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**abstract:**

The dynamic development of virtual reality (VR) technology is reconfiguring the relationship between humans and their avatars in virtual worlds. Physical bodies and spaces become entangled with their digital counterparts and are engaged in events within virtual environments, necessitating a shift in the approach to conducting anthropological research in VR. This essay challenges digital dualism through the exploration of the hybrid nature of embodiment in VR. The aim of the text is to lay the groundwork for a postdualistic and posthumanist approach to VR anthropology, which emphasizes the entanglements between humans and technologies, and between physical and digital bodies, blurring the boundaries between these dichotomies. In this approach, I conceptualize VR users as cyborg assemblages, emerging in intra-actions between humans, technologies, and digital bodies, thereby highlighting the agency of non-humans in co-shaping their hybrid somaticity.

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# **From Avatars to Hybrid Bodies: Postdualist and Posthumanist Approaches to the Anthropology of Virtual Reality**

## **Introduction**

The development and massification of immersive virtual reality (VR) technology are altering our presence in virtual worlds and our somatic engagement in virtual environments. Moreover, these phenomena contribute to a process that reconfigures the relationship between humans and their avatars, linking physical bodies to virtual selves. This results from technological giants' involvement in the production of not only increasingly advanced devices but also of social imaginaries concerning our future. A prominent example of these practices is Meta's concept of the metaverse, which envisions VR as an alternative space that transfers and augments elements of human existence from the physical world, such as meetings, concerts, and conferences.<sup>1</sup> VR is emerging as a new social space for communication. More and more often, it is becoming the focus of anthropological research.<sup>2</sup> Nevertheless, in my opinion, despite the technological changes that lead to the engagement of the physical body and space in virtual events, a significant portion of research continues to uphold a digital dualism. In this paradigm, events in the online and offline worlds are treated as separate.<sup>3</sup> As a consequence, a physical dimension of human engagement in VR events remains underexplored.<sup>4</sup> My aim is to challenge the transfer of the dualistic approach, prevalent in the anthropology of desktop virtual worlds, to the nascent field of VR technology.

The employment of head-mounted displays (HMDs) fundamentally transforms user interaction within virtual environments, diverging significantly from the experiences

mediated by desktop devices. Rather than manipulating avatars as proxies for action, individuals begin to perceive and interact with their digital bodies in VR as extensions of their own corporeality. As Guja and Żądło (2021) write: "Our avatars are no longer puppets that we control using pads or a mouse held in our hands – we literally 'enter' the cyberskin. This level of immersion is the greatest strength of communication in VR, but at the same time a psychological risk and anthropological experiment."<sup>5</sup>

Ensuring proper visuomotor synchronization between the user's physical body and the digital body perceived through the HMD proves crucial for the occurrence of virtual embodiment, a phenomenon in which users feel the digital bodies as their own.<sup>6</sup> This synchronization is possible thanks to body tracking systems, which can be installed in HMDs or external devices. Systems that allow for more precise synchronization of body movements usually enhance the sense of ownership of the digital body.<sup>7</sup> The dynamic development and commercialization of affordable full-body tracking devices (e.g., Sony mocopi, HTC Vive Tracker; or camera-based mobile applications, such as Viso FBT) are leading to intensified identification with our digital bodies on a mass scale, beyond the walls of laboratories.

Our physical bodies become entangled with the digital bodies, actively participating in events within virtual environments and contributing to the formation of our virtual selves in VR. Rather than identifying with avatars dancing on our screens, we have begun to engage physically in dancing on digital dance floors, while simultaneously dancing in physical space. We are no longer concealed behind distinct avatars that represent our intentions. Instead, we are immediately present to others through our entangled physical-digital bodies. The embodied presence in VR enriches communication between users with nonverbal cues (e.g., gestures, facial expressions, or proxemics<sup>8</sup>). It also enables the emergence of new somatic practices in virtual communities, related to the sense of bodily closeness and intimacy and their

opposites (e.g., a hug, a friendly pat on the head, erotic roleplays, or bodily aggression ).

Drawing on interdisciplinary empirical evidence, this essay emphasizes the need for an anthropological shift in VR studies, focusing more on users' physical bodies and spaces, and on the utilized technologies. First, I will present the concept of digital dualism in cyberspace anthropology. Then, I will elucidate how the relationship between humans and their avatars transforms in the context of VR technology use. Subsequently, my objective will be to contribute to the establishment of postdualist and posthumanist approaches to the anthropology of VR. I believe that this framework will facilitate an exploration of the entanglements between humans and nonhumans that co-shape users' experiences in VR.



Figure 1. An illustration depicting the operation of full-body tracking systems in VR. The left side shows a person wearing an HMD, holding controllers, and equipped with body trackers on the belt and legs. On the right side, the person's digital body is visible, with its movements synchronized with the physical body movements through tracking systems. The person sees their digital body through the HMD from a first-person perspective, aligned with the position of their physical body.  
Source

## Digital Dualism in the Anthropology of Virtual Worlds

For many years in the discourse on VR, researchers have perceived the physical body as a source of distraction from the immersive experience. Bédard (2023) points out that “the absence of one’s physical body from virtual reality has been highlighted by many scholars since the technology’s earliest iteration.”<sup>10</sup> This approach has its roots in the history of cyberspace research.

In anthropological studies of cyberspace, a deeply ingrained digital dualism exists, wherein, intentionally or otherwise, offline

and online spaces are treated as separate from one another.<sup>11</sup> This dualism seems particularly pronounced in the context of corporeality, as the utopian vision of cyberspace drew from the premise of a bodiless realm from its inception. The discourse of cyberfeminism has highlighted that the internet can serve as a “safe space” where individuals may experience liberation from the oppressions associated with their corporeality and the social expectations constructed around it.<sup>12</sup> Scholars anticipated that by concealing embodied categories such as race, gender, ability, or age, cyberspace would transform into a space where these institutions would cease to function.<sup>13</sup> As Heim (1991) articulates, “now the computer network simply brackets the physical presence of the participants, by either omitting or simulating corporeal immediacy.”<sup>14</sup>

By liberating the individual from the constraints imposed by human flesh, the disembodied cyberspace was to become a place where one could exist in the form of an avatar, freely crafting one’s virtual self—the user’s identity in virtual environments.<sup>15</sup> Precisely this concept inspired the establishment of the Second Life platform, which constituted a collection of open virtual worlds created by users where they could lead their alternative existence. In his anthropological study of Second Life, Boellstorff (2015) describes this dualistic separation of virtual and physical embodiments as a result of a gap between the human and the avatar in desktop virtual worlds, referred to later as the Boellstorffian gap.<sup>16</sup> To illustrate this, he cited a Second Life resident: “something interesting happened yesterday. I received an im [instant message] from a complete stranger. It said ‘Cheer up.’ I couldn’t figure out why he had sent it. I looked at my av [avatar] and noticed that I was sitting on a bench with my head down at an angle, like a sad-sack.”<sup>17</sup>

The Boellstorffian gap permits individuals in virtual worlds to construct their virtual selves as distinct from those in the physical world, for instance, by altering the gender of their avatars.<sup>18</sup> It is

possible because the gap ensures that the physical human body remains invisible in the virtual space and separate from the avatar. Each occurrence which poses a threat to this separation may prove destructive to the virtual self that functions thanks to the gap. Boellstorff (2015) provides an illustrative example in his description of a situation in which the Second Life creators decided to enable voice chat functionality on the platform (previously, communication was exclusively through text chat). The functionality shared the user's physical voice in the virtual space.<sup>19</sup> Many users protested against this idea, pointing out that it would blur the boundary between the physical and virtual worlds, potentially being destructive to their ability to create virtual selves.

In the context of using HMDs, not only the dominant voice communication but also the involvement of the user's physical body in virtual events further diminish this gap. Physical body movements are synchronized with the movements of the avatar visible in the virtual space. In conversation, actual nonverbal cues complement verbal communication. The physical body becomes indirectly visible in the virtual environment, reducing the Boellstorffian gap. Thus, in experiencing the other in VR, the physical subject and its avatar appear as a coupled unity, just as the subject and their physical body usually do during a conversation in the physical world. Therefore, in the context of research on VR, the concept of an avatar is often replaced with 'digital body,' highlighting that it can perform some functions analogous to those performed by the physical body in the physical world. As Lin and Latoschik (2022) note, "a personalized avatar reproduces the user's appearance as realistic and recognizable as possible, serves as the proxy of their physical body in the virtual world, and uniquely determines the user ... Thus, it can be considered a user's digital body."<sup>20</sup> In VR, the digital body does not serve as a tool to intentionally send delayed nonverbal messages, as in desktop conditions; rather,

akin to the physical body, it is a never-silent expression of the individual.

The reduction of the Boellstorffian gap between the avatar and physical subject in the VR context also manifests in somatic practices, such as dancing on social VR platforms.<sup>21</sup> Dance clubs were a popular phenomenon in Second Life.<sup>22</sup> Users activated dance animations for their avatars, which embodied their intentions on the virtual dance floor, while the subject itself was not physically engaged in dancing. In contrast, social VR dancing involves both the physical and digital bodies of the subjects.<sup>23</sup> The subject engages in dance movements with their physical body, which are then synchronized with the movements of their digital counterparts. The physical body's properties (e.g., fitness or flexibility), the digital body (e.g., appearance or capabilities within the virtual environment, i.e., flying), and the utilized devices (e.g., the range of motion tracking) determine the dancer's properties in VR, possible movements, and their quality. Effective dancing requires aligning the properties of the physical body with those of the digital body and devices, which in dance practice remain entangled and perceived as a single hybrid body, exhibited to others on the digital dance floor (see Figure 2).

User actions in VR engage not only their physical bodies but also the physical space that they occupy. For instance, pole dancers in social VR necessitate access to a tangible pole within their physical space. This enables them to elevate their bodies through muscular effort, which is subsequently reflected within the VR space as a performance of dancing on a virtual pole. Thus, the individual in VR is no longer concealed behind its avatar, as is the case in desktop virtual worlds, but rather, it begins to indirectly present itself and its space within VR.

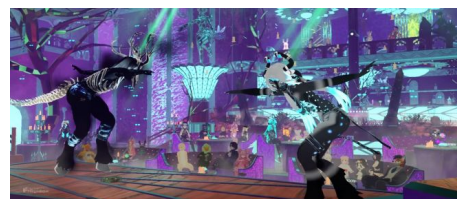


Figure 2. Performance by DustBunny at Dark Wood Manor in VRChat. Source: *DustBunny's Performance at New Eden's Dark Wood Manor | #VRChat | Into the Mist, 2023.*



This reduction of the Boellstorffian gap does not necessarily exclude the possibility of creating an alternative virtual self in VR. However, the process in question unfolds differently, transcending the digital dualism. For example, gender-swapping remains a present phenomenon in the VR context,<sup>24</sup> yet it demands the user's engagement of their physical body and space in the construction of their virtual self. In Zhang's dissertation, participants' responses vividly illustrate this issue: "The position of my knees when sitting and the position of my hands when standing will become factors for others to judge my gender, so I am more careful and cautious in VRChat"<sup>25</sup> and "Sitting pose can influence the assumption. When someone sitting with their knees goes down, it is more feminine."<sup>26</sup> The respondents point out the need to adapt their body language to the expression of the virtual self that they create, for instance, by replicating embodied patterns of femininity when presenting as female in VR. The voice, which some users consciously modulate during gender-swapping to align with anticipated gender norms, proves equally significant in the expression of gender within VR.<sup>27</sup>

Users' physical expressions occur concurrently in physical space and may be influenced by the dynamics within it, such as the presence of others. As participants in the study of Freeman et al. remark: "When I'm completely alone at home, I change the way that I speak in social VR. But most of the time, like now when my family is at home, I speak like I normally do because I don't want them to hear me and find out."<sup>28</sup> These fragmentary examples highlight the importance of paying attention to the physical dimension within which human interactions concurrently transpire in VR. It is also crucial to pose a question of how online and offline experiences reciprocally impact each other, rather than considering them as separate realms of virtual and real life.

The reduction of the Boellstorffian gap between physical and digital embodiments in VR raises questions about the validity of treating virtual and physical environments as distinct in the

anthropology of VR. Furthermore, it challenges the convention of disregarding the physical context in anthropological studies of cyberspace. The subject in VR becomes a hybrid entity rather than a bifurcated one, and the manner in which it shapes its virtual self is inseparably entangled with its physical body, environment, and personal experiences.

## Toward Hybridity

The hybrid digital-physical embodiment of the subject always exists within a hybrid space. On the one hand, the subject's visual and auditory perceptions in VR are intentionally directed toward the virtual environment. On the other hand, smells from the physical world can reach the individual. While dancing in social VR, the user must be careful not to collide with physical objects in the physical environment or with other dancing individuals in the virtual environment.

In their research conducted in social VR, Krell and Wettmann (2023) also emphasize the need for a change in understanding the relationship between the subject and their digital form: "Currently, VR-embodiment can neither be understood as digital puppetry or scripting of avatars via controller or mouse ... Instead, attaching tracking hardware on their physical bodies leaves users in a state of partial, hybrid corporeality which needs to be negotiated, accepted, and re-learned."<sup>29</sup> The authors define the process of hybridizing the subject's corporeality in VR as body synchronization: "it is the entanglement of physical and digital corporeality in a coextensive, shared environment, where mediatized situational intensity reaches new heights."<sup>30</sup> Body hybridization constitutes a process in which the digital body is not treated as an alternative to the physical body, "a proxy of the physical body,"<sup>31</sup> or "a virtual surrogate that replaces the physical body,"<sup>32</sup> but as its augmentation. In this sense, encountering others in social VR "does not imply referentiality between body-substitutes but affectual relations

between extensions of actual bodies.”<sup>33</sup> I wish to stress that the process of subject hybridization is not confined solely to corporeality but encompasses a broader range of somatic experiences. This hybridization of soma also pertains to the perceptual and susceptible dimensions of the body as the source of all cognition, inextricably infused with mentality.<sup>34</sup>

Properties of physical embodiment in the physical environment primarily determine the embodied cognition in VR. However, the latter is secondarily modulated by properties of digital embodiment in the digital environment and by the technology utilized. The use of VR technologies to simulate the perception of the world from the perspective of another being illustrates this well.<sup>35</sup> *Tarsier Goggles*, a VR tool designed by Gochman et al., serves as an example. It enables humans to experience a hypothetical way of perceiving the world by these nocturnal animals.<sup>36</sup> The tool shows that primary perception stems from the anatomical structure of the human visual system and can be secondarily modified in VR (e.g., perceiving different light sensitivity, which simulates the tarsier’s perception), but only within the limits set by the adaptability of physical corporeality (e.g., I cannot simultaneously see what is in front of me and behind me, or fully experience the sense of echolocation).<sup>37</sup> Thus, the emergent properties of hybrid visual perception in VR result from the capacities of the subject’s physical visual system, the utilized device (e.g., display resolution), and properties attributed to the digital embodiment (e.g., color saturation).

The body semantic effect demonstrates that “when through appropriate multisensory correlations participants have the illusion of ownership and agency over a virtual body (or indeed a robotic one) then this process has behavioral, attitudinal and probably also cognitive correlates for the embodied person.”<sup>38</sup> Numerous studies on this effect show that changes in the appearance and structure of the digital body can influence the multi-level functioning of the subject, their

attitudes,<sup>39</sup> behaviors,<sup>40</sup> perceptions,<sup>41</sup> and cognitive processes.<sup>42</sup>

As Banakou et al. write, “the brain’s body representation is amenable to rapid change, even though we tend to think of our bodies as relatively fixed and stable.”<sup>43</sup> One consequence of the temporary integration of the digital body into the subject’s bodily representation, achieved through visuomotor synchronization, may be the phenomenon of “phantom sense.” This phenomenon still remains underexplored in scholarly research.<sup>44</sup> Within this phenomenon, individuals experience the illusion of being touched on their physical body in the location where they see someone touching their digital body, despite the absence of a physical stimulus. One can experience the phantom sensations with varying intensity, depending on the individual and context, as either positive (e.g., a friendly pat on the head), negative, or even aggressive (e.g., sexual harassment<sup>45</sup> ).

The above examples demonstrate the hybridity of corporeality and the embodied cognition of the subject in VR. The instances described in the previous section illustrate how both the physical and digital bodies are engaged in constructing a virtual self in VR, for instance, by adjusting the voice, physical body language, and digital body’s appearance to conform to the expected gender norms during gender-switching. It is imperative not to overlook the fact that the experience of a hybrid subject in VR also depends on the employed technologies, which vary in their characteristics, such as the resolution of HMDs. The process of constructing a virtual self can also include the use of additional software, for example voice modulators.<sup>46</sup> In this regard, I argue that it is necessary to develop a new approach to anthropological research in VR, one that focuses on exploring the hybrid relationships between physical embodiment, digital embodiment, and the utilized technology, while rejecting digital dualism. In the subsequent section, I will present the theoretical framework underpinning the development of this approach, wherein the

user in VR is conceptualized as a cyborg assemblage.

## Posthumanist Approach to the Anthropology of Virtual Reality

Therefore, ontological questions arise: how does a hybrid subject exist in VR? What does it mean to be hybrid? How can a hybrid subject become the object of postdualist anthropological research? I will endeavor to propose responses to these questions from a critical posthumanist perspective.

Critical posthumanism is an umbrella term which represents a theoretical approach that transcends traditional, anthropocentric modes of thought, highlighting the complexities of interconnections between humans and nonhumans, and challenging the supremacy of Man. This approach originates from new materialism and affect studies.<sup>47</sup> Posthumanism questions the essentialist conception of humans as singular entities. In recent years, the social sciences have increasingly employed the posthumanist approach, for instance, in the field of education,<sup>48</sup> management,<sup>49</sup> and economics.<sup>50</sup> This perspective recognizes the agency of nonhuman entities, including plants, technologies, and discourses, in shaping social, cultural, economic, and environmental processes. It enables researchers to analyze the co-constitutive relations between humans and nonhumans, which can lead to a new understanding of phenomena.

Posthumanist anthropology emphasizes the heterogeneity of (post)humans in their becoming; the “agenda of posthuman anthropology is critically reframing, repositioning, and reinterpreting the status of the anthropos within the web of life. ... the aim is to reposition the (post)human as part of a vital meshwork constituted by other beings, bodies, and materialities.”<sup>51</sup> The (post)human is never only human, transcending such dichotomies as human/animal or

human/machine, constructed by what Agamben (2004) terms the anthropological machine.<sup>52</sup> The latter constitutes a historical way of producing universal *humanitas* through binary opposition to the category of animality. This can also be seen in defining *humanitas* in opposition to the machine.<sup>53</sup> Today, a leading example of posthumanist anthropology, which rejects human-animal oppositions, is multispecies anthropology “that stems from the recognition that humans and other life forms are deeply interconnected, interdependent, and coexist in a meshwork of relations.”<sup>54</sup> A less homogeneous discipline largely inspired by Haraway’s “A Manifesto for Cyborgs” (1985), cyborg anthropology challenges the human/machine dichotomy and can be associated with the works of researchers such as Case<sup>55</sup> and Wells.<sup>56</sup>

The user in VR embodies Haraway’s philosophical metaphor of the cyborg, shaped through the entanglement of human flesh with technology.<sup>57</sup> It is an ontologically heterogeneous subject, constituted by the human body, technology, and digital body, challenging the physical/virtual and human/machine dichotomies. The cyborg metaphor illustrates that the boundaries between the human body and technology become blurred in our technoculture; hence, we need new strategies to reconceptualize these interrelations, which transcend traditional categories of humanism.<sup>58</sup> Analyzing Haraway’s theory in the context of her research, Lupton notes: “It is this cyborg as metaphor that Haraway seeks to take up and use to support her theorizing of interrelationship of humans and nonhumans. ... In her concept of cyborg she is trying to express the broader idea that no human bodies/selves are stable or natural. Rather, we are multiple bodies and multiple selves, depending on the context in which we find ourselves and the other bodies and nonhuman entities with which we interact.”<sup>59</sup>

Indeed, a user in VR does not represent the cyborg depicted in science fiction, characterized by a stable fusion of human and

machine, but rather a temporarily heterogeneous assemblage—a relational entity emerging from intra-actions among beings of different ontological statuses: human body, VR technology, and digital body.<sup>60</sup> This complies with Lupton<sup>61</sup> who in the context of the sociology of medicine uses the term “digital cyborg assemblage” “to denote the body that is enhanced, augmented or in other ways configured by its use of digital media technologies.”<sup>62</sup>

As Chaberski (2019) writes, “an assemblage always arises from the relations established between its heterogeneous elements as a result of their interoperation. Therefore, it does not possess an essential nature, as it always establishes those relations outside itself, which at any moment can change its identity.”<sup>63</sup> This posthumanist approach enables the apprehension of the user’s complexity in VR. How? First, it draws attention to the agency of both human and nonhuman elements in constituting their emergent subjectivity. Second, it emphasizes the processuality and temporality of the user’s ongoing becoming, within the intra-actions among physical, digital, human, and technological entities. Third, it highlights the fact that the user is not only a sum of several components, but rather, through continuous intra-actions among them, becomes an emergent whole, acquiring new capacities and blurring the boundaries between individual entities. This does not only indicate a merging of physical and digital corporeality but also the intricate ways in which cognition, experience, and identity are reshaped by ongoing entanglements of this heterogeneous somaticity.

The relationships between elements that comprise a heterogeneous assemblage “are recursive in nature. This means that as soon as individual entities form a whole, it immediately begins to reciprocally influence them back, determining their identities.”<sup>64</sup> The user in VR functions as a relational entity and briefly as a new agent, thereby

temporarily redefining the identity of its individual components. As a cyborg assemblage, the user emphasizes the temporariness of the resulting entanglement, which can be easily disrupted, for example, when the HMD battery loses power.

The concept of the user as a cyborg assemblage does not marginalize the human in VR, but rather highlights their entanglement with nonhuman entities, within which the boundaries between the physical and digital bodies, a human, and technology become fluid. This does not imply that we are less human in VR, but rather that we are never only human, which forms a core premise of posthumanist anthropology.<sup>65</sup> As Haraway (1985) states: “the cyborg is our ontology.”<sup>66</sup>

## Implications

The posthumanist approach to VR anthropology facilitates an in-depth exploration of interrelationships between physical, digital, and technological embodiments which co-constitute the hybrid user in VR. This approach allows one to pose new questions, starting with: how does the digital body shape the user? How does technology shape the user? How does the human physical body shape the user’s experience? What other factors contribute to shaping the user? How do experiences in VR affect a human in the offline world, and vice versa? In this section, I will elucidate how the conceptualization of the user as a cyborg assemblage can enrich the anthropological study of VR.

*How does technology shape the user?* The user in VR functions as an entanglement of the human body, digital body, and technology, in which the latter not only facilitates the existence of a hybrid physical-digital body but also serves as a co-constituting element of the user. This important shift draws attention to the inclusion of utilized technologies and their agency in the subject’s hybridized somaticity.



In the contemporary anthropology of VR, devices' influence on human interactions remains notably underexplored. First, the use of different devices, such as HMDs and body tracking systems, can affect the intensity of the sense of digital body ownership, for instance, by determining the accuracy of visuomotor correlations, which in turn can impact the occurrence and strength of the body semantic effect.<sup>67</sup> Conversely, desktop technologies contribute to the emergence of the previously described Boellstorffian gap between the physical and virtual embodiments.

Second, the technology used co-constitutes properties of the embodied perception (e.g., through display resolution or additional haptic feedback) and action (e.g., the additional teledildonic technology facilitates the emergence of a new form of cybersexuality in VR<sup>68</sup>). Third, the employed software and hardware may co-constitute the user's expression within VR (for instance, software that enables the alteration of the physical voice's timbre<sup>69</sup>).

The posthumanist approach facilitates the exploration of how technology shapes who the user in VR is and who they may become. For example, HMD devices may reinforce and replicate the dominant discourse of masculinity by adapting their properties to fit able-bodied men. Research conducted by Stanney et al. (2020) demonstrates that most currently available HMDs are not adjusted in terms of interpupillary distance (IPD) for many women, which more frequently induces cybersickness in them according to statistics.<sup>70</sup> As these researchers conclude: "Quite interestingly, it was not an inherent characteristic of females but rather a characteristic of the VR headset itself, IPD non-fit, that was found to be the primary driver of cybersickness in both experiments."<sup>71</sup>

*How does the digital body shape the user?* This significant inquiry transcends the understanding of the digital body as a passive and distinct object of human expressions and

perception, which prevails in contemporary anthropological studies. Instead, it highlights the digital body's agency in shaping the user in VR. For instance, on the Spatial platform, the user is required to have a gender-binary digital body. The choice of the digital body influences which animation will be activated when the user intends to sit on a virtual chair (in this case, irrespective of their physical body's movements)—whether they will sit with one leg over the other or astride—and, consequently, how others will perceive them.

An increasing number of psychological studies on the aforementioned body semantic effect demonstrate how the digital body can impact user behaviors, attitudes, and cognitive functions. For example, research by Rivu et al. (2021) on the Rec Room platform shows that altering the gender of digital bodies in VR could increase the distance between friends in VR.<sup>72</sup>

According to Mello et al. (2022), heterosexual males reported greater pleasure and heightened erogenous sensations from caresses in intimate regions by a male avatar when they assumed a female digital embodiment.<sup>73</sup> Meanwhile, studies by Peck et al. (2020) conducted on the Proteus effect, which also pertains to the influence of digital body appearance on participants' behavior (in reference to other theoretical explanations), found that a female digital body lowered confidence in mathematical task performance in VR among male participants.<sup>74</sup> These examples highlight the need for VR anthropology to also address the digital body's agency in shaping the user in VR.

*How do the physical body and environment shape the user?*

I emphasized the necessity of posing this question in previous sections. We must acknowledge that VR as a medium significantly engages the physical body in virtual events, to a far greater extent than desktop devices. The digital body (e.g., appearance), technologies (e.g., voice modulator), and the physical body itself (e.g., body language) co-constitute the virtual

self in VR. The involvement of the physical body in constructing the virtual self also engages the physical space in which the user concurrently resides. This is exemplified by the aforementioned instances of dancing on a virtual pole, which necessitates the presence of a physical pole in the physical space, or the impact of others' presence in the physical space on user behavior in VR.

The above question can also concern the context, discourse, personal experiences, embodied practices, and habits that entangle a human stepping into VR, thereby transcending the separation between online and offline life. Even when one opts to construct alternative virtual selves within VR, such as through gender-swapping, this act is predicated on their situated experiences. What experiences? Even an ostensibly subversive act like gender-swapping can, in practice, reinforce binary gender discourse by reconstructing stereotypical images of femininity and masculinity within VR. For example, some Asian male users, when engaging in gender-swapping in VR, wear 'safety knickers,' a specific type of women's underwear designed to provide a sense of protection from the unwanted gaze, simultaneously symbolizing virtue and morality in conservative East Asian cultures.<sup>75</sup> While this elucidates the influence of a user's offline life on their activities in VR, we should also inquire how experiences in VR affect an individual in their offline life. For instance, this might encompass questions about the potential persistence of the body semantic and Proteus effects in the subject's functioning in the physical world, the impact of frequent changes to the appearance of one's digital body, as well as the influence of an idealized digital body on the perception of one's corporeality offline, or, more broadly, the reciprocal relationship between embodied social activities in VR and offline. These areas remain significantly underexplored in current anthropological research.

The concept of the user as a cyborg assemblage is still open to the exploration of new entanglements, which may temporarily

influence the user's reconfiguration. By employing this concept in the posthumanist anthropology of VR, we can endeavor to uncover new inquiries and gain a deeper understanding of who the hybrid user in VR can become.

## Conclusions

Leading technology companies are driving the widespread adoption of increasingly sophisticated and affordable VR technologies. Moreover, witnessing the growing popularity of social VR platforms, which are becoming a new space for human interactions, we face the challenge of developing the anthropology of VR. This essay argues that this nascent field must, on the one hand, reject the digital dualism inherent in cyberspace studies, and on the other hand, incorporate an understanding of complex interactions between physical and virtual embodiments, technologies, and practices in VR.

VR technology significantly engages the physical body within events in the virtual environment, making it indirectly present to others and effectively reducing the Boellstorffian gap that exists between virtual and physical embodiments in the context of desktop devices. In VR, we can still construct our alternative virtual selves, but this process, rather than hiding the physical body, necessitates its active involvement. Furthermore, every human interaction in VR intrinsically integrates the tangible environment, thus merging the physical and virtual spaces, as well as offline and online existence, which should also become an area of interest in further anthropological research.

To explore the entanglements of the physical body with the digital, as well as the human with the technological in VR, this essay proposes a posthumanist approach to the anthropology of VR. This framework conceptualizes the user as a cyborg assemblage that temporarily arises from the intra-actions among elements such as a human, technology, and the digital body. On the one hand, the concept of the user integrates

the VR technologies employed into the subject's hybrid somaticity in VR. On the other hand, it underscores the temporary nature of the entanglements formed. It also presents the heterogeneous embodiment of the user in VR, which blurs the boundaries between the human and the nonhuman, the physical and the virtual. This necessitates anthropological shifts in understanding who the (post)human becomes within the emerging VR.

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