"I can see the big picture": Comparing Switching to Single VR Perspectives when Empathizing with Multiple User Groups

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Abstract

Virtual reality (VR) offers user experience (UX) practitioners new ways to empathize with users by enabling them to adopt others' perspectives within immersive environments. To date, prior work has only studied fixed perspectives within a single user group. We created an interaction technique for switching perspectives and compared it with a single-perspective mode across multiple user groups in a simulated hospital emergency room. With a between-participant study ($n = 30$), we compared three conditions: single-perspective for 1) medical staff, 2) patients, and 3) switching between the two. Our results show that while all conditions fostered affective and cognitive empathy, the switching perspective method demonstrated broad strength in understanding both user groups and the environmental factors influencing user experience. In comparison, both single-perspective methods fostered an in-depth understanding of the respective user groups. Additional outcomes include the importance of visual cues, personal connection, and recommendations for using different perspective-taking methods.

CCS Concepts

• **Human-centered computing → Virtual reality**; *Empirical studies in HCI*; **Interaction techniques**; HCI design and evaluation methods.

Keywords

Virtual Reality, User Experience, Perspectives, Design Thinking, Empathizing

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1 Introduction

Virtual reality (VR) affords researchers and designers new spaces, interactions, and activities to explore and incorporate into their processes. The use of VR in experience design research, such as User Experience (UX), has been increasing due to its strength in perspective-taking. VR demonstrates strong potential in fostering empathy by allowing researchers to take another person's perspective in a simulated environment, deepening their understanding of others' needs [26].

Despite this capability, VR is underutilized in the early *empathizing* and *defining* stages of the Design Thinking process used by many experience design practitioners [35, 39]. Prior research largely focuses on single, fixed perspectives representing specific groups [e.g. 3, 4, 19, 22, 23, 41], and lacks guidance on which viewer perspective most effectively supports UX empathizing, or how it meaningfully influences subsequent design thinking phases. Very little work has exploited VR's ability to take *multiple* user perspectives within the same environment, and none has specifically sought to examine how this impacts understanding of user problems, needs and frustrations compared to a traditional first-person perspective.

To address these gaps, we created an interaction technique that allows alternation between user group perspectives, called *switching perspectives*. We presented an emergency room in VR depicting medical staff and patient problems, where avatars and the environment model user needs. We then conducted a between-participant study comparing the influence of single-perspective and switching-perspective viewing on understanding user problems and needs.

We aim to address two research questions:

RQ1 How might different perspectives influence one's *understanding and empathizing* for user problems in virtual environments?

RQ2 How does being able to switch perspectives in VR influence *defining* user problems and *ideation* of user solutions?

Our findings show that both affective and cognitive empathy are facilitated across all perspective-taking interactions, with differences depending on the user group toward whom they were directed. Switching perspectives enabled participants to become more aware of environmental context and both user groups, which may have influenced them to prioritize environmental problems addressing interconnected user needs. Single-perspective VR, by contrast, facilitated deeper understanding of a particular user group, influencing problem definition to focus primarily on that group's needs. We also discuss how visual cues in VR shape perspective-taking and embodiment, fostering personal connections with user groups. We conclude with guidance on leveraging diverse VR perspective-taking methods to support the empathizing stage, including when to use switching versus single-perspective interactions.

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Figure 1: VR Environment that shows the virtual emergency room. The image on the left shows the medical staff area, including a reception desk and a treatment room. The image in the middle shows where two users, medical staff and a patient are located. The image on the right shows the waiting room area.

2 Related Works

2.1 Using VR in UX Research and Design

Advancements in technology assist UX researchers and designers in creating enjoyable and functional experiences [8], such as VR to enhance *design thinking* [35], a strategic problem-solving process. Recent work highlights VR's capability as a design tool [37], particularly for *ideation*, *prototyping*, and *testing* [35]. VR's strong capacity to visualize ideas [28] enables more intuitive sketching and thinking [46]. Houzangbe et al. [25] compared VR and a 2D interactive whiteboard on divergent and convergent thinking in creative tasks, finding that VR enhances divergent thinking and the "breadth of ideas" [16] crucial for ideation.

VR is also an efficient way to explore use cases and environments. Simulated environments are easily replicable, accelerating development [33] and optimizing time and resources for validating design solutions [1]. Beyond well-known quantitative measures like eye-tracking [45], VR can also capture subjective factors such as workload and user experience [33], providing rich insights to support design thinking and better understand users.

VR can further serve as an effective communication tool. It facilitates remote collaboration [14] by enabling distributed teams to interact in a shared virtual space [43]. Close et al. [11] compared three remote co-design methods, finding that participants considered VR highly collaborative compared to tablet- and paper-based approaches — actively designing and elaborating on shared objects together. This supports VR's value for convergent thinking, as teams focus and combine efforts toward a shared goal.

2.2 Virtual Reality for Empathizing

Empathy is a form of social cognition to understand and share others' feelings [32], motivating prosocial behaviour such as helping [23]. It is most effective when *affective* (emotional) and *cognitive* (contextual) empathy are developed in balance [20]. Prior work shows VR's strength as an empathy tool for specific outgroups or inaccessible environments [e.g. 3, 19, 22, 23, 41]. For example, VR has been used to simulate the experience of being unhoused to elicit empathy and prosocial behaviours [23], and to foster compassion and helping inclinations toward people in need [19].

VR's unique properties, perspective-taking and embodiment could deepen understanding beyond traditional empathy facilitation methods [26]. Perspective-taking allows individuals to adopt another's point of view through simulated environments and interactions, bridging the empathy gap [27]. Embodiment, "being, having, and controlling a body" [30], activates embodied cognition [27] and enables individuals to experience others' minds and bodies [3]. This makes VR well-suited for fostering empathy toward specific individuals. Leveraging these properties, some works have explored perspective manipulation for empathy. One study adjusts eye height and interpupillary distance to improve designer empathy toward children for risk identification and design adjustments [49]. Grech et al. [20] proposes that taking a user's perspective, or observing a virtual user in third person, generates cognitive and/or affective empathy. Similarly, Dahl et al. [12] developed an interactive VR application to learn through first- and third-person perspectives, switching between them while experiencing the story. Switching perspectives between a victim and perpetrator in VR has been done as well, for safety education on smartphone use while cycling to reduce optimism bias and facilitate empathy [50].

However, these works largely treat empathy as a momentary emotional response rather than a foundation for ongoing design work. In design thinking, *empathizing* is a distinct stage involving direct user interaction [10], enabling designers to build understanding and develop solutions [17] — an active, iterative process oriented toward understanding specific user problems. Despite VR's potential, it remains underestimated for the *empathizing* and *defining* stages of design thinking [35]. While some works explore perspective-switching to facilitate empathy, little work has examined this within a UX design research context — specifically, switching between different users' perspectives to understand multiple stakeholders simultaneously. Our work addresses this gap, using VR to build an understanding of a specific user problem and support subsequent design thinking stages. We explore two perspective-taking interaction methods: *single-perspective-taking* across two user groups and *switching between them*, based on the emergency room scenario and interactions we created.

3 Development of Scenario and Switching-Perspectives Interaction

We designed a perspective-switching VR interaction to support UX researchers in understanding multiple user perspectives, set within a virtual emergency room, a commonly used VR environment for empathy facilitation [31], that naturally accommodates diverse, co-existing roles.

Figure 2: The image shows the SWITCH interaction. Starting from the medical staff perspective on the left, fading into a black screen that indicates the switch, to the patient perspective on the right.

Built in Unity[1] (Figure 1), the environment includes a waiting room, treatment room, and reception desk, populated with animated avatars representing patients, nurses, and doctors, verbally and visibly expressing 10 user frustrations (Table 1). Avatar behaviours varied; some moving to convey a chaotic atmosphere, others were stationary to suggest anxiety. *Medical Staff* and *Patients* were selected as the two target user groups for perspective-taking. Of the 10 frustrations, four relate to patients, four to medical staff, and one (missing patient on list) applies to both groups and is repeated twice due to its shorter length. These represent real-world pain points such as long patient wait times [18] and staff resource shortages [9], expressed through avatar dialogue and gestures. Frustrations are primarily situated within each group's respective area, with one per group deliberately placed in the opposing location to balance distribution across the environment (Table 1).

The switching-perspectives interaction (SWITCH) allows participants to toggle between a medical staff and patient perspective using the A button on the VR controller. A C# script managed camera and avatar positioning, with a 1.5-second fade-in/out transition indicating each switch (Figure 2). The angle of the viewpoint followed the participant's head movement during switching-perspectives interaction. Both avatars share the same z-coordinate, placed side-by-side on the same side of the emergency room (medical staff behind the reception desk and the patient in the waiting room), ensuring equal access to visual information and minimizing location as a confound.

Realistic avatars were used, as prior work shows realism does not significantly affect empathy [24] but is preferred over cartoon-style [15]. Mixamo avatars from Adobe [2] and Unity Assets depicting detailed medical settings were used, with the patient avatar in casual clothing to minimize assumptions. Avatar skin colour was not matched to participants by design since the goal was to encourage perspective-taking as a researcher rather than self-identification. Androgynous hands were chosen to avoid gender-specific depictions, as gender mismatches in VR avatar hands can elicit eeriness, particularly affecting females' perception [42]. Only the avatars' upper bodies were controllable to maintain consistent, seated interaction.

4 Methods

4.1 Participants and Recruitment

Participants were recruited through posters and emails around the university community. To be eligible for participation, participants must be 18-64 years old, have a working knowledge of UX design and research, have normal/corrected-to-normal vision, and have no history of severe cybersickness or medical conditions that make them susceptible to, or prior poor experiences with, VR (e.g., vertigo, sensory impairments). A total of 36 participants were recruited; however, 6 were excluded from the analysis after disclosing insufficient knowledge of UX design and research during the session, which affected their task completion. As eligibility relied on self-reporting, these discrepancies could not be identified prior to participation. Each study session was approximately 1 hour in duration, and all 36 participants were remunerated with a $20 CAD gift card of their choice. The 30 final participants' ages ranged from 19 to 33 ($M = 23, SD = 3.768$), comprising 18 women, 11 men, and 1 who did not disclose gender. There was a wide range of experience in UX research/design among the participants, from those who knew only the basic concepts to those who are professionals working in the field as UX researchers/designers.

4.2 Study Design

The study is a between-participant, mixed-methods study with three conditions:

(1) Switching Perspectives (SWITCH): Participants can switch between medical staff and patient perspectives by pressing the A button on the controller at any time. There are two sub-conditions within SWITCH: SWITCH$_{M \rightarrow P}$ begins with the medical staff's perspective, while SWITCH$_{P \rightarrow M}$ begins with the patient's perspective, thereby balancing the starting perspective of this condition.

Order	Frustration	User	Location
1	Wait time complaint	Patient	Patient
2	Emergency room bottleneck	Medical Staff	Patient
3	Filling out forms	Patient	Medical Staff
4	Confusion in file organization	Medical Staff	Medical Staff
5	Missing patient on list	Both	Patient
6	Short staff issue	Medical Staff	Medical Staff
7	Technological issue	Medical Staff	Medical Staff
8	Missing patient on list	Both	Patient
9	Lack of information in discharge process	Patient	Patient
10	Deteriorating patient	Patient	Patient

Table 1: Ordered list of user frustrations and their locations within the VR environment.

[1] https://unity.com/

(2) Medical Staff Single Perspective (MEDICAL): Participants can only experience the scenario from the medical staff's perspective.
(3) Patient Single Perspective (PATIENT): Participants can only experience the scenario from the patient's perspective.

4.3 Hypotheses

We had the following hypotheses, where H1 and H2 hope to answer RQ1, and H3 and H4 hope to answer RQ2.

H1: SWITCH will result in less embodiment than other conditions, thereby influencing empathizing abilities.

H2: SWITCH will empathize more towards both groups compared to other conditions.

H3: Participants in the single-perspective conditions will notice their respective group's problems, while participants in the SWITCH condition will notice both user problems and environmental factors leading to user problems.

H4: Participants in the single-perspective conditions will ideate more solutions for their respective groups, while participants in the SWITCH condition will ideate both user-related solutions and environmental solutions.

4.4 Data Collection

Data were collected via the Qualtrics online survey platform. With consent, we recorded video, audio, and screen recordings during VR scenario and interview sessions. The last question in the open-ended questionnaire was administered on paper, allowing participants to sketch their proposed solutions.

Avatar Embodiment Questionnaire (AEQ) — AEQ was used to measure avatar embodiment in VR [38], as it could influence one's empathy. It includes four subscales, Appearance, Response, Ownership and Multi-Sensory, used to calculate Embodiment level [38].

The Interpersonal Reactivity Index (IRI) questionnaire — IRI was used to measure empathy level of participants [13]. It includes four subscales: Fantasy, Empathic Concern, Perspective-taking, and Personal Distress. Empathic Concern and Personal Distress represent affective empathy [21] as Empathic Concern assesses sympathy and concern of others, while Personal Distress assesses anxiousness and unease [13]. Fantasy, the ability to transpose and imagine being others, and Perspective-taking, the ability to adopt others' points of view [13] indicate cognitive empathy [21].

Custom-designed Questionnaire — We designed a questionnaire to capture the specific type of empathy in the context under study. There is a limit to how much a validated questionnaire can measure empathy; thus, it is common practice for researchers to create their own Likert-scale questionnaire tailored to their study's context and situation [47]. Our questionnaire is a 7-point Likert scale that measures empathy in the UX research/design context, identifying the type of empathy elicited such as "I feel user frustration" and "I understand user frustration" for affective and cognitive empathy. The designed questionnaire demonstrated good internal consistency reliability, with a Cronbach's α of 0.829 (95% CI [.71, .91]).

4.5 Procedure

Task knowledge—Participants were informed before the study that the scenario would depict an emergency room without graphic medical procedures, blood, or serious injuries that portray medical trauma, but rather a user story focusing on user experiences. At the beginning of the study, participants were asked to complete the consent form, followed by a demographic and background questionnaire regarding their prior experience in UX research/design.

Pre-test—The Interpersonal Reactivity Index (IRI) questionnaire [13] was administered as a pre-test before the conditions to check that there were no significant differences in participants' empathy level throughout the different conditions [3, 19, 23].

VR Task—Participants experienced one of the conditions (SWITCH, MEDICAL, and PATIENT) through the Meta Quest 2 in a seated, stationary position. They observed an approximately 8-minute user scenario as if participants were UX researchers or designers, aiming to understand the user(s) to identify their needs and problems.

Post-test—Once the scenario ended, participants first completed the AEQ [38], followed by the post-test IRI to assess changes in empathy [40]. Our custom-designed Likert-scale questionnaire and an open-ended questionnaire were administered afterwards. Questions were asked to identify user frustrations, needs, and problem areas, followed by a design task to ideate possible solutions to the problems they identified. A semi-structured interview was conducted afterwards to elicit further insights into their experiences, identify key frustrations, and generate solutions, asking questions such as "Could you go through your design solution?" and "What benefits or drawbacks do you think switching perspectives has to understand the user?"

Perspective comparison—Finally, two short videos of the interaction method they did not experience were shown to them (e.g, a participant in the SWITCH condition would be shown the PATIENT then MEDICAL perspectives), followed by a short interview regarding the different perspective-taking methods.

4.6 Data Analysis

We applied a one-way ANOVA to the AEQ responses and designed questionnaire to examine differences across conditions. Each subscale of the AEQ and the combined Embodiment score were analyzed, as were each statement of the designed questionnaire items. Levene's test and Q-Q plots were used to check assumptions, and the Kruskal-Wallis test was used if a particular dataset did not meet the assumptions. For the conditions that showed significant differences, Tukey's post hoc test was conducted to further determine which specific pairs of conditions differ significantly, and controlled for family-wise error rates as we compared pairwise comparison levels. A one-way ANOVA was also conducted on the IRI pre-test data to assess if participants' empathy levels differed across the three conditions. Additionally, a 2-way mixed-effects ANOVA with a planned contrast (Table 2) was conducted to compare changes in IRI scores from pre-test to post-test. As completion of all questionnaire items was voluntary in accordance with ethical guidelines, two participants had missing IRI scores. Following the guidelines proposed by Jäger et al, data imputation was used to replace the missing one IRI score from two participants [29].

Qualitative data from questionnaires and interviews were analyzed using content analysis and reflexive thematic analysis (RTA). Following Bengtsson's framework [5], content analysis proceeded

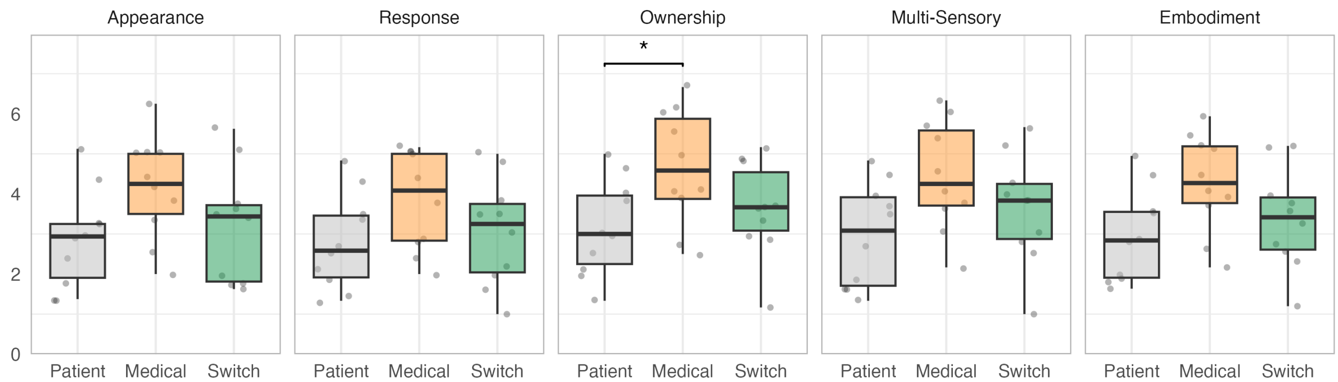

Figure 3: Boxplots that show results from the Avatar Embodiment Questionnaire (AEQ). The asterisks (*) denote statistical significance of $p < .05$ for pairwise comparision using Tukey's HSD.

by decontextualizing the data to identify meaning, coding it inductively, recontextualizing to verify coverage, and categorizing the codes to produce results. Counts of codes and categories were used to compare how frequently different user groups or factors were mentioned across conditions. RTA [7] complemented the quantitative results and content analysis by developing themes to explain how and why patterns occur. Beginning with data familiarization and inductive coding, we constructed, reviewed, refined, and defined themes, revealing further insights into the content analysis and addressing the research questions.

5 Results

5.1 Quantitative Results

5.1.1 AEQ. Analysis found only Ownership was statistically significant (F(2,27) = 3.859, $p = 0.041$, $\eta_p^2 = 0.210$), while Appearance, Response, Multi-Sensory, and Embodiment revealed no statistical significance. Post-hoc comparison shows a significant difference between MEDICAL and PATIENT for the Ownership subscale ($p = 0.037$, Figure 3). Although it is not statistically significant at $p < .05$, the Appearance, Multi-Sensory and Embodiment scores are close to the critical value of $\alpha = 0.05$ ($p = 0.098$, 0.062, and 0.061, respectively); future work with higher sample sizes might find an effect for these scales. The overall trend suggests that MEDICAL scores are highest, followed by SWITCH and PATIENT conditions.

Condition	Time	A	B	C	D
Switching M-P	Pre	0	-1	1	1
Switching P-M		0	-1	1	-1
Medical Staff		1	0	-2	0
Patient		-1	2	0	0
Switching M-P	Post	0	1	-1	1
Switching P-M		0	1	-1	-1
Medical Staff		-1	0	2	0
Patient		1	-2	0	0

Table 2: Planned contrasts for two-way mixed effects ANOVA for IRI questionnaire.

5.1.2 IRI. One-way ANOVAs for the IRI questionnaire showed no statistical difference on any subscales between conditions prior to the VR scenario [Fantasy: ($F(2, 27) = 0.911$, $p = .414$, $\eta_p^2 = 0.063$), Empathic Concern: ($F(2, 27) = 0.079$, $p = .924$, $\eta_p^2 = 0.006$), Perspective Taking: ($F(2, 27) = 0.331$, $p = .721$, $\eta_p^2 = 0.024$), Personal Distress: ($F(2, 27) = 0.009$, $p = .992$, $\eta_p^2 = 0.0006$)], suggesting randomization of condition assignment was successful. Two-way mixed effects ANOVAs with *time* (pre- and post-) as a within-participant factor and the between-participant factor of *condition* found no one-way or two-way effects. Planned contrasts were used to compare relevant questions: [A: MEDICAL VS PATIENT, B: SWITCH VS PATIENT, C: SWITCH VS MEDICAL), D: SWITCH$_{M \to P}$ VS SWITCH$_{P \to M}$]. Consistent with the two-way mixed effects ANOVAs, these planned contrasts revealed no statistically significant effects.

5.1.3 Custom questionnaire. One-way ANOVAs found no statistical difference between conditions for all questions in the custom-designed questionnaire. Although the results were not statistically significant, participants were able to perceive and understand the scenario and associated frustration(s) (see Figure A.1).

5.2 Content Analysis

The counted codes are shown in Table 3. For identified problems, SINGLE PERSPECTIVE conditions (MEDICAL and PATIENT) identified more interrelated problems than SWITCH , the most problems corresponding to their own user role, and the fewest for the other perspective. SWITCH fell between these extremes. However, it shows that SWITCH allowed individuals to identify more user needs of patients' and medical staff's on average than other conditions.

For solutions, SWITCH participants ideated the most overall, including the patient- and medical staff-related solutions. MEDICAL reported the fewest solutions for patients and environment but the most for medical staff, while PATIENT reported the most environment solutions but the fewest for medical staff. SWITCH reported the most in the environment area and the least in patient and medical staff areas to improve. MEDICAL reported the most in patient and medical staff areas with no environment selections, while PATIENT reported the most combined problems.

Categories	Sub-categories	Switching	Medical Staff	Patient
Problems (Average Counts)	Patient	2.9	2.6	3.1
	Medical Staff	3.5	4.0	3.3
	Environment	0.2	0.2	0.6
	Interrelated	0.9	2.1	2.1
Needs (Average Counts)	Patient	3.1	2.1	2.4
	Medical Staff	3.5	2.8	2.5
	Environment	0.2	2.8	0.5
	Interrelated	1.6	0.2	1.8
Designed Solution (Average Counts)	Patient	1.2	0.8	1.05
	Medical Staff	0.9	0.9	0.45
	Environment	0.6	0.4	0.78
	Total Ideated	2.7	2.1	2.2
Identified Areas (Total Counts)	Patient	2	5	2
	Medical Staff	2	4	3
	Environment	4	0	1
	Combined	2	1	4

Table 3: Results from the content analysis, showing average or total counts per category.

5.3 Reflexive Thematic Analysis

5.3.1 The Immersive Environment Fosters Empathy. Participants found the VR emergency room immersive, feeling present in a virtual environment that depicted real user stories and needs. They reacted as they would in real life — such as wanting to move away from a coughing patient — blurring the boundary between the two worlds: *"At one point the patient coughed and my first reaction was to move away from the patient to the other perspective. In real life, I get really paranoid when other people are coughing near me ... I realized [that] I'm immersed enough to feel"* (P4 - Switching). This immersion fostered personal connections, prompting participants to recall past experiences in similar real-life settings. Although the environment was not hyper-realistic, the user story, noise, actions, and chaotic atmosphere were believable enough to elicit emotional responses.

Participants felt physically present in the virtual emergency room and were compelled to address issues they observed. They actively listened to virtual agents, and when a user group faced a problem, they wanted to intervene and help — particularly those that adopted medical staff perspective, who *"wanted to jump out and say, you could come to the desk here and talk to me"* (P30 - Switching). Engagement ran deep enough that participants experienced stress, helplessness, and overwhelm, motivating them to treat avatars as real people and take action to address user frustrations.

5.3.2 Empathy Emerged as Both Understanding and Feeling. Participants primarily sought to understand users' frustrations, acting in their role as researchers/designers to identify problems and generate solutions. Through virtual agents' dialogues and expressions, they wanted to *"understand what [users] were saying, maybe to help them out a little ... in such a way that they're not worried anymore"* (P12 - Switching), indicating cognitive empathy.

Affective empathy was also fostered, eliciting irritation and dissatisfaction with virtual avatars. Participants empathized more often with patients' frustrations, even when adopting the medical staff's perspective. This was likely due to prior personal experience as hospital patients, leading them to *"treat [themselves] as one [of the] patients in the ER"* (P23 - Patient). While participants also felt medical staff frustration, they were more concerned with its impact on patients. Feeling and understanding user frustration simultaneously was common: by hearing and observing key pain points while actively seeking solutions, participants drew on both affective and cognitive empathy to build a complete picture of the user story.

5.3.3 Recognizing the User Groups Occurs Through Surroundings. Visual cues reinforced participants' sense of embodying a particular user, especially the medical staff avatar. Sitting behind the reception desk, *the placement made [them] feel like [they were] medical staff because [medical staff avatars] would come and talk right beside [them]"* (P24 - Medical Staff), showing how surroundings shaped their experience within a user group. The virtual environment clearly distinguished between user groups by allocating separate sections of the room, as in a real emergency room, and recognized how this affects their understanding of where they are and who they are. The difference between *being in [a] group and observing [a] group"* (P16 - Switching) was apparent to participants due to proximity. Being closer to a user group also improved audibility, as dialogue was confined to each group's respective area. Participants in the switching condition thus reported switching perspectives to *"listen in and get closer to their voices"* (P10 - Switching).

5.3.4 Switching Perspective Interaction Technique Provides More Opportunities for Research. Participants found SWITCH a powerful method for understanding the holistic user story, broadening perspective and enabling consideration of both sides. Being in different people's shoes widened their understanding and influenced design decisions toward solutions satisfying both user groups or addressing shared environmental factors: *"I could see the big picture. It's like I see a problem in one person's point of view, and I see a problem in a second person's. I can think of a solution that makes both of them happier"* (P26 - Medical).

Participants also believed SWITCH balances empathy across user groups, leading to more uniform understanding in the empathizing stage. P30 (Switching) noted that *"one of the biggest benefits is that you have a much more equal weighing or emotional weighing of the patient's problems versus the staff's problems ... When you're able to switch, you feel more of an obligation to listen to both sides"*, illustrating how switching shapes one's mindset toward both groups equally. A contrasting use case also emerged: some participants used switching to escape the discomfort caused by user frustration.

Beyond empathizing, participants saw SWITCH as valuable across the broader design thinking process, aiding in defining, creative brainstorming, and ideation. One participant highlighted its potential as a communication tool, *"provid[ing] a shared understanding about the situation and the problem, mak[ing] it more tangible for the people who have money and want to invest in such applications or platforms"* (P18 - Patient), connecting stakeholders and teams around a common understanding.

5.3.5 Switching Perspectives Hinders In-Depth Understanding of Users. Participants identified a key drawback of SWITCH: it hinders in-depth knowledge of any single user group. The freedom to

Hypothesis	Quant.	TA.	CA.	Takeaway
H1 SWITCH will result in less embodiment.	× (AEQ)	✓	—	Partially supported. AEQ shows only Ownership significantly differs across two conditions, but TA indicates participants felt detachment in SWITCH.
H2 SWITCH will empathize more towards both groups.	× (IRI, Custom)	■	—	Partially supported. IRI shows no significant empathy difference, but TA reveals SWITCH broadened participants' views, fostering equal empathy toward both user groups with an overall increase across all perspectives.
H3 SINGLE PERSPECTIVE will notice more in-group problems while SWITCH will notice both users and environmental.	—	■	■	Partially supported. CA shows SWITCH identified both groups' problems secondarily, and that most user needs overall, while MEDICAL and PATIENT focused on in-group and interrelated problems. TA suggests switching broadened understanding across both groups.
H4 SINGLE PERSPECTIVE will ideate more in-group solutions while SWITCH will ideate both users and environmental.	—	■	■	H4: Partially supported. CA shows SWITCH ideated the most user-focused solutions, but PATIENT ideated more environmental solutions. TA suggests understanding both groups led to broader user solutions and framing environment as a bigger picture issue.

Table 4: Hypothesis Support Summary. Quant. refers to our quantitative results. TA refers to the thematic analysis results, and CA refers to the content analysis results. Support or lack thereof for a hypothesis is indicated by a checkmark or an X, respectively, and a yellow square indicates partial support. A dash means that that analysis method was not used to support that hypothesis.

switch perspectives, while providing more information overall, felt disruptive, leading to confusion, loss of track, and a tendency to *"correlate things that aren't necessarily correlated"* (P3 - Patient).

In contrast, maintaining a single perspective facilitated a deeper understanding of a user group's experience. Without the need to attend to another group, participants could focus more deeply on user problems, perceiving themselves as the embodied user, receiving the user story, frustrations, and needs more clearly. P22 (Medical) noted they would *"have a total or clear mindset that [they are] a patient ... [and] would get more depth of knowledge"*. This suggests that a single perspective cultivates richer, more user-centred empathy.

5.4 Summary of Results

The quantitative and qualitative data from the user study show some contradictions, but provide complementary insights. Table 4 summarizes the support for each hypothesis across quantitative and qualitative data, with key takeaways. The following discussion contextualizes these divergences and explains how different perspectives influence the UX empathizing, defining, and ideating stages, alongside additional insights on factors to consider for VR perspective-taking.

6 Discussion

6.1 Different Perspectives on Empathizing and Understanding

In this section, we discuss how different perspectives influence participants' empathy and understanding, addressing **RQ1**. Consistent with prior research on VR's capacity to foster empathy [3, 19, 23, 34], experiencing a VR scenario created empathy towards specific groups. Both SINGLE (medical staff and patient) and SWITCH perspectives showed development in affective and cognitive empathy toward the user problems portrayed in VR, supporting the empathizing stage.

While no significant IRI differences were found, interviews revealed how affective empathy varied across perspectives. Participants showed greater emotional empathy toward patients, likely because most had prior patient experience, but few had second-hand experience as medical staff. Exposure to the patient's perspective prompted personal recollections and emotional connection. However, unfamiliarity with the medical staff role contributed to distress, where participants felt uncomfortable overhearing staff conversations and helpless when problems seemed solvable yet unaddressable. This heightened affective empathy may explain why single-perspective conditions identified the most problems within their own user group (Table 3), suggesting affective empathy aids in-group empathizing and understanding. It may also explain why SWITCH consistently ranked second for identified problems per user group, as exposure to both perspectives balanced the empathy.

For cognitive empathy, SWITCH participants reported that it takes them 'out' of the experience, leading to a feeling of detachment from their adopted perspective. This unusual sensation may have expanded imagination and deepened cognitive empathy, which is understanding. Increased willingness to help others further signals cognitive empathy, as prosocial behaviour reflects *"imagine-others"* [26], a perspective-taking closely linked to cognitive empathy. Accordingly, SWITCH participants ideated more solutions on average (Table 3), applying imagination in addressing user problems. Similarly, SWITCH identified the most patient and medical needs, as needs require cognitive understanding, unlike problems where participants showed affective empathy. However, participants noted that switching disrupted focus on any single perspective. This suggests that perspective-switching in VR trades depth of individual focus for broader prosocial engagement — fostering cognitive empathy that extends from the empathizing stage into defining and ideation, where SWITCH appears most beneficial.

6.2 Influence of Switching Perspectives on Design Thinking

In this section, we discuss the potential impacts of perspective-switching on the design thinking process, addressing **RQ2**. We focus on how empathy facilitated by SWITCH offers opportunities in the definition and ideation stages compared to single perspectives.

While switching perspectives may introduce distractions that hinder concentration on a specific user group, participants noted that it broadened their understanding by exposing them to multiple perspectives and allowing them to consider both groups equally. This is also supported by content analysis as SWITCH designed the most solutions for patients and medical staff. Table 3 also shows that SWITCH participants focused more on environmental problem areas than on other conditions for core problems they wish to work on, where they identified systematic problems, such as the emergency room setup, as a core issue that impacts both user groups. This points to switching perspectives, broadening understanding toward holistic, bigger-picture problems that address all users. Allowing to switch between different users in VR could influence the following design thinking stages to be more considerate of the diverse stakeholders in the problem space.

SWITCH participants also ideated the highest average number of solutions overall, including the most patient- and medical staff-related solutions. This may reflect both cognitive empathy and divergent thinking — prior work shows VR can enhance divergent thinking as a design tool [25], and our findings extend this by showing that perspective-switching specifically fosters this effect. Given the freedom to generate as many ideas as they wished, SWITCH participants consistently produced more ideas than other conditions, suggesting that perspective-switching positively affects the ideation stage by encouraging creativity and breadth of thought.

6.3 Visual Cues of User Roles In VR Increase Embodiment

The AEQ findings indicate greater body ownership in MEDICAL than in PATIENT, with statistical significance shown in Figure 3. Sense of ownership (SoO), a key component of embodiment, represents the feelings and thoughts one has toward the body [6], and higher levels may facilitate better understanding of the embodied experience in the empathizing stage. Interviews further revealed that participants felt more aware when embodying the medical staff avatar due to distinctive visual elements (the reception desk and role-specific attire) whereas patients' clothing depicted ordinary day-to-day wear, making their visual cues less vivid. Although we hypothesized that SWITCH would yield the lowest embodiment (H1), the findings suggest that visual cues shaping the experience are a more important factor than perspective type. These cues construct participants' mental models and increase embodiment, potentially strengthening the empathizing stage.

Some may perceive this embodiment as favouring role-playing over perspective-taking. However, role-playing involves acting in a role with freedom to interpret and respond [48], not developing genuine user understanding. UX practitioners using VR to empathize with users do so with full awareness and a concrete research goal. Because they already acknowledge their assumptions, biases, and tasks, visual cues should not undermine their motivation to study users or shift focus toward the role-playing simulation itself.

6.4 Considering Location, But Not Ignoring Perspectives

Participants often noted how avatar location influenced their understanding, feeling physically closer to their user group's problems (for example, hearing patients more clearly from the waiting room) and believed single perspectives would constrain their attention to a designated area. As addressed in the theme 5.3.3, surrounding visuals may have reinforced participants' sense of being in their user group's area, possibly leading them to feel closer to in-group problems. However, not all frustration points occurred in their respective sections (Table 1), and content analysis contradicts their claims: MEDICAL identified their own group's problems most, but PATIENT identified more medical staff-related problems than other conditions. If location truly limited understanding, SWITCH should have reported the most problems across both user groups. This suggests that location alone cannot explain differences in understanding of in-groups and out-groups.

A notable finding is that single-perspective participants identified more interrelated problems than those in SWITCH , averaging 2.1 per participant — contradicting interview data in which SWITCH participants described greater empathy and understanding across both groups. However, participants also noted that a single perspective enables in-depth, contextual understanding of how one user group's problems extend to another. An uninterrupted experience may have allowed single-perspective participants to connect the dots between user groups more effectively. Thus, while taking single perspectives may have shaped participants' perceived experience of being in a fixed location, it may also have fostered deeper user understanding, aiding in their empathizing stages

7 Suggestions for Using Switching Perspectives and Single-User Perspective Interaction

Based on the study's findings, we present the following suggestions on when and how to use the switching and single-user perspectives, along with general guidance on using VR as a perspective-taking tool for design thinking to support UX researchers and designers.

7.1 Clearly show the target user's role through visual cues

We found that visual elements, such as the perceived realism of the virtual environment and avatars, could play a key role in facilitating empathy and embodiment, shaping one's understanding of a user group. Waltemate et al. [44] show that personalizing a virtual avatar to resemble the user's real-world appearance increases body ownership and emotional responses, supporting our finding that more accurate depictions of oneself or a user group enhance avatar ownership. We recognize the limitations of current VR development software in achieving hyper-realistic visuals, as well as researchers' and designers' time and resource constraints. However, visual cues need not be detailed or realistic; as long as they clearly define the avatar's role, they remain effective in fostering empathy and understanding.

7.2 Use switching perspectives interaction for a holistic, environmental understanding

Switching perspectives in VR would be helpful for researchers and designers aiming to develop a holistic understanding of a problem space that encompasses multiple user groups and stakeholders. Our findings show that switching perspectives fosters both affective and cognitive empathy, though it may not be well-suited to facilitating deep knowledge of any single group. However, it can enhance spatial awareness and create opportunities to address broader problems that transcend individual user groups, enabling a 'bigger-picture' view of the design challenge. Crucially, it allows researchers and designers to move beyond what users say, toward observing behaviour and context: a cornerstone of UX research and design. One possible drawback to this interaction is the distraction from the 'switching' itself, which can detach one from experiences. Therefore, switching perspectives after an extended period is recommended, giving researchers and designers time to settle into a perspective and understand each user.

7.3 Use single perspective interaction for in-depth understanding

Single perspective is could be beneficial for researchers and designers seeking in-depth knowledge of a particular user group. Observing an entire VR scenario from one perspective enables deep understanding of that group and its relationships with others, facilitating both affective and cognitive empathy and resulting in prosocial behaviours that prioritize that user group. Because of this, having multiple single perspectives available to users could enable an in-depth understanding of various user groups. This approach may incorporate positive aspects of switching perspectives, having access to multiple perspectives, but may be tailored for understanding individual user groups separately, not simultaneously. However, careful judgment is needed when selecting a perspective to take. Without prior knowledge of a user group, researchers and designers may struggle to feel connected, leading to personal distress and hindering cognitive understanding. Thoughtful selection of the user perspective is therefore recommended when using a single perspective to empathize.

8 Limitations and Future Works

A key limitation was that participants were seated in a fixed position, unable to interact with virtual avatars. This is a deliberate choice to control for variables and ensure a consistent experience, but one that may have contributed to lower embodiment scores. Adding controlled interactions to each perspective in future work would better explore VR's potential as an interactive perspective-taking tool. Additionally, the problem and needs identification task may have involved memory recall rather than cognitive understanding, with participants potentially recalling problems in the order they were presented due to the serial-position effect [36].

While statistical significance was not observed in the pre/post IRI results, future studies could explore patterns across subscales in greater depth. Narrowing the focus to the switching perspective interaction, particularly with user groups sharing similar prior experiences, may reveal how specific empathy dimensions are affected. Beyond the switching mechanic, as our study concentrated on divergent thinking for ideation, future studies with a focus on convergent thinking, the ability to narrow down the scope and be persistent in finding a single solution [25] would provide further insights on the impact that VR has on empathizing and ideation.

9 Conclusion

VR demonstrates strength in fostering empathy towards specific groups and supporting the creative design process, but limited research explores its use in the initial stages of design thinking for empathizing with and understanding users in UX research and design. The manipulation of perspectives within VR to expand knowledge and deepen understanding also remains underexplored. We developed a switching perspective interaction that enables access to multiple user perspectives, leveraging VR's unique ability to embody and adopt anyone's perspective. We conducted a mixed-methods, between-participant study comparing two single perspectives (patient and medical staff) and switching between them, in which participants observed a VR scenario depicting the frustrations of two user groups in an emergency room. Our findings show that both affective and cognitive empathy are facilitated across perspectives, with varying directions and depths. Single perspectives offer deeper understanding of a specific user group by connecting stories, while switching perspectives broadens understanding to encompass both users and wider problems, suggesting its influence on ideating more design solutions. We also note the importance of visual cues and roles in VR for effective perspective-taking in UX research. We conclude with suggestions on when to use switching versus single perspective interactions to better understand and empathize with users across different contexts, recommending VR as a tool for empathizing and defining in UX research and design.

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A Appendix

Codes	Definition	Examples
Patient Problems	Problems that Patient user group face, not caused by, including delays, confusion, lack of support, etc.	"Patients waiting in the ER are not informed about wait times." (P21)
Medical Staff Problems	Problems that the Medical Staff user group face, not caused by, missing files, technical equipment issues, short-staffed, etc.	"Inability to look up the schedules of staff to attend to patient beds." (P30)
Environment Problem	Problem related to the hospital environment and/or room settings, including location of beds, chairs, desks, screens, etc	"I saw there was a screen on the top, but nothing was displaying on it." (P23)
Interrelated Problems	Problems from one group (patient, medical staff, or environment) that impact the other group. Only counted if the connection is clearly mentioned.	"Lack of communication between staff and patients." (P13)
Patient Needs	Needs from the Patient user group that are clear, resulting from the Patients, including clear instructions, efficient care, transparency in procedure, shorter wait times, etc.	"The patients - Clear instructions of what happens after triage." (P2)
Medical Staff Needs	Needs from the Medical Staff user group that are clear, resulting from the Medical Staff, including an efficient filling system, a support system for executing tasks, a better staff management system, etc.	"Better organization among the ER staff." (P29)
Environment Needs	Needs that are directly related to changing the hospital environment and/or room settings, including the location of beds, chairs, desks, screens, etc.	"Space for [to] take break." (P27)
Interrelated Needs	Needs from one group (patient, medical staff, or environment) that influence the other group's needs. Only counted if the connection is clearly mentioned.	"More staff to handle the large number of patients waiting ... The staff, too, would have benefited from more staff on shift to handle the large number of patients waiting." (P12)
Patient Area	Problem area that participants wants solve which focuses patients, including patient waiting time, taking care of deteriorating patients in a timely manner, and improving the lack of information.	"I would choose to focus on how I could make sure that there is someone available to take care of patients whose conditions start to worsen." (P6)
Medical Staff Area	Problem area that participants wants solve which focuses medical staff, including patient waiting time, taking care of deteriorating patients in a timely manner, and improving the lack of information.	"Better records and queueing system to prevent lost records, prevent confusion from the staff side, and facilitate more efficient turnover." (P4)
Combined Area	Problem area that participants want to solve which focuses patient and medical staff coherently.	"I perhaps would focus on communication between staff first and then filter that down to the patients." (P3)
Environment Area	Problem area that participants want to solve which focuses on changing the environment of the hospital emergency room, including the alarm system, chairs, and a private and comfortable space.	"The chairs seemed too close to one another; more space could have been given while designing." (P12)
Ideated Design Solutions	The total number of design ideas that participants ideated to provide solutions to the problems they observed in the Emergency room environment. Solutions regarding simple human issues, not designed or vague to understand the meaning, were not counted.	"Clear UI for wait times, Kiosk [that] checks patient history, order system for nurse" (P16) — was counted as 3.
Solutions for Patients	Design ideas that help patients to have a better experience, meet their needs and solve problems that center them	"Status board with information for all patients (e.g, estimated wait time)." (P21)
Solutions for Medical Staff	Design ideas that help Medical Staff to have a better experience, meet their needs, and solve problems that center them.	"Wristband for patients [that] helps ER staff recognize patiens and check their condition." (P29)
Solutions for Environment	Design ideas that change the Environment, the emergency room, to have a better experience, meeting needs, solving problems that center them.	"Music speakers." (P30)

Table A.1: Definition of generated codes from content analysis with examples.

Cases	Sum of Squares	df	Mean Square	F	P	η_p^2
Appearance						
Condition	8.728	2	4.364	2.529	0.098	0.158
Residuals	46.589	27	1.726			
Response						
Condition	5.813	2	2.906	1.857	0.176	0.121
Residuals	42.269	27	1.566			
Ownership						
Condition	11.785	2	5.893	3.589	0.041*	0.210
Residuals	44.331	27	1.642			
Multi-Sensory						
Condition	11.057	2	5.529	3.092	0.062	0.186
Residuals	48.272	27	1.788			
Embodiment						
Condition	8.728	2	4.560	3.113	0.061	0.187
Residuals	46.589	27	1.465			

Table A.2: One-way ANOVA results for Avatar Embodiment Questionnaire (AEQ)

Post-hoc Comparison		Mean Difference	SE	t	p_{tukey}
Switching	Medical	-1.033	0.573	-1.803	0.188
	Patient	0.467	0.573	0.814	0.697
Medical	Patient	1.500	0.573	2.618	0.037*

Table A.3: Post-hoc test result for Ownership subscale in Avatar Embodiment Questionnaire (AEQ)

Subscale	Comparison	t(26)	p	Cohen's d
Fantasy	A	0.136	0.893	0.048
	B	0.068	0.946	0.048
	C	-0.203	0.840	-0.144
	D	-1.573	0.128	-1.827
Empathic Concern	A	1.157	0.258	0.631
	B	-0.401	0.692	-0.437
	C	-0.757	0.456	-0.825
	D	0.193	0.848	0.194
Perspective Taking	A	-0.168	0.868	-0.067
	B	-1.064	0.297	-0.845
	C	1.231	0.229	0.979
	D	-1.257	0.220	-1.424
Personal Distress	A	-1.174	0.251	-0.361
	B	0.646	0.524	0.397
	C	0.528	0.602	0.325
	D	0.121	0.904	0.144

Table A.4: Result of 2-way mixed-effect ANOVA for each subscale in IRI questionnaire.

	Fantasy		Empathic Concern		Perspective Taking		Personal Distress	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Switching Perspectives	20.20	21.40	19.70	20.50	18.80	18.40	14.00	13.60
Medical Staff	17.80	18.70	20.30	19.40	18.60	20.40	13.90	14.40
Patient	17.80	18.90	19.50	21.20	20.20	21.70	13.70	12.20

Table A.5: Mean IRI subscale score of each condition before and after the VR session

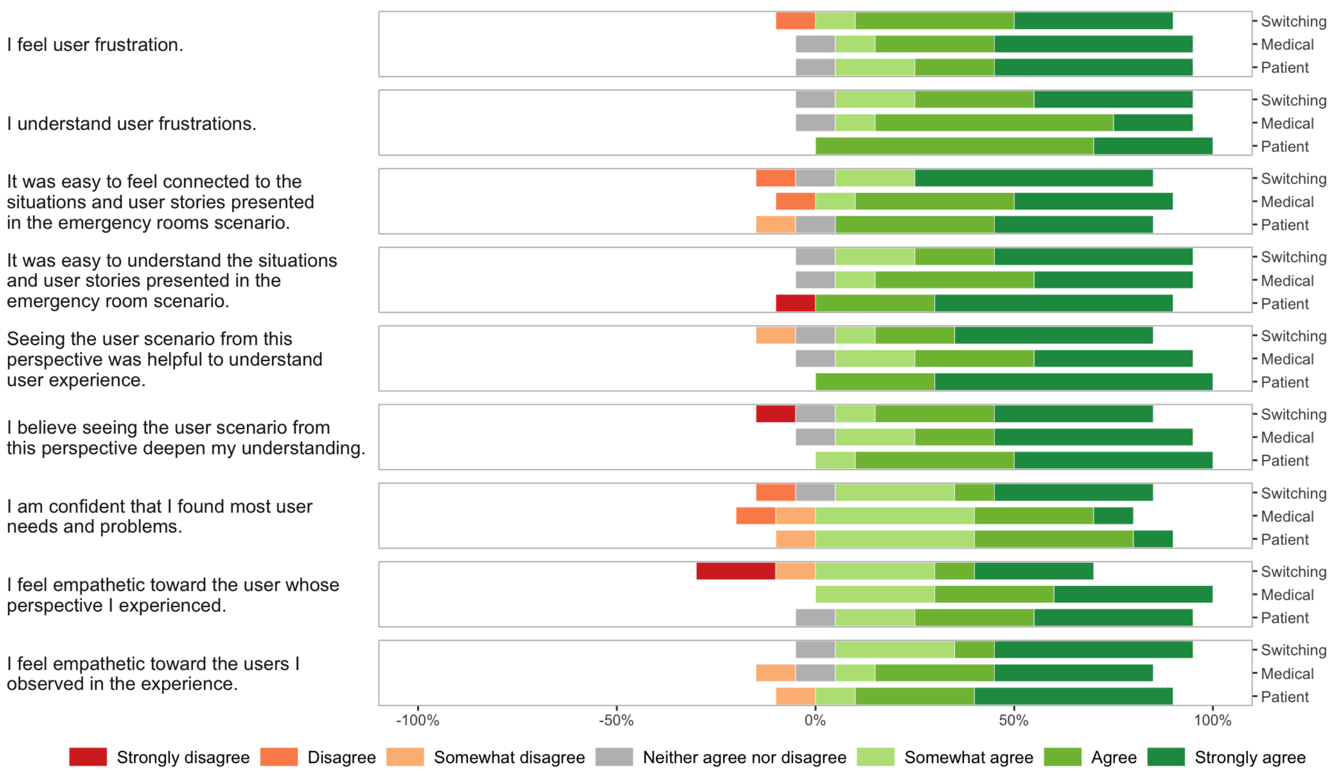

Figure A.1: Likert chart that show responses to the 9 Likert-scale items on our custom-designed questionnaire by condition

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