'Being in on the Action' in Mobile Robotic Telepresence: Rethinking Presence in Hybrid Participation

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ABSTRACT

Mobile Robotic Telepresence (MRP) systems afford remote communication with an embodied physicality and autonomous mobility, which is thought to be useful for creating a sense of presence in hybrid activities. In this paper, drawing on phenomenology, we interviewed seven long term users of MRP to understand the lived experience of participating in hybrid spaces through a telepresence robot. The users' accounts show how the capabilities of the robot impact interactions, and how telepresence differs from in-person presence. Whilst not feeling as if they were really there, users felt present when they were being able to participate in local action and be treated as present. They also report standing out and being subject to behaviour amounting to 'othering'. We argue that these experiences point to a need for future work on telepresence to focus on giving remote users the means to exercise autonomy in ways that enable them to participate — to be 'in on the action' — rather than in ways that simply simulate being in-person.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; **HCI theory, concepts and models**.

KEYWORDS

videoconferencing, hybrid, remote participation, distributed teams, phenomenology, being there

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1 INTRODUCTION

From conferences, to education, healthcare and workplaces, it is often proposed that hybrid modes of interaction are the future [3, 4, 14, 19]. Yet the industry is far from providing effective, friction-less, hybrid solutions that allow equal participation from all attendees, whether they are joining in-person or remotely. Mobile Robotic Telepresence (MRP) is a technology that should be a good solution in theory (and is often presented as an accessibility solution), but in practice may be otherwise. MRP is comprised of a remotely controlled mobile base, that carries a tablet for videoconferencing [21]. Its mobility and embodiment are meant to create a sense of 'presence' for the remote user, but studies also report several drawbacks of the technology that may have prevented it from entering mainstream use.

Our study highlights a core conceptual issue that we believe contributes to the limited success of mobile robotic telepresence and of telepresence technology more broadly; that of how 'presence' itself is conceived of. As a result we propose a respecification from a focus on simulating a sense of "being there" [15], to instead focus on a remote user's ability to participate and successfully 'gear into' everyday social interaction; our study shows that this is what really allows them to be truly included and feel 'present' in a hybrid activity.

We conducted an interview study that draws on phenomenology and Interpretive Phenomenological Analysis (IPA), with seven participants who have used mobile robotic telepresence for extensive periods of time for a variety of reasons. Phenomenology, originating in philosophy, is concerned with understanding experience and consciousness from the first-person perspective [46]. Doing this requires suspending pre-existing assumptions about the subject matter and attempting to understand it from the bottom up based the accounts of the participants [44].

We asked our participants to give detailed descriptions of their experiences of robotic telepresence and talk about what problems they face and how they resolve them. We identified two recurring themes related to *being telepresent via MRP*: 1) The troubles of perceiving and doing; and 2) Being present and ordinary. Through these we highlight how having limited capabilities impacts interactions, and how being telepresent differs from being 'present'.

We argue that for telepresence technologies to offer useful solutions to hybrid interactions, we should focus not on transcending physical boundaries to simulate in-person presence, but on enabling participation in the action. For instance, when work (especially in meetings) is focused on chat and shared documents, easy access to those resources may be more valuable for including remote users in the action of office life than the MRP affordance of movement

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around the office space. As such we should focus on understanding what actions are crucial to successfully gearing into everyday interactions and look at ways of enabling remote users to take part in them in ways that fit with the ongoing social situation .

2 RELATED WORK

2.1 The shortfalls of MRP

Studies of mobile robotic telepresence report that the technology is well received by the users [1, 2, 20, 23, 40, 43], and even that users feel more present and are perceived by local colleagues to be more available and committed [22]. Yet, little attention is paid to what 'presence' means in this context or why it matters. At the same time, the literature reports many shortfalls of the technology, and lack of use in the real world also suggests there are significant limitations.

Before delving into the matter of this paper, we briefly list issues reported in previous literature for context [1]. First, of course, MRP relies on internet connection to work, which limits where it can be used; and common network latencies frequently disrupt interactions [16]. Also, despite being a mobile medium, most robots only turn as one piece and their movement can be clumsy and inflexible [2]. Moreover, one of the main selling points of MRP is that mobility allows for informal and unplanned interactions, however, as Tsui et al. point out, 'walking and talking' using the robot is difficult, as the flat screen does not allow local users to see the remote user from the side [41]. In addition, the speed of the robot is slower than walking speed, and driving takes the remote user's attention away from the interaction [7, 41]. Another issue, is that remote users do not have clear awareness of their presence in the local environment, such as not being able to tell if they are being too loud or if the robot is causing obstructions to local users [2, 21, 22, 28]. Studies also suggest that when the robot causes a disruption (e.g., loud noise, bumping against furniture), local users may attribute blame to the remote user and form a negative opinion of them [22, 42]. Indeed, there are social implications in interactions via MRP. Users (local and remote) can struggle to establish appropriate social norms (e.g., how to handle lowering the robot's volume, how to gracefully enter and end interactions) [22, 26, 27, 30]. There can be disagreements among users on whether to treat the robot as an object or person (e.g., touching and personal space) [22, 26, 39]. And studies have even reported bullying behaviours (e.g., local users intentionally blocking a robots path) [27] and exclusion (e.g., local users rating the remote user as less trustworthy) [1, 38].

2.2 Presence via MRP

Beyond reporting that remote users feel present [e.g. 22], few studies have explored presence in robotic telepresence in greater depth. Virtual Reality research commonly approaches it as a "sense of being there" or "the perceptual illusion of nonmediation" [24, 32], by asking participants if they experienced the virtual world as more real than the real world, or if they experienced the virtual world as a place that is visited or just looked at [10, 36]. Oh et al.'s review, however, highlights distinctions between telepresence (presence in the mediated environment), self-presence (the virtual self experienced as the actual self) and social presence (sense of being with others).

Kristoffersson et al. surveyed healthcare personnel who used MRP in a training session. Participants were asked to rate their experience in terms of how remote, emotional or personal it felt and whether they felt as if they were in the same place as the person and objects they interacted with. Their study encompasses all three forms of presence outlined by Oh et al.. Their results suggest that users had a high experience of presence (in terms of feeling sociable, lively and responsive) but did not feel as if they were really in the mediated environment and could touch the objects in it. Looking at telepresence(as presence in the mediated environment), Kaptelinin et al. used questionnaire and interviews in conjunction with experimental tasks and found a statistically significant negative correlation between subjective ratings of presence and stops and bumps counted during the tasks. In the interviews, participants also reported that they had a better experience and felt more present as they got better at using the robot over time, and that their sense of presence diminished when they bumped on obstacles. The participants also stated feeling present both in the local and remote environments; there were also participants who reported not feeling present and comparing the experience to playing a game [18]. In light of these findings, the authors reference activity theory, which states that as skills develop they move from conscious actions to automatic. This allows for those actions to fade in the background of the location, and allow the person to feel engaged with other more complex or meaningful tasks in it, thus feeling more present there. Finally, James et al. looked at social presence in a case study of a telepresent speaker at a symposium, through the lens of positioning theory. They suggest that the experience of presence there was achieved by the remote and local users orienting towards the remote user as a person (as opposed to as a robot) [17].

These studies look at single instances of use, and the first two use experimental settings—as such we add to this literature by exploring the experience of people who used the technology in the real world for more extensive periods of time.

2.3 Phenomenology on presence

In this paper we explore presence from the lens of phenomenology—an area concerned with understanding lived experience as it is made available in people's first-person perspectives [46]. We draw on Heidegger's phenomenology, which, as is often rendered in HCI, focuses on how objects that are used without conscious effort (e.g., a keyboard) fade out of conscious experience (they are "ready-to-hand" but invisible). However, when ruptures occur (e.g. the keyboard breaks), they become relevant to ongoing conscious experience (becoming "present-at-hand") [8, 13, 44]. Based on that account, a mediated "sense of presence" relies on the medium functioning so well so as to be unnoticed by the user and therefore allow them to engage with the matter that is being mediated [cf. 18].

In addition we draw inspiration from Garfinkel, Goffman et al., and Sacks, whose works have been influenced by phenomenology.

[1] In line with existing literature, we will use the term *remote user* for the person piloting the robot, *local environment* for the location where the robot is situated, and *local users* for the people interacting with the MRP in the local environment [20].

Garfinkel [11] views interaction as a constant, effortful 'accomplishment' that people do together in the moment. Taking this approach, we need not worry about presence as a psychological state but about whether the remote user is 'present enough' to take part in the accomplishing of the interaction. For example, in James et al.'s case study, the user was able to participate in the production of the interaction, thus reporting feeling present among their local peers. Goffman and Sacks, also approach being "ordinary" and "normal" as interactional shared accomplishments. Goffman [12] describes interactions as attempts by people to present themselves in certain ways (as normal, worthy of being in the room, good people etc.) by influencing how the situation is 'defined' (how it is understood by everyone involved, for e.g.,as a meeting where everyone is equally present). Sacks [35] is also concerned with how people in interactions work towards doing what they understand to be the 'normal' thing to do. From that perspective, a person needs to be 'geared into' the ongoing acts of interaction, to act as a 'normal', present person would, practically speaking, regardless of whether they are inhabiting a robot, or other media, or are physically present.

3 METHOD

3.1 Telepresence users

The experiences of seven long-term telepresence users were examined in this study. The criteria for including them in the study was that they had had experience with using MRP systems in their regular daily life (not within an experimental context) and that they had used it repeatedly over an extended period of time. Although some used it more than others, all their experiences reflected competent, familiar use and not novelty effects. Their reasons for using telepresence varied from using it to attend remote work, to using it to connect with family at home (see Table 1). Two of the participants had conducted research about robotic telepresence. Notably, although Participant 1 only used it while he was doing research, he had several experiences during that period.

Our sample consists of seven men, ages 44-61. We recognise that this sample is small and represents a narrow demographic, and indeed the niche context of MRP use is an issue worth addressing. Whilst users from a more diverse population may have come across the robots in a museum or hospital [9, 20, 25, 45], daily, mundane use is only available to those privileged enough to work for companies or institutions that provide it or who can afford one for their home. We searched for, but failed to find telepresence-specific user groups on social media or forums, although they may exist in less publicly visible forms. We also attempted to recruit participants for this study through social media more broadly and by reaching out to organisations that were known to use robots, but we failed to get any responses. We were able to find the users included in this study by email and word of mouth. Thus even while narrow, the perspectives shared in this study were rare and difficult to access.

3.2 The robots

The MRP robots that the participants had used were the Double by Double Robotics and the Beam by Suitable Technologies (now GoBe) (see figure 1). Participant 5 used a Double, Participant 6 used a Double and a Beam, while the others used a Beam only. These are typical MRP systems, comprised of a screen for videoconferencing the (with microphones and camera), and a simple base that is attached to wheels at the bottom. The robots have a parking dock which allows them to charge when they are not in use. The remote users are able to see and hear through the robots, and they can drive them using the arrows on their keyboard. The Beam can also be driven using an Xbox controller and it also has a camera facing down, which allows the remote user to see objects that might block the robot's movements.

Figure 1: The Beam (left) and Double (right) robots next to a person.

3.3 Procedure

Ethical clearance for this study was provided by the university's ethics committee. Participants received information about the procedure and how their data would be handled, and gave their consent prior to participating.

The interviews were conducted online via Microsoft Teams meetings and each lasted about 45 minutes. During the interview, participants were asked to give descriptive accounts of their experiences with MRP. First, they were asked about their professional background, general familiarity with computer-mediated communication and the context in which they came to use the MRP. Then, they were asked to describe one good and one bad experience they have had with the technology as well as a funny one and a productive one, if they had any. After that, depending on what had already been mentioned and what might be applicable to their context of use, they were asked questions about their interactions relating to issues raised by previous literature (e.g., overcoming problems or limitations, dealing with uncertain social norms, interacting with bystanders).

3.4 Analysis

The interviews were recorded and transcribed. We then used the process of Thematic Analysis (TA) [5] to systematically go through the data, and drew on Interpretative Phenomenological Analysis in how we examined the participants' accounts.

TA is an analytic method for finding patterns of meaning (themes) in qualitative data [5]. The process involves familiarising ourselves with the data by repeated close reading of the transcripts, assigning

Table 1: Context and length of use for each user

ID	Role	Reasons for Use	Length of Use
1	Researcher (HCI)	Conducted research about MRP	4 months
2	Software developer	Work meetings	2 years
3	Researcher (HCI)	Work meetings (including prototypes and demos)	4 years
4	Program Manager	Work, home to connect with spouse when abroad	4 years
5	Company director	Visit office whilst immobilized due to injury	3 months
6	Professor (HCI)	Research about MRP, work events and at home	2 years
7	Researcher (Psychiatry)	Home to connect with family	3 years

meaningful labels (codes) to different parts of the data, grouping the codes into themes and reviewing the themes to ensure they provide an accurate view of the whole data set. Themes do not passively emerge from the data, rather, researchers have an active role in interpreting the participants' words and selecting what is important. In deciding what constitutes a theme, the researchers may decide, not only on what is more prevalent in the data but also on what is interesting and relevant to their research questions (for example, users may spend more time talking about the slow speed of the robots and less about being laughed at by their peers, but the latter may be more crucial to examine). As such we do not report frequency counts of the coded data.

Our use of TA takes the position of Interpretive Phenomenological Analysis (IPA), a qualitative method which is concerned with people's lived experiences and how they make sense of the world [37]. In this case, investigating the meaning of 'presence' involves unpacking how telepresence experiences come to exist in a persons' conscious worldview (e.g., what is it like to see and hear as a robot?) and on how interaction is accomplished in the moment (e.g., how do you speak or ask for help as a robot?). IPA advocates for consideration of each case for what it has to say about experience before searching for generalisations. As such we examined the data for both shared and unique experiential accounts with the aforementioned investigative priorities in mind.

4 FINDINGS

4.1 Troubles with perceiving and doing as a robot

Throughout their interviews, our participants described from their point of view what it was like to be telepresent and the difficulties they had. These pertained to seeing, hearing, manipulating the environment, and relying on internet connection. While the reports made here are in line with existing literature (section 2.1), we present them here in order to highlight that those limitations are quite central to the user's subjective experiences, they persist even in long-term use, and have a significant impact on how their interactions are conducted.

4.1.1 Seeing. When describing interactions, the interviewees often referred to their ability to see the local environment, highlighting this an important aspect of their experience when being remote. Whilst the wide view of the camera was seen as a good thing, users complained about the image quality being low. Furthermore, their reports also show that their capacity to perceive within the environment impacted their ability to participate in interactions.

Participant 3: *"The visual acuity is such that people can recognize me from much further away than I can recognize them. [...] that creates a socially awkward situation because someone who I can't recognize will say 'hello, hey [name], how's it going?' And I've got to kind of continue to move closer until I can recognize that person."*

Seeing, and being able to read text was frequently described as a challenge. Participants reported workarounds they developed to deal with such challenges. One described going into a meeting via the MRP, but once there, muting the MRP's sound feed and watching the presentations via Teams, as the presentation display was difficult to see clearly via the MRP's camera. The remote user in this case was using the MRP mainly to create a presence among the local users, but did not exclusively rely on it as a way of gaining access to information pertaining to that interaction.

In addition, the users accounts show that the movement of the robot is interlinked with their capacity to see in the environment.

Participant 2: *"I'll turn the Beam side to side, but it wasn't very comfortable. Usually, I prefer to just back up so that I could see both [local users] at the same time. OK, then the Beam has a pretty wide-angle camera, so it's not that hard. It was only necessary to turn back and forth when we're standing in the hallway, trying to get out of the way."*

The speed and flexibility of the physical structure of the robot impacted how easily the remote users could look around. Despite the wide view camera, sometimes turning to look at a different part of the room is essential to a task, but as the MRP moves relatively slowly, this cannot be achieved quickly and gracefully. For example, one user reported having trouble synchronising his speech with slides during a presentation as it was difficult to look at the slides and the audience.

Participant 6: *"I had somebody in the room present the slides on a projected screen for me and I would just tell them when to advance, but it was extremely difficult to synchronize and know what was being shown in the projector versus what I was saying and to make sure they're aligning. It was also difficult for me to know for sure if everybody in the room could hear me fine."*

4.1.2 Hearing. Participants also reported that hearing as an MRP was not always ideal. The clarity of their sound might depend on various factors such as internet connection, size of the environment and types of sounds. Particularly, a remote user can not discern where different sounds are coming from when in a room with many speakers and is not able to find and focus on the speech relevant to

the interaction in which they were intending to participate. This affected how remote and local users interacted; the remote user would either have to miss out on elements of the conversation or local users would have to adjust by moving closer to the MRP. One user reported that local users would have to lean in and speak close to the MRP's microphone so that he could hear them, which he found "jarring" .

Participant 2: *"Hearing would definitely have lower fidelity than a video game, in a video game you probably hear everything you were meant to hear, but on the Beam you could hear things behind you and not necessarily know how far away they are."*

4.1.3 Doing. When asked if they felt autonomous as remote users, all participants mentioned not being able to manipulate objects in the local environment as their main obstacle and source of frustration—this is where a lack of autonomy was most acutely felt.

Participant 1: *"I'm free to drive where I want but without a manipulator arm or two, or without any other sort of radio-based software control of other things in the environment I can't open doors, I can't go into the lift, I can't push the button in the lift, I can't go up and down stairs. I can't reach, grab, point."*

Not being able to manipulate objects means not being able to open doors or push elevator buttons—these are minor obstacles people face daily in the workplace but significantly disruptive if they can't be resolved. The remote users also had no means of taking action in their environment within work activities, such as drawing on a whiteboard or pointing. As such the remote user is slowed down, dependant on assistance and less capable to participate in interactions, reliant on help from local users or bystanders in order to overcome barriers such as doors and elevators. This is an experience users would have to go though regularly, and as Participant 2 describes below, being put in a position of having to ask for help would make the remote user feel self-conscious.

Participant 2: *"Occasionally I'd have to ask a friend a favour to escort me to a meeting that they weren't a part of and they were usually happy to oblige. But I always felt a little bit self-conscious and after that, when I felt confident enough in myself I would just hang out in front of the elevators and luckily the Beam gets enough attention that when people walk by, even if I don't know them, they'll stop and look. And then at that point I would say hey, 'could you do me a favour and open the elevator and hit floor four for me¿ or wherever"*

4.1.4 Reliance on internet connection. When asked to describe a bad experience, four participants brought up situations where Wi-Fi coverage was not sufficient and required them to seek the help of others nearby. The issue of signal loss also came up in several other instances throughout the interviews.

Participant 4: *"Signal almost invariably cut out in the elevator and requiring me to have someone's assistance"*

The remote user relies on the MRP having good internet connection in order to function. A weak connection—mostly invisible to any local users—might mean the remote users' ability to hear, see, and be heard are impacted. However, the participants mostly described situations were they lost internet connection completely. This commonly occurred in elevators but also in areas of an office where the Wi-Fi did not reach or between two Wi-Fi access points with non-overlapping coverage.

The experience of entering an area without Wi-Fi coverage and as a result being unable to communicate or control the MRP's movement can significantly impact the social interaction.

Participant 3: *"What is difficult is when I lose connection, then I lose the ability to socially interact and then, in that state, it doesn't have any explanation about what to do. So I do wish it had a kind of a help screen in that state."*

Essentially, the remote user's experience may be described as becoming incapacitated; their vision is lost, their hearing is lost, their access into the interaction taking place in the local environment is lost. They are completely removed from that environment while their 'body' remains there, inaccessible to them. While for other communication devices, such as smartphones, the user has the ability walk back to the Wi-fi area and reconnect, the MRP user is incapable of autonomously dealing with this trouble. They then have to wait for someone to notice the issue and understand what needs to be done or they need to use another way of reaching people locally and asking them for help.

4.2 Presence in MPR

Participants felt that when embodied through MRP they had somewhat of a sense of presence in the local environment but they did not describe it as a completely immersive experience of 'being there'.

Participant 5: *"I did [feel present], yeah. Clearly, not literally. Yeah, but it certainly made me feel like I was in the community. Definitely"*. Other interviewees gave similarly qualified answers.

4.2.1 Disrupted sense of presence. Some of the physical and perceptual capabilities of the MRP, such as those discussed in the previous section, *were* mentioned when users described disruptions of their sense of presence. For Participant 6, the height of the MRP was brought to bear when accounting for why they didn't feel that they were there.

Participant 6: *"Well, I wouldn't say that I felt like I was really there there. I think the challenge was that even in the robot, I still have a lot of social deficiencies. It was a BeamPlus, and so it was pretty short. Shorter than my I am in real life. And so I'm basically kind of looking up at my colleagues. The camera view is not particularly great in terms of fidelity and 'cause it was in a very big room and there's lots of people, the audio is hard sometimes to pick up certain people's conversations. They would have to lean in to my microphone and talk more closely. So that was a bit jarring as the remote person."*

The MRP did not match the user's real life height, or a height from which they could comfortably interact. It meant they had to be looking up to people and be looked down on by them. Their perceptual capabilities were also limited. As such the user was keenly aware of the features of the robot throughout the interaction. The MRP as a tool of the interaction did not fade in the background but rather posed obstacles that the user had to actively and consciously work with. Participant 7, who uses an MRP at home to connect with family also suggested that what detracted from an experience of presence was the inability to feel the warmth and touch of the other person.

4.2.2 Being present by participating in the action. When describing what contributed to the sense of presence, participants brought up the ability to move in space and be autonomous. To be not under an illusion of really being there, but nonetheless being capable of tuning their attention to the action taking place in the local environment, and actively participating in it though exercising autonomy and by being treated as present from the locals.

Participant 1: *"[...] it's not like being literally physically present in my own body. But the autonomy that I have to drive around definitely. I pay less attention to my immediate physical surroundings so if I'm driving it from this room, I'm of course aware that I'm physically present in the room but I'm also very much aware that I can drive around over there anywhere I like."*

Participant 4 further elaborates on how other capabilities of the remote user as an MRP, specifically ones that surpass those available in traditional video conferencing, support sense of presence.

Participant 4: *"It's like the Google Street View checking out somewhere you're going to. And so it definitely gives the feeling of presence in the space more than just Skyping for all sorts of reasons. I mean, first of all, the camera is fish eye, so you get like a much wider view. And also you rotate so you get an even wider view, right? By rotating you'll see more of it. [...] Yeah, so that definitely helps. And then, you are aware that other people can see a physical thing which corresponds to you, which helps you feel like you have a physical presence as well, right? You're taking up room."*

The participant describes being able to see more through the wider camera but also being able to actively pursue what to look at using the MRP's ability to move. In addition, Participant 4 refers to the literal, physical presence of the robot ("you're taking up room") in the local environment as evoking a sense of presence through an awareness that the local users are reacting to the telepresent user as an entity with a physical, embodied presence. As such, whether the remote user feels present is in part achieved through interactions with local users who orient themselves towards the remote user in such a way as to suggest that the remote user is perceived by them as present (in line with [17]).

Moreover, that experience of feeling present because the local people treated them as such, was particularly felt in instances where the remote user was the only remote attendee to a meeting, and where the other local users had a propensity to ignore video-conference attendees due to lack of familiarly with remote working. As such, the sense of presence was particularly felt when the capabilities of the remote user (to move and take up space) mattered.

Participant 4: *"I think it did help, because otherwise I've often otherwise been in situations, where if you're the only remote attendee people in the room can ignore you. [...] As soon as there's enough of a critical mass of people attending remotely, and nowadays everything is remote, then they don't need a physical presence, right? Everyone realizes that half the attendees or three quarters of the attendees are remote and you need to pay attention. So I think it's particularly valuable in situations where you're the only remote person."*

Participant 2: *"Usually people worked in the office and I was one of the few that worked remotely and so I felt a need to have a physical presence so that people would include me in in conversations. But now 'cause of COVID everybody's working remotely. But even before COVID for the last year people used [Microsoft] Teams anyway, so it was not important that I have to have physical presence."*

In the situations where the activity was taking place mainly in-person (as everyone else was physically present), the MRP helped the users to better command the local people's attention in a conversation where otherwise they might have been ignored. Having an autonomous, robotic body in that physical environment brought the remote participant more on par with the local people and this gave them a greater capacity to participate in the interaction. In that setting the physical aspect of the MRP was required to make up for the inability to engage via video. As such, we see that the embodied, mobile aspect of MRP is not what inherently creates a sense of presence; it does it when those features are relevant to the interaction.

4.2.3 Failing to be "ordinary". According to interviewees' accounts, when embodied by the MRP the remote user tends to stand out, to be seen, noticed, pointed out and reacted to without tact when making a mistake, when in a space with local bystanders. Whether attempting to or not, the remote user is not blending in with the others: instead they are treated as different. Standing out can be both a help or a hindrance, depending on the situation.

Participant 6: *"The attention is kind of fun and nice, but if you really want to get something done, like if I really need to drive to a particular location to attend a meeting, I don't want to have all that kind of attention on me."*

Participant 6 clearly refers to a kind of unwanted attention. Other accounts suggests that when in a "public" area of the office, the MRP attracted the attention of bystanders, who would not just look with curiosity but also initiate interactions. Whilst it can be nice and even useful to attract attention and be noticed in the office, such as for networking, participants also claimed that it prevented them from carrying on with their work.

The propensity of the MRP to stand out and be treated as different was a problem particularly in situations where the remote user did not have complete control over the MRP's behaviour and made mistakes due to that limited capacity. The conspicuous nature of the MRP means that remote users do not have an easy way to be discreet in public areas should they wish to. Rather, they are always prominent and their every movement tends to be noticeable by people in the local environment.

In situations where people are expected to remain quiet and not cause any interruptions, the remote users were at a disadvantage, as any small movement of the MRP could attract local attention owing to e.g., mechanical noise or the unusualness of large pieces of technology moving on their own. Participant 2 reported that he'd make an effort to position his MRP out of the way and stay as still as possible during meetings for that reason.

Participant 2: *"I felt like it was distracting when I would move. Usually it would catch the eye of a lot of people and they would look over it, not necessarily apprehensively. But maybe a little bit of that. I mean 'cause it is a big device. It's moving on its own."*

In the case that the remote user makes an error, the local users and bystanders will not only notice it, but make it known that they have noticed it, usually by laughing, breaking away from the conventional methods of politeness. Participant 6 describes what

happened after he made a driving error, whilst trying to quietly leave the room of a faculty event, and hit against a chair.

Participant 6: *"And I kind of start to hear people laughing and I sort of turn sideways to the audience. And then I didn't want to stay so I said, 'Sorry, I'm just trying to sneak out' and then the room just erupted in giant laughter, so it was kinda comical, but for me it was kind of really challenging because there was no way for me to gracefully leave that room."*

It was felt that local people in those situations are not necessarily as willing to tactfully overlook the disruption and pretend that they did not notice or that they don't mind so as to save the remote user from embarrassment, as might have been expected in an in-person interaction. Being present via an MRP seems to prevent the remote user from being perceived as 'ordinary' and to evoke a different treatment.

5 DISCUSSION

5.1 Being telepresent is a distinct experience

Quite obviously, using a telepresence robot offers its users limited capabilities to perceive the world and act in it compared to the physically present persons. To recap, our participants reported that the visual and audio fidelity was low, driving was burdensome, they were not able to manipulate their environment, and relied on consistent internet connectivity. These reports reaffirm previous literature, but their mention in our study shows that such issues persist even after extended use and that they disrupt the experience in important ways. Even if some users put up with them or find ways to compensate, the limitations still remain central to their experience of telepresence.

Our participants report almost always being very aware of the medium that they are using. This is partly because telepresence robots rely upon considerable foregrounded 'perception work' on the part of the user. The remote user often needs to move around simply to see and hear; participants described deliberate strategies for achieving this (moving backwards to get a wider view, having a videoconferencing application open). Looking around with a simple turn of the neck is done with little effort by most people when physically present, but doing so as a robot means coordinating a range of physical actions that continually bring the medium's existence to the foreground. Moreover, with regards to the absence of manipulators and dependence on internet connectivity which render the remote user reliant on their local peers, we may draw on Robillard's ethnomethodological studies of the disabled body [33]. He examines how his paralysis shapes all facets of his interactions and proposes that the disabled body is itself an interactional category, used and read as the text of the social structure it is involved in. Despite efforts, then, to create a sense of presence by attempting to give the remote users the same capabilities that are available to those that are in-person, telepresence remains a categorically different experience.

5.2 Rethinking 'Presence': Being In On the Action

Striving to imitate "being there" in telepresence seems difficult (maybe impossible?) in practice, yet it does not necessarily need to be an aim. Hollan and Stornetta specifically critiqued the drive towards manufacturing simulations, arguing that as it would never replace the in-person experience outright, mediated interaction would always be a second choice, and therefore users confined to only that mode of interaction would be at a disadvantage. Moreover, as we have seen from the users' accounts, what matters is *local participation* in what is going on. Compared with a technical conceptualisation of 'presence' [24, 32, 36], we argue that participants did not in any way describe their experience as if the mediated environment was more real than their real environment nor did they forget about the existence of the medium, but rather described feeling like they could explore the local environment and in the course of this *participate in interactions* in it, in comparison with clear limitations on doing so with traditional videoconferencing. This is in line with the findings by Kristoffersson et al., where users felt engaged and sociable in the mediated environment but not that they were really in it. Based on this, we argue that a reconceptualisation of the technical desire for enhanced 'presence' might be better thought of in terms of whether someone is able to 'gear into' the social circumstances. This means focusing our analysis more on how interaction between local and remote users is practically accomplished so as for the remote user to be 'in on the action' in an 'embodied' way, which allows for meaning to be created and communicated [8].

Further, similar to the findings by Kaptelinin et al., the participants described losing 'presence' when facing challenges with the MRP which impeded their awareness and autonomy and brought the situation and system to the foreground. In other words the MRP user is suddenly brought back to their desk, sitting at a computer trying to remotely control a robot—the action becomes more distinctly 'out there'. At the same time, a sense of presence arose from improved autonomy of action in the environment—but this was more prevalent in situations where most other attendees were physically present, and therefore the action was taking place in the physical environment. By contrast, when the action was taking place in a digital space, such as a videoconferencing application, users turned to that space in order to participate and did not need to feel as if they were really physically present to do that. In other words, features that seek to imitate "being there", such as embodiment and mobility, only contribute to a sense of presence if they are relevant to the activity at hand and allow the user to better participate in it, and not due to an independent relationship between richness and presence.

Moreover, the experience of being in on the action was also described in relation to the behavior of the local users towards the remote. Analogously, prior research has also reported that users felt they were paid more attention in meetings when they used MRP [41]. And in line with James et al.'s analysis, the remote users had a sense of social 'presence' when they felt part of the group (of local users). We can also understand this through Goffman's framework of presentation of the self as performance [12], which posits people's social actions as attempts to define a situation. For telepresence users, when they were seen and paid attention to, it meant that the group was able to accept their performance of being as much a part of the social milieu as the locals. In other words, rather than thinking of presence as a psychological attribute, we think designers should look to the ways in which social interactional participation is practically achieved by both local and remote users.

The capabilities of the remote user then, relate to presence both by allowing the medium to fade in the background and by allowing the user to act with agency and thus be oriented to by local users as 'just another' participant. This leads us to consider the ultimate effect of this kind of treatment of remote users as 'ordinary'.

5.3 Being Ordinary

Following the idea that presence is about how one is being treated, it was evident in our findings that telepresent remote users are often treated as 'Other'. Participants' accounts included descriptions of situations where they failed to blend in as an 'ordinary' participant. In public spaces, a telepresence robot attracts attention and in a meeting, the smallest movements do too. A telepresent remote user cannot go unnoticed (e.g., to quietly leave a meeting room) and when they make a mistake, it is not only noticed but remarked upon, often with laughter. Previous literature also shows that telepresence users are sometimes excluded or treated inappropriately [1, 22, 30, 38]. Politeness theory [6] proposes that in the interest of maintaining face one must also act so as to protect the face of others (i.e when others do something embarrassing we pretend not to notice). But this does not happen with robotic telepresent others; local people do not seem to be as tactful. Goffman [12] argues that while it is easy to see through each other's attempts to control the definition of the situation through dishonest 'performances', participants will usually not make this known publicly but rather work together towards a consensus of the situation that everyone is comfortable with. In this case however, when a remote user tries to act like "just another normal participant", local users do not play along, but rather point out that this person is different.

Sacks [35] describes how everyday interaction is saturated in the ways people are "doing being ordinary". People continuously work towards being 'ordinary', in the sense of being 'unremarkable' (literally, 'unremarked upon') by acting based on what they perceive to be normal and unremarkable ways to act [35]. "Doing being ordinary" when telepresent is not about being just like local people but rather about acting in ways that fit with the interior logic of social interaction. For our participants, the achievement of "being ordinary" was often disrupted by interactional fractures caused by the technology (like the inability to see and hear from a socially acceptable distance), so their capacity to act as they desired, to influence the situation and do "being ordinary" (e.g., to quietly leave a room) was limited. Ultimately, they were often stuck in a position of being an 'Other' to the local participants, holding a different perspective of the interaction, being treated as such, and with little control to change the situation.

5.4 Limitations

The demographics of our participants is a clear limitation to this study. As mentioned earlier, the participants were all middle-aged men, working in academia or tech industry in positions that allowed them access to telepresence robots. As such our study is likely to be incomplete, especially with regards to experiences around asking for help, attracting unwanted attention and (not) being treated as an equal. Some of our participants described finding such interactions uncomfortable, while some were able to 'laugh it off'. Still, we do not know what such interactions might be like for those with less privilege (such as women in male-dominated professional environments) and what strategies they might employ to be seen and taken seriously. For telepresence technologies to offer access to hybrid spaces to everyone, researchers and designers will need to reach out to excluded groups, give them access to the technology and aim to understand use from their perspective.

6 CONCLUSIONS

In this study we examined accounts of lived experiences of long-term users of mobile robotic telepresence. These accounts highlighted the impact that the medium's capabilities can have on how interactions are conducted, and to examine how being "present" and "ordinary" are achieved remotely. MRP impacts users' capacity to participate in mundane activities in the local environment, such as greeting colleagues or exiting a room. This in turn impacts their experience of presence and the way in which they are treated by others. Our participants did not describe presence as an illusion of "being there"—as they were regularly reminded of the presence of the medium when it didn't function as expected—but reported value in being able to participate in the activities unfolding in the local environment. Ultimately being "present" and being "ordinary" are linked in MRP interactions. Both relate to the capabilities of the MRP user and the degree to which these capabilities can engender from local users the treatment of the remote user as an equally present and ordinary colleague.

6.1 Future Work

In presenting this analysis, we wish to incite a more critical approach in future work on telepresence as well as teleoperation and hybrid participation more broadly [31, 34]. Specifically we call for the field to move away from thinking about hybrid media in terms of how well they allow a remote user to have the same capabilities as the local users, but rather to examine the action itself and seek to provide solutions for participating in it. We said above that this may be achieved by giving users the means to act with autonomy, but this autonomy may not only be achieved by improving their movement or imitating in-person capabilities. It may also involve the use of "unrealistic" capabilities such as contactless object manipulation or augmented and mixed realities. It may involve bringing the local users more into the digital space rather than the opposite, or integrating the two spaces better. The right solution would depend on the action and what it takes to participate in it. Designers and researchers might benefit from asking users not whether they felt 'there' but whether they were able to practically participate in the activities unfolding in the local environment. As such they might look at means of participating in actions rather than means of imitating in-person capabilities.

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