahalad & Ramaswamy, 2004). When dealing specifically with the digital store environment, the literature has underscored that high levels of interactivity have a relevant effect on the customer experience (Kim, Fiore, & Lee, 2007). Indeed, the interactivity that characterizes the digital environment make consumers act as if they were in the physical environment (Fortin & Dholakia, 2005). In this regard, customers' sense of presence in the environment evokes cognitive and sensory immersion that deepens the experience (Mollen & Wilson, 2010). VR technology stimulates a similar sense of presence by engaging the human senses (Biocca, 1992; Walsh & Pawlowski, 2002; Van Kerrebroeck et al., 2017a). In this vein, recent VR-related research has suggested a dual path of consumers' involvement with a brand, which is closely related to the sense of presence within a virtual environment (Cowan & Ketron, 2019). This aligns with previous literature, which has documented that VR enhances people's immersiveness in the store environment (Shin, 2018, 2019), and ultimately the overall shopping experience (Lee & Chung, 2008; Kwon, Kim, Kim, Hong, & Kim, 2015), by providing a holistic response to the inherent stimuli (Morgan-Thomas & Velotsou, 2013).

Accordingly, we hypothesize the following:

**H4:** Presence enhances the level of involvement with the shopping experience.

### *2.3. Shopping experience and change in perceived value*

Previous literature defined perceived value as “*the shoppers' assessment of the overall utility of an exchange with a retailer based on perceptions of what is received and given*” (Inman & Nikolova, 2017, p. 15). Within this definition, the literature has included all the monetary and non-monetary (Alavi, Wieseke, & Guba, 2016) and tangible and intangible (Baker, 2006)

benefits that the shopping experience can convey to consumers (Dodds, Monroe, & Grewal, 1991). Accordingly, consumers can internally elaborate the external signals deriving from a shopping experience into value perceptions (Chen & Dubinsky, 2003). In this vein, scholars have found that evaluations of the store environment impact customers' value perceptions of the retailer (El-Adly & Eid, 2016). Therefore, one can argue that consumers will exhibit changes in their value perceptions about a given retailer depending on their assessment of the shopping environment, and by extension, the shopping experience. Specifically, we hypothesize as follows:

**H5:** The shopping experience positively affects changes in consumers' value perceptions toward the retailer.

While store experience refers to a mental representation of a store's associated dimensions (assortment, value for money, service quality, etc.), value perceptions specifically involve the direct relationship between the consumer and the retailer (D'Astous & Levesque, 2003; Marcus, 1972). In this regard, Poulsson and Kale (2004) showed that consumers will incorporate an experience into their more general evaluation if it stimulates associations that are available to consumers at a conscious level (Gentile, Spiller, & Noci, 2007). Furthermore, the extent to which consumers are able to consciously recall the brand responsible for the experience positively affects the strength of the associations toward the brand itself (Klein, 2003). Since the image spillover from the store experience to value perceptions should require that individuals are aware of the responsible brand (Collins-Dodd & Lindley, 2003), we further hypothesize:

**H5a:** Store brand recall moderates the shopping experience–change in value perceptions relationship.

#### *2.4. Value perceptions and behavioral intentions*

The retailing literature has widely documented that perceived value is a fundamental antecedent of behavioral intentions (Turel, Serenko, & Bontis, 2007). For instance, Poncin and Mimoun (2014) stated that patronage intention can be expressed as a function of consumers' value perceptions toward the retailer. Analogously, Cronin, Brady, and Hult (2000) found that higher levels of perceived value yield greater intentions to patronize a store and spread positive word-of-mouth about the retailer. In relation to virtual environments, previous studies have found that value perceptions have a positive impact on simulated retail experiences and purchase intentions (e.g., with a virtual car driving experience, as in Papagiannidis, See-To, & Bourlakis, 2014). That is to say, perceived value can act as a mediator of the relationship between the shopping experience and customers' behavioral intentions (Babin & Attaway, 2000; Sirohi, McLaughlin, & Wittink, 1998), including patronage intentions and word-of-mouth (El-Adly & Eid, 2016).

In line with this, we propose the following:

**H6:** Consumers displaying a positive change in their value perceptions toward the retailer are more likely to spread positive word-of-mouth about the retailer;

**H7:** Consumers displaying a positive change in their value perceptions toward the retailer are more likely to patronize the retailer.

#### *2.6. Store environment and patronage intention*

Retail patronage has been deeply investigated in the extant literature. Converting customers into "patrons" by fostering a strong relationship with them is a key challenge for retailers seeking

to increase their competitiveness and sales (Hogreve, Iseke, Derfuss, & Eller, 2017). Many studies have found that physical store atmosphere has a positive influence on consumers' patronage intention (Baker, Levy, & Grewal, 1992; Grewal, Baker, Levy, & Voss, 2003; Hul, Dube, & Chebat, 1997; Van Kenhove & Desrumaux, 1997), and recently Blut, Teller, and Floh (2018) showed that the same may be true in the digital context. Accordingly, we expect the same to hold true in a virtual store:

**H8:** The virtual store environment enhances patronage intention.

The theoretical model is summarized in Figure 1.

FIGURE 1 ABOUT HERE

### **3. Main Study**

The purpose of this empirical study is twofold: First, we want to observe whether higher or lower levels of inattention blindness emerge for consumers who are exposed to the virtual versus physical store environment (RQ1). Second, we investigate whether being exposed to a virtual or physical retail store environment sequentially affects individuals' perceptions of social presence, shopping experience, change in value perceptions, WOM referral intention, and patronage intention; and whether the lack of conscious recognition of the retail store brand significantly moderates this set of relationships (RQ2).

#### *3.1. Experimental Design and Materials*

In order to accomplish the above goals, we developed an experimental study by manipulating the store environment (physical vs. virtual reality) and the presence of auditory sensory stimuli (absent vs. present), which resulted in a  $2 \times 2$  between-subjects experimental design. Two-

hundred respondents were recruited (57% females; mean age = 30.87 years) from Prolific in exchange for a small payment. They were asked to participate in a Qualtrics-implemented survey and randomly assigned to one of the four experimental conditions, thus yielding a cell size of 50 respondents per experimental condition. Participants were selected and screened on Prolific under the conditions that they were from the same European country as the brands and store featured in the experiment, as well as responsible for grocery shopping (at least once per week).

After reading a brief introductory section explaining the tasks required in the study, participants were asked to view a video featuring the store experience. We abstained from traditional experimental approaches (such as exposing participants to a virtual store through wearing headsets or having them shop in a physical store) because of the difficulty of controlling all the noise present in a “real” store environment (e.g., crowding, background music). In order to sidestep these confounds and protect internal validity, we opted for the theater methodology, which consists of presenting stimuli through a videotaped screenplay in order to “increase the level of experimental control while providing an environment similar to the actual setting” (Russel, 2002, p. 309). Previous literature has employed the same manipulation procedure to study, for instance, how consumers react to brands in advertising (Goldfarb & Tucker, 2011) or product placement (Ferguson & Burkhalter, 2015; Marchand, Hennig-Thurau, & Best, 2015; Van Vaerenbergh, 2017). Scholars have found that theater methodology can reduce noise in the data and increase experimental control (Balasubramanian, Karrh, & Patwardhan, 2006).

Accordingly, we manipulated the store environment by presenting participants with a short video (40 seconds) featuring an experience in a real versus VR-based store from a leading European grocery chain. The videos presented a first-person experience in some areas of the grocery store, so that both store-environment conditions displayed the same situation from the



same visual perspective. The only difference was that in the VR environment, some virtual tags appeared on the products specially highlighted for the customer, whereas in the physical store, this functionality was not available and only the printed shelf labels were displayed.

Furthermore, to prevent potential confounds, the videos were created by reconstructing by means of VR the same store used for recording the experience in the physical store, and the actions (e.g. choosing pasta) and products displayed were the same across the two experimental conditions. In addition, the videos serving as experimental stimuli varied in the presence versus absence of auditory stimuli. We manipulated the presence/absence of auditory stimuli by keeping on or turning off all video sounds, which included background noises and the voice of the customer acting in the video, listing what s/he needed to buy and asking her-/himself about the products to choose in front of the shelf. It is possible that auditory stimuli in VR might enhance the sense of presence (due to a higher sense of perceived realism) or diminish it (e.g., due to the voice of the customer activating the virtual tags through her/his queries). In any case, participants were instructed to pay attention to the video and imagine that they were the person engaging in the shopping experience. After watching the video, participants were asked to complete a questionnaire aimed at measuring the dependent constructs and moderators of the study, as detailed in the following section.

### *3.2. Measures*

Before viewing the video, participants were asked to assess their reliability perception of the retailer under investigation by means of an adapted version of the scale developed by Ou, Abratt, and Dion (2006). As a manipulation check, participants were asked whether the store environment they were exposed to was real or virtual. As a further attention check, they were

also asked to perform a recognition task of some brands appearing on the store shelves featured in the video. To this end, they answered a multiple choice question that offered brands that did and did not appear in the video. For the analysis, we removed those participants who did not pass the attention check, i.e., they selected brands that were not displayed or did not select brands that were displayed. Then, respondents completed a set of scales that measured our key constructs: Presence (Mania, & Chalmers, 2001), Shopping Experience (Bustamante & Rubio, 2017), Change in Value Perception (Inman & Nikolova, 2017), Store Patronage and WOM referral intention (Maxham & Netemeyer, 2003). Then, we measured respondents' perceptions of technological self-efficacy, which the extant literature has identified as a possible control variable (McDonald & Siegall, 1992). Furthermore, we measured individuals' aided recall of the store brand, which appeared several times during the video on both shelf labels and store signage, as a possible measure of Inattentional Blindness. Finally, participants were tested for suspicion, thanked and de-briefed.

### *3.3. Reliability and validity*

Factor analysis confirmed the factorial structure of the original scales. The reliability for all scales was satisfactory, with Cronbach's alpha ranging between .81 (Technological Self-Efficacy) and .95 (Shopping Experience). A confirmatory factor analysis provided support for the measures' convergent validity, with all factor loadings exceeding the recommended 0.6 threshold (Bagozzi & Yi, 1988), while the composite reliability (CR) and the average variance extracted (AVE) were greater than the recommended 0.7 and 0.5 thresholds, respectively (Fornell & Larcker, 1981). Accordingly, we averaged the items from the aforementioned scales

to define the factors for the subsequent analyses. Table 1 below reports the scale items, Cronbach's alpha, CR and AVE values.

TABLE 1 ABOUT HERE

#### 4. Results

First, as a manipulation check, we compared the proportion of participants who correctly identified whether the store environment they were exposed to was real or virtual across the four experimental conditions. We found that the proportion of individuals correctly identifying the store environment did not change as a function of the experimental condition ( $\chi^2(3) = 3.28$ ;  $p = .35$ ), and was overall very high (96%).

Then, we compared whether significant differences emerged between the four conditions regarding their impact on the set of investigated dependent variables. The results of Multivariate Analysis of Variance showed a significant multivariate effect of store environment (Wilks  $\lambda = .83$ ,  $F = 7.83$ ,  $df = 5$ ;  $192$ ,  $p < .001$ ,  $\eta^2 = .17$ ) and a marginally significant multivariate effect of auditory stimuli (Wilks  $\lambda = .95$ ,  $F = 1.89$ ,  $df = 5$ ;  $192$ ,  $p = .09$ ,  $\eta^2 = .05$ ). Univariate tests following the MANOVA showed a significant main effect of store environment on presence, customer experience, change in perceived value, willingness to patronize the store, and word-of-mouth referral intention. Specifically, the VR store environment enhanced the sense of presence ( $M_{Store} = 4.58$  vs.  $M_{Vr} = 5.14$ ;  $F = 14.08$ ,  $df = 1$ ;  $199$ ,  $p < .001$ ,  $\eta^2 = .07$ ), improved the customer experience ( $M_{Store} = 3.68$  vs.  $M_{Vr} = 4.52$ ;  $F = 25.29$ ,  $df = 1$ ;  $199$ ,  $p < .001$ ,  $\eta^2 = .11$ ), positively changed value perceptions ( $M_{Store} = 4.53$  vs.  $M_{Vr} = 4.99$ ;  $F = 10.77$ ,  $df = 1$ ;  $199$ ,  $p = .001$ ,  $\eta^2 = .05$ ), and enhanced both individuals' intention to patronize the store ( $M_{Store} = 4.58$  vs.  $M_{Vr} =$

5.19;  $F = 19.50$ ,  $df = 1$ ; 199,  $p < .001$ ,  $\eta^2 = .09$ ) and spread positive word-of-mouth about the retailer ( $M_{Store} = 4.48$  vs.  $M_{Vr} = 5.22$ ;  $F = 24.29$ ,  $df = 1$ ; 199,  $p < .001$ ,  $\eta^2 = .11$ ).

We predicted that the effect of store environment on individual attitudes and intentions toward the store brand would be serially mediated by perceptions of presence, the shopping experience, and the changes in value perceptions. Accordingly, we conducted a sequential mediation analysis with three mediators, using the PROCESS macro for SPSS (Model 6; see Hayes, 2018) to evaluate the causal sequence: store environment  $\rightarrow$  presence  $\rightarrow$  shopping experience  $\rightarrow$  change in value perception  $\rightarrow$  store patronage intention and WOM referral intention, yielding a full mediation. Technological self-efficacy was added as a covariate in the model to control for the effect of individuals' perceptions about their ability to deal with innovative technologies on their perceptions about the store experience.

Supporting our predictions, the indirect pathway from store environment and auditory stimuli to patronage intention through presence, shopping experience, and change in perceived value was significant, and the 95% confidence interval (CI) did not include zero (indirect effect for those who did not recognize the brand = .11, 95% CI: .04 to .21; indirect effect for those who recognized the brand = .09, 95% CI: .02 to .18). More specifically, the store environment was found to exert a significant and positive impact on presence ( $\beta = .80$ ;  $t = 4.13$ ;  $p < .001$ ; 95% CI: .42 to 1.19), supporting H1. This finding suggests that a VR-based store environment can trigger higher levels of presence perceptions than a "traditional" physical store environment. Consistent with H2, presence was also affected by auditory stimuli ( $\beta = .41$ ;  $t = 1.98$ ;  $p < .05$ ; 95% CI: .01 to .82); contrary to H3, no interaction emerged between store environment and auditory stimuli ( $\beta = -.48$ ;  $t = -1.68$ ;  $p = .09$ ; 95% CI: -1.04 to .08). Presence, in turn, was found to positively affect participants' shopping experience ( $\beta = .60$ ;  $t = 8.69$ ;  $p < .001$ ; 95% CI: .47 to .74),

supporting H4. In other words, individuals became more involved in the shopping experience as the sense of presence and vividness increased. The results from the moderated mediation model further suggest that the shopping experience significantly determines the changes in perceived value with respect to the store ( $\beta = .61$ ;  $t = 12.22$ ;  $p < .001$ ; 95% CI: .51 to .71), thereby supporting H5. The results also underscore participants' inattentive blindness: 82% of them were unable to correctly recall the brand name of the store depicted in the video. However, in contradiction to H5a, we did not find that the ability to correctly recall the store brand had a moderating effect on the relationship between shopping experience and change in perceived value ( $\beta = -.15$ ;  $t = -1.51$ ;  $p = .13$ ; CI:  $-.35$  to  $.05$ ;  $R^2$  change =  $.006$ ;  $F(1;187) = 2.30$ ;  $p = .13$ ).

Meanwhile, change in perceived value ultimately affected both WOM referral intention ( $\beta = .80$ ;  $t = 16.46$ ;  $p < .001$ ; 95% CI:  $.71$  to  $.90$ ) and patronage intention ( $\beta = .37$ ;  $t = 5.52$ ;  $p < .001$ ; 95% CI:  $.24$  to  $.50$ ), thus supporting H6 and H7, respectively.

The absence of any significant direct effect on patronage intention, from either store environment ( $\beta = .18$ ;  $t = 1.59$ ;  $p = .11$ ; 95% CI:  $-.04$  to  $.41$ ) or auditory stimuli ( $\beta = .09$ ;  $t = .76$ ;  $p = .45$ ; CI:  $-.14$  to  $.32$ ), leads us to reject H8. This finding suggests there is a full mediation path from store environment to patronage intention based on the hypothesized causal sequence between store environment and patronage intention.

Figure 2 presents the path coefficients for the aforementioned mediation model.

#### FIGURE 2 ABOUT HERE

Interestingly, technological self-efficacy was found to exert no effect on presence nor on any of the other model variables, thus ruling out the possibility that participants displayed different reactions to the depicted shopping experience because of their self-rated ability with technology.

Finally, in order to rule out the possibility that inattentive blindness was affected by the experimental condition participants were exposed to, we examined whether participants differed in their brand recall across the experimental conditions. We found that the proportion of individuals correctly recalling the store brand did not differ between the VR (20%) and the physical store condition (16%,  $\chi^2(1) = .39; p = .58$ ). Similarly, the presence of auditory stimuli ( $\chi^2(1) = .05; p = .85$ ) did not seem to generate differences in the ability to recall the brand. This finding suggests that inattentive blindness toward the store brand is equally likely in a virtual and physical store environment, and in the presence or absence of auditory stimuli. In short, we can rule out the possibility that participants' inattentive blindness can be ascribed to the experimental condition.

## **6. General Discussion**

This research sought to address two basic research questions: Do consumers exhibit higher or lower levels of store brand recognition in the physical versus virtual store environment (RQ1)? And how does the image transfer unfold from the store environment to consumers' perceptions and intentions toward the retailer's brand through consumers' sense of presence in the store environment and the shopping experience (RQ2)?

With regard to the former question, the present research found evidence that inattentive blindness exists in virtual environments. This evidence aligns with previous findings in other disciplines that observed lower learning performance from immersive virtual environments (Makransky, Terkildsen, & Mayer, 2017). Notably, individuals' ability to correctly recall the brand name of a store was not found to moderate the relationship between store experience and the change in value perception. That is to say, individuals transfer their perceptions from the virtual environment to the brand at both a conscious and an unconscious level.

With regard to the second question, the results show that individuals exposed to a VR-based retail environment perceived higher levels of presence than those exposed to a physical store environment, regardless of their technological self-efficacy perceptions. In other words, feeling embedded in the virtual store environment does not depend on the extent to which individuals self-rate their ability with the specific technology. This result partially diverges from what Pellas (2014) found in an educational context, where self-efficacy positively affected participants' engagement in a computer-assisted task. The underlying reason might be that the effect of technological self-efficacy depends on the target population and, especially, the technology under examination (Holden & Rada, 2011). The results from our study reveal that higher feelings of presence in the virtual environment determine higher levels of shopping experience, which then encourage a positive change in people's value perceptions toward the retailer. Noticeably, despite the levels of inattention blindness that characterize the virtual environment, the relationship between the shopping experience and the change in value perception still held for those participants who could not correctly recall the retailer's brand name. This finding suggests that the image transfer from the virtual environment to more general brand attitudes follows both a conscious and an unconscious route. The shopping experience is paramount because it positively affects changes in value perception, which ultimately influence individuals' intentions to patronize the retailer and spread positive WOM about the retailer.

On one hand, customers might arguably develop more positive value perceptions toward a retailer as a direct response to the retailer's adoption of innovative technologies that enhance both the utilitarian and hedonic aspects of the shopping experience (Burke, 2002; Inman & Nikolova, 2017; Pantano & Viassone, 2015; Sethuraman & Parasuraman, 2005). On the other hand, immersive technology might lead customers to focus on the experience itself (Jeandrain,

2001; Suh & Prophet, 2018) and thereby discard retailer-related information as a form of inattentive blindness (Simons & Chabris, 1999). To address this potential contradiction, the present research found that immersive digital technologies do not exert a direct impact on consumers' perceptions of and intentions toward the retailer. Rather, we hypothesized that the relationship between technology and store value perceptions unfolds through a set of causal relationships sequentially mediated by presence, shopping experience, and change in value perceptions.

The present study built on two streams of research that have scarcely cross-fertilized so far: Studies in the domain of VR and its impact on individuals' perceptions, and studies in the domain of retail branding that focus on the antecedents and consequences of retail brand image. Among the former, studies have highlighted the positive relationship between immersiveness and the sense of presence in virtual environments (Baños et al. , 2004; Cummings & Bailenson, 2016; Lee & Chung, 2008), as well as the relationship's impact on individuals' reactions (Peperkorn, Diemer, & Mühlberger, 2015). The latter stream has instead focused on how the various features of the retail environment contribute to the development of a distinctive store image (Collins-Dodd & Lindley, 2003), which ultimately stimulates customer patronage intention (Sirgy, Grewal, & Mangleburg, 2000). Although the literature does not deny that virtual retail stores can extend their sense of presence and immersiveness beyond the virtual environment (van Herpen, van den Broek, van Trijp, & Yu, 2016), our study is, to the best of our knowledge, the first investigation into whether and how retailers can attract and retain customers through innovative immersive channels such as VR. In this regard, our research contributes to scholarly knowledge by showing that the value perceptions developed in immersive



environments such as VR are not relegated to said environments; rather, there is spillover from the virtual environment to individuals' general attitudes and intentions toward a retail brand.

Thus, this paper contributes to the extant literature by showing that virtual environments are subject to inattention blindness in a way that parallels traditional offline channels. At the same time, we showed that even when customers do not consciously retain knowledge of the retail brand operating the virtual store, the sense of presence and involvement in the virtual environment still leads to higher levels of value perceptions and patronage intention.

Finally, this research contributes to the literature on human–computer interaction by showing that the level of presence and involvement that individuals experience within a virtual environment can affect their general attitudes toward the store being virtually interacted with. The path we uncovered—from virtual interactions to real perceptions—is consistent with previous studies that found an analogous transfer of perceptions from advertisements seen in VR toward the advertised brand (Van Kerrebroeck et al., 2017b). In this regard, our results extend previous knowledge by showing that individuals extract value perceptions not only from the objects they directly interact with (or are explicitly exposed to) in the virtual environment, but also from the background, and even at an unconscious level.

From a managerial standpoint, our results should encourage retailers to provide customers with immersive virtual channels such as VR, since the higher sense of presence experienced by customers in virtual store environments positively affects their value perceptions toward the retailer's brand, as well as their intention to patronize and spread positive WOM about the retailer. Our findings show that the VR store environment, especially when combined with multi-sensorial elements such as auditory stimuli, can facilitate a rewarding shopping experience for customers. This finding might be relevant both for physical stores providing in-store VR

solutions and for v-commerce retailers that want to generate a shopping experience in the absence of a physical store. Interestingly, our study might be encouraging for omni-channel retailers that provide VR solutions as part of the set of touchpoints that constitute the customer journey: Indeed, our results suggest that the VR shopping experience spills over the boundaries of the virtual environment and produces a positive change in consumers' general attitudes toward the retailer, ultimately leading to higher intentions to patronize the retailer brand across the different channels and spread positive word-of-mouth about the retailer.

A word of caution is needed about the relatively low levels of brand recall that emerged in the present study: On one hand, the provided evidence may reassure retailers that even those customers who leave the virtual environment unaware of the retail brand operating the store display higher levels of perceived value and patronage intention. On the other hand, these results could stimulate developers of virtual environments to introduce innovative features that prevent the visual-identity elements of the store brand from falling below the level of individuals' attention. In physical stores, consumers are more likely to use store signage to locate certain product categories, which makes store signage a powerful tool for fostering the retailer's brand identity. In the VR environment, however, consumers might be driven by the virtual shopping assistant (provided by the auditory stimuli in the present research, but which could be extended to avatars and/or anthropomorphic shopping assistants). Accordingly, VR retailers might better exploit the virtual shopping assistant in order to promote awareness of the brand operating the store.

### *6.1. Limitations and future research*

The present research's contribution should be read in light of its limitations, which suggest potential areas of further analysis.

First of all, we purposely manipulated store environment by means of videos in order to maintain strict experimental control over the tasks performed by individuals in the two conditions. With this goal in mind, we employed the theatre methodology (Russell, 2002) in order to create experimental manipulations that were vivid, albeit controllable, which allowed us to isolate the effects of VR on consumers' perceptions and behavioral intentions. That said, future research should consider replicating the study in a natural context. This would provide the advantage of higher ecological validity by observing how individuals react when they are shopping in a physical store versus a VR-based shop (where they engage more actively in the task by wearing a VR headset and using controllers to select products). That said, a field experiment would sacrifice at least partial control over the store experience.

Further, and related to the previous point, we did not find any significant effect for technological self-efficacy. This might be because participants in our study were not actively performing the shopping activity themselves and therefore were not concerned about the actual usability of the tools needed to interact with the virtual store environment. Again, more research is needed to ascertain whether and to what extent actively engaging in a virtual shopping experience enhances the salience of technological usability.

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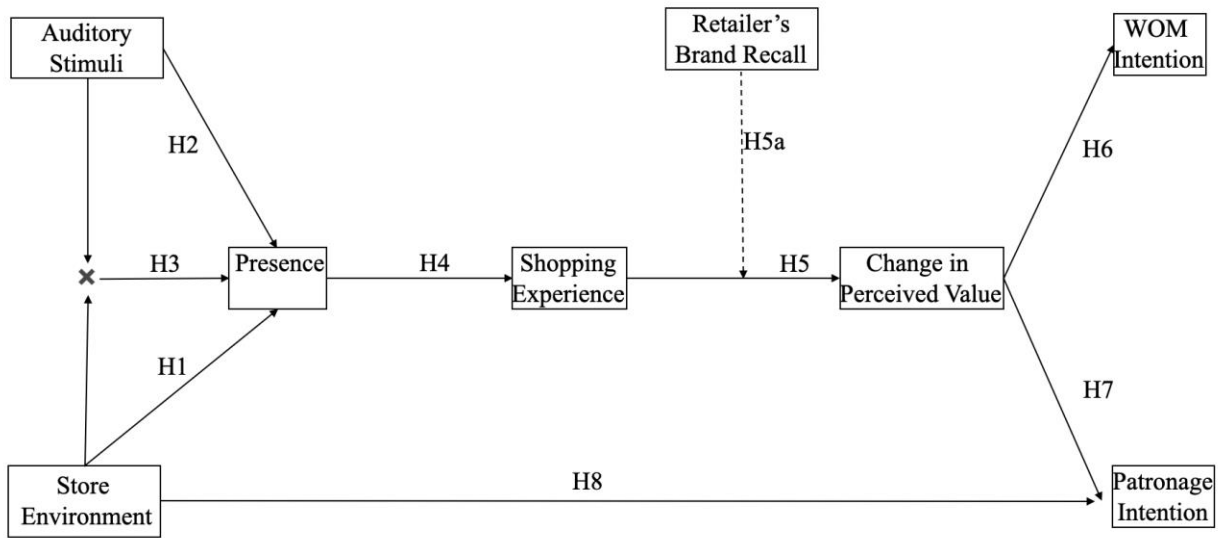
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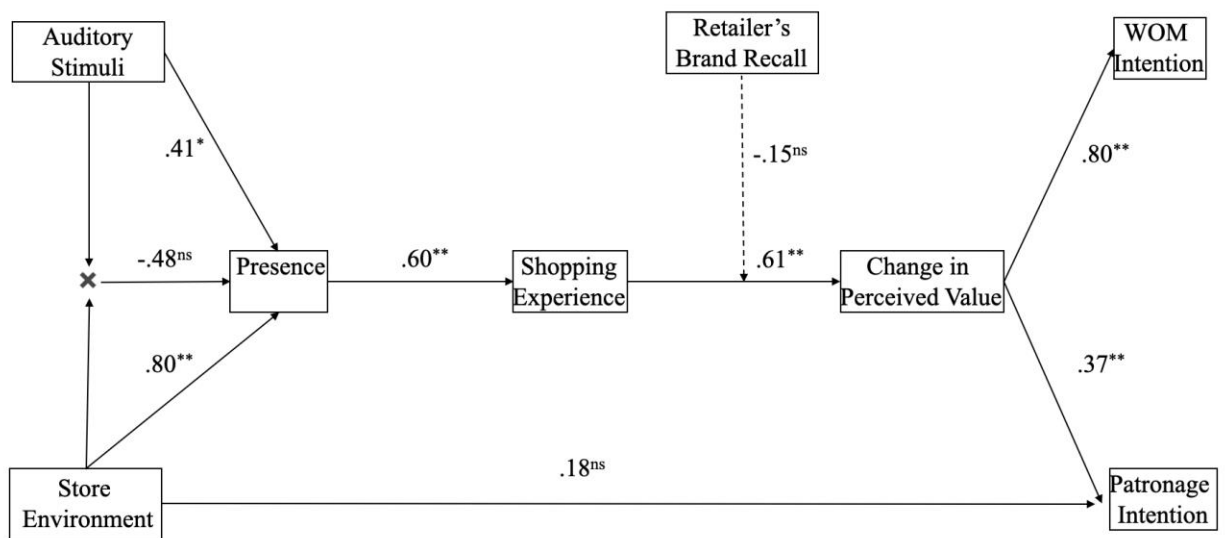
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**Fig. 1.** Theoretical model.



**Fig. 2.** Moderated mediation model in which the effects of store environment and auditory stimuli on patronage intention and WOM referral intention are mediated by presence, shopping experience, and change in perceived value.

**Table 1.**  
Construct Measures

Items	Cronbach alpha	AVE	CR
<b>Presence (adapted from Mania and Chalmers, 2001)</b>	0.84	0.52	0.84
1. Please rate your sense of being in the retail store, where 7 represents your normal experience of being in a place.			
2. To what extent were there times during the experience when the retail store was the reality for you?			
3. When you think back about your experience, do you think of the retailer more as images/sounds that you've seen/heard, or more as somewhere that you visited?			
4. During the time of the experience, which was the strongest on the whole, your sense of being in the store or of being elsewhere?			
5. During the time of the experience, did you often think to yourself that you were actually in the store?			
<b>Attitude toward the retailer (adapted from Ou, Abratt, &amp; Dion, 2006)</b>	0.90	0.58	0.90
1. I admire and respect this retailer			
2. I trust this retailer			
3. This retailer offers high quality products and services			
4. This retailer has a clear vision for its future			
5. This retailer is up-to-date with recent technologies			
<b>Change in retailer's perceived value (from Inman &amp; Nikolova 2017)</b>	-	-	-
1 Compared to what I have to give up, the overall ability of this grocery retailer to satisfy my wants and needs is (1 = Very low; 7 = Very High)			

**Shopping Experience (adapted from Bustamante & Rubio 2016)**

0.95      0.54      0.93

*The environment of this retail store, the display of its products, etc.*

1. Made me think and reflect
2. Awoke my curiosity
3. Brought interesting ideas to my mind
4. Inspired me
5. Made me feel enthusiastic
6. Made me feel thrilled
7. Made me feel surprised
8. Made me feel amazed
9. Made me feel energy
10. Made me feel comfort
11. Made me feel vitality
12. Made me feel well-being

**Word-of-Mouth (adapted from Maxham, & Netemeyer 2003)**

0.91      0.83      0.91

(1 = Much lower than before; 7 = Much higher than before)

1. My willingness to recommend this store to my relatives and friends would be ... as a result of the implementation of this new technology
2. My likelihood of saying good things about this store to my relatives and friends would be... as a result of the implementation of this new technology

<b>Patronage intention (adapted from Maxham, &amp; Netemeyer 2003)</b>	0.88	0.79	0.88
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(1 = Much lower than before; 7 = Much higher than before)

1. My willingness to purchase from this retailer would be ... as a result of the implementation of this new technology
2. My willingness to visit this store in the future would be ... as a result of the implementation of this new technology

<b>Technology Self-Efficacy (adapted from McDonald &amp; Siegall 1992)</b>	0.81	0.62	0.87
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1. When I have to learn a task that is high tech, my first reaction is that I'm sure I can do it
2. In terms of my ability to learn new tasks that are high tech, I would describe myself as one of the best in my work group
3. In the past, I have had a great amount of experience performing high-tech tasks