Comparative Analysis of the Perception of the Game World in Narrative Games through Interaction in Virtual Reality and on a Flat Screen

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ABSTRACT

Understanding how players perceive and emotionally interpret narrative game worlds across different presentation modes remains an open problem in game studies and human-computer interaction. Prior research suggests that virtual reality (VR) enhances presence, embodiment, and affective responses compared to flat-screen play; however, these differences are often framed in terms of intensity rather than changes in narrative meaning construction. This work conceptualizes immersion as a multidimensional construct and proposes an analytical framework for comparing narrative world perception across VR and flat-screen formats. Using a structured case study approach, it examines medium-specific affordances that influence representational coherence and narrative engagement, including embodied interaction, diegetic interfaces, and feedback consistency. A mixed-methods validation plan is outlined, combining comparative feature analysis of commercial games, computational analysis of player feedback, and a dual-mode Unity prototype designed to control narrative content while varying interaction modality. The study aims to clarify how VR transforms dimensions of immersion in narrative games and to provide practical design guidelines for coherent cross-platform experiences.

Keywords

virtual reality, narrative games, presence, embodiment, immersion, emotional challenge, player experience, affordances, comparative analysis, HCI, game studies

INTRODUCTION

Narrative games rely on the player's interpretation of events, character relations, and the perceived coherence of a game world. Unlike linear media, interactive narratives can place the player in a participatory role, where actions and attention shape what is noticed and what is emotionally salient. Virtual reality introduces a different relationship between player and world, frequently discussed through presence and embodiment. Commercial VR titles and VR ports suggest that the same content may be experienced differently when the player's perceptual and bodily cues are coupled to the virtual environment (Pallavicini et al. 2019; Wilson et al. 2018). However, the landscape of research remains fragmented: many studies compare VR and non-VR conditions using standardized questionnaires and affect scales, but fewer studies connect measured differences to design specific

affordances that structure narrative perception (Christensen et al. 2018; Sweetser et al. 2020). This work focuses on narrative world perception in VR versus flat screen play and asks which aspects of immersion are transformed by modality, and which remain primarily determined by intrinsic features such as narrative structure and mechanics (Pallavicini et al. 2019).

CONCEPTUAL FRAMEWORK

Immersion as a multidimensional construct

Immersion is often used inconsistently across disciplines. A useful distinction separates immersion as a property of technology from immersion as a player state. At the technology level, immersive systems differ in how extensively and vividly they surround the user, whereas at the experience level, immersion refers to the subjective sense of being absorbed or losing awareness of the external environment (Pallavicini et al. 2019). Recent philosophical and conceptual work argues that immersion has multiple dimensions, including perceptual or representational immersion, participatory immersion, affective immersion, and narrative immersion, and that non-VR games can score highly on several of these dimensions even without full perceptual surrounding (Jackson et al. 2024; Cartlidge 2024). This work adopts a multidimensional view, because narrative perception depends not only on perceptual vividness but also on representational coherence and the cognitive states a world generates about objects, events, and relations (Cartlidge 2024).

Embodiment and self-representation

Embodiment is not only a perceptual phenomenon but also a representational one: how the player's body and actions are depicted can influence social interaction and behavior. The Proteus effect describes how transformed self-representation can alter behavior, suggesting that avatar design can shape how users act and identify within a virtual context (Yee et al. 2007). Related findings show that embodied experiences can influence self-other merging and pro social attitudes (Jackson et al. 2024). Because narrative games often depend on identification and perspective taking, these effects motivate an analysis of how embodiment design, including hands and action representation, contributes to narrative world perception. Recent work on virtual characters also demonstrates that detailed hand motion can be important for communication and interpretation of intent (Adkins et al. 2023), reinforcing the design relevance of hand and body representation in VR.

Emotional challenge

Emotional challenge has been proposed as a concept for understanding diverse player experiences that are not captured by skill-based difficulty alone. Recent work argues that emotional challenge in games involves tension, ambiguity, and emotionally demanding situations, and notes that it has been underexplored experimentally, especially in VR (Peng et al. 2020). Studies examining emotional challenge report that VR may shape emotional involvement across game types, but the mechanisms that connect modality, interpretation, and emotional processing remain insufficiently specified (Peng et al. 2019, Peng et al. 2020). This work treats emotional challenge as closely linked to narrative immersion, because the appraisal of events and the meaning assigned to threats or losses depend on narrative context.

RELATED WORK AND EVIDENCE SYNTHESIS

Comparative studies of VR and flat screen play

Multiple studies compare player experience across VR and non-VR conditions. Comparative work in gaming reports higher sensory or imaginative immersion and higher flow after VR play than after desktop play, while also finding that some perceived needs such as competence and challenge may not differ significantly across modalities (Pallavicini et al. 2019). Other studies report that many aspects of player experience are rated higher in VR than in non-VR alternatives, including in multiplayer contexts, but outcomes can vary across VR implementations of the same game (Christensen et al. 2018). Research on cinematic VR similarly reports differences in emotional response between immersive and 2D (two dimensional) presentations (Ding et al. 2018). Together, these findings support the view that modality can alter experiential intensity, but they also suggest that deeper experiential structures may depend on factors beyond display technology alone (Pallavicini et al. 2019).

Commercial content and narrative consequences

Lab based VR studies often use bespoke environments to isolate factors, which raise questions about generalization to commercial games with richer narrative and interaction systems. Work examining a commercial first-person horror game that supports both VR and flat screen presentations found that the same 15-minute content segment was experienced differently in VR, with participants reporting greater personal involvement in receiving and enacting in game violence. This result is consistent with the idea that embodiment and plausibility can change the perceived proximity of narrative events and may require different descriptors or safeguards for VR content (Wilson et al. 2018).

Design factors, affordances, and enjoyment

While many comparative studies focus on questionnaire outcomes, design-oriented analyses highlight that the coherence between intended action and system response matters for immersion and enjoyment. A recent affordance focused analysis of VR games emphasizes that feedback mismatches, interface placement, and interaction expectations can inhibit enjoyment and reduce immersion even when presence is high. These issues are visible in VR ports and hybrids, where the same game world is experienced through different interaction channels and where embodiment cues and feedback fidelity can differ substantially (Sweetser et al. 2020).

Emotional arousal and affect in VR

Beyond game specific studies, research has examined whether VR is generally emotionally arousing. Experimental work using emotion inducing VR scenarios reports that VR environments can evoke measurable emotional responses (Felnhofer et al. 2015). Review work links presence and perception to emotional reactions across VR contexts (Diemer et al. 2015). These findings motivate the inclusion of affect measures in comparative evaluation, while also reinforcing the need to interpret affect in relation to narrative meaning rather than treating arousal as a proxy for narrative engagement.

RELATED WORK AND EVIDENCE SYNTHESIS

Across the literature, VR often increases presence, sensory immersion, and affective intensity compared to flat screen conditions (Pallavicini et al. 2019; Wilson et al. 2018; Christensen et al. 2018). However, immersion is multidimensional, and narrative games

rely heavily on non-perceptual dimensions such as representational coherence, participatory agency, and narrative meaning construction (Jackson et al. 2024; Cartlidge 2024). Existing comparative studies frequently operationalize modality differences through general player experience scales or affect intensity, while giving limited attention to how medium specific affordances such as embodied hands, diegetic interface integration, interaction fidelity, and feedback coherence shape the interpretation of narrative events and emotional challenge (Peng et al. 2020; Sweetser et al. 2020). It remains unclear whether VR primarily amplifies intensity or whether it qualitatively transforms the player's narrative position and meaning making processes.

Research questions.

RQ1: How does interaction modality (VR versus flat screen) influence narrative world perception and the interpretation of story events?

RQ2: Which design affordances (embodied interaction, diegetic UI, feedback coherence, world reactivity) most strongly support presence and narrative coherence in narrative games?

RQ3: Does VR change emotional challenge qualitatively, for example by altering appraisal and coping, rather than only increasing arousal?

RQ4: Which aspects of narrative perception remain stable across modalities, suggesting dependence on intrinsic narrative and mechanical design rather than display technology (Pallavicini et al. 2019)?

PROPOSED APPROACH

Stage A: Comparative design analysis of commercial games

The current stage of the work is a structured comparative analysis of commercial narrative games and VR ports. The analysis codes modality relevant affordances across cases, including (i) embodiment representation (hands, body cues), (ii) interface integration (diegetic versus overlay UI), (iii) interaction fidelity (object manipulation and tool use), (iv) feedback coherence (match between intended action and out- come), (v) world reactivity, and (vi) narrative anchoring (how the game maintains story orientation). The approach is informed by prior affordance and enjoyment analyses in VR (Sweetser et al. 2020) and by findings that different VR implementations of similar games can yield different player experience outcomes (Christensen et al. 2018).

Illustrative affordance examples

Figures 1 to 5 provide illustrative examples used in the planned case study matrix. They are included as design evidence for how embodiment and interface integration may support or disrupt representational coherence and narrative engagement. Interaction design plays a crucial role in how players perceive and engage with narrative game worlds. In virtual reality, many successful games attempt to embed interaction and interface elements directly into the fictional environment rather than presenting them as external overlays. This design strategy helps maintain continuity between player action and narrative context.

Figure 1: Fallout 4 VR: Pip Boy presented as a diegetic wrist worn device.

A clear example can be observed in *Fallout 4 VR* (Bethesda Game Studios 2017), where the Pip-Boy interface is integrated into the character's body as a wrist-mounted device (see Figure 1). Instead of interrupting gameplay with a separate menu screen, players physically raise their arm to access information. This approach allows informational interaction to remain part of the world's fiction and reduces the sense of separation between the player and the avatar. Embodied interaction also contributes to a stronger sense of agency within the virtual environment.

Figure 2: Skyrim VR: embodied hands used for spell casting.

In *The Elder Scrolls V: Skyrim VR* (Bethesda Game Studios 2017), spell casting is performed through hand gestures rather than abstract button inputs (see Figure 2). This mapping between physical movement and in-game action situates player agency directly within the virtual space and reinforces the sense of participating in the game world. However, the same game worlds can be experienced differently when presented on a traditional display.

Figure 3: Fallout 4 on a flat screen: conventional HUD and crosshair structure attention and feedback through overlays.

In flat-screen versions of games, interaction and feedback are typically mediated through heads-up displays, crosshairs, and static interface elements like we can see in flat-screen version of the videogame *Fallout 4* (Bethesda Game Studios 2015) (see Figure 3). While these systems provide clarity and efficient communication of information, they can also reinforce the role of the player as an external observer rather than a participant within the world. These differences motivate the development of the Radiance prototype used in this research.

Figure 4: Radiance prototype (planned validation): the player carries a lamp containing the wife's soul. Environmental hazards can damage the lamp, linking embodied handling to narrative stakes.

In *Radiance* (ALAMID Games, still on DEMO), the player carries a lamp containing the soul of the protagonist's wife (see Figure 4). The lamp functions both as a light source and as a narrative object that must be protected while navigating the environment. Environmental hazards that damage the lamp therefore directly affect both gameplay

progression and narrative meaning. A comparable form of embodied interaction can also be observed in other VR horror titles.

Figure 5: MADiSON VR: diegetic camera interaction. Object handling and close inspection support narrative inference through embodied manipulation.

For example, *MADiSON VR* (Bloodious Games 2024) uses an in-game camera as a primary investigative tool (see Figure 5). Players must physically position and activate the device to capture images, turning observation into a tangible action that contributes to narrative discovery.

Stage B: Computational analysis of player feedback (planned)

To complement case study coding, the work plans a computational analysis of player feedback comparing VR and flat screen versions where available. Reviews will be annotated using categories derived from the conceptual framework, including presence, embodiment, narrative coherence, feedback mismatch, interface integration, and emotional challenge. Large language model assisted coding can be used to scale thematic analysis, followed by manual validation on a subset to improve reliability. This approach aims to identify recurring modality dependent interpretive patterns and to connect design features to perceived narrative experience.

Stage C: Radiance as a controlled validation platform (planned)

Radiance is a first-person narrative horror and walking simulator style game developed in Unity and designed for both VR and flat screen modes. The player enters a liminal purgatory like forest and must escape while carrying the soul of the protagonist's wife, bound inside a lamp. The lamp's light guides navigation and progression, while environmental elements can harm or corrupt the soul. The core loop centers on protecting the lamp and maintaining its light, linking embodied interaction to narrative stakes (see Figure 4). A planned study will present the same narrative content and level layout in both modes and compare narrative world perception, presence, emotional engagement, and interpretive responses using questionnaires and open-ended prompts. The selection of measures will follow instruments and practices used in prior VR player experience and emotional challenge work, such as GEQ based dimensions, SAM style affects ratings, and immersion or presence items (Pallavicini et al. 2019; Christensen et al. 2018; Peng et al. 2019; Peng et al. 2020).

Affordance dimension	Skyrim VR	Fallout 4 VR	*Subnautica* (Unknown Worlds Entertainment) (VR/flat)	*Resident Evil 7*: Biohazard (Capcom 2017) (VR/flat)	Radiance (planned)
Embodied hands and actions	Spell casting via hands (Figure 2)	Handheld interaction around wrist UI	Hands and tools vary by mode	First person embodiment central	Lamp carrying as embodied stake (Figure 4)
Diegetic interface integration	Partial, depends on system UI	Pip Boy wrist device (Figure 1)	HUD vs world integrated indicators	Minimal UI, atmosphere driven	Diegetic light and damage cues
Feedback coherence	It can be strong, but depends on hit and haptics (Sweetser et al. 2020)	Depends on interaction mapping	Strong environmental feedback loops	Tension through audiovisual feedback	Damage to lamp communicates narrative risk
World reactivity	High density of interactable	Scavenging and object presence	Reactive ecology and survival systems	Threat driven reactivity	World hazards targeted at the soul lamp
Narrative anchoring	Quest framing and role identity	Story and faction framing	Environmental narrative through discovery	Horror narrative proximity	Memory fragments and protective motivation
Emotional challenge triggers	Threat, awe, role fantasy (Sweetser et al. 2020)	Survival tension, scarcity	Exploration and fear of depth	Personal involvement in horror (Wilson et al. 2018)	Protecting the soul under threat

Table 1: Illustrative case study affordance matrix for Stage A.

MEASURES AND ANALYTICAL MATRIX

Case study affordance matrix (illustrative)

Table 1 outlines an illustrative coding matrix for Stage A. Entries reflect observable design characteristics and are intended for systematic comparison rather than for claiming performance effects, *Subnautica* (Unknown Worlds Entertainment 2018) and *Resident Evil 7: Biohazard* (Capcom 2017*)* also were considered as good examples of videogames where VR format was integrated.

EXPECTED CONTRIBUTIONS

The work aims to contribute a structured account of how narrative game world perception differs across VR and flat screen interaction. Conceptually, it links multidimensional immersion and representational coherence to modality specific affordances (Jackson et al. 2024; Cartlidge 2024) Analytically, it proposes a repeatable coding matrix for comparing commercial games, informed by affordance-based VR enjoyment research (Sweetser et al. 2020). Methodologically, it outlines a triangulation

pipeline that combines case study analysis, scalable review mining, and controlled dual mode validation via a dedicated prototype.

LIMITATIONS

At the current stage, the work is literature driven and analytical. It does not yet include new experimental data from Radiance. Case study conclusions will depend on the selection of games and the consistency of VR ports. Review based analysis can be affected by platform demographics and self-selection bias, and any model assisted coding requires human validation to avoid overgeneralization. These limitations motivate the planned controlled evaluation stage.

CONCLUSION AND FUTURE WORK

Prior work shows that VR often increases presence and affective intensity compared to flat screen play (Pallavicini et al. 2019; Christensen et al. 2018; Wilson et al. 2018). At the same time, immersion is multidimensional, and narrative games depend on representational coherence and meaning construction that are not guaranteed by perceptual surrounding alone (Jackson et al. 2024; Cartlidge 2024). This extended abstract proposes a comparative framework that focuses on modality specific affordances, embodiment, and emotional challenge as drivers of narrative world perception. Future work will operationalize the framework through comparative game coding, computational feedback analysis, and a controlled dual mode study using the Radiance prototype.

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