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PSYCHOLOGICAL ASPECTS OF IMMERSION IN VIRTUAL REALITY

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Анотація

У цій статті досліджуються психологічні механізми, що лежать в основі занурення у віртуальну реальність (VR), з розмежуванням між технологічним зануренням та суб'єктивним відчуттям присутності. Аналізуються когнітивні та перцептивні процеси, що сприяють «втіленому» досвіду у VR, зокрема феномени ілюзії місця (Place Illusion) та ілюзії правдоподібності (Plausibility Illusion). У статті також розглядається «ефект Протея», коли користувачі змінюють свою поведінку та самосприйняття залежно від характеристик свого аватара, а також стан «потоку» (Flow), викликаний оптимальним балансом викликів та навичок у віртуальних середовищах. Обговорюються клінічні застосування, з акцентом на новітні дані 2024-2025 років щодо ефективності VR у лікуванні тривожності, депресії та страху падіння у літніх людей. Насамкінець розглядаються негативні психологічні наслідки VR, включаючи кіберхворобу та дисоціативні симптоми, такі як деперсоналізація та дереалізація, надаючи збалансований погляд на вплив цього медіа на людську психіку.

Ключові слова: Віртуальна Реальність (VR), занурення, ефект присутності, ефект Протея, стан потоку, кіберхвороба, деперсоналізація, втілення, кіберпсихологія.

Abstract

This article explores the psychological mechanisms underpinning immersion in virtual reality (VR), distinguishing between technological immersion and the subjective sensation of presence. It analyzes the cognitive and perceptual processes that facilitate the "embodied" experience of VR, specifically the phenomena of Place Illusion (PI) and Plausibility Illusion (Psi). The review further examines the "Proteus Effect" where users modify their behavior and self-perception based on their avatar's characteristics, and the state of "Flow" induced by optimal challenge-skill balance in virtual environments. Clinical applications are discussed, highlighting recent 2024-2025 findings on VR's efficacy in treating anxiety, depression, and fear of falling in older adults. Finally, the article addresses the adverse psychological effects of VR, including cybersickness and dissociative symptoms such as depersonalization and derealization, providing a balanced perspective on the medium's impact on human psychology.

Keywords: Virtual Reality (VR), immersion, presence, Proteus effect, flow state, cybersickness, depersonalization, embodiment, cyberpsychology.

Introduction

Virtual Reality (VR) has evolved from a niche technological curiosity into a robust medium that fundamentally alters human perception and cognition. Unlike traditional screens that present information to be viewed, VR systems replace the user's sensory input with a computer-generated simulation, creating an "embodied technology". The relevance of studying the psychological aspects of VR lies in its unique ability to hack the brain's predictive coding mechanisms; by synchronizing visual, auditory, and proprioceptive feedback, VR can convince the brain that a simulated environment is a physical reality [1].

This psychological "buy-in" has profound implications across various domains, from the treatment of mental health disorders to the reshaping of social behavior. As VR hardware becomes more accessible and high-fidelity, understanding the nuances of how users experience immersion – and the potential psychological costs of that immersion – is critical. This article dissects the core psychological phenomena associated with VR: the sensation of presence, the transformation of identity through avatars, the induction of cognitive flow, and the emerging clinical evidence of its therapeutic utility, while also critically examining the adverse effects such as cybersickness and depersonalization [1].

The Phenomenology of Presence: Place and Plausibility

The central psychological construct in VR is "Presence" defined as the subjective sensation of "being there"

in a virtual environment, despite cognitive knowledge of its artificiality. Researchers differentiate presence from "immersion" which refers strictly to the objective technological capabilities of the system (e.g., field of view, resolution, latency) [2].

Psychologist Mel Slater proposes that presence relies on two orthogonal illusions: Place Illusion (PI) and Plausibility Illusion (Psi). Place Illusion (PI) is the qualia of being located in a distinct physical space. It is a perceptual reflex constrained by sensorimotor contingencies; if the virtual scene updates naturally with head movements, the brain's spatial navigation systems accept the location as real. Plausibility Illusion (Psi) refers to the credibility of the events occurring within that space. For Psi to be maintained, the environment must acknowledge the user (e.g., a character making eye contact) and adhere to a consistent internal logic [2].

When both PI and Psi are active, users exhibit "realistic behavior" reacting physiologically to virtual threats as if they were real. This response is rooted in the "predictive coding" model of the brain, which minimizes "surprise" by generating internal models of the world; well-designed VR minimizes the prediction error between expected and actual sensory input, effectively simulating reality at a neural level [2].

Embodiment and the Proteus Effect

One of the most transformative psychological aspects of VR is "Embodiment" – the sensation that a virtual body (avatar) is one's own. This sense of embodiment (SoE) is composed of the sense of agency (motor control), the sense of body ownership (perceiving the avatar as oneself), and self-location [3].

This embodiment leads to the Proteus Effect, a phenomenon where users conform their behavior and attitudes to the stereotypes associated with their avatar's appearance. Unlike behavioral confirmation, which depends on how others perceive the user, the Proteus Effect is an internal process of auto-suggestion and self-perception [4].

Research indicates that users embodied in taller avatars behave more confidently and aggressively in negotiations. Conversely, users in attractive avatars display greater social confidence and reduced interpersonal distance. The effect extends to physical performance – users in athletic avatars may exert more effort in physical tasks. Crucially, these behavioral shifts can persist transiently after the user leaves the virtual environment, influencing real-world interactions for a short duration [5].

Cognitive Flow and Psychological Well-Being

VR is uniquely positioned to induce the state of Flow – a cognitive state of deep absorption, intrinsic motivation, and loss of self-consciousness. The immersion provided by VR acts as a catalyst for flow by blocking external distractions and providing immediate, unambiguous feedback [6].

Recent research establishes a strong link between the sensation of presence and the depth of the flow state. When users feel truly "present" (Telepresence), the cognitive load of interacting with the technology vanishes, allowing full engagement with the task. This mechanism has significant well-being implications. A 2025 study on long-term care facility residents demonstrated that VR-induced flow positively correlates with both hedonia (feelings of pleasure) and eudaimonia (sense of meaning and personal growth), suggesting that VR can serve as a "prosthetic for experience" for those with limited physical mobility [7].

Clinical Applications and Therapeutic Efficacy

The psychological potency of VR has been harnessed for therapeutic interventions, particularly in Exposure Therapy (VRET). By simulating feared stimuli in a controlled setting, VRET allows for habituation and the extinction of fear responses [8].

A systematic review and meta-analysis by Yang et al. (2025) confirmed that VR interventions significantly reduce anxiety symptoms in adults with chronic diseases [9].

Saragih et al. (2025) found that while VR training significantly improved balance and reduced fall risk in older adults, the psychological "fear of falling" showed mixed results, though general depression and anxiety scores improved [10].

VR operates on the "Attentional Gate Theory" diverting cognitive resources away from pain processing. High-immersion VR has been shown to reduce subjective pain ratings during medical procedures more effectively than low-immersion distractions [11].

Adverse Psychological Effects: Cybersickness and Dissociation

Despite its benefits, VR immersion carries psychological risks. The most common is Cybersickness, a syndrome distinct from motion sickness caused by a conflict between visual inputs (perceived motion) and

vestibular inputs (physical stasis). This sensory mismatch triggers a “poison response” mechanism in the brain, leading to nausea, oculomotor strain, and disorientation that can persist as “aftereffects” for hours [12].

More concerning are the dissociative phenomena. High-fidelity VR can induce transient symptoms of Depersonalization (feeling detached from one's body) and Derealization (feeling the world is unreal). A longitudinal study (2022) confirmed that intense VR sessions can increase these dissociative symptoms immediately post-exposure, creating a “VR hangover” or “existential vertigo” where the physical world feels flat or artificial. While typically short-lived , these effects highlight the need for careful implementation of VR, particularly for individuals with pre-existing dissociative tendencies [13-14].

Conclusions

The psychological aspects of immersion in virtual reality are multifaceted, acting as a double-edged sword that can both enhance and disrupt human cognition. On one hand, the mechanisms of Presence and Embodiment allow for profound therapeutic interventions and the exploration of new identities via the Proteus Effect. On the other, the manipulation of the brain's reality-testing systems can lead to physiological distress (cybersickness) and psychological disorientation (depersonalization). As VR technology matures, the focus must shift from merely increasing graphical fidelity to understanding these deep psychological interactions, ensuring that immersive experiences are designed to maximize human well-being while mitigating the risks of neural confusion.

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