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How to strategically choose or combine augmented and virtual reality for improved online experiential retailing

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Abstract

Despite the promise of augmented reality (AR) and virtual reality (VR) to help experiential retailers align online and offline experiences, guidance on choosing or combining these technologies is lacking. In three experiments, we address this research gap by investigating the individual and combined impact of AR and VR on key marketing objectives. First, we establish that AR is more effective in stimulating purchase intentions than VR, due to its ability to support customers in fluent product-focused mental imagery. Second, we demonstrate that VR is better suited for improving brand attitudes than AR, as it helps customers to form fluent context-focused mental imagery. Third, we show that AR and VR, in combination, can improve both purchase intentions and brand attitudes, but only when the order of deployment is sequenced as AR then VR. This is due to greater alignment with the customer’s online-to-offline journey in experiential retail. When deployed the other way around, we observe a detrimental impact on purchase intentions and a potential harmful impact on brand attitudes. Our research offers a nuanced theoretical perspective of AR and VR in marketing and provides experiential retailers with evidence-based guidelines for leveraging AR and VR within their online retailing strategy.

Keywords: experiential retail; augmented reality; virtual reality; mental imagery; online retailing; retail strategy
1. Introduction

Whilst the COVID-19 pandemic accelerated the trend towards shopping online at large, one-stop retailers such as Amazon, Walmart or AliExpress, it disproportionately disrupted experiential retailers including restaurants, cafés, fashion boutiques and many specialty stores (Grewal et al. 2021). These retailers traditionally compete on the basis of rich sensory experiences (Spence et al. 2014), provided through in-store product trial and retailscape ambience (Roggeveen et al. 2020). As a result, many experiential retailers have struggled to retain—or attract new—customers when transitioning online (Kelly 2020), and are amongst those most afflicted economically by the pandemic. For instance, in the UK these retailers account for a major share in the more than 17,000 store closings in 2020, averaging three store closures per day in some categories (PWC 2021). At the same time, despite calls for using technologies such as augmented reality (AR) and virtual reality (VR) to facilitate the transition online (Papagiannis 2020), few experiential retailers have successfully implemented AR and/or VR (Hensel 2020; Jenkins 2019). This is surprising, given that AR and VR promise to improve online experiences and ostensibly support key marketing objectives such as stimulating purchase intentions and building positive brand attitudes. For example, AR offers improved product visualization and comfort with purchase decisions by embedding interactive digital content in a customer’s view of the physical environment (e.g., 3D holograms of food and drinks from a café’s menu; Heller et al. 2019a); and VR immerses the customer into an interactive digital environment (e.g., a 360° tour of a café’s interior) that provides an enhanced experience of the branded retailscape (Pizzi et al. 2020).

Aside from technical issues, this lack of implementation can, in part, be explained by knowledge gaps in the literature, and hence a lack of guidance about how to best apply AR and VR. Research has mainly focused on comparing AR or VR to conventional marketing media such as text, images, or videos (e.g., Mishra et al. 2020), often in the context of pure online retailing (e.g., Hilken et al. 2017; Martínez-Navarro et al. 2019) or in-store retail...
experiences (e.g., Pizzi et al. 2019; Poncin & Mimoun 2014). The use of AR and VR for
experiential retail with an online-to-offline customer journey (Herhausen et al. 2019) is less
studied (e.g., Pleyers & Poncin 2020) and has yielded equivocal support for the technologies’
benefits (Deng et al. 2019). In general, there is mixed support for the premise that AR and VR
both have similar effects on purchase intentions and brand attitudes (e.g., Kang et al. 2020;
Smink et al. 2020), which suggests that a more nuanced approach of choosing between AR
and VR might be needed. However, a comparison of which technology is better suited for
achieving which marketing objective (i.e., purchase intentions or brand attitudes) is currently
lacking. This paucity of knowledge goes hand in hand with a lack of a unifying theoretical
perspective that would help managers understand not only when to choose AR or VR, but also
how to strategically combine both technologies. Despite parallels in theory building efforts
(Bogicevic et al. 2018; Heller et al. 2019a) and valuable taxonomies (Flavián et al. 2019),
research has yet to conceptualize and empirically test underlying psychological mechanisms
for AR and VR’s (individual or combined) impact on the achievement of marketing
objectives. We thus have a limited view of how AR and VR might best support experiential
retailers in transitioning online.

To address these knowledge gaps, we draw on mental imagery theory as a conceptual
perspective applicable to both AR and VR. This stream of theorizing holds that customers
seek to form fluent mental imagery of products and consumption contexts before making
decisions about brands and products (Petrova & Cialdini 2005; Yim et al. 2018). However,
the fluency of mental imagery is easily disrupted, for instance when customers cannot
personally inspect products or experience the ambience of a physical retail space (Ballantyne
& Nilsson 2017; Childers et al. 2001). We theorize that in these situations the unique
visualization rendered by AR and VR can support customers in maintaining fluent mental
imagery related to products and consumption contexts (Bogicevic et al. 2019; Heller et al.
2019a). On this basis, we explore how AR and VR might differentially stimulate customer
purchase intentions and brand attitudes, and how they can be combined in an online experiential retail strategy. To the best of our knowledge, our research is the first to conceptualize and empirically study the shared psychological mechanisms and distinct outcomes of using AR and VR in retail. In doing so, we make three main contributions.

First, we theorize how AR and VR are differentially suited for stimulating purchase intentions versus brand attitudes when experiential retailers use these technologies to promote their physical products and retailscapes online. Based on an inherent suitability for visualizing specific products with AR (Heller et al. 2019a) versus retailscapes with VR (Bogicevic et al. 2019), we establish that AR has a greater positive impact on purchase intentions, whereas VR promotes more favorable brand attitudes. Second, we verify that this differential impact is explained by variation in the type of supported mental imagery. Specifically, we examine the fluency of customers’ product-focused (vs. context-focused) mental imagery as an underlying psychological mechanism. Third, we test ways to combine AR and VR to improve both purchase intentions and brand attitudes by focusing on the order of deployment (i.e., AR then VR or vice versa). We conjecture that AR and VR have distinct roles at different stages of the customer’s purchase journey, specifically that VR’s ability to simulate action sequences (i.e., sets of behaviors needed to execute consumption) is best deployed only after customers have decided on which products to buy through AR. This order of deployment is consistent with the online-to-offline customer journey in experiential retailing, and hence supports the achievement of both underlying marketing objectives in an integrated strategy.

In the remainder of the paper, we first develop our conceptual framework with hypotheses along the three key themes of (1) choosing between AR and VR, (2) exploring the mediating role of fluency of mental imagery, and (3) combining AR and VR. We then present a series of three studies in which we empirically assess these hypotheses before discussing our results and offering implications for theory, practice, and future research.
2. Conceptual background and hypotheses

2.1 Current research on AR and VR in retail

In Table 1 we summarize selected relevant literature on AR and VR across retail contexts, identifying common themes and gaps as a basis for our present study. Notably, previous research compares either AR or VR to conventional marketing media. To date, no study has directly juxtaposed AR and VR to assess their individual or combined impact on customer intentions and attitudes. This seems pertinent, given mixed support for the positive effects of AR and VR on both purchase intentions and brand attitudes (e.g., Kang et al. 2020; Smink et al. 2020). Furthermore, research has mainly studied AR or VR in online settings (e.g., Hilken et al. 2017; Martínez-Navarro et al. 2019) or to a lesser extent in offline settings (e.g., Pizzi et al. 2019; Poncin & Mimoun 2014). The online-to-offline customer journey that experiential retailers seek to leverage has received less attention (e.g., Pleyers & Poncin 2020) and yielded equivocal findings (Deng et al. 2019). Finally, despite parallel streams of theorizing on mental imagery (Bogicevic et al. 2019; Heller et al. 2019a; Petit et al. 2021), these streams have not yet been synthesized into an overarching perspective for both AR and VR. We aim to address these gaps by conceptualizing how experiential retailers might (1) choose between or (2) combine AR and VR to support their marketing objectives.
<table>
<thead>
<tr>
<th>Study</th>
<th>Technologies compared</th>
<th>Retail context</th>
<th>Theory base</th>
<th>Key findings related to purchase intentions and/or brand attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poncin &amp; Mimoun (2014)</td>
<td>AR vs. interactive terminal vs. no technology</td>
<td>Offline</td>
<td>Store atmospherics</td>
<td>AR-based product try-on has a positive effect on store atmospherics, perceived value, and positive emotions, and, in turn, re-patronage intentions.</td>
</tr>
<tr>
<td>Javornik (2016)</td>
<td>AR vs. online room designer / photo-based try-on</td>
<td>Online</td>
<td>Media characteristics</td>
<td>Customers experienced flow when previewing products in AR, but this did not result in greater brand attitudes or purchase intentions.</td>
</tr>
<tr>
<td>Hilken et al. (2017)</td>
<td>AR vs. photo-based try-on vs. 360° rotation vs. pictures</td>
<td>Online</td>
<td>Situated cognition</td>
<td>AR-based product try-on stimulates purchase intentions through heightened perceptions of spatial presence and hedonic and utilitarian value.</td>
</tr>
<tr>
<td>Poushneh &amp; Vasquez-Parraga (2017)</td>
<td>AR vs. conventional website</td>
<td>Online</td>
<td>User experience</td>
<td>Product visualization in AR offers customers an improved retail experience, which, in turn, increases their willingness to buy.</td>
</tr>
<tr>
<td>Bogicevic et al. (2019)</td>
<td>VR vs. 360° video vs. pictures</td>
<td>Online-to-offline</td>
<td>Mental imagery</td>
<td>A VR preview of a hotel elicits greater mental imagery of the servicescape and a stronger sense of presence, resulting in a positive brand experience.</td>
</tr>
<tr>
<td>Deng et al. (2019)</td>
<td>VR</td>
<td>Online-to-offline</td>
<td>Experiential consumption</td>
<td>VR decreases consumption intentions by reducing involvement and increasing in perceived similarity between virtual and real experiences.</td>
</tr>
<tr>
<td>Heller et al. (2019a)</td>
<td>AR vs. 3D objects vs. pictures</td>
<td>Online; offline</td>
<td>Mental imagery</td>
<td>AR-based imagery of products increases customers' likelihood of choosing a product and stimulates choice of higher-priced products.</td>
</tr>
<tr>
<td>Martínez-Navarro et al. (2019)</td>
<td>VR (PC, Powerwall, HMD, 3D, 360°) vs. no technology</td>
<td>Online</td>
<td>Affect, cognition and conation</td>
<td>Customers who viewed a retailscape in VR showed higher brand recall. Some configurations of VR (e.g., 360°, HMD) increased purchase intentions, but also discomfort.</td>
</tr>
<tr>
<td>Pizzi et al. (2019)</td>
<td>VR vs. no technology</td>
<td>Offline</td>
<td>Immersion, presence</td>
<td>Exploring a retailscape in VR increases utilitarian and hedonic value perceptions of the shopping experience as well as greater satisfaction with the store.</td>
</tr>
<tr>
<td>Mishra et al. (2020)</td>
<td>AR vs. pictures; VR vs. video</td>
<td>Online</td>
<td>Sensory marketing</td>
<td>Customers who viewed an ad for a car (tourism experience) in VR (did not) reported greater purchase intentions.</td>
</tr>
<tr>
<td>Kang et al. (2020)</td>
<td>VR vs. website with 3D images vs. video vs. picture</td>
<td>Online</td>
<td>Playfulness and informativeness</td>
<td>Customers who viewed products in VR reported lower purchase intentions than those who viewed the products as 3D images on a website.</td>
</tr>
<tr>
<td>Pizzi et al. (2020)</td>
<td>VR vs. no technology</td>
<td>Offline</td>
<td>Presence</td>
<td>Exploring a retailscape in VR improves the shopping experience, value perceptions of the retailer, and patronage and WOM intentions.</td>
</tr>
<tr>
<td>Study</td>
<td>Technology &amp; Media</td>
<td>Medium</td>
<td>Framework</td>
<td>Summary</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
<td>--------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>Pleyers &amp; Poncin (2020)</td>
<td>VR vs. pictures</td>
<td>Online</td>
<td>SOR framework</td>
<td>A VR tour of a real estate property improves attitudes towards the property and the provider of the experience, and increases intentions to visit.</td>
</tr>
<tr>
<td>Smink et al. (2020)</td>
<td>AR vs. pictures</td>
<td>Online</td>
<td>Equity theory</td>
<td>Product presentation in AR increases customers' purchase intentions, but not their brand attitudes, when compared to conventional websites (with pictures of models or the customer).</td>
</tr>
<tr>
<td>Petit et al. (2021)</td>
<td>AR vs. 3D objects</td>
<td>Online</td>
<td>Mental simulation</td>
<td>AR holograms of food items increase customers' purchase intentions through greater mental simulation.</td>
</tr>
<tr>
<td>This study</td>
<td>AR vs. VR vs. pictures / video; AR then VR vs. VR then AR</td>
<td>Experiential online-to-offline</td>
<td>Mental imagery</td>
<td>Although both technologies outperform conventional media, AR (VR) is better suited for stimulating customers' purchase intentions (brand attitudes) when firms choose between the technologies. When used in combination, AR and VR improve both purchase intentions and brand attitudes, but only when customers first use AR and then VR.</td>
</tr>
</tbody>
</table>
2.2 Choosing between AR and VR

For experiential retailers, the successful deployment of AR and VR hinges upon each technology’s ability to increase customer purchase intentions and/or improve brand attitudes. When transitioning online, standard retail websites typically restrict some of the experiential information present in a physical setting, which makes the appeal of product interactions and ambience of the retailscape difficult to convey (Ballantyne & Nilsson 2017; Childers et al. 2001), especially to new customers. For retailers such as restaurants, cafés, or specialty stores that critically rely on sensory experiences in physical settings, this poses challenges for maintaining their customer base and attracting new customers. AR and VR promise to substitute part of the lost experiential information by enhancing the visualization of products and retailscapes online (Bogivecic et al. 2019; Heller et al. 2021). Accordingly, we expect both AR and VR to outperform conventional marketing media (e.g., product descriptions or retailscape images); but we posit that experiential retailers must carefully select AR or VR in support of a specific marketing objective. Specifically, we argue that AR and VR are differentially suited for improving purchase intentions or brand attitudes, due to the distinct nature of the visualization (products vs. contexts) offered by each technology.

In line with current research, we contend that AR is inherently suited for offering customers an authentic, vicarious examination of products online (Alimammy & Wadeem 2021). Although AR supports various content formats (including visual cues, information layers, or face filters), most retail applications enable customers to interact with 3D product holograms within their immediate surroundings (Carrozzi et al. 2019) – which is forecasted to become the predominant mode of shopping online in the future (Deloitte 2020). This unique form of product interaction provides greater comfort in decision making (Heller et al. 2019a; Hilken et al. 2017), as customers can learn about specific product attributes (Poushneh & Vasquez-Parraga 2017), creatively engage with products (Chylinski et al. 2020; Jessen et al. 2020).
2020), and even develop feelings of ownership (Carrozza et al. 2019). Supporting customers in product evaluation and enabling them to personally connect with products is vital to forming purchase intentions, and, accordingly, studies have more consistently implied positive effects of AR use on purchase intentions (e.g., Hilken et al. 2017; Poushneh & Vasquez-Parraga 2017; see Table 1). In contrast, VR users often find it difficult to evaluate specific products within the holistic virtual environment (e.g., due to ‘cue overload’), and research thus offers more equivocal results (e.g., Kang et al. 2020; Mishra et al. 2020), demonstrating in some cases that VR diminishes consumption intentions (Deng et al. 2019) due to simulated satiation (Pala et al. 2021). Consequently, we posit:

**H1:** The use of AR has a greater positive impact on customer purchase intentions towards products than the use of VR.

Although AR use has been linked to the formation of positive brand attitudes (Rauschnabel et al. 2019), there is mixed support for this effect (Smink et al. 2020). Instead, research offers more consistent support for VR’s positive impact on evaluations of the overall experience and the brand (e.g., Bogicevic et al. 2019; Pizzi et al. 2020). VR has also more frequently been linked to intentions to visit a location (Pleyers & Poncin 2020) rather than intentions to purchase specific products (Mishra et al. 2020). This is due to VR’s ability to immerse users in ambient virtual environments (Cowan & Ketron 2019), which is considered to be less effective in facilitating purchase decisions about specific products (Kang et al. 2020). This more context-focused (vs. product-focused) visualization offered by VR supports the exploration and evaluation of the physical retailscape (Pizzi et al. 2019; Pizzi et al. 2020), and consequently the formation of higher-order attitudes towards the provider of the experience (Pleyers & Poncin 2020). Since many experiential retailers rely on a (themed or branded) retailscape to drive brand attitudes (Foster & McLelland 2015), we expect VR to be
more effective in eliciting positive brand attitudes than AR due to its ability to provide a richer, more holistic experience of the retailscape.

**H2:** The use of VR has a greater positive impact on customer brand attitudes than the use of AR.

### 2.3 Fluency of mental imagery as the underlying mechanism

We further argue that the differential impact of AR versus VR on purchase intentions or enhanced brand attitudes can be explained by a mental imagery process related to products and consumption contexts. Mental imagery describes a customer’s ability to generate images of products or experiences ‘in the mind’s eye’ (MacInnis & Price 1987) when forming decisions and attitudes about brands and their products (Escalas 2004; Soliman et al. 2017). Customers frequently create visions of themselves consuming products or experiences, to simulate possible outcomes and benefits of consumption, and to inform their decision-making (Petrova & Cialdini 2005; Zemack-Rugar & Rabino 2019). For instance, customers often attempt to mentally picture what a stay at a vacation resort would be like, how a dessert at a café will look and taste, or whether a new sofa would fit the décor of their living room.

The **fluency of mental imagery** (i.e., the ease with which mental images are generated and/or transformed; Heller et al. 2019a) crucially shapes purchase intentions and brand attitudes (Petrova & Cialdini 2005; Yim et al. 2018). Marketers thus attempt to support customers in creating fluent mental images of products and experiences, for instance, through descriptions, pictures, or videos. Yet, a shortcoming of these conventional marketing media is that they require customers to exert significant mental effort when imagining experiences with the advertised products or contexts (Escalas 2004; Yim et al. 2018). For instance, even after seeing a picture, customers still need to imagine how a sofa fits within their home, and they mentally fill in missing details about a travel experience or visit to the café. As mental
imagery is processed in working memory, it is easily distorted and subject to rapid decay, which implies that many marketing media do not optimally support fluent mental imagery.

Compared to conventional marketing media, we contend that AR and VR uniquely support fluent mental imagery through the generation of quasi-real simulations of products or consumption contexts that relieve the customer of excessive strain in generating mental images (Bogicevic et al. 2019; Heller et al. 2019a). Consistent with the argumentation for H1, we conjecture that AR supports the fluency of product-focused mental imagery, as customers can see lifelike product ‘holograms’ (Carrozzi et al. 2019) within their immediate environment, as if they were real and physically present (Hilken et al. 2017). Consequently, we argue that AR’s greater impact on purchase intentions is mediated by enhanced fluency of product-related mental imagery.

**H3:** The positive effect of the use of AR on purchase intentions is mediated by greater fluency of product-focused mental imagery.

Following the line of argumentation for H2, we conjecture that VR supports greater fluency of context-focused mental imagery, since customers are able to blend out their immediate surroundings and feel that they are immersed in another place and time (Cowan & Ketron 2019). This sensation allows customers to gain a holistic experience of a (branded) retailscape, better approximating a real experience (Bogicevic et al. 2019; Deng et al. 2019; Pizzi et al. 2020). Thus, VR relieves customers of the need to mentally picture the ambience of a consumption context, for example when deciding whether visiting a new café is pleasant or offers a sufficiently intimate setting. Thus, we expect that VR’s greater impact on brand attitudes is due to enhanced fluency of context-related mental imagery.

**H4:** The positive effect of the use of VR on brand attitudes is mediated by greater fluency of context-focused mental imagery.
2.4 Combining AR and VR

We argue that choosing between AR and VR entails trading off improvements in purchase intentions versus brand attitudes; however, retailers might try to combine the technologies to support both these marketing objectives. To explore a joint application of AR and VR, we consider their alignment with stages in the customer’s purchase journey, as previous research emphasizes that the deployment of AR and VR should be tailored to customers’ different needs at each stage (Farah et al. 2019; Hilken et al. 2018; Wedel et al. 2020). When experiential retailers transition online, they typically leverage an online-to-offline journey, where customers engage online in anticipation of visiting the physical location. Customers use the information gathered online to evaluate the prospective quality of the consumption experience in the physical location (Herhausen et al. 2019). For instance, a customer may inspect photos of a restaurant’s dining ambience before deciding to visit in person. In this journey, the customer’s view of products or consumption contexts is likely more abstract in the initial stages, and then becomes more concrete in later stages (Humphreys et al. 2020).

Based on this structure, the order of deployment of AR and VR hinges on the differential roles of these technologies in supporting the customer in their journey. With AR, customers can realistically experience a product within their personal surroundings (Poushneh & Vasquez-Parraga 2017), which, in the early stages of the journey, aligns with the need to make the overall decision of what to purchase and why (Zemack-Rugar & Rabino 2019). VR affords customers a more concrete experience through immersing them into a navigable virtual representation of a physical retailscape (Pleyers & Poncin 2020), and thus assists them in visualizing the specific action sequences needed to execute the consumption experience (Zemack-Rugar and Rabino 2019; Soliman et al. 2017). For example, in VR a customer may sit at any table in a restaurant and experience the view and ambiance at each table. This simulation opens up possibilities to try different sets of actions without the constraint of the
physical environment, and hence at lower behavioral cost (Cowan & Ketron 2019), which should be conducive to developing comfort and behavioral awareness of the physical location.

We argue that the simulation of action sequences in VR becomes relevant once the customer has decided on what to buy and then moves on to inspect the consumption context (i.e., the retailscape). This is consistent with contemporary mental imagery theorizing on ‘consumption visions’ (Yim et al. 2018) and related research (Petit et al. 2021), which suggests that customers seek to simulate the consumption process only after having evaluated the available products. For instance, having used AR to inspect a café’s menu and decided to buy coffee and cake, a customer can inspect the café using VR to visualize walking into the retailscape, ordering at the counter, and evaluating whether they would enjoy the ambience. Accordingly, we expect that when VR is deployed after AR, this supports both purchase intentions and attitudes towards the brand as it enables customers to visualize completing the consumption experience, reducing purchase uncertainty, whilst gaining appreciation of the offered retailscape. In contrast, a reverse order of deployment might interfere with the typical online-to-offline sequencing of the experiential retail journey we consider here. For instance, inspecting the location in VR before having bought decided on a product to buy puts procedural concerns (about how to consume) before the substantive decision on what to buy (and why). Similarly, making a detailed assessment of the retailscape before developing a conviction about the quality of its assortment might interfere with customers’ interest in the product, and disrupt their purchase journey. That is, a deployment sequence of AR then VR is more consistent with the fluency of mental imagery with respect to both products and environments, and hence should positively enhance purchase intentions and brand attitudes.

**H5:** When combining AR and VR, an order of deployment sequenced as first AR and then VR facilitates stronger (a) purchase intentions and (b) brand attitudes than vice versa.
3. Studies and experimental stimuli

We conducted three studies to test the proposed hypotheses (Figure 1). In Study 1, we examine whether AR, due to its greater product-focused imagery, is better suited for stimulating customer purchase intentions compared to VR (H1, H3). In Study 2, we investigate whether VR, due to its greater ambience-focused imagery, fosters more positive brand attitudes compared to AR (H2, H4). In Study 3, we assess the optimal order of deploying of AR and VR together to increase both purchase intentions and brand attitudes (H5a and H5b).

To create the experimental stimuli, we collaborated with a European café chain who provided us with access to their products and a café location. We developed an AR menu that displayed five of the café’s products (coffee, caramel-chocolate bar, muffin, and two cheesecakes; priced €1.90 to €4.10) as interactive 3D holograms. For the VR experience, we created a 2-minute 360° VR video that provided an immersive first-person experience of walking through the café location. The video included the above-mentioned products in a glass cabinet next to the counter. Appendix A provides examples of the stimulus materials.

Figure 1: Overall research model with hypotheses
4. Study 1

4.1 Method

We conducted an online study with a three-group (control, VR, AR) between-subjects design, in which we asked participants to browse the website of a new café. We employed equivalent stimulus materials in all conditions, but varied how these were presented. Participants in the AR group viewed the menu with the product holograms on-screen and interacted with these using their computer mouse or touchpad. We also provided them with a photo of the café location. Participants in the VR group viewed the virtual tour of the café in which they could freely look around and view the products on-screen by controlling their perspective with their computer mouse or touchpad. We also showed these participants an online menu containing the product names and prices. Consistent with previous studies (e.g., Heller et al. 2019a; Pleyers & Poncin 2020), we purposefully employed these web-based AR and VR applications since they offered us experimental control in the online study, whilst minimizing potential response bias from participants’ use of differing personal devices. In the control group, participants saw the online menu and photo of the café. We recruited US-based participants via Amazon MTurk, who would be unfamiliar with the café chain, in exchange for a small payment, obtaining 296 valid responses (49.0% females, $M_{age} = 37.41$, age range = 18 - 69 years). Participants indicated their purchase intentions and fluency of product-focused mental imagery on two single items. We also asked them to indicate how hungry they felt before starting the study. Participants rated all items on seven-point Likert scales (Appendix B).

4.2 Results

4.2.1 Purchase intentions

An ANOVA ($F(2, 293) = 12.09, p < .001$) revealed that participants in the AR ($M_{AR} = 5.97$, $F(1, 293) = 23.96, p < .001$) and VR group ($M_{VR} = 5.57, F(1, 293) = 7.88, p = .005$) reported greater purchase intentions than those in the control group ($M_{CG} = 5.04$). Furthermore,
supporting H1, participants who used AR indicated that they were more likely to purchase something from the menu than those who used VR (M_{AR} = 5.97 vs. M_{VR} = 5.57, F(1, 293) = 7.34, p = .039). Figure 2 visualizes these differences across the groups.

4.2.2 Mediation analysis

We used the PROCESS macro (Hayes 2018, model 4, coded VR = 0 and AR = 1) to test whether participants’ greater purchase intentions in the AR (vs. VR) group were due to heightened fluency of mental imagery related to the products (H3). We included hunger as a control in all analyses. In a first regression ($R^2 = .17$, $F(2, 192) = 19.22$, $p < .001$), AR (vs. VR) use increased participants’ fluency of product-focused mental imagery ($\beta = 1.03$, SE = .18, $p < .001$), controlling for hunger ($\beta = .10$, SE = .05, $p = .051$). In a second regression ($R^2 = .22$, $F(3, 191) = 18.00$, $p < .001$), fluency of mental imagery positively influenced purchase intentions ($\beta = .41$, SE = .06, $p < .001$), again controlling for hunger ($\beta = .07$, SE = .05, $p = .112$). A bootstrapping procedure with 5,000 samples and bias-corrected confidence intervals (CIs) provided further support for the positive indirect effect hypothesized in H3 ($\beta = .44$, 95% CI = .22 to .72).

4.3 Discussion

Consistent with previous research (Hilken et al. 2017; Martínez-Navarro et al. 2019), we find that both AR and VR have a discernible impact on customers’ purchase intentions when compared to conventional marketing media (e.g., online menus, retailscape images). We extend these findings through a direct comparison of the technologies, demonstrating that AR is more effective in stimulating purchases than VR (H1), as it supports customers in forming more fluent mental imagery of the products under consideration (H3).
5. Study 2

5.1 Method

We conducted an online study with the same three-group (control, VR, AR) between-subjects design, procedure, and stimuli as in Study 1. However, in this study, we asked to participants to rate their brand attitudes on a three-item scale ($\alpha = .97$). Furthermore, we sought to substantiate the conjecture that VR (vs. AR) is better suited for stimulating brand attitudes due to more fluent mental imagery related to the consumption context (vs. products). We thus asked participants to rate the fluency of mental imagery related to the (1) café location and (2) products on two single-item scales. We also asked them to indicate how hungry they felt before completing the study. Participants responded to all measures on seven-point Likert scales (Appendix B). We recruited US-based participants on Amazon MTurk in exchange for a small payment, obtaining 365 valid responses (51% females, $M_{age} = 40.87$, age range = 21 - 74 years).

5.2 Results
5.2.1 Brand attitudes

We conducted an ANOVA ($F(2, 362) = 23.60, p < .001$) and found that participants in the VR group ($M_{VR} = 6.11$, $F(1, 362) = 44.54, p < .001$) and AR group ($M_{AR} = 5.77$, $F(1, 362) = 22.44, p < .001$) reported more favorable brand attitudes than those in the control group ($M_{CG} = 5.04$). As shown in Figure 2, H2 was supported as participants who used VR rated the brand more favorably than those who used AR ($M_{VR} = 6.11$ vs. $M_{AR} = 5.77$, $F(1, 362) = 4.55, p = .034$).

5.2.2 Mediation analysis

We used the PROCESS macro (Hayes 2018, model 4, coded AR = 0 and VR = 1) to test whether the more favorable brand attitudes in the VR (vs. AR) group were explained by heightened fluency of mental imagery related to the consumption context (H4). We controlled for hunger in all analyses. The regression results are presented in Table 1. In support of H4, VR (vs. AR) use increased the fluency of context-focused mental imagery, which in turn positively influenced brand attitudes. Furthermore, in line with our previous findings, AR (vs. VR) increased the fluency of product-focused mental imagery, which, in turn positively shaped brand attitudes. A bootstrapping procedure with 5,000 samples and bias-corrected confidence intervals (CIs) provided support for both indirect effects (Table 2). However, supporting H4, a pairwise comparison revealed that the VR-enabled indirect effect through fluency of context-focused mental imagery was larger than the AR-enabled indirect effect through product-focused mental imagery ($\beta=.21$, SE = .06, CI .09 to .33).

5.3 Discussion

We provide corroborating evidence that VR and AR outperform conventional marketing media in building positive brand attitudes (Bogicevic et al. 2019; Rauschnabel et al. 2019). Furthermore, consistent with H2, we find that VR is better suited than AR in this respect, as it supports customers in generating more fluent mental imagery of the retailscape (vs. products), which we identify as the dominant pathway to forming positive brand attitudes.
Table 1
Study 2 Regression and mediation analysis results

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Fluency of mental imagery (context)</th>
<th>Fluency of mental imagery (products)</th>
<th>Brand attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.93***</td>
<td>5.77***</td>
<td>2.69***</td>
</tr>
<tr>
<td></td>
<td>(.20)</td>
<td>(.19)</td>
<td>(.31)</td>
</tr>
<tr>
<td>VR (vs. AR)</td>
<td>.37*</td>
<td>-.53**</td>
<td>.29*</td>
</tr>
<tr>
<td></td>
<td>(.17)</td>
<td>(.16)</td>
<td>(.13)</td>
</tr>
<tr>
<td>Fluency of mental imagery (context)</td>
<td>--</td>
<td>--</td>
<td>.34***</td>
</tr>
<tr>
<td>Fluency of mental imagery (products)</td>
<td>--</td>
<td>--</td>
<td>.16*</td>
</tr>
<tr>
<td>Hunger</td>
<td>.15**</td>
<td>.07</td>
<td>.08*</td>
</tr>
<tr>
<td></td>
<td>(.05)</td>
<td>(.04)</td>
<td>(.03)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.06</td>
<td>.05</td>
<td>.36</td>
</tr>
<tr>
<td>MSE</td>
<td>1.73</td>
<td>1.54</td>
<td>.83</td>
</tr>
<tr>
<td>F</td>
<td>7.53**</td>
<td>6.69**</td>
<td>32.70***</td>
</tr>
<tr>
<td>df</td>
<td>2, 240</td>
<td>2, 240</td>
<td>4, 238</td>
</tr>
<tr>
<td><strong>Indirect effect through:</strong></td>
<td>Effect</td>
<td>Boot SE</td>
<td>Boot CI</td>
</tr>
<tr>
<td>Fluency of mental imagery (context)</td>
<td>.12</td>
<td>.06</td>
<td>.01 to .26</td>
</tr>
<tr>
<td>Fluency of mental imagery (products)</td>
<td>-.09</td>
<td>.05</td>
<td>-.19 to -.01</td>
</tr>
</tbody>
</table>

**NOTE.** — The numbers in parentheses are standard errors. Unstandardized coefficients are shown. Significance based on two-tailed test *** p < .001    ** p < .01    * p < .05.

6. Study 3

6.1 Method

We tested the optimal sequencing of AR and VR (H5a, H5b) and also enhanced the ecological validity of our research by using mobile/wearable AR and VR devices and sampling potential customers of the café. We conducted a lab study at a European university with one of the café chain’s locations in the vicinity. The study took place at the beginning of the academic year and we recruited first-year students, who were new to the city, in exchange for course credit. Our sample of potential customers was thus largely unfamiliar with the location, brand, and products. We assigned participants to one of two between-subject groups (AR then VR vs. VR then AR) in a two-phased study. In phase 1, participants used AR (or VR), then completed a survey with the measures for the dependent variables. In phase 2, they used the
other technology (VR or AR) and again responded to the survey, providing us with repeated measures for the dependent variables. Participants also received a follow-up survey after completing the study. Participants used the AR menu on a tablet PC, which allowed them to project 3D holograms of food and drink onto the table in front of them. They viewed the 360° tour of the café using a wearable VR headset, with which they could freely look around the café by moving their heads. We also provided them with a printed menu. In total, 368 participants completed the study. We excluded the responses of eight participants with technical difficulties using AR or VR and seven outliers\(^1\), yielding a final sample of 353 participants (42% females, \(M_{\text{age}} = 18.84\), age range 17 to 28 years). We used the purchase intentions and brand attitude (\(\alpha_{\text{Phase1}} = .86, \alpha_{\text{Phase2}} = .85\)) scales from our previous studies, and controlled for hunger and previous experience with the café\(^2\).

6.2 Results

6.2.1 Purchase intentions

We used the MEMORE macro (Montoya 2019, model 2) to test for moderation of the repeated measures (\(R^2 = .02, F(1, 351) = 7.73, p = .006\)). In support of H5a, the sequencing of technologies moderated the differences in purchase intentions between the two phases (\(\beta = .42, SE = .15, p = .006\)). Analysis of the conditional effects (Figure 3) revealed that the purchase intentions of participants who used AR and then VR increased from phase 1 to 2 (\(\beta = .21, SE = .11, p = .050\), while they decreased for those who used VR and then AR (\(\beta = -.21, SE = .11, p = .050\)). Furthermore, in phase 2, after participants used both technologies, purchase intentions were higher in the AR then VR group (\(\beta = .44, SE = .14, p = .002\)).

6.2.2 Brand attitudes

Our analysis with the MEMORE macro (Montoya 2019, model 2, \(R^2 = .04, F(1, 351) = 15.89, p < .001\)) showed that the sequencing of technologies also moderated the differences in brand attitudes between the two phases (\(\beta = .35, SE = .09, p < .001\)). Consistent with H5b, and as
shown in Figure 3, brand attitudes increased from phase 1 to 2 for participants who used AR then VR ($\beta = .32$, SE = .06, $p < .001$), but not for those who used VR then AR ($\beta = -.32$, SE = .06, $p = .607$). Furthermore, after using both technologies, participants reported more favorable brand attitudes when they used AR then VR ($\beta = .20$, SE = .09, $p = .027$).

**Figure 3.** Mean purchase intentions and brand attitudes across study phases and sequencing of technologies

### 6.3 Discussion

We offer first empirical evidence of how experiential retailers might optimally combine AR and VR to forgo trading off improvements in purchase intentions and brand attitudes. Supporting H3, we demonstrate that letting customers first use AR to decide on what to buy, and then VR to envision the consumption of these products in the retailscape, results in a positive impact on both these marketing objectives at the same time.
7. General discussion and theoretical implications

AR and VR promise to enable novel retail strategies, but recent academic and managerial interest in these technologies has not yet translated into specific guidance for experiential retailers that crucially rely on product and retailscape experiences. Consequently, through the COVID-19 pandemic these retailers have struggled to transition online. Our research offers a first step towards a new strategic framework for the optimal deployment of AR and VR in experiential retailing, and advances contemporary theorizing in three ways.

First, previous studies have mainly compared AR or VR, individually, against conventional media (Bogcevic et al. 2019; Mishra et al. 2020; Pleyers & Poncin 2020; Poushneh & Vasquez-Parraga 2017). While we replicate the baseline AR/VR superiority over these media, we extend the literature by offering a first direct comparison of AR and VR. Rather than suggesting a uniform suitability for achieving diverse marketing objectives, we advance the more nuanced conceptualization that AR is better suited for improving purchase intentions (Study 1) and VR for brand attitudes (Study 2). This perspective also helps reconcile some equivocal findings related to VR’s impact on purchase intentions (Deng et al. 2019; Mishra et al. 2020) and AR’s influence on attitudes towards the overall experience or brand (Mishra et al. 2020; Javornik 2016; Rauschnabel et al. 2019).

Second, we synthesize parallel streams of theorizing (Bogicevic et al. 2019; Heller et al. 2019a) to advance mental imagery as a common theoretical perspective for both technologies. On this basis, we conceptualize and empirically validate that AR and VR differ in the extent to which they support fluent mental imagery of products (Study 1) versus contexts (Study 2). We also extend research on the fluency effects of imagery-evoking media (Petrova and Cialdini 2005; Yim et al. 2018) to AR and VR, and contribute to research on the optimal presentation formats of retail products and the retailscape (Roggeveen et al. 2020).
Third, we evidence how retailers might optimally combine AR and VR (Study 3). Combining AR and VR has thus far mostly been considered in technical terms (e.g., VR environments with AR holograms), while the use of AR and VR across different customer journey steps has only been conceptualized for each technology in isolation (Farah et al. 2019; Hilken et al. 2018). An optimal sequencing of AR and VR within a customer’s path to purchase is currently lacking in the literature. Focusing on settings in which experiential retailers transition online, we show that using AR followed by VR helps customers simulate procedural action sequences (with VR) once they have decided on which product(s) to consume (with AR). This results in improved purchase intentions and brand attitudes.

8. Managerial implications

Our work offers practical implications, particularly for experiential retail managers who often struggle to find the right strategy to move their business online (Kelly 2020). In contrast to pure online retailers, experiential retailers attract customers through the depth (instead of breadth) of customer experience, which requires a strategy focused on product and retailscape experiences. We offer a framework for leveraging AR and VR to offer an online experiential retail strategy, with specific guidance on two managerial concerns: (1) how to choose and (2) how to combine AR and VR for improved purchase intentions and brand attitudes.

While applications of either AR or VR outperform the legacy approach of building a standard website, careful deployment of AR and VR requires that managers prioritize each technology towards its most effective use. Retailers with a strong strategic focus on direct product sales might favor the use of AR due to its impact on customers’ purchase intentions. AR could also be used as a tool for stimulating short-term sales (e.g., AR-based sales promotions). In contrast, retailers that prioritize ‘time well-spent’ in a themed retailscape (e.g., Nike or Lego flagship stores) might better prioritize VR to immerse customers in the
retailscape and thus build favorable brand attitudes. Similarly, retail-as-a-service providers (e.g., b8ta or Leap) that leverage constantly changing assortments might use VR to build long term attitudes and, subsequently, loyalty to the brand.

However, many retailers, and especially experiential retailers, strategize to improve both purchase intentions and brand attitudes. We demonstrate that they can do so by combining AR and VR in a deployment order aligned with how (particularly new) customers typically move between online and offline channels during their purchase journey. For these customers that examine products and the retailscape online before visiting in person (Herhausen et al. 2019), sequencing the deployment as AR followed by VR strategically aligns technology use with the stages in the customer’s purchase journey. Allowing the customer time and virtual space to try out different behaviors in the relative safety of VR potentially reduces procedural uncertainty, helping the customer ‘go the last mile’ by visualizing not only what to buy but also how to obtain it and execute the consumption event. For experiential retailers, this logic of sequencing experiences is imperative, because an inconsistent order of deployment can disrupt the customer’s purchase journey and in effect reduce purchase intentions.

9. Limitations and future research

We note some limitations in our research that offer opportunities for further study. We focus on the benefits of AR and VR for experiential retailers that transition the early phases of the customer journey online. That is, in identifying the optimal sequencing of AR and VR, we study an online-to-offline journey. Although this represents a common journey pattern (Herhausen et al. 2019), future studies might identify boundary conditions to these effects. One potential condition might be different retailscape types, and future research could assess whether our observed effects are amplified for more elaborate retailscapes. Further, whilst we
focus on customers with little prior brand exposure, future research should study the use of AR and VR by customers with extensive previous experience or established brand attitudes. Such research might examine the role of loyalty in relation to the effects of AR and VR, and consider potential wear-out effects of what currently are novel retail technologies. Another potential boundary condition relates to memories of previous experiences (Escalas 2004). We examine forward-looking mental imagery, so future research should consider the optimal sequencing of AR and VR in repeated customer journeys as we suspect the effects of deployment order may change with increased customer experience. We also consider AR retail applications that visualize product holograms, so future research might assess the impact on purchase intentions when AR is used to deliver other product-related content (e.g., nutritional information or meal preparation instructions).

Furthermore, we only consider favorable customer responses to AR and VR use, but research has demonstrated that customers’ privacy concerns reduce the perceived usefulness of these technologies (Cowan et al. 2021). Further research is thus needed to better understand privacy concerns related to how AR and VR gather personal information in novel ways (e.g., through facial or object recognition), as well as potential repercussions against retailers and how to counteract these (e.g., through privacy statements; Cowan et al. 2021).

Finally, AR and VR technologies are rapidly evolving, including multisensory interfaces (Heller et al. 2019b), social features (Hilken et al. 2020) or AI-integration (e.g., visual search in IKEA’s AR app). Continued study must assess how these developments shift the advantage of AR or VR in relation to purchase intentions or brand attitudes, as well as their optimal sequencing.
References


Endnotes

1 Four participants reported motion sickness while using VR and subsequently provided unusually low scores (>3 SD) on one of the brand attitude measures. Three participants provided unusually low scores (>3 SD) on both purchase intention measures.

2 To control for potential effects of hunger and previous experience at the café, we asked participants to indicate how long ago they had their last meal (in hours) and whether they had previously visited the café location (yes or no). We included both variables as controls in our analyses, but did not observe any significant effects.
Appendix A

Overview of experimental stimuli

Augmented Reality (AR)  
Virtual Reality (VR)
**Appendix B**

**Overview of constructs and measurement items**

<table>
<thead>
<tr>
<th>Constructs and items</th>
<th>1 = Extremely unlikely – 7 = Extremely likely</th>
<th>7-point semantic differential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purchase intentions</strong></td>
<td>If you were to go to [X] right now, how likely would it be that you buy something from the menu?</td>
<td></td>
</tr>
<tr>
<td><strong>Brand attitudes</strong></td>
<td>Mackenzie and Lutz (1998)</td>
<td>Please describe your overall feelings towards [X].</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>bad – good</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>unfavorable – favorable</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>unpleasant – pleasant</strong></td>
</tr>
<tr>
<td><strong>Fluency of product-focused mental imagery</strong></td>
<td>adapted from Heller et al. (2019a)</td>
<td>How difficult was it to imagine the following?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The featured products you saw in the menu.</td>
</tr>
<tr>
<td><strong>Fluency of context-focused mental imagery</strong></td>
<td>adapted from Heller et al. (2019a)</td>
<td>How difficult was it to imagine the following?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yourself being in a [X] café and buying something from the menu.</td>
</tr>
<tr>
<td><strong>Hunger</strong></td>
<td></td>
<td>How hungry do you feel right now?</td>
</tr>
</tbody>
</table>

Notes: [X] = Café’s brand name, excluded for confidentiality