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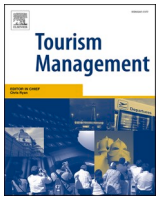

How virtual reality influences travel intentions: The role of mental imagery and happiness forecasting

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ABSTRACT

Virtual reality can influence consumer behavior in powerful ways, but in the domain of tourism marketing, less is known about the psychological process. One possibility is that VR has stronger impact on mental imagery than traditional channels, creating vivid simulations of what it would be like to visit destinations. This process might create hedonic expectations of future happiness, which should increase the willingness to actually seek out the destination in real life. The results from a laboratory experiment provided support to this hypothesis. Participants were randomly assigned to view a nature destination either in traditional still images or virtual reality, and then reported their initial responses before making an actual consumer choice. VR exposure led to higher levels of mental imagery and happiness predictions, which in turn was associated with stronger travel intentions and purchasing decisions. However, VR effects on consumer choice were moderated by previous experience with the destination.

1. Introduction

Recent advances in virtual reality (VR) have made it a widespread and apparently impactful marketing tool for the tourism industry. Destinations, attractions, hotels, and tour operators can use VR to offer low-cost immersive experiences, even in the privacy of one's own home. The unique VR factors of vividness and interactivity provide new ways of engaging and persuading consumers (Nah, Eschenbrenner, & DeWester, 2011). The technology, which lets consumers become fully immersed in a virtual world by blocking out sensory impressions from the physical world (Fox, Arena, & Bailenson, 2009), can evoke both emotional and physical reactions in the person (see, for instance Macedonio, Parsons, Digiuseppe, Weiderhold, & Rizzo, 2007; Riva et al., 2007).

In tourism, VR can be used to enhance one's perception of destinations, such as theme parks (Wei, Qi, & Zhang, 2019), museums (Jung, Tom Dieck, Lee, & Chung, 2016), cultural heritage centers, and art galleries (Jung et al., 2016; tom Dieck & Jung, 2017). Accordingly, there is great interest in using VR as a pre-experience destination marketing tool. Recent research in tourism has advanced our understanding of how stimulation of mental imagery via VR can increase the tourism brand experience (Bogicevic, Seo, Kandampully, Liu, & Rudd, 2019). In this paper, we argue that a process of mental imagery helps consumers anticipate how visiting a specific destination would make them feel, and how happy they could be if they decide to go. Hence, we posit that mental imagery and happiness forecasting may both be essential factors in determining the effectiveness of destination marketing in virtual reality.

The main purpose of this paper is to extend the emerging literature on VR effects by taking a closer look at the psychological process between VR exposure and actual consumer behavior. In doing so, we will examine whether mental imagery and happiness forecasting are operating as mediating variables, helping to explain *why* VR might have positive effects on the willingness to visit nature destinations in real life. We build on existing work on processing mechanisms involved in VR experiences (e.g., Bogicevic et al., 2019; Nah et al., 2011; Schlosser, Mick, & Deighton, 2003; Tussyadiah, Wang, Jung, & tom Dieck, 2018) and the impact of affective forecasting on consumer choice (e.g., Ebert, Gilbert, & Wilson, 2009; MacInnis et al., 2006; Shiv & Huber, 2000), and propose a sequential processing model for the effects of VR on consumer behavioral intention and purchasing behavior.

Although recent research reveals important insights into the relationship between VR and consumer behavior, there are at least three important gaps in the literature. First, recent reviews on VR research in tourism (Beck, Rainoldi, & Egger, 2019; Zeng, Cao, Lin, & Xiao, 2020)

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reveal there has been quite limited exploration of the role of mental imagery as a processing mechanism explaining VR-related outcomes. Second, studies on VR effects on emotions have been limited mainly to evaluations of the VR experience during the time of exposure (i.e., what the consumers *feel* during the VR-exposure) (Kim, Lee, & Jung, 2020), and not on affective forecasts of VR-featured objects (i.e., how they think they will feel *in the future* when visiting the destination). Perhaps the most interesting potential of VR in tourism is its ability to produce vivid mental images that consumers can use as a basis for happiness forecasts, if they were to visit the destination. Third, research on boundary conditions for the relationship between VR and behavioral outcomes in tourism is limited. There is a good chance that VR will not work equally well for all consumers. Insight into specific individual factors that may moderate the effect of VR on tourists' decision-making is therefore needed both for destination managers and marketers.

To address these knowledge gaps empirically, the current study was designed to test the processing mechanisms accounting for the relationship between a fully-immersive VR-experience and behavioral outcomes, as well as the moderating role of consumers' prior experiences with the travel destination in question.

2. Conceptual development and research hypotheses

We now turn to discuss a series of psychological processing mechanisms that may account for the behavioral effects of engaging consumers in a fully immersive VR platform. Specifically, we propose a serial mediation relationship between VR exposure, telepresence, mental imagery, and predicted happiness. In what follows, we will formulate hypotheses on each of the sequential steps in our suggested process model.

2.1. Engagement in mental imagery

Many studies (e.g., Coyle & Thorson, 2001; Klein, 2003; Suh & Chang, 2006; Tussyadiah et al., 2018) have shown that VR technology creates telepresence, defined as a psychological state of feeling present in a mediated environment (Steuer, 1992). In this study, we argue that the effect that VR has on telepresence stimulates active engagement in mental imagery processing. The concept of mental imagery is defined as "a process […] by which […] sensory information is represented in working memory" (MacInnis & Price, 1987, p. 473). When people imagine something, they develop mental images based on previous experiences and/or available information (Lee & Gretzel, 2012). Studies in tourism marketing have documented the role of mental imagery as a central driver of positive consumer outcomes (Lee & Gretzel, 2012).

Mental imagery relies on image vividness (MacInnis & Price, 1987) and interactivity with objects in the virtual environment (Schlosser et al., 2003). Therefore, with its unique technological properties of vividness and interactivity (Steuer, 1992), VR facilitates the process of mental imagery. When pictures of destinations are presented in VR, rather than in a traditional 2D format, a feeling of being present at the destinations will increase (i.e., telepresence) and envisioning a trip to the destinations will evolve (i.e., mental imagery). This line of reasoning is consistent with Hyun and O'Keefe (2012) who suggest that telepresence acts as a mediator of the effect of online virtual information on mental image formation. However, in their study, mental images were only assessed as evaluative responses to image attributes (e.g., good value for money), not as the process of developing mental images of a destination. The perceived process of image formation as reflected in established conceptualizations of mental imagery was not examined (e.g., Schlosser et al., 2003).

Crucially, telepresence is a psychological state that immediately is induced when entering the virtual world, whereas mental imagery is a form of information processing. Therefore, in contrast to Bogicevic et al. (2019), we argue that telepresence leads to greater engagement in mental imagery, rather than the other way round. Hence, our prediction is that when individuals are immersed in the virtual world and experience telepresence, they are more likely to engage in a process of mental imagery.

Based on the discussions above, we propose the following mediation hypothesis:

H1. VR (vs 2D) has a positive effect on mental imagery, through higher levels of telepresence.

2.2. Predicted happiness

Affective forecasting is the process of making a prediction of the hedonic consequences of a future event, including future happiness (Wilson & Gilbert, 2003), and brings us to the next mediator variable in our model. The concept is widely studied in psychology (for reviews, see Gilbert & Wilson, 2007; Wilson & Gilbert, 2005), but consumer behavior researchers have only recently begun to acknowledge its relevance for consumer-oriented decision-making processes (e.g., Bagozzi, Belanche, Casaló, & Flavián, 2016). Because consumer choice may be influenced by the affect that one expects will arise from the consequences of a particular choice, predicted happiness is likely to be a central driver for choice outcomes (MacInnis, Patrick, & Park, 2006). In VR research, affective responses have typically been measured as experienced enjoyment *during* virtual experiences (e.g., Nah et al., 2011), but no study, to the best of our knowledge, has examined the prediction of future affect in relation to a VR experience. The central question here, is whether people will expect to feel happier during a *future* visit to a nature destination, after getting exposed to a pre-view in VR rather than a traditional 2D format.

For almost all tourism products and services, choices are driven by anticipated future hedonic benefits, such as joy, relaxation, or excitement (MacInnis et al., 2006; Kwon & Lee, 2020). To the extent that vivid representations in VR resemble real-life experiences, consumers can use them to more easily imagine the experience of specific objects or settings as shown in VR, and thus make more intensive predictions of how those objects/settings would make them feel.

Because affective forecasting involves the creation of mental representations, factors that influence this creation process may also affect affective forecasting (MacInnis et al., 2006). Prior research shows that advertising messages can evoke mental imagery, which affects consumers' responses to brands positively (Yoo & Kim, 2014). Although research has uncovered predictive factors of mental imagery, less is known regarding the implications of such predictors for affective forecasting (MacInnis et al., 2006). Because simulation is key to affective forecasting, VR-facilitated mental imagery should increase consumers' ability to make predictions about the hedonic benefits of potential travel options. Accordingly, we expect that VR will have a positive effect on predicted happiness through a process of telepresence and mental imagery (H1). Specifically, this can be formulated as the following sequential mediation hypothesis:

H2. VR (vs. 2D) has a positive effect on predicted happiness through a serial process of higher telepresence and higher mental imagery.

The effect of individuals' predicted emotions on choices is well documented (Gilbert & Wilson, 2007). Accordingly, we expect that increases in predicted happiness engendered by VR will have a positive influence on consumers' behavioral intentions and actual purchases. Given the expected relationship between telepresence and mental imagery (H1), and between mental imagery and affective forecasting (H2), we propose the following sequential mediation path from VR to the dependent variables: VR (vs 2D) → telepresence → mental imagery → predicted happiness → behavior (intentions and actual purchase). Formally, the following hypothesis is formulated:

H3. VR (vs 2D) has a positive effect on a) behavioral intentions and b) purchase decisions through a serial process of higher telepresence, mental imagery, and predicted happiness.

2.3. The moderating role of prior experience with destinations

Research shows that pretravel expectations affect one's decision to travel (Rodríguez del Bosque, San Martín, & Collado, 2006; Wirtz, Kruger, Scollon, & Diener, 2003). In this study, we predict that behavioral effects of VR will be moderated by consumers' prior experience with the travel destination. Consumers with prior experience will probably already have mental images of the destination based on their direct experiences, and presumably be less influenced by VR exposure of well-known sceneries. Because attitudes based on direct experiences are more robust (i.e., held with more confidence) than those formed by indirect experiences, they might also be more resistant to counterarguments (Rajagopal & Montgomery, 2011). Moreover, when experienced consumers process VR content, they might be less focused on destination features because they will be taking into consideration a broader set of experiences (Buehler & McFarland, 2001). Thus, their predictions about affective consequences of future interactions with the focal object may be tempered (Buehler & McFarland, 2001), and VR-induced mental imagery will be contaminated by prior experiences. Therefore, it is likely that, relative to consumers with prior experience, inexperienced consumers will be more strongly influenced by the vividness of VR object representation. Based on this line of arguments, we expect that the ability of VR to boost consumers' intention to visit a destination will be moderated by consumers' prior experience. Formally, we suggest the following hypothesis:

H4. VR (vs. 2D) has a positive effect on a) behavioral intentions and b) purchase decisions, but these effects are stronger for consumers with low levels of direct experiences with the destination.

3. Research methodology

3.1. Sample and materials

E-mail invitations to participate in a survey about travelling experiences in Norway were sent to all students enrolled in a large Norwegian business school. The invitation informed that participants had the opportunity to win one out of two $300 gift certificates. The useable sample of 103 participants[1] (58.3% female; age $M = 22$ years), was randomly assigned to the VR condition (N = 52) or the 2D condition (N = 51).

In the VR condition, participants were exposed to 360-degree images of a travel destination in a head-mounted VR system. A mobile immersive Samsung Gear VR headset that allows one to see vivid 3D images and to navigate by moving his or her head in all directions was used. Each picture depicted a destination (Fjord-scenery) in Western Norway.

Participants in the 2D condition were exposed to the same images on a high-resolution Samsung Galaxy S7 edge smart phone with a 5.5-inch screen, the same model that was used in the VR headset. Participants were shown a series of 2D pictures that had been converted from the VR condition images. The pictorial information was presented as similar as possible across the two platforms, keeping levels of vividness and interactivity, which are the key technological characteristics of VR (Steuer, 1992), as the main variation across the conditions (See appendix for pictures).[2]

[1] In total, 136 students completed the experiment, but due to technical problems during some sessions that may have affected responses, we ended up with a useable sample of 103 participants.

[2] Our experimental set-up rests on the assumption that VR is a more interactive and vivid medium than 2D. Since this difference has been demonstrated in a range of different studies, we did not include a formal manipulation check in the current experiment.

3.2. Procedure

The experiment was conducted in four separate rooms, each lead by research assistants trained for the purpose of this study. The average exposure time, measured in time intervals, was 1.5–2 min. Participants in the VR group spent on average 2–2.5 min looking at the images, whereas the participants in the 2D group spent 1–1.5 min on average. After completing a post-experiment questionnaire, all participants were offered discounted tickets to an organized daytrip ("Norway in a Nutshell") to the destinations displayed during the experiment presentation. Participants were told that they could buy a maximum of two tickets, the purchase was binding with the payment being due in a few days, and they had to make the purchase decision before the session was concluded.

3.3. Pretest: calibrating the price level on tickets

There were several constraints on the purchase decision. First, the decision had to be made immediately after the offer, during the laboratory session. Second, participants could purchase a maximum of two tickets, without conferring with other people. Third, one of the tickets purchased had to be used by the buyer personally (to avoid resale). Given the risk involved in this decision, it was important to offer a considerable discount to avoid a floor effect. To avoid a ceiling effect due to the high value of the offer, a survey pretest was conducted to ensure a suitable price point. A sample of 89 business students were asked to indicate their willingness to purchase tickets at different price levels, given the aforementioned restrictions. Based on those results, tickets were offered at a 66% discount in the main experiment.

3.4. Measures

Behavioral intention was measured with three items reflecting intention to travel to and recommend the destination displayed in the experiment. Items were adopted from Nah et al. (2011) and measured on an 11-point Likert scale (0-10), anchored at "completely disagree/completely agree". Actual *purchase* was coded by the experimenters as "yes" (one or two tickets) or "no".

A three-item, 11-point Likert scale (0-10), anchored at "completely disagree/completely agree" was employed to assess *telepresence*. The items were based on previously established items from the literature (Hyun & O'Keefe, 2012; Nah et al., 2011). Three items (based on Lee, Li, & Edwards, 2012; Schlosser et al., 2003), captured on an 11-point Likert scale (0-10) and anchored at "not at all/to a high degree", were used to measure *mental imagery*. *Predicted happiness* was measured with a single item based on Wilson, Wheatley, Meyers, Gilbert, and Axsom (2000). The item asked participants to imagine a trip to the displayed destination and indicate how happy they think the trip would make them. The scale was anchored at 0 = not happy and 10 = very happy.

The moderator, *level of experience with the destination*, was operationalized by asking participants to indicate the geographical area where they had grown up. During analyses, this variable was categorized into Western Norway (the area displayed) versus other parts of Norway. The scenery of (coastal) Western Norway is unique owing to Fjords not found in Eastern Norway. Those who grew up in Western Norway were thus identified as individuals with 'high prior direct experience'; the remaining participants were designated as having 'low prior direct experience'.

As control variables, participants in the VR condition were asked to indicate their previous experience with and knowledge about VR technology. First, participants answered "yes", "no", or "I don't know" to the following question: "Have you used/tried VR googles before"? Then, they rated how much knowledge they had about VR before this experiment on an 11-point scale, anchored at "no knowledge"/"a lot of knowledge". To control for potential unpleasant physiological reactions to VR headset use, referred to as cybersickness or simulator sickness (Fox

et al., 2009), participants were asked to indicate the extent to which they felt nauseous, uncomfortable, and dizzy during VR exposure in three respective items with an 11-point Likert response scale, anchored at "not at all"/"to a very high degree".

We included perceived image quality as a control variable, and participants in both experimental groups were asked to indicate their subjective evaluation of the quality of the images on an 11-point Likert scale anchored at "very poor quality"/"very good quality". Gender and age were included as demographic controls. Scale items and Cronbach's alpha values can be found in the appendix.

4. Results

4.1. Sample descriptive statistics and control variables

Participants' birth municipalities were coded into five geographical areas, with 35% reporting having grown up in Western Norway, the area displayed in the experimental material. Thus, 35% of the sample was coded as 'high experience participants' and 65% was coded as 'low experience participants'. This dichotomy is used as the moderator to test H4 below.

Most (75%) of the participants reported having no experience with VR, and the average score on VR technology knowledge was below the 11-point scale average (M = 4.17). Participants reported experiencing very little physiological discomfort during the experiment. Perceived image quality scores across the two conditions show that the VR pictures were perceived as having lower quality (M = 6.46, SD = 1.97) than the 2D pictures (M = 9.63, SD = 1.65; $p < .0001$).

4.2. Hypothesis testing

Prior to the mediation analyses, we examined the simple main effects on our three process variables using independent t-tests. Compared to the 2D control condition, VR exposure led to a stronger sense of telepresence (M = 6.97, SD = 2.27 vs. M = 4.73, SD = 1.88, t(101) = 5.45, $p < .001$, $d = 1.07$), stronger engagement in mental imagery processing (M = 8.76, SD = 1.52 vs. M = 7.72, SD = 1.77, (t(101) = 3.21, $p = .002$, $d = 0.63$), and higher predicted happiness from visiting the specific destination in the future (M = 9.37, SD = 1.25 vs. M = 8.73, SD = 1.22, (t(101) = 2.63, $p = .010$, $d = 0.51$). All three effects were highly significant, and the effect sizes were robust, ranging from medium to large (Cohen, 1988, pp. 20–26). Additional analyses reveal that these effects were significant for participants with both high and low prior experience with the destinations in the pictures. Fig. 1 reports mean differences between VR and 2D on all three mediating variables.

Turning to our first prediction (H1), we used Model 4 in PROCESS for SPSS (Hayes, 2018) to test whether the positive effect of VR on mental imagery was mediated by telepresence. The 95% bootstrapped confidence interval showed a significant indirect effect of VR (vs. 2D) on mental imagery through telepresence (β = 0.83; 95%CI = 0.4898, 1.3302), supporting H1.

The second prediction (H2) was that participants in the VR (vs. 2D) condition would score higher on predicted happiness, and that this effect would be mediated through telepresence and mental imagery. PROCESS model 6 was used to test this serial mediation hypothesis. The 95% bootstrapped confidence intervals showed a significant indirect effect of VR (vs. 2D) on predicted happiness through telepresence and subsequent mental imagery (β = 0.18; 95%CI = 0.0652, 0.5689), lending support to H2.

The third prediction was that VR (vs. 2D) would have a positive effect on behavioral intentions and actual purchase decisions through telepresence, mental imagery, and predicted happiness. PROCESS model 6 was used to test this serial mediation hypothesis. Results showed a significant three-way serial mediation through the three mediators for both behavioral intention (β = 0.07; 95%CI = 0.0094, 0.2149) and purchase (β = 0.07; 95%CI = 0.0035, 0.2278), supporting H3a-b. The full serial mediation results are presented in Fig. 2a and b.

H4 predicted that positive main effects of VR on behavioral outcomes would be stronger for consumers with low levels of prior direct experiences with the destination. No total effects of VR (vs. 2D) on the two dependent behavioral variables were found. The two groups did not differ on behavioral intentions ($M_{VR} = 8.43$, SD = 1.92; $M_{2D} = 8.42$, SD = 2.06, $p = .98$) or number of tickets bought (VR: 9.7%, 2D: 8.7%; $X^2 = 0.043$, $p = .84$). However, there was a significant interaction between the experimental condition and participants' prior experience on both dependent variables. Results from PROCESS model 1 revealed significant interactions for both behavioral intentions (β = 2.07, $p = .011$) and purchase (β = 2.63, $p = .048$). The nature of the interactions was in the predicted direction (see Table 1). First, participants with *low* levels of prior experience with the displayed destinations showed a tendency to report *higher* levels of behavioral intentions when they were exposed to pictures in VR (M = 8.9, SD = 1.86) than 2D pictures (M = 8.19, SD = 2.18), although this difference was not statistically significant ($p = .16$). Unexpectedly, participants with *high* levels of prior experience with the destinations reported significantly *lower* levels of behavioral intentions when they were exposed to VR pictures (M = 7.45, SD = 2.15; $p = .025$) than 2D pictures (M = 8.82, SD = 1.32). The same pattern was found for actual purchase behavior. Participants with low experience purchased more tickets in the VR condition than in the 2D condition (25.7% vs 12.5%; $p = .172$), whereas participants with high experience purchased fewer tickets in the VR condition than in the 2D condition (5.9% vs 26.3%; $p = .101$). The opposite patterns for low and high experience participants explain why there are no total effects of VR (vs 2D) on the behavioral outcomes. However, the current sample size provided rather low statistical power to identify interaction effects in moderation analyses. We therefore encourage future studies to recruit a much larger sample to enable a more robust test of our fourth and final hypothesis, concerning an interaction between prior experience with the

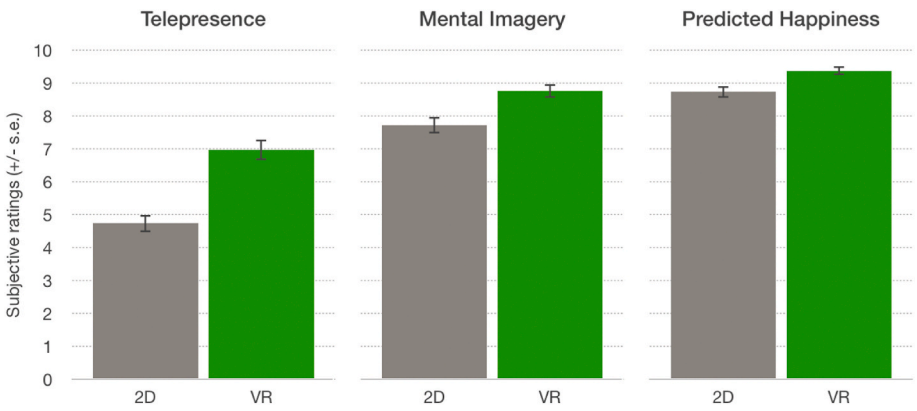
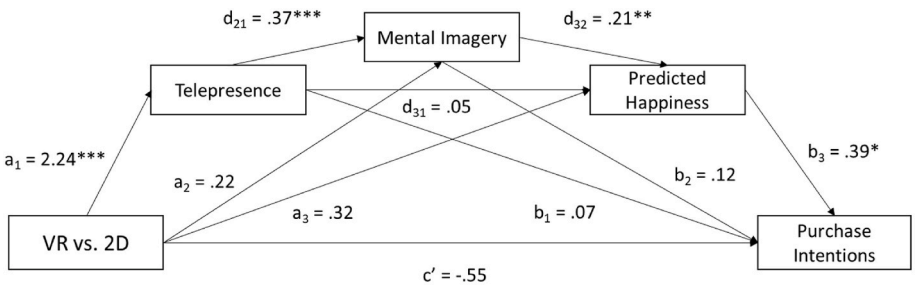


Fig. 1. Participants ($N = 103$) were randomly assigned to a virtual reality (VR) or a 2D control condition, and responded to three process variables. Participants who were exposed to VR (vs. 2D) reported significantly higher telepresence ($p < .001$, $d = 1.07$) and mental imagery ($p = .002$, $d = 0.63$), and they predicted higher levels of future happiness from visiting the (identical) nature destination ($p = .010$, $d = 0.51$). Error bars indicate standard error. All three variables were measured on a 0–10 response scale.



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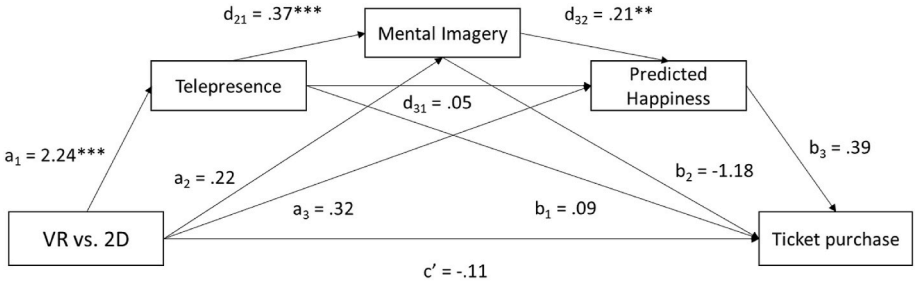


b

Fig. 2. a. Serial multiple mediation model for the effect of VR (coded as 2) vs. 2D (coded as 1) on purchase intentions through telepresence (M1), mental imagery (M2), and predicted happiness (M3). b. Serial multiple mediation model for the effect of VR (coded as 2) vs. 2D (coded as 1) on actual ticket purchase (coded as 1 = no purchase, 2 = purchase) through telepresence (M_1), mental imagery (M_2), and predicted happiness (M_3).

Table 1
Behavioral outcomes of manipulations (VR and 2D) for high and low levels of prior experience with displayed destinations.

	Low level of prior experience with destinations		High level of prior experience with destinations	
	2D (N = 32)	VR (N = 35)	2D (N = 19)	VR (N = 17)
Behavioral intentions	8.19 (2.18)	8.90 (1.86)	8.82 (1.32)	7.45 (2.15)
% Ticket purchase	12.5%	25.7%	26.3%	5.9%

destinations and VR exposure.

The hypothesis testing results are summarized in Table 2. The significance of these results was not altered when running the analyses with control variables and exposure time as covariates.

Table 2
Summary of hypothesis testing results.

Hypothesis	Effect	Sig.	Boot-strapped 95%CI
1: VR → telepresence → MI	.83		(.4898, 1.3302)
2: VR → telepresence → MI → predicted happiness	.18		(.0652, .5689)
3a: VR → telepresence → MI → predicted happiness → behavioral intentions	.07		(.0094, .2149)
3b: VR → telepresence → MI → predicted happiness → purchase	.07		(.0035, .2278)
4a: VR*prior experience → behavioral intention	2.07	.011	
4b: VR*prior experience → purchase	2.63	.048	

Note: Hypotheses tested in PROCESS for SPSS. The tested models were: H1, Model 4; H2-H3, Model 6; and H4, Model 1. VR, virtual reality; MI, mental imagery.

5. Conclusion and implications

The main purpose of this study was to test psychological processing mechanisms that can explain effects of VR (vs. 2D) on consumers' offline behavior. Numerous studies have supported the notion of telepresence being a central mechanism (e.g., Fiore, Kim, & Lee, 2005; Hyun & O'Keefe, 2012). The present study extends this research by documenting the relationship between telepresence and other explanatory mechanisms, thereby providing a more comprehensive understanding of how VR engages consumers and influences their decision-making. The present results support the theoretical proposition that telepresence may be a mediator mechanism that explains VR effects on mental imagery.

Second, this study shows that the ability of VR to engage consumers in affective forecasting is an important explanation for its influence on consumer behavior. The present work demonstrates that VR has a positive effect on happiness predictions, which can be explained by a serial mediation process through telepresence and mental imagery. Schlosser et al. (2003) showed that mental imagery might have a direct effect on purchase intentions. Conversely, upon failing to demonstrate a direct effect of mental imagery on attitudes, but finding a mediating role in perceived diagnosticity of virtual information, Lee et al. (2012) suggest that mental imagery "offers a sensory and emotional surrogate of consumption experience, it stands to reason that [it] may influence attitude strength through affective responses". Our study supports this notion, by showing that mental imagery influences consumer behavior through affective forecasting. However, whereas other VR researchers refer to affective responses as *enjoyment at the time of information processing* (Nah et al., 2011; Lee et al., 2012), our study focuses on *anticipated future affect*. This distinction is particularly relevant for tourism and destination marketing, aimed at selling to consumers a future pleasurable experience. In accordance with prior research on the effects of affective forecasting on consumer choice (MacInnis et al., 2006; Wirtz et al., 2003), we find that predicted happiness from a future choice has an effect on consumer behavior (both intentions and actual purchase).

Finally, the study results suggest that VR effects on behavioral intentions and purchase decisions are contingent on consumers' prior experiences with a destination. Individuals with high levels of prior experience, operationalized as growing up in the advertised region, were not as positively influenced by VR pictures as individuals with low levels of prior experience, and even showed a trend in the opposite direction. This boundary condition is both theoretically and practically intuitive. Having little prior knowledge of the featured object enables novel mental imagery to emerge from VR exposure, which in turn influences consumers' perceptions and affective forecasting. For more experienced individuals, the VR images may have been contrasted with actual experiences with the destinations, being less stimulating. In this way, the attempt to imitate real life experiences in VR may have caused an unintended negative contrast effect for the experienced individuals, whereas the effect was positive for individuals with no previous experience. Our data shows a strong effect of VR on mental imagery, and this effect was not moderated by prior experience with the destinations ($\beta = .34$, $p = .62$). However, exploring the mean scores on mental imagery for the two groups shows that in the 2D-condiction, high-experienced participants scored higher on mental imagery ($M_{high} = 7.84$, $M_{low} = 7.64$). In the VR-condition, low-experienced participants scored higher on mental imagery ($M_{low} = 8.81$, $M_{high} = 8.66$). These differences are not statistically significant, but they might encourage future large-scale studies into how VR may induce different mental processes depending on individuals' prior experience with destinations.

5.1. Practical implications and future research

VR can be applied in a variety of areas in tourism, ranging from on-site entertainment and education to pre-experience marketing communication and destination presentations. The current study investigates VR from the latter angle, namely how VR can be used to engage, persuade, and influence potential consumers to visit destinations.

Previous research has shown that the effect of VR exposure is more profound on consumer-oriented outcomes when used to promote products whose most salient attributes are experiential (Suh & Lee, 2005). We document another important boundary condition for VR effects, namely the level of consumers' prior experience with the focal object (operationalized in this study as having grown up in the advertised region). The practical implication of this finding is rather straightforward: marketers should use such VR destination presentations primarily to inform and persuade consumers with *no or limited* prior experience with the specific destination in question. For more experienced consumers, VR marketing must add value and content that extends beyond their existing knowledge, established memories, and mental images to have a positive effect. For instance, instead of presenting the usual and well-known sights, VR content for more experienced consumers could feature new and novel services, advanced options and trips, "hidden gems" or display the destination from unfamiliar angles, times or contexts (e.g., nighttime, extreme-sport, hiking). Hence, VR marketing of nature destinations needs to be adapted to the consumers' profile, experiences and preferences, and not following the one-size-fits-all approach that currently is the most common. Also, as the results indicate that experienced consumers have *lower* intentions to visit and in fact make fewer ticket purchases when they are exposed to VR (vs. 2D), marketers risk under-estimating the effects of VR if also exposing seasoned visitors to standard destination presentations in VR.

Future research should investigate this further in large-scale experiments, and examine the moderating role of prior experiences across a wide variety of product categories. In our view, mental imagery and affective forecasting effects are likely more pronounced for products whose benefits are primarily hedonic.

More generally, an important contribution of this research is the documentation of psychological process mechanisms underlying how VR affects purchasing behavior. Whereas prior studies have been concerned with immediate emotional responses to the medium itself, we show that predictions about future happiness influence choices in the present. Because tourism services are in essence *future* hedonic experiences that cannot be fully inspected in advance, expectations are important influencers of choice (Wirtz et al., 2003), and anticipation can in itself affect current happiness (Kwon & Lee, 2020). Given the importance of affective forecasting as a driver for consumer choice and decision-making in tourism, it is of managerial interest to uncover factors, such as mental imagery induction (MacInnis et al., 2006), that in turn can generate positive hedonic expectations. Our study shows that the ability of VR to induce mental imagery has a positive effect on predictions of future happiness, which can drive behavior.

Affective forecasting thus represents a promising, yet previously unexplored, theoretical explanation for VR effects. Although emotional and experiential aspects of consumption are relevant for all types of products and services (Brakus, Schmitt, & Zarantonello, 2009), it is likely that the VR effects shown in our research are stronger for products and services that are experiential in nature. This proposition remains a question for future research.

Impact statement

This paper proposes and tests psychological processing mechanisms that explain *how* VR (vs 2D) may influence behavioral outcomes in the tourism industry. It shows that mental imagery and affective forecasting (predicted happiness) are central in predicting behavioral intentions and actual purchase behavior. Mental imagery has only received limited attention as a processing mechanism in existing research on VR in tourism. Affective forecasting is also a novel perspective on VR effects, and has not been studied previously.

The second main contribution of this paper is to highlight prior experience with destinations as a potentially important boundary condition for the effect that VR can have on consumer decisions. Results show that consumers with high levels of previous experience with the destinations actually can have a *negative* effect of VR images compared to 2D images. Therefore, destination managers should take our results into account when choosing target groups for destination marketing through VR.

Declaration of competing interest

None.

APPENDIX

Measurement items

Construct (Cronbach's alpha) *Measurement items*	Source(s)
Behavioral intention ($\alpha = .786$) [Question header:] "*In general, how would you consider going on an organized daytrip from Bergen, which include destinations you saw in the pictures?*"	Nah et al. (2011)

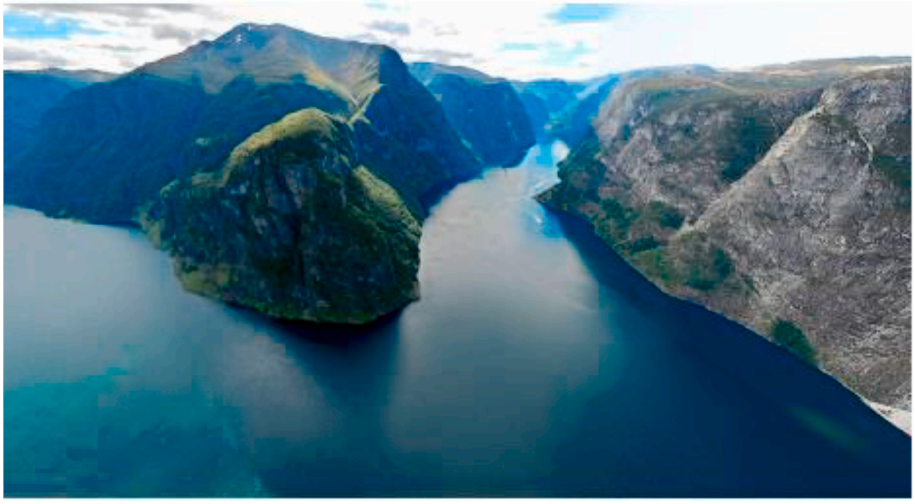
(*continued on next page*)

(*continued*)

Construct (Cronbach's alpha) *Measurement items*	Source(s)
• *I would consider travelling to this type of destination next time I go on a trip* • *I would recommend this type of destination if a friend calls me to get my advice about a travel destination in Norway* • *It is likely that I will travel to this type of* destination *in the future*	
Telepresence (α = .845) [Question header:] "How did you experience looking at the pictures?" • *When I looked at the pictures, it felt as if I was present at the destinations* • *When I was done viewing the pictures, I felt like I was coming back to the real world after a journey* • *When I looked at the pictures, I almost* forgot *where I really was*	Nah et al. (2011); Hyun and O'Keefe (2012)
Mental imagery[a] (α = .804) [Question header:] "How did you experience looking at the pictures?" • *To what extent did the pictures bring to mind mental images of the destinations?* • *To what extent did the pictures contain information that helped you imagine a trip to these destinations?* • *To what extent did the pictures help you* visualize *a trip to these destinations?*	Schlosser et al. (2003); Lee et al. (2012)
Predicted happiness [Question header:] *"Imagine travelling on an organized trip that includes the destinations from the pictures you saw"* • *How happy do you think that this trip* would *have made you?*	Wilson et al. (2000)

[a] Some research (e.g., Sinha and Lu, 2019) refers to "vividness of mental imagery". In our research, we refer to vividness as a property of the VR technology (Steuer, 1992).

Experimental material



Picture of Nærøyfjorden.

Picture of Flåmsbana.

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