



“I just embodied you”: Psychological Ownership of Personalized Photorealistic Avatars

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ABSTRACT

Developing and using personalized photorealistic avatars in research settings poses novel challenges for research ethics procedures. These challenges stem from the highly identifiable nature of avatars, which are imbued with the users' identities. This study examines how individuals, who have had personalized photorealistic avatars created for participation in multiple research experiments, relate to their avatars when not embodying them. In three focus groups (N=9), we use hypothetical scenarios to explore avatar ownership. Using thematic analysis, we identify three themes that encapsulate individuals' psychological sense of ownership of and connection to their avatars: i) the desire for control over the avatar, ii) the entangled relationship between user and avatar identities, and iii) feelings towards the avatar. From these themes, we suggest three recommendations for enhancing future ethical procedures, emphasizing transparency, access, control, and consent, and discuss factors limiting the generalizability of our results.

CCS CONCEPTS

• **Human-centred computing** → Human-computer interaction (HCI); Interaction paradigms; Virtual Reality.

KEYWORDS

personalised photorealistic avatars, psychological ownership, privacy

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1 INTRODUCTION

Personalized photorealistic avatars are high fidelity digital representations which closely resemble users' own human features, preserving their identity and appearance [30, 35]. In recent years, the use of personalized photorealistic avatars in industry applications and academic research has witnessed a surge [32]. This shift can be attributed to technological advancements, where improvements in graphics, photogrammetry methods, rendering and artificial intelligence have facilitated the generation of increasingly lifelike avatars [30]. The increasing popularity of personalized photorealistic avatars also reflects a preference for more authentic virtual representations [36]. However, personalized photorealistic avatars represent a novel and highly identifiable data source, imbued with a sense of personal ownership and self-identification [8, 26]. Currently, ethical recommendations developed for virtual and augmented technologies (e.g., [13, 27]) are unable to cover the unique connection that users develop towards personalized photorealistic avatars. Similarly, established legal frameworks (e.g., General Data Protection Regulation; GDPR) do not aptly cover the protection and sensitivity of personalized photorealistic avatars, including avatars which are created within research settings.

This study explores the lived experiences of individuals who have had personalized photorealistic avatars (Figure 1) developed for participation in research studies. The individuals had four embodied experiences with their avatars over a 15-month period [26]. We examine how these individuals relate to their avatars and their perspectives on avatar ownership. This work is directly relevant to HCI researchers as we make practical suggestions for how research ethics can and should be adapted to address the unique challenges associated with personalized avatar data. These findings also have wider implications for the handling of avatar data in regulatory frameworks more generally.

1.1 Avatars and Virtual Body Ownership

The exploration of virtual body ownership is a well-established research area within the context of embodied experiences [10, 21]. Specifically, the Body Ownership Illusion (BOI) defines the experience of perceiving a virtual body as one's own [11, 19]. Experiencing BOI has been found to influence behaviors, self-perceptions, and attitudes based on the characteristics of the embodied avatars (known as the Proteus Effect [34]). For example, following the embodiment of older avatars, participants experience a reduction



Figure 1: Example of the photorealistic avatars (faces blurred for anonymity purposes)

in age bias [3], and report higher intentions to receive vaccinations [20]. Related effects have been found when varying avatar features such as gender [5], ethnicity [2] and group membership [14].

Whilst significant strides have been made in understanding how individuals perceive and relate to their avatars during embodiment [21], a notable gap exists in the literature concerning the relationship individuals maintain with their avatars when not actively engaged with them or embodying them. Here we consider the notion of non-embodied avatar ownership and look to understand the persistent connection individuals may have with their virtual representations, even during periods of non-engagement. Through studying non-embodied avatar ownership, this may provide insights regarding how personalized photorealistic avatar data should be handled by data controllers and researchers. Given the increased desire for photorealistic avatars [35] coupled with the recent technological advancements which have simplified the process of creating personalized photorealistic avatars (e.g., Meta’s Codec Avatars), we can expect more research to involve the development of these highly sensitive and identifiable forms of data. It is thus imperative to develop stringent ethical processes for research involving personalized photorealistic virtual representations of participants.

1.2 Virtual Reality Ethics and Existing Legal Frameworks

At present, existing ethical frameworks and guidelines for virtual reality-based research, e.g., [13, 27] do not address the unique challenges posed by personalized photorealistic avatars. This omission stems from the fast pace of technological development and lack of longitudinal studies using personalized avatars. Resultantly, there is a lack of understanding regarding the nuanced ownership dynamics that exist between individuals and their avatars.

Conversely, legal frameworks (i.e., GDPR) state individuals have the right to “own” their personal data. A range of different types of identifiable data are necessary to create personalized photorealistic avatars, including photographs, which are computed onto 3D models preserving body dimensions and measurements, and

motion data. Given the identifiability of personalized photorealistic avatars, these avatars are classified as personal data. Whilst photographs have been at the heart of privacy discussions for over a century [31], it is not yet clear how privacy and ownership dynamics are best constructed in relation to embodied personalized media representations.

Specifically, this study aims to explore the concept of ownership in both ethical and psychological senses. This includes aspects of data ownership such as control, access, and use of the avatar, as well as questions around appropriate data handling and user involvement during the development stage. Further, this research also considers psychological questions around privacy and theories of self. We suggest that a starting point for grappling with this complexity is to explore how individuals psychologically relate to their non-embodied avatars and the boundaries of those relationships.

1.3 Psychological Ownership of Personal Data

Psychological ownership is the sensation of possessiveness and psychological connection to an object [24]. More specifically, it can be understood as “the state in which individuals feel as though the target of ownership or a piece of that target is ‘theirs’” [23], and notably, can persist even in the absence of formal ownership. Previous studies focusing on psychological ownership of data have explored internet users’ boundaries towards the open access of photographs and social media data. Within this research, factors such as who has access, the timing of their access (e.g., in 10 years’ time), reuse intent, audience of reuse, context of the original media creation, existence of legal frameworks, and technological constraints have been found to influence individuals’ perceptions of ownership and data sharing [12, 15–17].

Outside of the data ownership literature, organizational research into psychological ownership has suggested four antecedents to perceptions of ownership. These are: control over the target of ownership, intimate knowledge of the ownership target, self-investment in the target of ownership and accountability for the target of ownership [1, 22]

In this study, we explore how these factors influence participants’ relationships with their personalized avatars. The primary objective is to understand how avatar ownership is conceived by participants, both psychologically and ethically. Subsequently, we identify how this understanding can be used to improve existing guidelines for ethical research.

2 METHOD

2.1 Participants

Participants were recruited from a sample of 23 who had previously had personalized photorealistic avatars developed as part of a series of four studies. The studies examined the effects of avatar personalization and photorealism on embodiment, avatar perception, physiological reactions, and behaviour in VR. In the first study [26], participants were recruited via opportunity sampling, word of mouth and from two mailing lists in the Psychology and Computer Science departments at a UK university. Due to the COVID-19 regulations in place at the time of recruitment, all participants were either students or members of staff, but were not otherwise associated with the project in any way. Of the 23 original participants,

nine participated in the current research (5 female, 4 male; mean age = 29.33 years, SD = 3.60).

2.2 Procedure

The research used focus groups to understand participants' conceptualizations of avatar ownership. Focus groups were chosen to facilitate a dynamic interaction amongst participants, allowing them to co-construct their realities collaboratively and collectively refine their thoughts. We anticipated that participants may disagree, and thus the communal nature of the focus group would allow the participants to collectively navigate their experiences. The research received ethical approval from the Social Sciences Research Ethics Committee at the University of Bath.

Participants were divided into three focus groups consisting of three participants per group (Group 1: 1F, 2M; Group 2: 1F, 2M; Group 3: 3F). Having smaller focus groups meant each individual's experience could be captured, whilst also allowing for discussion and debate. In line with legal scholarship methodologies [25] and prior research on psychological ownership [16–18] we used hypotheticals to understand participants' conceptualizations of data ownership.

The focus groups were conducted by the researcher who led the original studies for which the avatars were created. Participants were therefore familiar with the researcher, thus building on an already established rapport. All participants gave informed consent prior to the study and were provided with a debrief sheet afterwards. They were reminded that all scenarios posed during the focus groups were hypothetical, and responses would not have any bearing on the handling of their avatar data (which were due to be deleted at the end of 2023). Participants were reimbursed for their participation.

Following the focus groups, an independent transcription company transcribed the data. The transcripts were then checked against the audio files to ensure accuracy, and any transcription errors were corrected.

2.3 Materials

Participants were first asked whether they thought they owned their avatar. This included how they defined ownership. They were then asked about hypotheticals regarding sharing their avatars with other researchers, government bodies, or industry partners. Participants were prompted on how aspects such as the purpose of sharing avatars (e.g., for social good or profit), the timeframe (e.g., sharing the avatar in ten years' time), the intended reuse of the avatar (e.g., as a background character or embodied) affected their willingness to share. Additionally, participants were asked their perspectives on sharing selective avatar features (e.g., limbs), their thoughts on customization, and their views on sharing images of the avatars (e.g., in conference presentations). Participants were prompted to identify any additional factors influencing their willingness to share and their concerns related to cyber-attacks. These features were developed from the existing literature on personal data sharing [12, 15, 16]. The full interview schedule can be found in the Supplementary Materials.

3 ANALYSIS

Reflexive thematic analysis (RTA) was used to analyze the data. Our approach adhered to Braun and Clarke's [6, 7] method for RTA, which provides theoretical independence and flexibility. Both semantic and latent coding were applied and the analysis was guided by a critical realist perspective. We employed a predominantly inductive approach, where themes were derived from the data, rather than from a prior theoretical structure [7]

Initial coding and theme development was performed by AC, a researcher who was not involved in the original embodiment research and thus came to the data with a less biased perspective (in line with inductive approaches to qualitative analysis [7]). AC identified six themes, which were then discussed with AS and DSF. After further recursive coding and refinement by AC, three themes were discussed with the remaining authors of the paper (AJ, DE, LS). Importantly, the version of thematic analysis employed [6, 7] explicitly discourages the use of inter-rater reliability.

4 RESULTS

From the RTA, three themes were identified that related to avatar ownership: i) pragmatic considerations regarding control over the avatar, ii) the complex relationship between user and avatar identities, and iii) ownership as conceptualized through feelings towards the avatar.

4.1 Theme 1: "The right to use it, and to stop whoever's using it"

The first theme captured how participants conceptualized avatar ownership. The driving force behind conceptualizations of ownership related to control over the avatar. Participants often reported feeling as though they did not own their avatars as they did not have control over them. Instead, avatars were perceived as being owned by the university as they had been created within the research setting. However, participants reported feeling as though they "should" own them:

It feels like we should, but then I wouldn't even know where to go to get access to it. I don't feel like I do, I've not seen it for a long time now. I don't know where she is or what she's doing, but it feels like something we should have control over. It's like my face, I don't feel like I do at the moment (G1, P2, F).

Participants were often unsure whether they owned their avatars due to their lack of control over the avatar, access to the avatars, and their knowledge of how avatars were being handled. They referred to ethical and legal frameworks to help them make sense of ownership, in line with [16]. Whilst they knew they could request their avatar data be deleted (in line with university ethics and GDPR), they did not feel in control of other decisions regarding their avatars. This reliance on knowledge of existing legal and ethical frameworks may be quite unique to this specific sample, given that all participants have worked or studied in a university. However, this uncertainty around the parameters of ownership may be more pronounced in participants who are less familiar with research ethics procedures, irrespective of informed consent.

Notable in these references to control and agency was the distinction between positive and negative agency [28]. In [28], the authors suggest that the Positive Agency refers to “feeling in control of one’s body, mind and environment” (p. 8) whereas the Sense of Negative Agency refers to a lack of control, and a feeling of helplessness. Throughout the focus groups, participants appeared to feel helpless with regards to their lack of control. Whilst the participants trusted that research ethics processes would mean that the avatars would not be shared, they expressed concern that they would not have knowledge if this were true or not.

There’s too much risk because someone like I say, even if they agree to certain parameters, you have no ability to stop them doing something else, even with you. No. Not saying that you’re untrustworthy. I’m sure your data storage is fine but what’s stopping you using it? Even if you tell us you’ve deleted it, I’m not going through your computer, it’s too much risk. (G1, P1, M)

This lack of transparency and knowledge of how the avatar was being used was key to understanding participants’ sense of vulnerability. The participants appeared not to have really considered their ownership of their personalized avatars before, but on reflection, believed that they should have greater control and knowledge over what happened with them. This lack of consideration of data ownership may leave individuals open to potential exploitation [29]. Participants reported being particularly concerned about hypotheticals involving publicly sharing the avatars, as they would have no control or knowledge over how the avatar was used. Further, there was an acknowledgement that participants had no choice but to trust the holder of the data after the avatars were created, as they were unable to verify how their avatars were being used. Whilst this is the case for all personal data shared with a company or research institution, there was an enhanced sense of risk related to the sharing of avatar data due to the potential implications of the misuse of this data for the participants’ offline identities.

4.2 Theme 2: “I just embodied you.”

The relationship between the participants and their avatars was complex. Participants reported concern about potential “subconscious associations” between their avatar and themselves, if their avatars were to be used in future research:

Even if we know it’s not real, if my students take part in a study where I’m harassing someone or I’m attacking someone, they come away from that knowing it’s not real but can’t fully take that out of their mind (G2, P1, F)

If we’re used as a tool for people to, for example, get out who can’t really leave the house[...] Then avatars need to be available to make the experience in a certain way then I’d be like, “Yes, no issues. Please do”(G3, P3, F)

What is noteworthy within these examples is the pronouns used to describe the avatars. In both examples, the avatar is referred to as “I” – “if we are used as a tool” and “I’m harassing someone”. In these small linguistic choices, participants reveal a fusion between

their avatar and themselves which may explain the enhanced sense of vulnerability that is felt at the idea of sharing their avatar.

Despite this, when offered the opportunity to conceal their identity through customization or editing of the avatar, some participants reported an unwillingness to share an avatar that may have been customized to look less like them. This was because they saw the “purpose” of the avatars as presenting a realistic resemblance of their offline identities:

I think it’s really best to keep their presentation as it is. [...] I’ll consider it, but probably if you ask for consent for using my avatar, I’d really like you to use it as it is without any modifications. (G1, P3, M)

If it looks so far removed from what we look like, then what’s the point of using it at all, maybe (G1, P2, F)

Participants 2 and 3 (Group 1) both indicated that they saw the purpose of the avatar as representing themselves, and thus viewed modifications to the avatar as defeating the purpose of it. However, later in the focus group, both participants also indicated an unwillingness to share their avatars with others because of an insecurity around the quality of the avatar:

Personally, I wouldn’t want anyone to see my avatar just because it’s awful. (G1, P2, F)

I don’t like the idea of having my avatar being shown because I don’t think it’s a good avatar (G1, P3, M)

This observation suggests that participants simultaneously desire their avatar to closely resemble their offline identity, whilst also feeling vulnerable because of that resemblance. The unwillingness to have others see their avatar may also be because participants do not feel that the representation accurately reflects their self-image. This shows parallels to research on photographs of self [33]. Moreover, this tension between accuracy of self-image and desire for self-presentation relates to self-discrepancy theory [9] whereby discomfort arises from a discrepancy between one’s actual image and one’s ideal image. With personalized photorealistic avatars, participants appear conflicted about whether one’s actual image or one’s ideal image is the best representation of self. In line with this idea, several participants also acknowledged the role that avatar customization plays in imbuing more of the customizer’s identity into the avatar:

I think it would be more– Even if you made it, if you customized it, even if you made it look less like you in the real world, I think it would have a lot more of you in it because it knows your decisions on what you want to show and what you think is important, so I think that would actually be– I’d be less hesitant. Depending on how much you can do to it. I’d probably be– No, I’d be more hesitant to share that than even if it was a super photorealistic one that otherwise, didn’t have any control over. (G3, P3, F)

In this extract, the participant feels more comfortable sharing their avatar without customization as they believe that more of their identity would be captured in the customization decision-making. Several other participants also reported that being able to customize their avatars or be involved in the development and

rendering stage of the avatar creation process would lead them to feel more ownership over the avatar. For example:

I'd say as well, like just the fact that I guess because it was set up how it was, it wasn't customizable, it is how it is. [...] I think I probably at least want ownership of it if perhaps it was like you could change it a bit more, customize it a bit, but just because it is how it is and just sent off, I guess you're comfortable with it (G3, P3, F)

They [the University] are fully within their right to.. when they're modelling it and they're rigging it, they're fully within their right to make me have big shoulder bones or really long nose or massive droopy ears. They could definitely do that. I don't think there's anything legally stopping them because they own it. (G2, P3, F)

Without the ability to customize the avatars, participants felt less ownership over the avatars. In fact, P3 (Group 2) felt that the ability to customize and make decisions about the avatars' features was central to the university's ownership of the avatar. Again, we note this sense of negative agency over the avatars, with positive agency belonging solely to the university. This acknowledgement of the creation process being important to ownership shows synthesis with the work of [16]. The inability to customize avatars creates a level of detachment from the avatars which may also have consequences for embodiment processes. Without the ability to control how the avatar looks, or be involved with the rendering and development process, participants occupy an awkward middle ground where it is their physical image, but they simultaneously have little control over how the image is used. Multiple participants brought up references to the actor strikes in the film industry [4], where a similar lack of control over one's image is at the heart of numerous legal debates.

4.3 Theme 3: "I have an intuitive sense that it's different from just a photo"

The psychological attachment of individuals to their avatars is further exemplified in the affective responses that participants detail when considering ownership of their avatars. Throughout the focus groups, participants relied upon feelings and intuitions to guide their responses to the hypotheticals about ownership.

I think I have an intuitive sense that it's different from just a photo or a video because you can embody it to do stuff, and theoretically other people could also embody it to do stuff. It feels more personal in a way and more like you should have ownership over it for that reason. Then, at the same time, I feel like the gap is actually narrowing a bit between photos and videos and this sort of application. Because with the rise of deepfake, you can actually get people to look like they're doing other things by manipulating photos. Or if you have footage of people speaking or their voice, you could make them say things or sing things or whatever that they haven't actually done. So I feel like I have an intuitive sense that they're different,

but actually, I think the gap is narrowing because of what has become capable with AI and photo and video manipulation. (G2, P1, F)

In this extract, the participant details the conflict between her intuitive sense of the personal nature of the avatar, and her logical understanding when situated within the wider technological context. Commonly, participants stated that they "felt" as though they should have ownership of the avatar, or that certain situations "felt" uncomfortable even if the exact reasoning could not be pinpointed. Sometimes, participants changed their minds when confronted with logic that undermined their feelings of discomfort, however feelings often provided the central force for reasoning about psychological ownership of the avatars.

This tendency towards relying on feelings to navigate boundaries of ownership shows synthesis with the original depiction of psychological ownership as an affective process [22]. Whilst we have previously touched upon the cognitive elements of ownership – i.e., the desire for control – the affective component is often stronger than cognitive evaluations of ownership [23]. This psychological connection to avatar data is not captured sufficiently when considering research ethics in a purely logical manner. In fact, per the ethics procedures under which the avatars were developed in the original research, the avatar data were required to be destroyed following the termination of the research. On being reminded of this fact at the end of a focus group, two participants requested their avatars, with one remarking:

I guess there's that level of like, "That's me being destroyed." I guess. (G2, P2, M)

Whilst ethical and legal regulations stipulate that data not be stored for longer than is necessary for its intended purposes (e.g., GDPR), this logical argumentation fails to account for the psychological attachment and psychological ownership of individuals to their avatars. Below, we discuss what this means for updating and refining existing ethical processes.

5 DISCUSSION

The results revealed that participants felt a significant lack of control over the development, access, and use of their avatars. Because of this inability to control or have knowledge regarding the use and handling of their avatar data, participants felt that they did not own their avatars, even though they believed that they should. Further, we identified that individuals felt a psychological attachment to their avatar, often referring to the avatar as 'I', and they felt that uses (or misuses) of their avatars would likely impact their offline reputations. In this sense, the potential exploitation or misuse of avatar data may pose a more direct threat to individuals than the misuse of some other forms of personal data. Additionally, in line with the psychological ownership literature [22], participants often relied on their feelings and intuitions to make sense of their vulnerability and their attachment to their avatars. These findings show great overlap with the four antecedents to perceptions of ownership as proposed by [1], namely: control, knowledge, self-investment in the target of ownership and accountability for the target of ownership. As a result of these findings, we suggest three adaptations to current ethical frameworks regarding the handling and processing of avatar data.

First, we identify the need for greater transparency in how avatars are stored, handled, used, and created. Whilst the avatars are currently stored securely on the University's servers, participants are not aware of who has access to the avatar, or how the avatar is handled. In order to render the avatars, avatars are accessed by a range of technicians who assimilate different data sources which make up the final avatar (e.g., photographs, skeleton, motion data, facial expression data). One solution to promote transparency could be to store avatars and associated data on a blockchain ledger, where access could be controlled via private keys. This would give participants greater knowledge and control over access to the avatar, in line with existing legal regulations (GDPR, CCPA). Future work could explore the practicalities of this suggestion.

Second, we found that participants felt they did not have control over the decisions made about the development of their avatars. Consequently, they felt less attached to their avatars by virtue of their inability to be involved within the design process. We suggest that allowing participants greater control over design choices such as the subtle reshaping of misaligned features (e.g., fingers, noses) may enhance ownership perceptions and self-affirmation, perhaps also influencing embodiment processes. However, customizing avatars can make them more sensitive compared to those designed by a technical team, as the personalization process imbues a sense of identity. The option to participate in customization could be offered to future research participants although more research is needed to disentangle this complex relationship between customization (including for reduced resemblance) and identity.

Finally, individuals reported a psychological attachment to their personalized photorealistic avatars which they may not have anticipated prior to the creation of the avatar. As individuals' relationships with their avatars evolve and technological advancements impact avatar usage, consent processes should be more iterative, adapting to ongoing avatar developments such as the specifics of the 3D model construction, the motion capture component, and the use of avatars outside of the research setting. In the future, avatar representations may become more mainstream and thus it is important to consider the wider social context when understanding individuals' sense of vulnerability with regards to their high fidelity virtual representations.

These findings are limited by the non-representativeness of the study participants, who were exclusively affiliated with the university. Their familiarity with research ethics and data storage procedures is likely to have influenced their trust in avatars storage methods. In future, it would be beneficial to repeat this study with individuals beyond the university setting.

6 CONCLUSIONS

In sum, this study investigated users' psychological connection to their avatars. We identified the desire that participants had for control over their avatar, the complex relationship between avatar and offline identities, and the feelings of attachment that participants felt towards their avatar. Based on these three themes, we proposed ethical recommendations focusing on transparency, control, access, and consent.

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