Back to the Virtual Future: Presence in Cinematic Virtual Reality

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ABSTRACT

Extended Reality (XR) technologies transform how we experience digital content, offering unparalleled immersion and interaction capabilities. Cinematic Virtual Reality (CVR) stands at the intersection of storytelling and technology, providing a unique medium through which narratives are experienced in an immersive environment. However, the psychological mechanisms through which CVR fosters presence, a key element of immersion, remain under-explored, hindering the potential of CVR to revolutionize storytelling and audience engagement. This study addresses the gap by examining how the sensation of presence differs when a cinematic XR experience is presented on two different platforms: a traditional screen-based monitor and a head-mounted display (HMD). Here, we show that the HMD platform significantly enhances the sense of spatial presence, involvement and overall immersion compared to the monitor. The findings reveal that while both platforms provide engagement with the content, the immersive qualities of the HMD contribute to a stronger sense of being in the virtual environment, thus enhancing the narrative experience. This study advances our understanding of presence in CVR, suggesting that the medium's ability to envelop the viewer plays a crucial role in storytelling. This research underscores the importance of device choice in designing immersive narrative experiences by situating these results within the broader context of XR applications. It provides a foundation for future work to explore how different aspects of presence influence user engagement and narrative absorption in CVR, offering insights into how technology can enhance the storytelling landscape.

CCS CONCEPTS

• **Human-centered computing → Human computer interaction (HCI)**.

KEYWORDS

Presence, Virtual Reality, Cinema, Immersive Experiences, User Study

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1 INTRODUCTION

The realm of Virtual Reality (VR) is undergoing rapid transformation, with significant advancements in hardware technologies that redefine user interaction and experience. Recent introductions, like Meta's Quest 3 [28] and Apple's Vision Pro [37], highlight the industry's commitment to pushing the boundaries of VR capabilities. These devices, leveraging '*spatial computing*,' [14] signify a leap towards more immersive and interactive environments. The influence of these advancements extends beyond entertainment, impacting sectors such as education, where VR facilitates immersive learning experiences [15, 43]; manufacturing, where it aids in complex assembly processes [6]; and healthcare, offering novel therapeutic and training methods [11].

While VR's technological evolution is impressive, the Cinematic Virtual Reality (CVR) domain presents a unique confluence of technology and storytelling. Using 360-degree video technology, CVR offers an immersive narrative experience, diverging from traditional cinema [9] by placing the viewer at the heart of the story [42]. However, the mechanisms through which CVR fosters a sense of presence and engagement are not fully understood. This gap hinders CVR's potential to revolutionize storytelling and audience engagement, making it a critical area for research.

CVR does not, however, come without its limitations. While viewing the 360-degree video creates an immersive experience, interactivity is generally not part of the experience. Combined with only three degrees of freedom in terms of the viewing experience, it does not offer viewers the ability to fully engage with the virtual space they are situated in. These limitations allow for an exploration of what factors of presence are most impacted by the use of an HMD and the elements of presence that are affected by it.

Research in VR has predominantly focused on hardware advancements and their immersive applications [20]. However, the study of psychological engagement, particularly in CVR, remains underexplored. Presence — the feeling of being in the virtual environment [16] — and immersion [21], crucial for VR's effectiveness, are often mentioned but not profoundly analyzed in the context of CVR. This paper identifies a significant gap: the need to understand how the technical attributes of CVR contribute to the psychological sensation of presence [41] and, consequently, to a more engaging narrative experience.

This study aims to delve into the presence phenomenon within CVR, exploring how this virtual space influences user engagement and narrative immersion. By examining the interplay between CVR's technological features and the viewer's psychological response, this paper seeks to uncover how CVR can create compelling narrative experiences. The findings are expected to offer valuable insights for content creators and technologists, informing the development of more engaging and emotionally resonant user-centred design approaches in VR experiences.

2 BACKGROUND

Immersion in virtual environments is a multifaceted concept integral to creating a compelling user experience [3]. It is broadly defined by interplaying factors that coalesce to engross the user fully within a virtual environment. These elements can be categorized into technological factors, human factors, and task performance, each contributing uniquely to the immersive experience.

Technological factors encompass the hardware and software capabilities of the VR system [33]. These include the VR environment's visual and auditory fidelity, the system's responsiveness to user input, and the virtual world's overall stability and coherence. High-quality graphics, accurate sound localization, and seamless interaction mechanisms are crucial for technological immersion, as they influence the user's perception of the virtual environment as being 'real.'

Human factors related to the user's psychological and physiological responses to the VR experience [27]. This includes the user's sense of presence, defined as the subjective feeling of being 'in' the virtual environment despite knowing it is artificial. Presence is influenced by the user's engagement with the content, willingness to suspend disbelief, and cognitive and emotional involvement with the virtual environment.

Task performance factors consider how users interact with the VR system to accomplish specific goals or tasks within the virtual environment [44]. Effective task design and interaction mechanisms can enhance immersion by providing users with intuitive and satisfying ways to engage with the virtual world.

To support this description of immersion, Nilsson et al.'s [22] research further refines our understanding of immersion by breaking it down into three components: a property of the system, a subjective response to narrative contents, and a subjective response to challenges within the virtual environment. This delineation helps clarify that immersion is not just about the technology but also how users perceive and interact with the content.

Coelho et al.'s [7] exploration of presence and immersion offers two distinct viewpoints: the rationalist and the environmental/psychological perspectives. The rationalist perspective sees presence as a direct outcome of the medium's experience. In contrast, the environmental/psychological perspective views it as a neuropsychological phenomenon shaped by human biological and cultural heritage. This dual perspective provides a nuanced understanding of presence, highlighting its multifactorial nature.

Narrative immersion within this domain [22] also includes temporal, spatial, and emotional subcategories. Temporal immersion refers to how time is perceived within the virtual environment, with well-designed narrative structures leading users to lose track of real-world time. Spatial immersion is about the extent to which the user feels 'present' in the virtual space, influenced by the virtual environment's design and realism. Emotional immersion occurs when users connect emotionally with the narrative or characters within the virtual environment, enhancing their overall engagement and immersion.

Immersion and presence in VR is an intricate interplay of technology, user perception, and interaction within the virtual environment. It's a dynamic state influenced by the system's properties, the user's subjective experiences, and the nature of their activities within the virtual world. Therefore, understanding these components is crucial for designing and evaluating compelling VR experiences [23].

2.1 Exploring Narrative Immersion

Narrative immersion describes how the viewer becomes involved in the story world and has roots in oral storytelling [5]. In CVR, it is also seen as a factor that contributes to the immersive experience [34]. The use of perceptual techniques and various methods of storytelling in CVR has also been explored in several papers. A more expanded investigation into the vast amount of narrative styles found in CVR can be found in [29] in which Rothe et al. detail several CVR experiences, where among them and about the CVR used such as *"Diegetic Methods Diegetic, Visual/Auditive, on-Screen/off-Screen, World-Referenced, Subtle, Voluntary"* and "*Image Modulation non-Diegetic, Visual, on-Screen, world-Referenced, Subtle/overt, Voluntary"*.

In exploring the grammar used for VR storytelling, narrative immersion and experiential fidelity in VR cinema denote the use of a diegetic device [26]. Pillai et al. used an animated dragonfly to guide the viewer's attention, giving viewers with less experience of VR a more significant chance of digressing from the storyline and how experience with the medium influences the ability to understand the narrative style.

Williams et al. identified four possible observers for a viewer's perspective in CVR [39]: God, Griffin, Bod, and Dog. God is described as neutral, all-seeing, and invisible to the characters. Griffen is an actual character in the space but without a physical body. Bod is a character with a body that the characters can interact with. Dog, a non-human perspective. Palma Stade et al. investigated the use of a first perceptive and the effect this has on the sense of embodiment experienced by the viewer using the possible observers mentioned [24]. They conducted several case studies and concluded that there is a spectrum between disembodied and embodied perspectives, from aerial shots that have the same affordance between VR and screen-based film to techniques where the viewer is more closely identified with a character through the inclusion of a presence through the use of a body. The relationship between spatial forms and storytelling has been explored in [2] where Bieger describes a two-world model, one of narrative and another of space. Storytelling in a spatial aspect has also been investigated by Mayr et al. [18], where the use of storytelling for geo-temporal visualizations was seen from the cognitive perspective and what they mean for the integrated perception and understanding of a story's spatial and temporal dimensions.

2.2 Presence

The main characteristic of spatial presence is the conviction of being located in a mediated environment [40], or when the viewer becomes unaware of their actual physical location and self-location in the presented world. In this, it is assumed that unconscious spatial cognitive processes are involved in creating a mental model of the virtual environment, and presence arises from this. Schubert suggests that this occurs when the unconscious processes of spatial perception try to locate the body concerning its environment and determine possible interactions with it [30]. If these processes are successful, the feeling of spatial presence is fed back and becomes available for conscious processes. According to Wilkinson et al., this can have an objective quality in terms of the technology used in the construction of the virtual environment and its ability to afford realistic feedback to the viewer in terms of the user's interaction in such a world as they usually would [38].

Several questionnaires to measure presence have been developed [32]. Of these, the Igroup presence questionnaire (IPQ) [31] is often chosen as it offers a subscale that measures the spatial presence that the subject experienced. This presence element is particularly important now that spatial computing is a leading industry term. It is supposed that if spatial presence forms an essential part of the immersion experience, then it may be a factor necessary to the design of CVR experiences and XR experiences as a whole. The IPQ, originally in German, was developed to measure the sense of presence. It includes three subscales and a general item: spatial presence (SP), involvement (INV), and experienced realism (REAL). The general (GA) assesses the '*sense of being there*' and has high loadings on all three factors, especially spatial presence. The subscales mentioned can be regarded as largely independent factors.

IPQ has been the subject of much investigation. In [19], Melo *et al.* created qualitative scores to interpret the raw scoring from the questionnaire. Berkman et al. evaluated the English version of the questionnaire and, using several indices, including Cronbach's alpha, found that they indicated that the subscales of the 11-item version are reliable, but not the 14-item version [1]. However, they still recommend that researchers continue to employ the complete questionnaire and report on all 14 items until further studies are carried out. By having viewers complete the IPQ after each viewing condition, it is hoped to establish a more concise idea of the effect of an HMD on presence.

3 METHODOLOGY

To assess the perceived quality of video accurately, it's essential to employ subjective scaling techniques. Such assessments will be meaningful only if there's a demonstrable connection between the video's physical properties—specifically, the 360-degree video sequence shown to participants in a study — and the intensity and type of sensation that this visual stimulus provokes. Thus, an International Telecommunication Union (ITU), a specialized agency for information and communication technologies (ICTs), subjective assessment methodology was used to evaluate the quality of experience. Two ITU recommendations guided the experiment set-up, namely the Rec. ITU-T P.919 - Subjective test methodologies for 360º video on head-mounted displays [35] and Rec. ITU-R BT.500-15 - Methodologies for the subjective assessment of the quality of television images [36].

3.1 Participants

Sixty participants voluntarily participated in the study (24 females – mean age = 21.92 - SD = 3.4; 35 males – mean age = 25.23 - SD = 10.57; 1 non-binary - age = 22). The participants also reported their familiarity with VR technology, the results of which can be seen in Figure 1. Participants were recruited through social media announcements via the project website. The college's ethical committee approved the experimental protocol before data collection. Each participant received a research information sheet, and written informed consent was obtained.

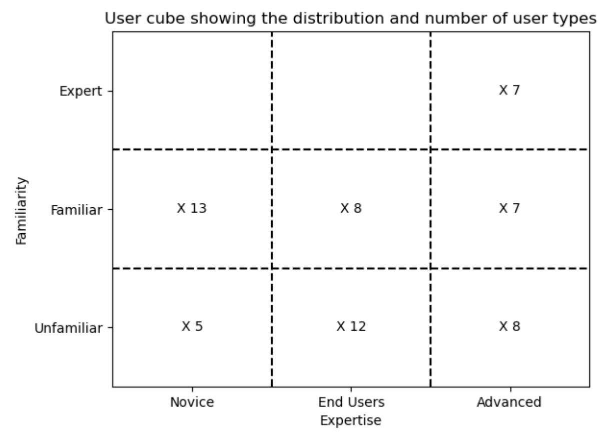

Figure 1: A user cube showing the familiarity and expertise of the participants

3.2 Stimulus materials

In the experiment, the HMD used was a HTC Vive Pro with a refresh rate of 90 Hz and a field of view of 110 degrees. It has a Dual AMOLED 3.5" diagonal for each eye, which offers a resolution of 1440 x 1600 pixels per eye or 2880 x 1600 pixels combined. Hi-Res certificate headphones were used for audio.

The representation of the CVR displayed on YouTube was shown on a 4K monitor connected to a PC with an Nvidia GeForce RTX 2080 graphics card and Intel Xeon E5 1630 v3 CPU. A mouse interacted with the video, allowing the participant to move their viewport area as the CVR played. The headphones used were Scarlett Studio HP60.

3.3 Procedure

Participants were given an information sheet detailing the experiment outline and their right to freely stop and leave the experiment without penalty at any stage. They were greeted and brought to the experiment area, where the experiment was fully explained. The opportunity to ask questions about the experiment and how their data would be handled was given. After they were satisfied that they understood the experiment and their rights within it, a consent form was asked to be signed.

The CVR used in the experiment was *Faoladh*, a live-action 360-degree film filmed using the Google Jump camera. A screenshot can be seen in figure 2. It is a narrative experience that details a Viking raid on an Irish village and uses several techniques to guide the audience's attention. A more detailed description of the production and the storytelling techniques can be found in [10].

3.4 Measurements

The IPQ, with a 7-point Likert scale, was used to gauge the viewer's presence after each representation of CVR was shown. This was presented on Microsoft Forms, which collected the raw data for later processing and scoring according to the criteria given by the Igroup project consortium. The SUS, with a 7-point Likert scale, was also used, with the wording slightly changed to suit the nature of the VR set-up.

The IPQ has several sections that each deal with a different aspect of presence: Spatial Presence, Involvement, and Experienced Realism. Each section is given a subscore to measure its subsections.

Open-ended questions were also asked to understand further how the participants interacted with the experience and to provide an opportunity for them to give a greater level of feedback directed to the particular CVR used in the experiment. These questions were,

- What about the presentation did you like the most or least? Can you explain why?
- Did you feel engaged with the content? Can you explain why?
- How did you feel emotionally while viewing the content? Can you explain why?
- Can you describe any moment during the experience when you particularly felt present or immersed in the environment? Can you explain why?
- Do you have any further comments?

A Thematic Analysis (TA) was then conducted to analyse this data. TA is a flexible and widely used qualitative method for identifying, analyzing, and reporting patterns (themes) within data. It minimally organizes and describes your data set in rich detail and frequently interprets various aspects of the research topic. This approach is valued for its flexibility and ability to produce complex, insightful analyses beyond surface meanings.

Figure 2: Screenshot from '*Faoladh*'

Table 1: Response to rate their overall evaluation of the experience and the two questions from the SUS

Device	Rate	SUS
HMD	4.41	10.333
Screen	3.09	8.083

Table 2: Mean scores and standard deviation for the IPQ

Device	GA	SP	INV	REAL
HMD mean	5.28	3.63	3.19	1.65
Screen mean	2.06	1.82	1.50	1.533
HMD standard deviation	0.86	0.61	0.85	0.70
Screen standard deviation	1.86	0.94	0.74	0.71

Table 3: Results from the repeated measures AVONA

Factor	Wilks' Lamdba	F	P	η^2
GA	0.217	209.085	<0.001	0.783
SP	0.232	192.369	<0.001	0.768
INV	0.276	837.201	<0.001	0.935
REAL	0.968	1.894	0.174	0.032

4 RESULTS

The results provided detailed findings from the study, directly comparing the effectiveness of the HMD versus the traditional screen in delivering immersive experiences.

The results from the IPQ are displayed in Table 2, including the three subscales and the general factor '*sense of being there*'. From the results, an analysis of variances (ANOVA) was carried out on the general factor and the three subscales. The results from this can be found in Table 3. The HMD scored more highly across each factor aside from realism. There was statistical significance on the general factor and spatial presence subscales as well as that of involvement. Statistical significance was not found on the factor of realism.

Participants were also asked to rate their overall evaluation of the experience out of five. There were also two questions adapted from the SUS to understand the ease of using either system. In the case of the adapted questions from the SUS, only two questions were asked, so the score was evaluated out of twenty. The HMD scored more highly, as can be seen in Table 1, on both factors.

As seen in the values in Table 2, the HMD scored significantly higher than the screen for the spatial presence and involvement subfactor. The HMD scores can also be seen in Fig 3. This means the participants felt surrounded by the world and had a high sense of presence. The HMD scored more highly than the screen for experienced realism but not to a statistical significance, as can be seen in Table 3. The scores for the screen presentation can be be seen in Fig 4. Overall, the general factor showed that the use of the HMD increased the feeling of presence for the viewers by a statistically significant amount.

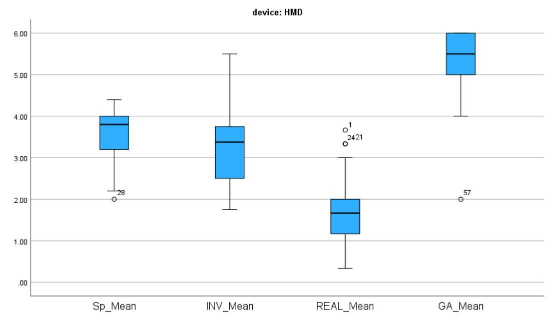

Figure 3: A box plot of the results for the HMD. Sp - spatial presence, INV - involvement, Real - realism, GA - general sense of 'being there'

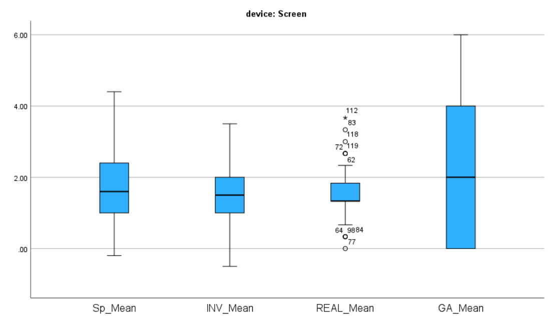

Figure 4: A box plot of the results for the Screen. Sp - spatial presence, INV - involvement, Real - realism, GA - general sense of 'being there'

4.1 Qualitative Feedback

We utilized thematic analysis (TA), a method well-regarded for detecting patterns and themes in text-based data [4]. Participants provided feedback, which was analyzed using TA to understand differences in engagement and immersion, technical influence, and sensory and physical interaction. This involved a systematic review of participants' responses, aided by using MaxQDA software for qualitative data evaluation. This technique allowed us to create initial codes and then cluster these codes into themes. Through repeated cycles of assessment and refinement, we identified and labelled the central themes, eventually crafting a narrative that encapsulated essential viewpoints and insights gleaned from the data.

4.1.1 Engagement and Immersion: This theme encompasses participants' experiences of being absorbed in the media content, focusing on the depth of their engagement and sense of being 'in' the experience.

> "Felt very engaged, like I was part of the virtual world. The first-person view and surrounding visuals made it more engaging."

This response highlights the enhanced immersion provided by HMDs, attributed to the first-person perspective and high sensory involvement. It contrasts sharply with the screen-based experiences, where participants noted detachment and awareness of their physical surroundings.

4.1.2 Technical Influence: This theme reflects how technical aspects of the media platforms influenced user experiences, explicitly focusing on immersion disruptions caused by quality issues.

> "Poor video quality and lag reduced engagement. It felt more like watching a regular movie, not immersive."

Technical limitations in screen-based media detracted significantly from user engagement, suggesting that higher fidelity in visual and audio output is crucial for immersive experiences. This theme is less pronounced in HMD feedback, where participants rarely mentioned technical flaws impacting their experience.

4.1.3 Sensory and Physical Interaction: This theme captures how physical interactions with the device and sensory inputs affect the user experience.

> "Being able to look around freely enhanced the experience. Felt physically present and involved in the virtual environment."

This theme underscores the importance of interactive and responsive environments in creating a compelling user experience. HMDs facilitate a higher level of physical engagement than screen-based media, leading to a more immersive and enveloping experience.

This analysis indicates that while HMDs offer superior immersion and sensory interaction, technical quality is crucial across both platforms to maintain user engagement. These findings align with existing literature emphasizing the role of immersive technologies in enhancing user engagement through sensory stimulation and interaction. The contrast between HMDs and screen-based media supports theories suggesting that immersion is significantly influenced by the user's ability to interact with the environment. These results reveal critical insights into the comparative user experiences of screen-based media and HMDs, highlighting the superior immersive capabilities of HMDs facilitated by enhanced sensory interactions and fewer disruptions from technical limitations.

Table 4: Summary of Themes and Codes

Theme	Codes	Example Quote
Engagement and Immersion	Engagement, Immersion	"Felt very engaged, like I was part of the virtual world."
Technical Influence	Video Quality, Audio Quality	"Poor video quality and lag reduced engagement."
Sensory and Physical Interaction	Physical Interaction, Sensory Feedback	"Being able to look around freely enhanced the experience."

5 DISCUSSION

From the scores in table 2 and 1, using the HMD resulted in better scores for both presence and usability. The HMD generally scored higher across most factors except for involvement, indicating a more immersive experience with the HMD. Significant differences were noted in the general factor, the spatial presence subscale, and the subscale of involvement, favouring the HMD. However, no statistical significance was found in the experienced realism factor. This shows that spatial presence and the sense of involvement are significant factors that must be catered to while designing an immersive experience.

The HMD scored significantly higher in table 2, indicating that participants felt more surrounded by and present in the virtual environment than the screen. The HMD also scored statistically significant in *involvement*, suggesting higher levels of engagement with the content across the HMD medium. The HMD scored higher in *realism* but not significantly so, indicating a marginally better sense of realism with the HMD. The HMD provided a statistically significant better understanding of overall presence.

Table 1 shows higher ratings for the HMD regarding overall evaluation and usability. Participants rated their overall experience with the HMD as higher than the screen. The HMD also scored higher on an adapted version of the SUS, suggesting better ease of use or user satisfaction. The material used in this experiment did not use interactivity regarding input required from the viewer aside from the choice of viewing angle on the 360-degree video. When using the HMD, this was easily controlled by moving the head; on the screen, it was more explicit, and the viewer had to click and drag on the screen. It may be possible that a form of interaction could lead to a greater degree of involvement experienced and, therefore, a higher loading on the subfactor of '*involvement*' in the questionnaire. The video quality was also negatively mentioned in the open-ended questions, which suggests that if improved, it could lead to higher loadings on the subfactor 'experienced realism'.

Using a narrative VR experience across the two representations, it was hoped that this immersion aspect would not affect the presence rating across the other factors. Ten participants who participated in the experiment chose "*through the eyes of my character*" while using the HMD and '*behind/above*' my character while using the screen to view the exact representation. All other participants choose the same option for both representations, with only three using the option of "*behind/above my character*". In the VR experience, the viewer is cast in the role of a creature, to whom characters within the experience were directly addressed; the findings for this question would suggest that using the HMD allowed the viewer to gain a greater sense of embodiment.

While increasing the subfactors of "*involvement*" and "*experienced realism*" would increase the general factor of presence and the overall immersive quality of the experience, the subfactors of "*involvement*" and "*spatial presence*" is fundamental to the experience. Greater realism can build upon the immersive experience where spatial presence and involvement have laid the foundation.

Participants reported a profound sense of engagement and presence, feeling emotionally connected to the story and its characters, and valuing VR's interactivity. While the narrative and environmental details like audio and visual effects were praised for enhancing realism, technological limitations and physical discomfort sometimes hindered the experience. This can be seen in the thematical analysis in Table 4. Comparisons to traditional screen viewing highlighted VR's superior engagement, although the usability varied among users. The overall sentiment suggests that while VR's potential to deliver a compelling and emotionally resonant experience is straightforward, attention to user comfort and technological refinement is necessary to realize its promise fully.

The feedback on the screen-based experience reflects a nuanced interplay of technical and narrative elements influencing user engagement. Technical issues such as depth perception, video clarity, and control mechanisms, particularly mouse navigation, were recurrent concerns impacting the sense of immersion and realism. While some users appreciated the familiar 2D experience and the strong narrative delivered through effective sound design and voice acting, others found these elements insufficient to overcome the detachment caused by technical shortcomings. Emotional engagement varied, with certain immersive and interactive moments eliciting stronger connections to the content, yet often juxtaposed with feelings of disorientation or confusion about the user's role within the experience. While the creative aspects of the story and environment were celebrated, the technical execution's influence on immersion and user comfort emerged as a critical factor in the overall experience. This platform also touches on user confusion regarding their role within the experience — whether they are an active participant or a passive observer.

When screen-based media was compared to HMDs, notable similarities and differences emerged, highlighting distinct user experiences. Both mediums elicited feedback concerning technical aspects (see Table 4), such as video quality and lag, that impact user engagement. However, the nature of these impacts varied significantly. Participants using screen-based media frequently mentioned that such technical limitations led to reduced immersion. They described their experience as akin to watching a regular movie, where they remained acutely aware of their physical surroundings.

Conversely, users of HMDs reported fewer technical disruptions and emphasized the enhanced realism and immersion facilitated by the ability to interact physically and freely with the virtual environment. This contrast underscores a fundamental difference in how each medium delivers and sustains engagement and immersion. HMDs offer a more enveloping and interactive experience that minimizes the user's awareness of the world, enhancing the overall immersive experience.

Additionally, sensory and physical interaction played a crucial role in defining these experiences; HMD users highlighted the integral role of tactile and kinesthetic feedback, significantly enriching their engagement and contributing to a more compelling and immersive virtual experience.

The clear outcome of the results from the questionnaire that the sense of spatial presence is significantly higher in the HMD, also suggests that design in XR applications should make use of this in the construction of narrative experiences. Comprehension comes from the construction of mental models that the viewer creates and updates continuously as more information is presented to them [13]. This process has been explored in literature and screen-based mediums but has not yet been brought to bear in the context of XR applications [8]. By using spatial mental models as a base of design, a more intrinsic experience could be formed, taking advantage of the increased effect of spatial presence [12]. This would require a reevaluation of current storytelling techniques and their repositioning to cater to a spatial mental model that is more inherent in the sense of "*being there*" or being located in the space. By taking such an approach a more intuitive form of storytelling and visual narrative native to XR could be formed and exploited [25], to create a visual grammar that allows for the fundamental mental processes of spatial understanding to be used. While this would be a great advantage for the ability to tell stories in the XR medium, it could also aid the navigation of virtual worlds [17].

In summary, while feedback for both experiences revolved around immersive experiences, VR seems to focus more on the subjective experience of immersion and emotional connection within a virtual world, highlighting both the strengths and limitations of the platform. The screen experience presents a more critical view of the technical execution of the experience, with a strong focus on navigation difficulties and a desire for more explicit storytelling and higher-quality visuals. The latter set also indicates that familiarity with traditional media formats might influence the reception of new interactive experiences.

6 CONCLUSION

Presence is an important factor in creating any form of XR experience, and from the experiment, both involvement and spatial presence are fundamental aspects of this. This offers a clear route to practitioners in the medium regarding the core design of their created experiences. The findings also show the apparent difference in presence and, therefore, immersion that can occur with the same experience in two different presentations, so VR experiences are best suited to be evaluated within a VR environment.

Further work will examine the type of interactivity best suited to improving the quality of an immersive experience and evaluate formats. It is hoped that such a form of interaction would increase the involvement aspect of the VR experience while also catering to the cognitive models that people use to understand their surroundings in a spatial sense.

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