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Virtual reality and embodiment: rethinking self-construction and identity in therapeutic contexts

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Immersive virtual reality has surfaced as a revolutionary instrument in psychology, clinical practice, and neuroscience creating unique opportunities to explore embodiment, identity, and therapeutic applications. This review advances the field by reframing embodiment as a core psychological mechanism linking perception, identity, and therapeutic change in immersive virtual reality. Embodiment in VR functions as a psychological process through which perceptual, emotional, and identity-level changes emerge. These processes have demonstrated relevance to clinical practice, including pain management, cognitive rehabilitation, and interventions for anxiety, depression, and social phobia. This mini review synthesizes current research across these domains, highlighting the mechanisms through which VR shapes self-perception and psychological functioning. By integrating findings from empirical studies and theoretical frameworks, the review identifies both opportunities and limitations in VR research and practice, providing a foundation for future investigations into its potential to enhance wellbeing and support personal transformation. By reframing embodiment as an active process rather than a perceptual illusion, this review clarifies how immersive VR can produce both immediate experiential effects and long-term changes in self-perception and therapeutic outcomes. However, it also highlights that current research has gaps in theoretical clarity and methodology, emphasizing the need for more personalized, accessible, empirical and long-term studies in the future.

KEYWORDS

embodiment, identity, self-construction, therapy, virtual reality

Introduction

As immersive technologies evolve rapidly, virtual reality (VR) has become a central focus within psychological, neuroscientific, and clinical investigations. More than a technological novelty, VR possesses a unique capacity to alter, extend, and embody the human self within digital environments. Central to this experience is embodiment, which provides the experiential link between the user's physical body and the virtual environment (Kilteni et al., 2012). Drawing from fields such as cognitive neuroscience, phenomenology, human-computer interaction, and clinical psychology, embodiment underscores the inherently interdisciplinary nature of VR research and highlights its practical significance, particularly in healthcare (Sansoni et al., 2022).

Building on this foundation, immersive VR has been proposed as a novel framework for narrative self-recreation, offering powerful opportunities in trauma recovery. By combining embodiment, immersion, and interactivity, VR allows individuals to interact with representations of the self in ways that are difficult to achieve in physical settings (Georgieva and Georgiev, 2022; Garcia-Gutierrez et al., 2025). At the same time, VR is

being increasingly recognized as a promising complementary therapy for pain management across age groups. Through the creation of immersive, multisensory environments that heighten the individual's experiential sense of 'being there' as well as embodiment, VR successfully diverts attention from painful stimuli and reduces perceived discomfort (Matamala-Gomez et al., 2019; Viderman et al., 2023). Taken together, such applications illustrate how embodiment in VR not only reshapes perception and self-experience but also generates tangible therapeutic benefits, bridging theory and practice in meaningful ways.

Even though research on VR has grown quickly across many fields, it is often inconsistent in terms it uses, the theories it relies on, and the quality of its methods. This makes it difficult to clearly understand the psychological processes that explain how embodiment, presence, and self-transformation work in virtual environments. While studies have shown that VR can help with many issues such as depression, anxiety, body image concerns, and chronic pain, there is still limited understanding of how a person's sense of self in VR shapes these outcomes.

Despite the rapid expansion of immersive virtual reality research across psychology, neuroscience, and clinical practice, the field remains conceptually fragmented. Embodiment, presence, self-experience, and therapeutic change are often examined as separate outcomes rather than as interrelated psychological processes. As a result, there is limited theoretical clarity regarding how embodied experience in VR produces changes in perception, identity, and psychological functioning. The aim of this mini review is to synthesize research on embodiment in immersive virtual reality and examine how embodied virtual experiences influence self-perception, identity construction and therapeutic outcomes. This paper also analyzes the gaps and weaknesses in current studies that limits the long term impact of VR based interventions and suggests directions for future research and design. Therefore, based on the published literature the review is guided by the following questions:

1. How is embodiment conceptualised in immersive virtual reality research?
2. How does embodied virtual experience contribute to the construction and transformation of self and identity?
3. How does embodied VR interventions produce psychological and therapeutic outcomes in clinical and rehabilitative contexts?
4. What are the research gaps that limit current understanding of these processes?

Embodiment and presence in virtual reality

To address how embodiment is conceptualised in immersive virtual reality, existing research has drawn primarily from cognitive neuroscience, phenomenology, and human-computer interaction. Therefore, embodiment in VR has been examined from multiple perspectives, ranging from philosophical inquiry to empirical experimentation. It extends beyond simulation to personal transformation (Moura et al., 2021) and shows how synchronized multisensory cues can generate body ownership illusions even when

avatars differ in traits such as race or age (Slater and Sanchez-Vives, 2014). This demonstrates how multisensory integration in VR can realign bodily and spatial self-representation. The brain adapts to sensory conflicts through embodied alignment, demonstrating VR's capacity to transform the relationship between body, mind, and environment (Gonzalez-Franco et al., 2020).

Embodiment also impacts cognition and emotion by enhancing memory recall (Bréchet et al., 2020) and fostering deeper self-reflection and emotional regulation (Slater et al., 2019). High embodiment increases emotional engagement (Gall et al., 2021), though it can also evoke negative effects, which highlights the importance of avatar design and body image sensitivity (van der Waal et al., 2022). These findings indicate that embodiment modulates how sensory and motor information is integrated into experience. The therapeutic and behavioral potential of embodiment is evident in its ability to reduce depression and enhance self-compassion (Falconer et al., 2016; Cebolla et al., 2019), influence time perception as well as decision-making (van Gelder et al., 2022), and support mindfulness-based interventions that reduce anxiety and depression while enriching sensory perception (Ma et al., 2025). Taken together, embodiment in VR reshapes perception, identity, and behavior, offering powerful opportunities for therapeutic practice and personal transformation.

Self-construction and identity in virtual reality

Building on these embodied processes, research has examined how virtual embodiment contributes to the construction and transformation of the self and identity. Self-construction is inherently embodied because the sense of who one is emerges through how the body is perceived, controlled, and situated in the world (Merleau-Ponty and Landes, 2014), in virtual reality, this bodily self is represented through the avatar. Thus, the alignment between one's physical and virtual presence through full body tracking, voice, gender, or cultural cues strengthens a sense of authenticity, shaping how identity is experienced and enacted (Freeman and Maloney, 2021). Beyond its technological basis, embodiment has also been conceptualized in philosophical and artistic terms as a means of expanding digital selfhood and opening new possibilities for reimagining identity (Moura et al., 2021). Shifting perspective in immersive environments alters how the body is experienced as 'self', creating scope for growth and identity exploration through changes in embodied self-representation (Slater and Sanchez-Vives, 2014). The way avatars are perceived both internally and externally directly influences cognitive performance, indicating that changes in digital embodiment alter how individuals evaluate and enact the self during task engagement (Kocur et al., 2020a). Even subtle manipulations, such as altering perceived height, can change self-esteem and task performance, revealing how identity in VR is malleable and responsive to environmental cues (Leung et al., 2021). Likewise, modifying avatar embodiment can recalibrate motor responses and action initiation, suggesting that VR not only influences how we think about ourselves but also how we act in the world (Buetler et al., 2022).

At the same time, VR also provides new ways of enhancing self-awareness by allowing individuals to observe, assess, and expand their own sense of identity within controlled yet immersive environments

(Muratore et al., 2019). In this way, VR functions both as a mirror and a canvas: reflecting existing identities while simultaneously offering the means to reconfigure them. The transformative potential of VR extends well beyond therapy, where VR becomes a medium for reworking inner conflicts and personal narratives. By visualizing identity dilemmas and embodying alternative perspectives, individuals can externalize critical aspects of the self and reconstruct them in healthier ways, leading to significant psychological improvements (Garcia-Gutierrez et al., 2025). Similarly, embodying self-compassion within VR has been shown to foster emotional integration and alleviate symptoms of depression (Falconer et al., 2016). Supporting this, VR's immersive qualities allow individuals to directly reshape bodily experience and self-representation, positioning it as a powerful tool for clinical interventions aimed at rebuilding identity (Riva et al., 2016).

Therapeutic potential of virtual reality

With respect to how embodied VR produces psychological and therapeutic outcomes, clinical and experimental studies consistently indicate that the strength of embodiment and presence mediates intervention effectiveness. The therapeutic potential of VR lies in its capacity to simulate emotional, cognitive, and sensory experiences through immersive embodiment. By engaging users in emotionally rich and reflective scenarios, VR facilitates personal transformation by modifying embodied self-experience, thereby supporting emotional engagement and psychological change (Riva et al., 2016). This includes applications in exposure therapy, perceptual control, and transformative learning, enabling patients to confront fears, practice coping strategies, and regulate emotions in controlled virtual environments (Emmelkamp and Meyerbröker, 2021).

In pain management, immersive VR has been shown to effectively reduce both acute and chronic pain by diverting attention and altering body representation, acting as a non-pharmacological analgesic (Hoffman, 2004; Matamala-Gomez et al., 2019). Factors such as avatar perspective, transparency, and physiological synchrony influence analgesic outcomes, and VR can also reduce exercise-induced pain and effort, supporting engagement in physical activity regardless of individual differences in body consciousness (Matsangidou et al., 2019). Beyond pain, VR supports neurocognitive development and rehabilitation. Enriched virtual environments and brain-computer interfaces enhance neuroplasticity, contributing to cognitive recovery and broader personal development strategies (Georgiev et al., 2021). VR therapy has been successfully applied in post-stroke rehabilitation, improving motor function, balance, daily activity performance, and cognitive and mental health outcomes through immersive, repeatable exercises (Lohse et al., 2014; Zhang et al., 2021). Immersive VR therapy has also been applied to social anxiety and public speaking anxiety, providing controlled social environments that reduce anticipatory stress and enhance coping skills (Emmelkamp et al., 2020; Sarpourian et al., 2022).

These findings indicate that therapeutic outcomes depend on how strongly users experience embodied presence within the virtual environment.

Synthesis and implications

Rather than considering the effects of virtual reality on perception, identity, and therapy as separate outcomes, this review advances a mechanism-oriented interpretation of immersive VR. Across diverse domains, a common process comes forth, immersive VR alters experience by changing how the self is embodied. Embodiment, understood as the integration of agency, body ownership, and self-location (Kilteni et al., 2012), functions as a core psychological mechanism through which perceptual, emotional, and identity-level changes arise. This reconceptualization moves beyond viewing embodiment as a perceptual illusion or design feature and instead positions it as an active process shaping how individuals experience themselves. Therefore emphasizing how embodiment in VR shapes cognition rooted in bodily interaction with the virtual environment through variations in multisensory feedback and avatar characteristics, in ways not readily achievable in physical environments.

When embodiment is modified in VR, the sensorimotor system reconceptualizes how the body is experienced as “me.” This reshaping affects how sensory information is interpreted, how emotions are regulated, and how actions are initiated. Because identity and affect are grounded in bodily self-experience, even subtle changes in avatar form, movement, or synchrony (Freeman and Maloney, 2021; Moura et al., 2021) can influence self-evaluation, motivation, and emotional processing (Garcia-Gutierrez et al., 2025; Riva et al., 2016). From this perspective, changes in self-concept, confidence, and emotional engagement observed in VR studies reflect deeper shifts in embodied self-representation rather than superficial responses to virtual stimuli.

This embodied-mechanistic framework also elucidates why VR can produce therapeutic effects across diverse clinical contexts. Therapeutic change is not driven by immersion alone, but shifts because of the lived experiences of individuals and how one inhabits and experiences their virtual bodies. When users experience stronger agency, ownership, and presence, they become more receptive to emotional engagement, self-reflection, and behavioral change. This helps explain how embodied VR can influence social anxiety, pain perception, mood, and rehabilitation outcomes within a unified psychological model, despite differences in clinical application.

Collectively, these findings re-envision virtual reality as a technology for systematically manipulating the embodied self. By enabling controlled variation of bodily perspective, action, and self-representation, VR provides a powerful means of studying and influencing how identity, emotion, and psychological functioning emerge from embodied experience. This perspective moves VR research beyond isolated representation of effectiveness toward a more coherent understanding of how virtual environments reshape human subjectivity and support therapeutic and personal transformation.

Limitations and future directions

Despite the promising applications of VR across embodiment, self-construction, and therapy, several limitations remain. One such limitation highlights accessibility and usability challenges which are specifically relevant for older adults and populations with limited technological experience, potentially restricting its generalizability

(Ramalho et al., 2024). Individual variability in response, including differences in cognitive profiles, prior VR exposure, and susceptibility to cybersickness, can influence outcomes, focussing on the need for personalized interventions. Moreover, most research has concentrated on immediate effects, with long-term efficacy and transfer of benefits largely unaddressed. Methodological constraints further limit interpretations. Heterogeneous protocols, small sample sizes, and inconsistent reporting of VR parameters reduce comparability and hinder meta-analytic synthesis. Even routine VR experiences can introduce unanticipated cognitive and emotional effects, emphasizing the importance of careful environmental and interaction design (Alvarez Igarzábal et al., 2021; Alnagrat Alnagrat et al., 2023). Additionally, practical challenges such as cost, infrastructure requirements, and integration into clinical workflows present barriers to widespread adoption (Halbig et al., 2022). Research moving forward should give priority to longitudinal studies encompassing larger and more varied populations, alongside adaptive VR systems that tailor sensory, cognitive, and narrative elements to individual needs. Investigating neural and psychological mechanisms of VR-induced changes in embodiment, identity, and therapeutic outcomes will strengthen theoretical understanding. Integration with artificial intelligence, biofeedback, and real-time physiological monitoring could enhance precision and scalability, while careful attention to accessibility and usability will be essential for equitable and effective implementation (Halbig et al., 2022; Ramalho et al., 2024; Alnagrat Alnagrat et al., 2023).

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VV: Conceptualization, Writing – original draft, Writing – review and editing. SC: Project administration, Supervision, Writing – review and editing.

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