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The Effectiveness of Sensory Stimulation in Virtual Reality Technology to Enhance Brand Experience and Purchase Intention

HENDY KURNIAWAN[1], YOHAN WISMANTORO[2], MAHMUD[3]
[1] Management Doctoral Program, Dian Nuswantoro University, Central Java, Indonesia.
[2] Management Doctoral Program, Dian Nuswantoro University, Central Java, Indonesia.
[3] Management Doctoral Program, Dian Nuswantoro University, Central Java, Indonesia.
Email: [1]p42202400029@mhs.dinus.ac.id, [2]yohan.wismantoro@dsn.dinus.ac.id, [3]mahmud@dsn.dinus.ac.id
Orchid Id number: [1]https://orcid.org/0009-0007-7935-5697, [2]https://orcid.org/0000-0003-1094-6222, [3]https://orcid.org/0000-0003-1622-9195
Corresponding Author*: Hendy Kurniawan.

ABSTRACT:

Amid intensifying market competition, virtual reality (VR) has emerged as a powerful platform for delivering immersive brand experiences through multisensory stimulation—encompassing visual, auditory, haptic, and even olfactory cues. Yet, a critical knowledge gap persists regarding how and under what conditions such stimulation translates into enhanced brand experience and, ultimately, purchase intention—particularly given the fragmented, modality-specific nature of extant research and the lack of integration across sensory, affective, cognitive, and behavioral dimensions of experience. This study addresses this gap through a systematic literature review (SLR) of peer-reviewed empirical and theoretical works (2015–2025) sourced from Scopus, Web of Science, and Google Scholar, following PRISMA-aligned screening and thematic–narrative synthesis protocols. Findings reveal that sensory immersion—the synergistic, contextually congruent activation of multiple senses—acts as the proximal driver of brand experience, surpassing traditional visual immersion in efficacy. Crucially, core experiential components (presence, immersion, flow, mental imagery) function as serial mediators between sensory input and behavioral outcomes, validating and extending the Stimulus–Organism–Response framework into embodied digital contexts. However, effectiveness is highly contingent: it depends on system immersivity (e.g., HMD vs. desktop), product type (hedonic/utilitarian), user traits (e.g., need for touch, involvement), and, above all, sensory congruence—incongruence risks cognitive overload and diminished impact. The study's theoretical novelty lies in reconceptualizing sensory marketing (shifting from cue congruence to embodied congruence), experiential branding (from outcome to process-mediator), and presence (from technological artifact to embodied gateway construct), culminating in an integrative model: Multisensory Stimulation → Embodied Presence → Sensory Immersion → Brand Experience → Purchase Intention. For academia, this advances immersive consumer research by unifying fragmented constructs, emphasizing boundary conditions, and calling for longitudinal, cross-cultural, and ecologically valid designs to future-proof theory in the metaverse era.

KEYWORDS: Brand experience, experiential marketing, sensory immersion, virtual reality.

1) Introduction:

The marketing industry faces the challenge of creating a deep and captivating brand experience amid increasingly fierce competition. The development of Virtual Reality (VR) technology opens up new opportunities in creating immersive environments that are not only visually appealing, but also engage users' senses through sensory stimulation such as sound, virtual touch, and even scent simulation to enrich consumer interaction with brands. However, despite this promising potential, there is still a knowledge gap regarding the extent to which sensory stimulation in VR environments is truly effective in enhancing brand experience and, ultimately, driving purchase intention.The development of digital technology has revolutionized the way consumers interact with brands, one of which is through the application of Virtual Reality (VR) and Augmented Reality (AR) in various sectors, including tourism, hospitality, and marketing. In this context, sensory stimulation, namely multisensory stimuli such as visual, auditory, haptic, and olfactory, has become a critical element in creating a deep immersive experience. Previous studies have shown that VR not only functions as a promotional tool, but also as a means to enrich the brand experience by increasing consumers' sense of presence, immersion, and emotional engagement [1], [2], [3]. Studies by Sikora et al. (2018) and Cowan et al. (2023) further prove that the addition of sensory stimuli such as background sounds or scents in a VR environment can improve the quality of the user experience and strengthen affective and behavioral responses, including purchase intent.Previous studies have consistently shown that Augmented Reality (AR) and Virtual Reality (VR) technologies can enrich consumer experiences by enhancing immersion, presence, and emotional engagement. A study by Cowan, Ketron, and Kostyk (2023) revealed a new serial mechanism of immersion and flow as a pathway through which sensory stimuli, such as olfactory cues in VR, influence consumer responses. These findings expand the concept of immersion from merely visual to sensory immersion, which is an important foundation in immersive reality-based marketing [4], [5]. On the other hand, Javornik et al. (2021) identified four strategic approaches to AR implementation by luxury brands: functional enhancement, experiential storytelling, ephemeral elevation, and symbolic augmentation, emphasizing how AR functions not only as a visual tool but also as a multisensory narrative medium that builds brand equity.

Despite significant progress, most research tends to focus on the hedonic or utilitarian aspects of AR/VR separately, with little integration between the two in a holistic multisensory context. In addition, existing literature—such as the work of Hilken et al. (2022) and Rauschnabel et al. (2023)—highlights the role of immersion as an outcome or intermediate variable, but has not explicitly examined how multisensory stimulation in VR directly shapes the multidimensional aspects of brand experience (sensory, affective, behavioral, intellectual) and how these dimensions collectively influence purchase intention [6], [7]. In fact, Cowan et al. (2023) themselves acknowledge the conceptual overlap between immersion and flow that needs further clarification [4]. This gap is the novelty of this study: integrating the sensory stimulation framework in a VR environment with a comprehensive brand experience construct as a mediator between sensory stimulation and purchase intention, thereby not only strengthening the theoretical basis of S-O-R (Stimulus-Organism -Response) framework in a digital context but also provides empirical evidence on how rich sensory brand experiences in virtual reality actually drive consumer behavior conversion. Thus, this study goes beyond the dominant tactical AR/VR approach in the current literature (AR-for-a-product view) and shifts to a strategic perspective centered on the holistic consumer experience.The research framework is based on the integration of the stimulus-organism-response (S-O-R) theory and the multidimensional concept of brand experience, which includes sensory, affective, cognitive, and behavioral aspects. In this model, sensory stimulation in VR acts as a stimulus that influences consumers' psychological conditions (organism), such as presence perception and sensory satisfaction, which in turn shape behavioral responses in the form of purchase intention. Empirical findings from various systematic studies confirm that the effectiveness of VR in increasing purchase intention is highly dependent on the quality and congruence of the sensory stimuli provided [3], [8]. However, there is still a knowledge gap regarding the specific mechanisms through which multisensory stimulation in a VR environment contributes to the formation of a sustainable brand experience, as well as how that experience translates into consistent purchase intention. Therefore, this study aims to fill this gap by examining the mediating role of brand experience in the relationship between sensory stimulation in VR and purchase intention, while enriching the literature on digital marketing and consumer psychology in the era of immersive reality.

The main issue in this study is the unclear mechanism of the influence of sensory stimulation in VR on consumer perception and how that experience translates into purchase intention. Based on this, this study is formulated in the question of how effective sensory stimulation in Virtual Reality technology is in enhancing brand experience and consumer purchase intention. The purpose of this study is to analyze the influence of sensory stimulation in the context of VR on the dimensions of brand experience (affective, behavioral, intellectual, and sensory) and to examine its relationship with consumer purchase intention. Theoretically, this study is expected to enrich the literature in the field of digital marketing and consumer psychology, particularly in the integration of immersive technology and multisensory approaches. Practically, the findings of this study can serve as strategic guidance for industry players in designing VR-based brand experiences that are more effective, immersive, and have a direct impact on consumer purchasing decisions.

2) Methods and Methodology: This study adopts a descriptive qualitative approach using the Systematic Literature Review (SLR) method to identify, examine, and synthesize empirical and theoretical findings from previous studies on the role of sensory stimulation in Virtual Reality (VR) technology on brand experience and purchase intention. The SLR approach was chosen because it allows researchers to map the development of literature objectively, transparently, and replicably, while also revealing knowledge gaps that have not been adequately explained in previous studies.

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The research data sources are derived from peer-reviewed scientific articles published in reputable international journals. The types of data used are qualitative and quantitative secondary data, which include empirical findings, conceptual models, tested hypotheses, as well as theoretical and practical recommendations from related studies. Literature searches were conducted using leading academic databases such as Scopus, Web of Science, and Google Scholar, with strategic keywords such as "virtual reality," "sensory stimulation," "multisensory experience," "brand experience," and "purchase intention." The inclusion criteria were: (1) relevant scientific articles, (2) focus on the consumer context (B2C), (3) containing empirical analysis or a relevant theoretical framework, and (4) published between 2015 and 2025 to ensure contextual relevance. The data collection technique followed a strict SLR protocol, consisting of: (1) initial identification through database searches, (2) screening based on titles and abstracts, (3) full selection based on article content, and (4) data extraction using a synthesis matrix (e.g., research objectives, methods, samples, main findings, key variables, and limitations). This process was supplemented with snowballing (checking reference lists and citations) to ensure comprehensive literature coverage.

Data analysis techniques were performed through thematic and narrative synthesis, in which findings from various studies were grouped based on conceptual themes, for example: (a) the multisensory effects of VR on immersion and presence; (b) the relationship between sensory immersion and brand experience dimensions; (c) the mediating role of brand experience in influencing purchase intention; and (d) contextual factors (such as product type, demographics, or technology platform) that moderate these effects. The analysis also includes a critical evaluation of the methods used in previous studies, such as the dominance of laboratory experiments, reliance on student samples, or the lack of objective measurements of sensory responses.

3] Results (a) The Effect of Sensory Stimulation in VR on the Multidimensional Dimensions of Brand Experience Multisensory stimulation in virtual reality (VR) significantly enriches the brand experience as conceptualized by Brakus et al. (2009) in its four dimensions [9]. In the sensory dimension, the integration of visual senses (through 360° content or HMD), auditory senses (environmental sounds), haptic senses (interaction with virtual objects), and especially olfactory senses (both through physical diffusers and imaginative descriptions) enhances presence and immersion, thereby stimulating richer and more realistic perceptions, as evidenced by Cowan et al. (2023), who showed that adding olfactory cues in VR significantly increases immersion, which then triggers flow [4]. This enhancement further encourages stronger affective responses, including enjoyment, hedonic value, and emotional engagement, especially when these multisensory stimuli are congruent and increase the authenticity of the experience [3], [10].Intellectually, multisensory experiences, particularly through vividness, interactivity, and contextual embedding, facilitate mental imagery, learning, and more confident decision-making (e.g., through product or location simulations), as seen in hotel studies by Lim et al. (2024) and tourism studies by Calisto & Sarkar (2024). Finally, on the behavioral dimension, this sensory combination has been shown to increase behavioral intentions such as purchase intention, willingness to pay, and online engagement (e.g., likes in a Facebook campaign by Cowan et al., 2023), although these effects are mediated by immersion and flow levels and moderated by factors such as system immersivity (HMD vs. desktop), innovativeness, and usage context (pre-visit, during visit, or post-visit). Thus, these findings holistically support that VR is not merely a visual tool, but a multisensory platform with the potential to transform the entire spectrum of brand experience, provided that its stimulation design considers the balance between technological embodiment, psychological presence, and behavioral interactivity.

Based on cross-study findings in the documents provided—particularly the works of Cowan et al. (2023), Alyahya & McLean (2021), Sikora et al. (2018), Lim et al. (2024), and Nunkoo et al. (2024)—a comparative narrative can be drawn regarding when and why the strength of multisensory effects in augmented reality (AR/VR) varies depending on sensory modality and context of use [1], [4], [5], [8].

In general, visual-auditory stimulation (such as 360° displays, HMDs, or environmental voice narration) dominates in building the sensory and affective dimensions of brand experience. Vivid and contextually embedded visualizations (e.g., in the hotel study by Lim et al., 2024) enhance presence and immersion, which in turn trigger affective responses such as enjoyment, hedonic value, and emotional engagement. This is consistent with findings that vividness and interactivity have a strong influence, especially on first-time users who rely heavily on sensory richness to shape their perceptions and emotional engagement. Conversely, haptic stimulation, whether through physical controls in the interface (e.g., spatial physical control in AR; Hilken et al., 2017) or through direct touch in smartphone apps [11], tends to have a greater impact on the behavioral dimension, particularly in short-term purchase decisions and choice confidence. For example, haptic feedback on 2D interfaces (mobile apps) shows a significant effect on purchase intention for instant consumption—because it triggers a sense of control, affordability, and self-efficacy, which cognitively reinforces confidence in choosing products [11], [12]. In this context, haptics function as a cue of diagnosticity [13], which is especially important when consumers need certainty before a transaction.

Meanwhile, olfactory stimulation, both ambient and imagined [4], shows a moderating effect that is highly dependent on the level of system immersivity. In high-immersion VR environments (e.g., HMD), scent cues significantly increase immersion and flow, which in turn drive purchase intention and online engagement. However, in low-immersion systems (e.g., 360° video on desktop), the olfactory effect weakens because it does not reach the superadditive effect threshold between visuals and scent [14], thus failing to sufficiently trigger flow. The same applies to complex haptic auditory stimulation, such as AR soundscapes [5], which increase arousal and excitement (affective), but only have a behavioral impact when supported by spatial presence and contextual congruence.

Holistically, the power of specific sensory effects depends on (1) the level of novelty of the user experience, (2) the level of technological immersion, and (3) the type of consumption or purpose of use. For first-time users, visual vividness is crucial for establishing initial immersion; for habitual users, augmentation (realism of object interaction) and personalized recommendations that often utilize haptics and cognition are more decisive in determining choice confidence and purchase intention. Inconspicuous (private) consumption is more responsive to haptics and utility, while conspicuous (public) consumption is more strongly influenced by visual-auditory elements that reinforce self-expressiveness and brand warmth in the 3D Metaverse environment [11]. Thus, it is not a single sensory modality that is most dominant, but rather the congruence between modalities and their suitability to the user's psychological context, particularly psychological distance (temporal/construal level), consumption motives, and level of technological experience, that determine the intensity and direction of influence on the four dimensions of brand experience.

The conceptual evolution of immersion from its original technological and visual-centric dimensions towards a more holistic construct, namely sensory immersion, reflects a fundamental shift in our understanding of consumer experiences in the digital environment. Initially, immersion was understood primarily as a system attribute: Slater & Wilbur (1997) defined it through technical characteristics such as field of view, stereoscopicity, and the number of senses simulated, conceptualizing immersion as system immersivity, which distinguishes between fully immersive systems (HMD/VR headsets) and non-immersive systems (360° video on desktops). This approach places technology as the main determinant, with the user experience seen as a passive result of the quality of visual simulation. As emphasized by Cowan et al. (2023) and confirmed across studies [3], [8], this limitation has proven to be inadequate. Research shows that immersion is not simply "built by technology," but is a subjective and embodied process, in which users actively "immerse" themselves in the environment both mentally and physically, so that the virtual world feels more proximate psychologically and physically [15], [16]. A conceptual turning point occurred when olfactory cues, haptic feedback, and even auditory layering (such as the soundscape in Sikora et al., 2018) were found to significantly enhance immersion even when visuals were constant, subsequently triggering stronger flow and affective-behavioral responses. This is where the idea of sensory immersion emerges: not just "seeing the virtual world," but experiencing it multisensorily, with a superadditive effect between modalities [14], that creates a deeper illusion of reality.

The implications for experiential marketing theory [17], are significant. While Schmitt initially proposed five dimensions of experience—sense, feel, think, act, relate—as a holistic marketing strategy, the evolution to sensory immersion reinforces and updates this framework with a more robust psychological-empirical basis. Sensory immersion becomes the core mechanism that connects sensory stimuli with experience states: for example, olfactory + visual not only stimulate Sense, but through increased immersion and flow also strengthen Feel (affective), Think (through mental imagery and diagnosticity), and Act (through purchase intention and behavioral engagement).

Furthermore, sensory immersion allows experiential marketing to operate beyond physical boundaries: experiences such as "smelling the sea" in VR tourism destinations [1] or "feeling the texture of fabric" via haptics in try-on applications (De Canio & Fuentes -Blasco, 2021) are no longer marketing metaphors, but rather neurocognitively real experiences that trigger psychological ownership, self-expressiveness, and brand warmth [11], [18]. Thus, the evolution from visual immersion to sensory immersion not only enriches theoretical constructs but also transforms experiential marketing from a narrative art into a precise techno-sensory discipline where experience design must consider congruence, timing, and hierarchy of sensory modalities according to consumption context, user familiarity level, and behavioral objectives. This marks a new era: no longer "Tell them a story," but rather "Let them live it fully, sensorially, and memorably."

Cross-study findings reveal a number of interesting inconsistencies and contradictions, not as methodological failures, but as indications that the effects of AR/VR are contextual and contingent, not universal. One major inconsistency concerns the role of technological innovation as a signal of quality: Anderson & Laverie

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(2022) found that only consumers' perceptions of innovation, not objective industry assessments, increased perceptions of quality and purchase intentions for unbranded properties [19]. while in the context of museums and tourism, Deng et al. (2019) showed that high realism in VR can reduce future physical visit intentions, as the virtual experience "replaces" the need for real experiences due to psychological substitution effects, rather than complementarity. These findings appear to contradict studies such as Lombart et al. (2020) or Calisto & Sarkar (2024), which report an increase in travel intention and booking intention after VR exposure. This contradiction can be explained by the type of consumption context: VR used for initial exploration (pre-purchase) of complex products (property, hotels) tends to be complementary, while VR that provides a complete and emotional experience (museums, cultural attractions) risks becoming a functional substitute, especially if the level of presence and flow reaches a certain psychological threshold [3], [20].

Another inconsistency arises in the additional effects of sensory modalities: For example, Cowan et al. (2023) and Mishra et al. (2021) show that multisensory stimulation (especially olfactory and haptic) increases immersion and purchase intention, but Alzayat & Lee (2021) caution that virtual touch is more effective for products that are body extensions (tools, devices) than body presentations (clothing), and Mishra et al. (2021) add that this effect is much stronger for hedonic products than utilitarian ones. This indicates that product structure (hedonic vs. utilitarian) and body-object relations (body-extension vs. body-presentation) function as boundary conditions that determine whether multisensory stimulation results in value creation or sensory overload [21].

Additionally, the level of visual realism (visual fidelity) also shows a non-linear effect: Peschel et al. (2024) found that low visual fidelity actually increases spending in virtual supermarkets, possibly because it reduces cognitive load and speeds up decision-making, contrary to the common assumption that "the more realistic, the better." However, in the context of evaluating high-risk products (e.g., real estate), factual realism (proportional and spatial accuracy) is crucial [22], indicating that perceived risk level and product involvement level (high- vs. low-involvement) are key moderators.

Finally, individual differences also explain the contradiction: Zhang et al. (2024) show that consumers with high product knowledge are less responsive to VR because they have established mental shortcuts, while for consumers with a high need for touch, haptic simulation in VR can mitigate purchase barriers [20], but not for those with low sensory processing sensitivity. Thus, the inconsistency of findings does not reflect unreliability, but rather the complexity of interactions between technological context (fidelity, immersivity), product context (hedonic/utilitarian, high/low involvement, body-relation), and individual context (knowledge, need for touch, cultural orientation), all of which need to be considered systematically in AR/VR design for experiential marketing.

(b) The Role of Brand Experience Mediation in the Relationship between Sensory Stimulation and Purchase Intention

Based on a synthesis of empirical evidence in the available literature, brand experience was not explicitly tested as a mediator in the relationship between sensory stimulation through VR and purchase intention. However, there is strong empirical evidence regarding psychological mechanisms that are closely related or overlap with brand experience, particularly immersion and flow, which function as mediators in this relationship.

Cowan et al. (2023) in their four studies (including laboratory experiments and field A/B tests) found that olfactory cues (a form of sensory stimulation) in a VR environment increase immersion. This immersion then increases flow, and it is this flow that subsequently increases purchase intention and online engagement. They emphasize that immersion and flow are key processes (serial mediation), and immersion itself does not directly increase purchase intention, but only through flow. This indicates a strong sequential mediation pattern.) [4].

Lim, Jasim, & Das (2024) also found that the perceived usefulness, ease of use, and innovativeness of AR/VR increase satisfaction and intention to stay, which in turn increases intention to return. Satisfaction and intention to stay can be viewed as components of brand experience, even though the term "brand experience" is not explicitly used [8].

Calisto & Sarkar (2024) highlight that presence (the ability to feel present in a virtual environment) is a central mechanism that increases enjoyment and preference for a destination, which ultimately drives visitation intention. Presence, enjoyment, and mental imagery together form the core of the experiential response that is the foundation of brand experience [3].

Although the term brand experience is not always used directly, empirical evidence strongly supports that rich and immersive psychological experiences (such as immersion, flow, presence, and enjoyment), which are at the core of brand experience in the context of VR, serve as significant—even dominant—mediators between sensory stimulation and purchase intention. Although it cannot be said that brand experience functions as a full or partial mediator explicitly, empirical findings show that key components of brand experience are dominant and significant mediators in this relationship.

Within the Stimulus–Organism–Response (S-O-R) framework of Mehrabian & Russell (1974), empirical findings from the VR literature indicate that sensory stimuli in VR, such as olfactory cues [4], visual immersion, interactivity, and multisensory layering (including auditory and haptic)—function as Stimuli (S) that are significantly stronger than traditional digital contexts due to their embodied and ecologically valid nature. These stimuli not only attract attention, but also transform the way consumers process information: they no longer interact cognitively-deductively (as when reading product descriptions), but rather experience sensorimotorically, as they would in a physical store.

Internal responses—Organism (O) component—involve two main pathways:

1. Cognitive: increased mental imagery [4], [23], perceived diagnosticity, and sense of presence [24], which enable consumers to form richer and more concrete mental representations of products or destinations.
2. Affective: the emergence of immersion → flow [4], enjoyment, and hedonic engagement [25], which create peak experiential moments. This combination of cognitive and affective elements forms what is operationally referred to as brand experience: a holistic experience that integrates sensory, affective, intellectual, and even behavioral engagement (Brakus et al., 2009; although not explicitly mentioned, these constructs are represented in variables such as presence, flow, and mental imagery that are measured).

From the Response (R) side, evidence shows that changes in this organism, particularly flow and mental imagery, consistently and significantly mediate increases in purchase intention, willingness to pay, and other behavioral intentions (e.g., intention to return, WOM). For example, Cowan et al. (2023) demonstrated serial mediation: olfactory cue → immersion → flow → purchase intention, a pattern that reinforces the validity of S-O-R in the VR domain. Even when product knowledge is high (which typically weakens the VR effect), experiential shopping orientation and high product involvement can strengthen this organismic pathway, indicating that consumer motivational context acts as a boundary condition in the S-O-R mechanism.

Theoretically, these findings expand S-O-R by emphasizing that in VR environments, stimuli are not merely "processed" but "lived," making organisms no longer passive-responsive but active-constructive. In other words, VR enables stimuli to activate embodied cognition and affective priming simultaneously—mechanisms that are typically more dominant in physical retail—resulting in a deeper and more sustainable brand experience, which in turn drives stronger and more consistent behavioral responses.Based on a review of the literature in the document, the quality of mediation testing in previous studies shows varying degrees of development, ranging from relatively simple approaches to more sophisticated and methodologically rigorous designs, although there are still gaps in the consistent application of best standards.First, in terms of estimation techniques and statistical inference, most recent studies, such as those conducted by Cowan et al. (2023) and Zhang et al. (2024), have adopted bootstrapping (usually 5,000–10,000 samples) within the PROCESS macro framework to test indirect effects, which is the current recommended practice because it does not assume the normality of the sampling distribution and is more accurate in estimating standard errors and confidence intervals [26], [27]. For example, Cowan et al. (2023) used PROCESS Model 6 to test serial mediation (olfactory cue → immersion → flow → purchase intention) with 95% bootstrap-based CI; Zhang et al. (2024) also applied parallel mediation (elaboration & quality of mental imagery) with 5,000-sample bootstrapping, demonstrating adherence to contemporary methodological standards.

Second, in terms of model complexity, there has been a shift from simple mediation testing to more realistic models:

1. Serial mediation (e.g., immersion → flow) and parallel mediation (e.g., elaboration + quality of mental imagery) have been explicitly used to reflect hierarchical or multidimensional psychological processes.
2. Several studies have even tested double moderation in a moderated mediation framework (e.g., three-way interaction: product presentation × product knowledge × shopping orientation/involvement), using PROCESS Model 11, which demonstrates a serious effort to identify boundary conditions and improve the external validity of the findings [8], [23].

However, there are several recurring methodological limitations:

1. Control variables are often ignored or not reported transparently. For example, although Cowan et al. (2023) tested covariates such as novelty and imagery in sensitivity analyses, many other studies, especially those using PLS-SEM, do not mention controlling for demographic variables (age, gender),

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dispositional variables (product involvement, experiential orientation), or contextual variables (prior VR experience, simulator sickness) that are known to influence responses to VR/AR stimuli [20].

2. Some studies still rely on path analysis or hierarchical regression without bootstrapping [28], which risks producing higher Type I errors in mediation testing [26].

3. In studies based on secondary surveys or field data [29], it is not always clear whether the assumption of temporal precedence (causal sequence S→O→R) is satisfied, a common constraint in cross-sectional designs.

Overall, the quality of mediation testing in this literature tends to improve, with recent experimental studies demonstrating awareness of the importance of: (1) using bootstrapping for robust inference, (2) specifying theoretical mediation paths (serial/parallel), and (3) integrating moderators to enrich generalizations. However, inconsistencies in reporting controls and potential cross-sectional design biases remain challenges that need to be addressed to strengthen claims of causality in the VR/AR domain.

Based on a synthesis of the three available documents, there is a significant research gap in hierarchical mediation testing that explicitly links presence → brand experience → purchase intention. A number of studies have tested sequential paths such as presence → flow → desire to stay [28] or olfactory cue → immersion → flow → purchase intention [4]as well as sense of presence → mental imagery → purchase intention [30], but no study operationally defines and measures brand experience as a full mediator in these sequences—even though constructs such as immersion, flow, enjoyment, and mental imagery are theoretically core components of brand experience [9].

Furthermore, Khan & Fatma (2024) did test AR app-based brand experience as a moderator in the engagement → attitude → brand love/co-creation relationship, but did not position it as a mediator in the presence-to-intention pathway. This shows that although brand experience is recognized as conceptually important, its empirical testing is still residual or proxy-based, rather than as a separate latent construct in a hierarchical path model.

Regarding moderation based on product involvement levels, this is where there has been considerable methodological progress—yet it remains not fully integrated with brand experience. The study by Zhang et al. (2024) clearly shows that product involvement moderates the effect of product presentation (VR vs. static) on mental imagery and purchase intention, especially in conditions of high product knowledge: consumers with high involvement still show an increase in elaboration of mental imagery and purchase intention in the VR format, even when their product knowledge is high; conversely, low-involvement consumers lose the benefits of VR when their product knowledge is high.

These findings are consistent with the logic of the Elaboration Likelihood Model: high-risk products encourage central processing, so immersive cues in VR remain relevant as a diagnostic aid. However, no studies have examined whether product involvement moderates the mediating power of brand experience itself. For example, does presence have a stronger effect on brand experience, and subsequently on purchase intention, for high-involvement products than for low-involvement products? In other words, the moderating influence of product involvement has been tested on direct and first-stage mediation (e.g., VR → mental imagery), but not on second-stage or full-chain moderated mediation involving brand experience as the core mediator. Thus, the main research gap encompasses two layers:

1. Conceptual-operational: lack of models that integrate presence → brand experience (as a multidimensional latent construct: sensory, affective, intellectual, behavioral) → purchase intention in a strictly tested hierarchical framework (e.g., with bootstrapping, CFA before SEM).

2. Contextual-moderational: no exploration of whether the mediation path is conditional depending on product involvement, despite partial evidence from Zhang et al. (2024), Serravalle et al. (2023), and Cowan & Ketron (2019) cumulatively strongly suggest that this differentiation is highly likely—especially since high involvement increases cognitive and affective motivation to engage in immersive brand experiences [4], [30], [31].

Closing this gap will strengthen the external validity of VR/AR findings while deepening the integration of S-O-R theory with signaling theory and ELM in the context of experiential marketing.

4] Strategic Implications Towards a Holistic Brand Experience Based on Immersive Reality

The significance of the three core theoretical domains of sensory marketing, experiential branding, and presence theory through the integration of immersive technology (VR/AR) and a holistic multisensory approach. Theoretically, this study expands on all three in three main directions:

1. From Unisensory to Sensory Immersion as a Core Mechanism in Sensory Marketing

Empirical findings show that sensory marketing is no longer limited to visual stimulation or partial multisensory stimulation in the real world, but has shifted to a new construct: sensory immersion, the synergistic integration of sensory modalities (visual, auditory, haptic, olfactory) that produces superadditive effects [14]. This expands the framework of Holbrook & Hirschman (1982) and Krishna (2012) by shifting the focus from cue congruence to embodied congruence. It is not only the congruence between stimuli, but also the harmony between sensory modalities, the system of immersivity, and the psychological construal level of consumers. Sensory immersion becomes a more fundamental proximal mechanism than vividness or diagnosticity in explaining why and when multisensory experiences enhance brand experience.

2. From Experience as Outcome to Experience as Process-Mediator in Experiential Branding

This study reinforces and reformulates experiential branding by [9], [17]: Confirming that the four dimensions of brand experience (sensory, affective, intellectual, behavioral) are not separate entities, but rather process states that are activated sequentially (serial mediation) through the following pathway: sensory stimuli → presence/immersion → flow/mental imagery → affective & cognitive elaboration → behavioral intention. Positioning brand experience not merely as an outcome of technology, but as a mediating organism within an updated S-O-R framework—where immersive stimuli trigger embodied cognition, which then shapes a richer, more sustainable, and actionable experiential representation of the brand. Thus, experiential branding in an immersive context is no longer about storytelling, but about world-building—the creation of psychologically proximal environments that allow consumers to live the brand, not just see or feel it.

3. From Presence as a Technological Function to Presence as a Psychological-Ecological Construct in Presence Theory

These SLR findings revise the classical understanding of presence by asserting that [32], [33]:

a. Presence is not a deterministic product of immersivity systems (e.g., HMD vs. desktop), but arises from sensorimotor coupling between the user's body and the virtual environment—primarily through action-feedback loops (e.g., responsive haptics) and multisensory coherence.

b. Presence operates in two modes: spatial presence (self-location in the virtual world) and social/embodied presence (sense of ownership, self-location, and agency), both of which are reinforced by sensory modality congruence (e.g., smell of the sea + sound of waves + visual of the beach).

More importantly, presence now acts as a gateway construct: a psychological threshold that, when crossed, triggers flow, mental imagery, and psychological ownership, thus becoming a necessary (though not always sufficient) condition for brand experiences that influence behavior. Holistically, these SLR findings introduce an integrated theoretical framework: Multisensory Stimulation → Embodied Presence → Sensory Immersion → Experiential Branding → Purchase Intention. This framework expands the Stimulus–Organism–Response paradigm by emphasizing that in immersive environments, organisms are not only responding, but constructing reality through active sensing and predictive processing (Clark, 2016), making brand experiences phenomenologically real, rather than mere simulations. The main theoretical contribution lies in the re-operationalization of brand experience as a tiered mediation process triggered by the sensorimotor qualities of the environment, as well as the identification of boundary conditions (such as product involvement, experiential orientation, and system fidelity) that determine the validity of the findings' generalization. The implication for the future of sensory marketing and experiential branding is that it no longer relies on “how many senses are stimulated,” but on “how cohesive, contextual, and body-compatible the stimuli are in forming a meaningful illusion of presence.” Effective VR content design must focus on the principle of optimal multisensory integration, prioritizing sensory congruence over simply adding more sensory modalities. The addition of multisensory elements should not only aim to create a “wow effect,” but must ensure that each stimulus supports each other functionally and contextually. For example, in a virtual café experience, the combination of coffee aroma, the sound of a coffee grinder, the visual of a barista extracting espresso, and the haptic sensation of a cup vibrating will enhance the user's sense of authenticity and presence. Conversely, the use of lavender aroma in a virtual car showroom is irrelevant and can interfere with the diagnostic process, thereby reducing the user's perception of the quality of the experience.

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Table 1. Select sensory modalities based on the psychological function you want to trigger and the type of consumption:

Marketing Objectives	Primary Modality	Rationale & Examples
Building emotional engagement and self-expression (conspicuous products: fashion, luxury)	Visual + Auditory (narrative, music)	Enhancing spatial presence & brand warmth [11], example: VR runway show with orchestral soundscape.
Strengthening trust and choice confidence (inconspicuous or high-involvement products: property, finance)	High haptic and visual fidelity	Haptics provides a sense of control and diagnosticity [11]; examples include “pulling out a drawer” or “opening a door” in a virtual property showroom.
Triggering peak experiential moments & memory encoding (tourism destinations, F&B)	Olfactory + Visual	Superadditive effect: the smell of the sea + the visual appeal of the beach increase flow and future visitation intention [4].

In VR content design, improving the quality of the experience cannot be achieved through passive viewing alone, but must be realized through embodied interactivity that mimics natural body movements, such as reaching, turning, or pressing, rather than relying on gaze-based interactions or simply pressing buttons. The use of haptic feedback synchronized with visuals—for example, vibrations when a virtual hand touches a rough surface—can strengthen sensorimotor contingency, thereby increasing the user's sense of agency and psychological ownership. In addition, it is important to avoid sensory overload by applying the principle of progressive disclosure. For new users, the experience can begin with a combination of visual and auditory elements, then gradually add haptic or olfactory elements once a basic level of immersion has been achieved. For utilitarian content, such as virtual try-ons of technical products, the number of modalities should be limited to two to three truly relevant elements, as sensory overload can increase cognitive load and actually decrease decision-making efficiency, as shown in the findings of Peschel and colleagues (2024).

Table 2. Based on empirical evidence, the effectiveness of multisensory in VR is not universal—here are the profiles of the most responsive users:

User Segment	Responsiveness to Sensory Stimulation	Target Recommendations
Users with high Need for Touch (NFT) (e.g., Millennials/Gen Z, fashion/F&B shoppers)	Very high in terms of haptic simulation; it can even replace in-store touch [12].	Focus on virtual try-on with haptics (e.g., fabric texture via smart gloves or vibrotactile feedback on the controller).
Consumers with low product knowledge but high involvement (e.g., first-time property buyers)	Highly responsive to visual + haptic + olfactory stimuli that support mental imagery and diagnostic processing.	Use VR as a pre-purchase exploration tool with contextual embedding: 'walk' in the living room while 'opening the windows' and 'smelling the garden.'
Tech-novice users or first-time VR users	Relies more on visual and auditory vividness to create initial presence; less responsive to olfactory/haptic cues if not supported by narrative.	Simplify the interface, provide clear visual-auditory onboarding, and avoid complex olfactory stimulation in the first session.
Hedonically oriented & experientially motivated consumers (e.g., travelers, users of luxury experiences)	Very responsive to olfactory + soundscape + visual storytelling that triggers flow and peak emotion.	Experiential storytelling design: “exploring Balinese temples” with gamelan sounds, incense aromas, and simple ritual interactions.
High sensory processing sensitivity (SPS) user	Prone to sensory overload; better with controlled and personalized stimulation.	Provide sensory customization options (e.g., turn off aroma/sound, adjust haptic intensity).

The theoretical foundation of sensory marketing and experiential branding in an immersive ecosystem also opens up horizons for more ambitious research, where the next challenge is no longer to prove whether sensory stimulation in VR is effective, but rather how these effects endure, transform, and adapt in more dynamic, heterogeneous, and real-world contexts. First, the majority of current studies are cross-sectional and laboratory-centric [4], [34], so longitudinal effects such as the durability of brand memory, habituation to sensory cues, or decay of presence after repeated exposure remain terra incognita. In commercial practice, however, VR experiences are often designed to be repeated (e.g., virtual showrooms visited multiple times before purchase decisions), making an understanding of sensory adaptation and experience saturation crucial. Future research needs to adopt a within-subject longitudinal design or VR storefront-based field experiments on Metaverse platforms (e.g., Decentraland, Spatial), measuring not only initial purchase intention but also repeat engagement, brand recall after 30/60/90 days, and spillover effects to physical channels—so that it can test whether sensory immersion creates sustainable brand equity or just a short-lived peak experience. Second, the external validity of the findings is still limited to WEIRD samples (Western, Educated, Industrialized, Rich, Democratic), with little exploration of cross-cultural differences in perception and response to multisensory stimulation. For example, while the scent of vanilla increases warmth and trust in Western contexts [14], in some Eastern cultures, strong scents are actually associated with rudeness or unnaturalness in commercial interactions—a phenomenon that has yet to be tested in VR. Future research needs to conduct multi-country replications with measurements of cultural moderators (e.g., individualism-collectivism, uncertainty avoidance) to build a global experiential branding theory that is not only technologically robust but also culturally intelligent. Third, although the potential for real-world deployment of VR is increasingly mature with the emergence of VR storefronts, virtual pop-up stores, and AR/VR integration in phygital retail, empirical research evaluating performance in real operational contexts is still scarce. Laboratory studies like Lim & Jasim (2024) provide high internal validity but do not fully address practical questions: How does sensory stimulation work when users experience simulator sickness? Do olfactory effects persist in a home environment full of distractions? Is simulated haptic feedback less effective than physical touch in a real store? Field experiments based on A/B testing on metaverse commerce platforms or VR-enabled e-commerce (e.g., Alibaba’s VR Mall) are needed to close the ecological validity gap, while also testing the scalability and cost-effectiveness of multisensory designs, providing direct contributions for practitioners who have to choose between high-fidelity HMDs vs. low-cost mobile VR.Finally, and perhaps most critically from a theoretical standpoint, current literature tends to assume that more sensory input = better, whereas early evidence [35], [36]suggests there is an optimal threshold beyond which sensory overload or fatigue actually reduces processing fluency, decision confidence, and even brand attitude. This phenomenon has not yet been systematically modeled within marketing theory. Future research needs to integrate constructs from cognitive load theory [37], and sensory gating (neuroscience) to build a Sensory Optimization Model in VR: when redundancy helps (e.g., visual + auditory for reinforcement), when complementarity is needed (e.g., haptics for disambiguation), and when minimalism actually increases efficiency (e.g., low-fidelity VR for low-involvement products). Exploration of sensory fatigue—through physiological measures (EEG beta suppression, GSR habituation slope) and behavioral measures (drop-off rate, task abandonment)—will enrich experiential marketing theory with the dimension of sustainability of experience, not just its intensity. Thus, the future research agenda should not only deepen the mechanisms but also expand the boundaries, temporalities, and ecologies of immersive brand experience so that its contribution does not stop at understanding how technology shapes experience, but also how sustainable, inclusive, and ethical experiences can be designed in an increasingly.

5] Conclusion

This systematic literature review reveals that sensory stimulation in VR enhances brand experience not as a static outcome, but as a dynamic, multidimensional process—integrating sensory, affective, intellectual, and behavioral dimensions—driven primarily by *sensory immersion*: the synergistic, congruent activation of multiple senses. While brand experience itself is seldom tested directly as a mediator, its core psychological components (presence, immersion, flow, mental imagery) consistently operate as sequential mediators between sensory input and purchase intention, reinforcing and extending the Stimulus–Organism–Response framework in immersive contexts.

Crucially, effectiveness is highly contingent—not all sensory combinations work universally. Outcomes depend on system fidelity, product type, user traits (e.g., need for touch, prior experience), and above all, *sensory congruence*. Incongruent cues risk cognitive overload and reduced persuasive impact. Theoretically, this study advances three domains: (1) *sensory marketing*, by recentering on *sensory immersion* as the key mechanism; (2) *experiential branding*, by reconceptualizing

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brand experience as a *process-mediator* rather than endpoint; and (3) *presence theory*, by framing presence as an embodied psychological threshold—not a technological output. Together, these yield a refined model: Multisensory Stimulation → Embodied Presence → Sensory Immersion → Brand Experience → Purchase Intention.Limitations include overreliance on lab-based, cross-sectional, and WEIRD-sampled studies, lack of physiological validation, and exclusive focus on B2C settings. Future research should: (1) adopt longitudinal and real-world deployment studies (e.g., VR storefronts in the metaverse) to assess experience durability; (2) validate findings across diverse cultural contexts; (3) investigate sensory fatigue and overload using objective neuro-behavioral measures; and (4) explicitly model brand experience as a latent multidimensional mediator, moderated by involvement and experiential orientation—to build a robust, generalizable theory of immersive marketing.

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