Journal on Interactive Systems, 2026, 17:1
ISSN: 2763-7719 • doi: 10.5753/jis.2026.5437

Research Paper

Avatars That Represent Us: A Study on the Influence of Marginalized Identities on Avatar Personalization in Virtual Environments

Ailton Ribeiro [Federal University of Bahia | *ailton.ribeiro@ufba.br*]
Murilo Guerreiro Arouca [Federal University of Bahia | *murilo.guerreiro@ufba.br*]
Ana Maria Amorim [Federal University of Bahia | *ana.amorim@ufba.br*]
Maria Clara Pestana [Federal University of Bahia | *mpestana@ufba.br*]
Dafne Apolinário de Souza [Federal Institute of Bahia | *dafneapolinario@gmail.com*]
Vaninha Vieira [Federal University of Bahia | *vaninha@ufba.br*]

Institute of Computing, Federal University of Bahia, Av Milton Santos, s/n - Campus de Ondina, PAF 2 CEP: 40.170-110 Salvador-Bahia-Brazil.

Abstract. Avatars are increasingly recognized as important components of online interactions, particularly within the context of the Metaverse. However, research on their inclusive representation remains relatively limited. This study seeks to examine self-representation through avatars, with a particular focus on personalization and its potential implications for inclusion and diversity. An online survey was conducted with 133 participants to investigate how demographic factors, such as age and race/ethnicity, may influence preferences for avatar personalization. The findings suggest that age and race/ethnicity may play a significant role in shaping avatar personalization preferences, with age appearing to have a more consistent influence. This study highlights the potential importance of considering demographic diversity in efforts to design more inclusive and representative virtual environments.

Keywords: Avatars, Embodied Presence, Self-expression, Personalization, Disability Disclosure, Accessibility

Edited by: Ana Paula Chaves | **Received:** 16 January 2025 • **Accepted:** 02 April 2026 • **Published:** 28 April 2026

1 Introduction

The term "avatar" originally stems from Indian mythology, where it refers to a deity taking on a human form to offer humanity new perspectives, self-awareness, and self-realization. In virtual environments, however, avatars serve as digital representations of their users [Bailenson *et al*., 2008]. Widely utilized in online games, virtual stores, online messaging, and forums, avatars have been found to wield influence over users' perceptions and behaviors. A change in avatar representation can lead to a modification in user behavior, a phenomenon identified as the "Proteus Effect" [Yee and Bailenson, 2007].

Avatars play an essential role in diverse virtual contexts, particularly as the vision of a Metaverse centered on avatar-mediated interactions underscores the need for authentic representation [Hourcade *et al*., 2024]. While customization empowers individuals to construct digital versions of themselves, this process is influenced by a variety of sociotechnical factors. For instance, Wu *et al*. [2023] found that self-representation is directly shaped by identity and self-expression, often navigating the tension between personal attitudes and societal expectations.

Furthermore, the virtual environment's context is critical in determining how users choose to represent themselves. Consequently, the degree of visual resemblance between users and their avatars varies according to situational perceptions; in casual social settings, for example, users tend to be more open to self-disclosure and are often inclined to customize avatars that reflect personal ideals or fantasies [Wu *et al*., 2023].

Self-representation through digital avatars in virtual ecosystems has emerged as a pivotal domain of inquiry within Human-Computer Interaction (HCI) and collaborative systems. Although previous scholarship has predominantly explored avatar design and customization within specific, task-oriented boundaries, there remains a significant empirical void regarding customization across broader activity spectrums. More critically, the promotion of inclusive representation remains an underdeveloped area of research, particularly concerning the socio-technical barriers and representational frictions faced by marginalized groups [Mack *et al*., 2023; Zhang *et al*., 2023; Han and Ho, 2024; Smith, 2024; Oyedokun *et al*., 2024] and [Kosciesza, 2025].

In Brazil, the necessity of advancing ethno-racial and gender equity within the technology sector is further reinforced by the strategic proposal of Sustainable Development Goal 18 [Visseren-Hamakers, 2020]. This national imperative seeks to guarantee equality across both academic training and professional practice, aligning with the GrandIHC-BR 2025-2035 roadmap [Neris *et al*., 2024]. This work identifies plurality and decoloniality as central challenges for the next decade of Brazilian computing, emphasizing that digital identity tools must transcend Western-centric defaults to reflect the country's diverse social fabric [Brito *et al*., 2025].

The primary objective of this research is to investigate and analyze the factors influencing decisions related to self-representation through avatars in virtual environments, with a particular emphasis on assessing strategies aimed at fostering the inclusive self-representation of these avatars. This involves considering the inherent complexity of the context and the expression of users' identities in their online activities. To achieve this objective, the study adopts a methodologi-

cal strategy of qualitative data collection through an online questionnaire. This approach seeks to obtain information directly from individuals of diverse age groups and genders, aiming to understand how people use avatars as a means of self-representation in virtual environments.

This article presents an extended version of the study titled "Towards Inclusive Avatars: A Study on Self-Representation in Virtual Environments", originally published in the proceedings of the Brazilian Symposium on Collaborative Systems (SBSC) [Ribeiro *et al.*, 2024a]. While the initial research established the groundwork for avatar self-representation, this expanded contribution broadens the scope by investigating the specific preferences and challenges faced by individuals across diverse age and racial demographics during avatar customization. Furthermore, it examines the implications of these findings for the development of more inclusive virtual platforms. By incorporating these new insights, this study uncovers significant disparities in customization choices related to both race and age, with age emerging as a particularly strong and consistent predictor of user preferences.

The remainder of this manuscript is organized as follows: Section 2 reviews the theoretical background and related work; Section 3 details the research methodology; Section 4 presents the results; Section 5 discusses the findings, limitations, and ethical considerations; and Section 6 concludes the paper.

2 Background and Related Works

This section addresses fundamental concepts of avatar identity and self-expression, exploring their diverse representations with a focus on opportunities for vulnerable groups.

2.1 Avatar Identity and Self-expression

Identity is a comprehensive concept that, as defined by Leary and Tangney [2011], encompasses an individual's self-perception, including personal, cultural, social, and psychological characteristics that constitute their uniqueness. It is shaped by life experiences, culture, and social roles and may undergo evolution over time. Identity encompasses various interrelated dimensions that define how individuals perceive themselves and interact with their environment. These dimensions include:

- i) Personal Identity: refers to unique characteristics such as personality traits, talents, skills, and preferences that form the core of an individual's self-awareness;
- ii) Social Identity: shaped by membership in social groups such as gender, ethnicity, religion, or nationality, influences self-perception within societal structures;
- iii) Cultural Identity: rooted in shared values, norms, beliefs, and traditions, reflects an individual's connection to their cultural heritage and its integration into their sense of self;
- iv) Role Identity: tied to social roles like parent, student, professional, or friend, encompasses responsibilities and behaviors associated with these roles;
- v) Gender Identity: representing an individual's deeply felt sense of their gender, which may or may not align with biological sex, shapes personal expression and societal interaction;
- vi) Group Identity: involving affiliation with communities such as clubs, organizations, or online groups, fosters a sense of belonging and shared purpose.

These dimensions are dynamic and interconnected, evolving through personal experiences, social interactions, and cultural contexts to create a multifaceted and fluid understanding of identity.

Conversely, self-expression serves as a subset of identity, focusing on how individuals convey their identity to the external world. This manifestation encompasses various aspects such as attire, behavior, language, artistic creation, and engagement in social interactions [Giddens, 2023].

The interplay between these internal constructs and their outward manifestation is synthesized in Figure 1. As illustrated, these six dimensions are not isolated; rather, they converge through the process of self-expression to form a tangible virtual avatar representation. This visual model underscores how the avatar serves as a bridge between the fluid self-understanding and the external digital environment [Wolfendale, 2007; Sung *et al.*, 2011].

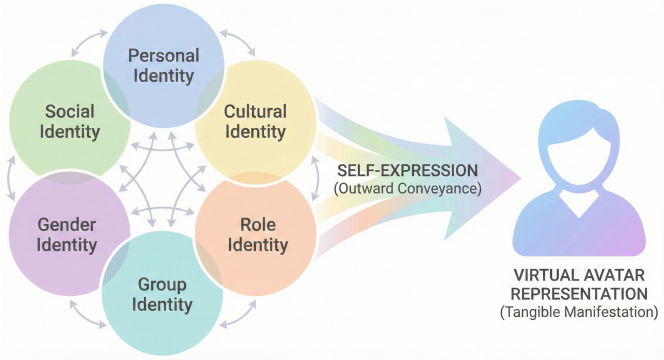

Figure 1. Interconnected dimensions of identity and their manifestation through self-expression in virtual environments.

Source: Elaborated by the authors.

2.2 Self-Representation and Avatar Customization

As defined by Lin and Wang [2014], self-representation encompasses the expression of identity and personality through the customization and use of avatars to portray their controllers. However, this process is often nuanced; research by Szolin *et al.* [2023a] indicates that individuals in diverse virtual settings manifest varying levels of self-expression awareness. For instance, a user might select an avatar that authentically captures one facet of their identity while inaccurately representing another. Furthermore, while some users prioritize anonymity to safeguard their privacy, others leverage digital representation to experiment with identities and traits they might not reveal in the physical world [Wan and Lu, 2024].

Avatar customization represents a pivotal process for self-expression, as it allows users to visually tailor their digital personas to reflect their identities and personal preferences [Salagean *et al.*, 2023]. Recent years have seen significant advancements in this field, as documented in the surveys by Ning *et al.* [2023] and Javier *et al.* [2024]. Specifically, across various virtual platforms, users can now leverage ar-

tificial intelligence—such as the Lensa AI app[1] to generate avatars through sophisticated image capture and processing techniques [Moga and Rughiniş, 2023; Lu *et al*., 2024]. Furthermore, human virtual agents are used for online interaction and conversation [Bispo *et al*., 2025], as well as, more recently, AI-generated avatars [Ye *et al*., 2026].

The increasing adoption of virtual reality (VR) platforms has popularized interactions with digital humans, a trend primarily driven by the growing accessibility of VR headsets and immersive applications. Nevertheless, accurately simulating human behavior remains a formidable challenge [Makled *et al*., 2018; Oyedokun *et al*., 2024; Lu *et al*., 2024]. This difficulty arises because generating and interacting with realistic avatars demands vast amounts of contextual information, rendering the task both computationally intensive and conceptually complex. Ultimately, by effectively integrating such rich contextual data, these systems hold the potential to enhance the authenticity of virtual social interactions and foster greater inclusivity within digital environments.

Embodied presence and co-presence are key drivers of user engagement within the Metaverse, fostering positive intentions for continued participation [Dwivedi *et al*., 2024]. The intricate relationship between experience and embodiment underscores how these elements collectively reshape digital interaction and individual perceptions of presence.

For individuals with invisible disabilities or neurodivergent traits, such as ADHD or dyslexia, avatar customization serves as a critical tool for mitigating barriers in digital spaces. Research in this area explores the diverse ways these users navigate virtual environments [Mello *et al*., 2025]; for instance, Gualano *et al*. [2024], and Marinho *et al*. [2025] reports that neurodivergent individuals often leverage embodied virtual reality (VR) features, such as facial expressions and body language, to represent their energy levels or social availability dynamically.

2.3 The Influence of Context

Contextual factors shape the interplay between identity, self-expression, and avatar customization within digital self-representation. For instance, the specific nature of online activities and the representational choices of vulnerable groups are often mediated by a variety of situational variables [Wu *et al*., 2023]

Beyond anonymity, context plays a fundamental role in digital identity formation. For instance, Zent [2023] investigated the impact of anonymity and heterogeneity within online support groups, while the VISHnu approach, proposed by Ribeiro *et al*. [2024b], underscores how various contextual dimensions actively shape avatar customization choices. This relationship between appearance and context is further complicated by the "Proteus Effect", where individuals often draw inferences about expected behaviors and attitudes based on their avatar's visual characteristics [Yee and Bailenson, 2007].

This dynamic interplay between environmental expectations and representational choices is synthesized in Figure 2. The image illustrates a spectrum of contextual influence, ranging from formal professional settings that demand high realism and adherence to social conventions to creative gaming spaces that encourage uninhibited identity experimentation and fantastical expression. As the social constraints of the environment decrease, users tend to feel more empowered to explore facets of their identity that diverge from their physical appearance.

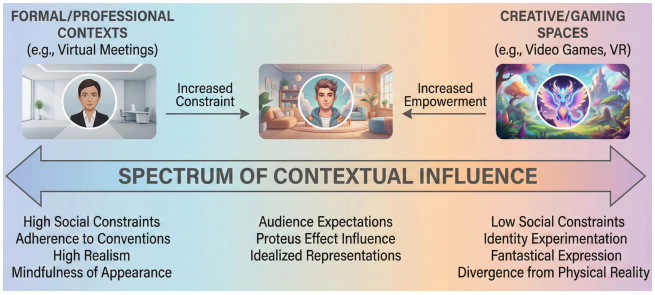

Figure 2. The impact of digital context on avatar representation: a spectrum from formal social conventions to creative identity experimentation.

Source: Elaborated by the authors.

Consequently, individuals frequently adapt their behavior to align with their surroundings, requiring a heightened mindfulness of appearance and responsiveness to environmental cues [Ferguson, 2009]. However, certain digital environments impose social conventions that make authentic self-expression challenging [Ducheneaut *et al*., 2009]. In professional or academic virtual meetings, for example, distinctive patterns in customization have been observed as users navigate these formal expectations [Wu *et al*., 2023].

In contrast, virtual spaces such as video games often encourage uninhibited self-expression, even when avatars diverge significantly from a user's physical appearance [Szolin *et al*., 2023a]. This flexibility is particularly relevant for users with visible disabilities, who may choose avatars without disabilities to navigate these digital realms [Takano and Taka, 2022].

Conversely, on messaging platforms and social media, people tend to create avatars that closely reflect their real-world identities. Audience expectations, such as interactions with colleagues versus friends, also influence these choices, particularly when offline stereotypes carry over into virtual contexts [Whitehouse *et al*., 2023]. Additionally, creating idealized or fictional avatars provides a space for identity experimentation with greater flexibility compared to real life [Zhang *et al*., 2022].

2.4 Representation of Vulnerable Identities: Disability and Gender

To synthesize the complex dynamics discussed in these subsections, Figure 3 provides a visual framework illustrating the representation of vulnerable identities within virtual environments. The central panel highlights the core challenge: the fragmented digital self resulting from embedded platform biases and associated social risks, such as harassment and stigmatization.

Flanking this challenge are distinct pathways for navigating representation: the left panel visualizes strategies for disability disclosure grounded in the Social Model, while the right panel depicts the fostering of authentic gender expression via Levitt's psychosocial framework. Collectively, these components demonstrate that moving from a fragmented ex-

[1] Available at: `https://lensa-ai.com/` Accessed on: April 26, 2026

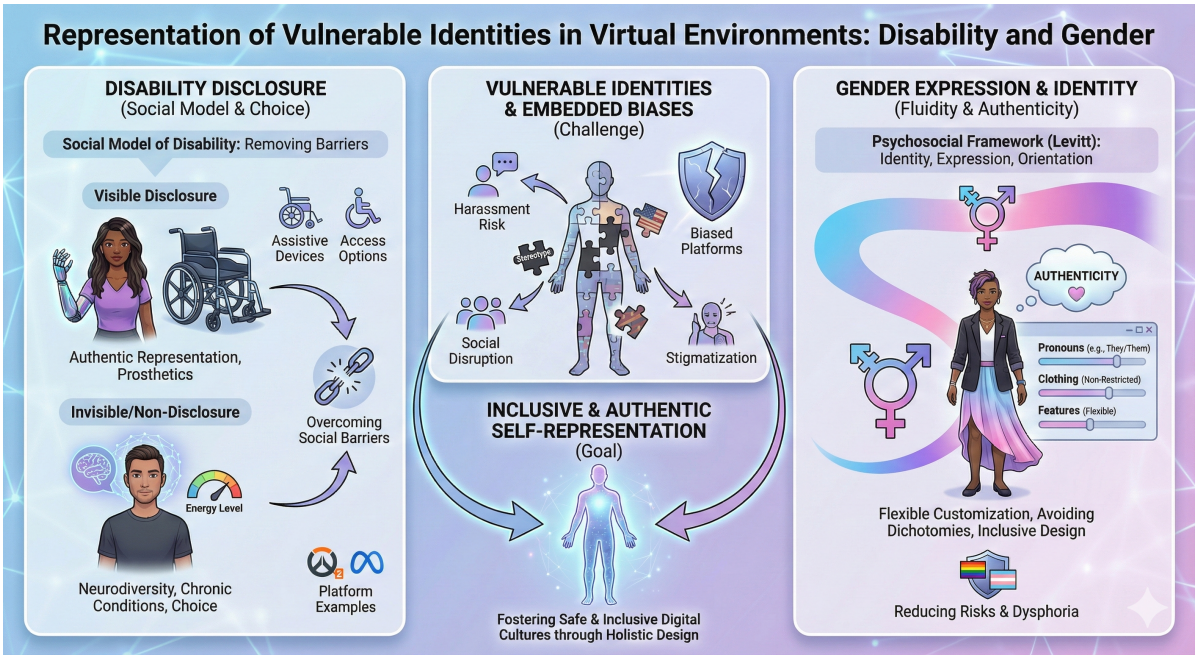

Figure 3. Challenges and theoretical approaches for representing disability and gender diversity in virtual environments.

Source: Elaborated by the authors.

perience towards the ultimate goal of inclusive and authentic self-representation requires holistic design interventions that address the specific, nuanced needs of both disability and gender diversity.

While avatars serve as conduits for entertainment, social interaction, and identity exploration, customization platforms often systemically perpetuate socio-racial stereotypes. Previous research demonstrates the presence of embedded biases within these interfaces [Ratan and Sah, 2015; Oliveira *et al.*, 2022; Hatfield *et al.*, 2022; Mack *et al.*, 2023; Singh *et al.*, 2025; Marranita, 2019]; for instance, racial stereotypes persist in various games, exemplified by the disproportionate assignment of lighter skin tones to protagonists and darker tones to antagonists [McArthur *et al.*, 2015; Santos *et al.*, 2025]. However, authentic representation across diverse ethnicities necessitates a holistic approach that extends beyond skin tone to encompass distinct physical features, such as eye shapes, facial traits, hairstyles, and hair textures [Iantorno and Consalvo, 2023].

Furthermore, customization environments frequently marginalize specific demographics, particularly older adults, by prioritizing youth-centric designs over a broader spectrum of human identities [Carrasco *et al.*, 2017; Morris *et al.*, 2023]. For historically marginalized groups, including LGBTQIA+ individuals, ethnic minorities, and women, identity disclosure in virtual spaces often correlates with heightened risks of harassment and social disruption [Freeman *et al.*, 2022; Han, 2024; Silva *et al.*, 2023]. Empirical evidence suggests that women experience disproportionately higher rates of harassment in social virtual reality (VR) compared to men, while users with non-white avatars face an increased likelihood of stigmatization and racial discrimination.

Moreira and Cassanego Jr. [2025], observe that the representation of minority groups in the digital gaming landscape remains in its early stages, frequently limited by the hypersexualization of female characters and the invisibility of the LGBTQIA+ community. This representational gap reverberates throughout the gaming ecosystem, fostering hostile behaviors and perpetuating stereotypes during interactions with marginalized groups [Correia, 2022].

Despite the critical nature of these issues, the existing literature on self-representation, particularly concerning ethnic minorities, including Black people, Indigenous people, and other non-white populations, remains notably scarce. This research gap underscores the urgent need for a more nuanced understanding of how these groups navigate and customize their digital personas.

2.4.1 *Disability disclosure*

The growing emphasis on accessibility, particularly regarding disability rights, has become increasingly prominent in digital discourse [Rodrigues *et al.*, 2025]. Modern avatar platforms reflect this shift; for instance, the game *Overwatch 2*[2] features diverse characters utilizing prosthetics, such as an elderly Black woman and a neurodivergent hero, while *Meta Avatar*[3] and *Bitmoji*[4] now offer options for assistive devices. This study adopts the Social Model of Disability, which frames disability not as an individual physical limitation, but as the result of social barriers and a failure of society to accommodate the inherent diversity of human bodies and mental capacities [Oliver, 2013].

Building upon this perspective, Kopf *et al.* [2023] emphasizes that effective avatar representation is crucial, particularly within sociolinguistic contexts like sign language translation. Their findings suggest that customization must go beyond gender and ethnicity to encompass the unique nuances of in-

[2]Available at: `https://overwatch.blizzard.com/pt-br/`Accessed on: April 26, 2026

[3]Available at: `https://acesse.dev/meta-avatar` Accessed on: April 26, 2026

[4]Available at: `https://encr.pw/bitmoji-avatar` Accessed on: April 26, 2026

dividual and linguistic identities. However, significant gaps remain in local contexts. In Brazil, for example, the *VLibras* suite[5], designed to translate digital content into Brazilian Sign Language (Libras), offers only three avatar options: a male adult, a male child, and a female adult, starkly limiting user representation.

Furthermore, Zhang *et al*. [2022] explores how individuals with disabilities navigate virtual reality (VR), noting that while many use assistive technology to represent their conditions, others may choose non-disclosure in specific social settings to prioritize other facets of their identity. Subsequent researchers by Zhang *et al*. [2023] and Mack *et al*. [2023] further expand this scope to include 'invisible disabilities, such as neurodiversity and chronic illnesses, which require distinct representational approaches.

Despite these advancements, the intersection of disability and gender diversity, especially outside the realms of gaming and VR, still lacks substantial attention in the existing literature [Park and Kim, 2022; Han and Ho, 2024; Smith, 2024].

2.4.2 Gender expression in avatars

To mitigate prejudice, sexual harassment, and sexism in digital environments, researchers have proposed various strategies that account for both the affordances and limitations of online platforms [Han, 2024; Kosciesza, 2025]. These approaches specifically address the complexities of gender expression and identification among non-cisgender users by advocating for inclusive features, such as diverse pronoun options and the removal of gender restricted clothing [Whitehouse *et al*., 2023]. Furthermore, designers are encouraged to enable flexible combinations of physical characteristics, thereby avoiding rigid gender dichotomies that constrain self-representation [Oliveira *et al*., 2022].

Such inclusive design interventions are critical, as the transgender and gender diverse community remains a marginalized group disproportionately subjected to stigmatization, violence, and severe mental health challenges—including dysphoria, anxiety, depression, and higher rates of suicide [Whitehouse *et al*., 2023; McKenna *et al*., 2024].

Central to analyzing these issues is a clear and explicit conceptualization of gender. This article adopts the psychosocial framework proposed by Levitt [2019], which defines gender as a social construct encompassing the interrelated dimensions of identity, expression, and orientation. Genders are:

> social constructions that integrate sets of personal attributes associated with biological sex or developed in response to preexisting gender biases. They serve to meet individuals' needs to incorporate gender characteristics that promote authenticity and align with their individuality and relational position to others, thereby creating cultures that value traits previously stigmatized and denied in former gender norms [Levitt, 2019].

Based on perspective, it is clear that self-representation through avatars is not merely a technical choice but a psychosocial process of identity construction. By providing tools that allow for diverse gender expressions, virtual environments can support users in achieving the authenticity mentioned by the author, especially for those whose identities have been historically stigmatized. Consequently, examining how these constructs manifest in avatar customization is essential for developing platforms that foster inclusive and safe digital cultures.

3 Methodology

The methodological workflow, from the initial design of the instrument to the final data validation, is synthesized in Figure 4. This structure was designed to ensure participant anonymity and data integrity, particularly when addressing sensitive topics such as neurodivergence and racial identity.

This research adopts an exploratory and descriptive approach, utilizing a quantitative survey method to investigate the nuances of avatar-mediated self-representation. The study was conducted in three primary phases: instrument design and ethical alignment, participant recruitment via snowball sampling, and data synthesis. By employing an online questionnaire, we aimed to reach a diverse demographic across various virtual contexts, ensuring a broad perspective on how marginalized identities navigate these spaces [Leitão and Prates, 2017].

3.1 Procedures and instruments

The data collection instrument was developed using Google Forms[6] and structured into five thematic blocks to ensure a logical flow for the participants. Initially, users were presented with an Informed Consent Form, detailing the study's objectives, the voluntary nature of participation, and their rights regarding data privacy. This was followed by a Screening Question (Q2) to verify the target audience; only individuals with experience using avatars in interactive virtual environments proceeded to the full questionnaire.

The core of the instrument consisted of:

- Participant Profile (Q3.1–Q3.8): Demographic data and relevant personal characteristics;
- Virtual Environments (Q4.1–Q4.3): Usage patterns and platform preferences;
- Identity and Self-expression (Q5.1–Q5.4): Motivations and methods for avatar customization;
- Contextual Influence (Q6.1): How different digital settings alter representational choices;
- Diversity and Inclusion (Q7.1–Q7.7): Perceptions of bias, barriers, and inclusive design;
- Feedback (Q8.1 and Q8.2).

The questionnaire was distributed through snowball recruitment [Kvale and Brinkmann, 2009], utilizing academic mailing lists, social media, professional groups, and gaming communities to maximize reach. Participants were informed that the estimated completion time was 10 minutes.

[5] `https://www.gov.br/governodigital/pt-br/vlibras` Accessed on: April 26, 2026

[6] Available at: `https://www.google.com/intl/pt-BR/forms/about/` Accessed on: April 26, 2026

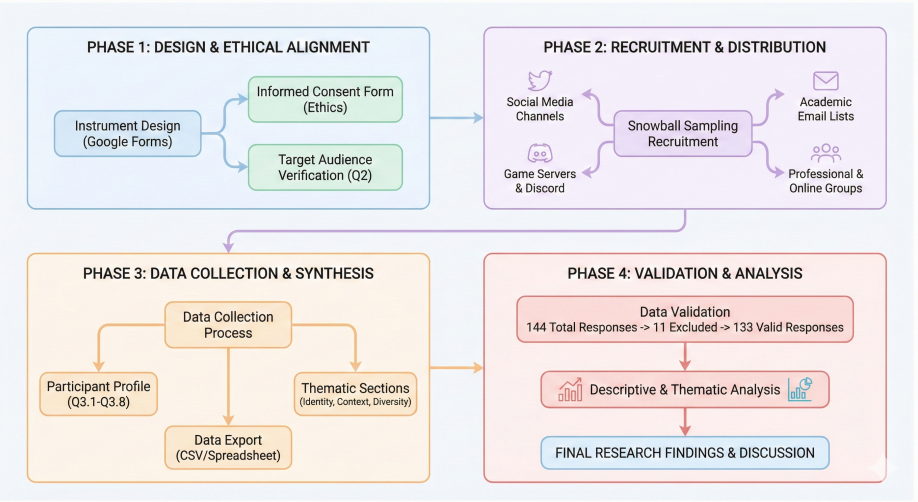

Figure 4. Methodological workflow: from research design and recruitment to data validation and analysis.

Source: Elaborated by the authors.

3.2 Participants

The intended audience for the questionnaire comprises individuals who have employed avatars in virtual environments for interactive purposes, encompassing a diverse array of contexts, such as the metaverse, video games, artificial intelligence applications, social networks, emojis, immersive virtual worlds, and video conferencing scenarios. This information was explicitly conveyed in the participation invitation, on the questionnaire's landing page, and within Q2 after obtaining informed consent.

The data collection period spanned from October 13 to 25, 2023, yielding 133 valid responses, with an additional 11 responses excluded based on non-compliance with the specified target audience criteria in the screening question (Q2). Table 1 displays the demographic information of the participants.

Upon examination of the age distribution, the predominant cohort of participants falls within the 18 to 28 age bracket, encompassing 52.6% of the entire sample. A noteworthy segment (27.1%) falls within the 29 to 39 age range, indicating a diverse range of ages, including participants aged 50 and above (4.5%). Concerning gender identification, the majority align with the male gender (cisgender), constituting 51.9% of the participant cohort, followed by those identifying as female (cisgender), representing 45.1% of the sample. Moreover, a small percentage opted not to disclose their gender. Additionally, some participants reported experiencing hearing impairment, visual impairment, or vitiligo.

Concerning neurodivergences, attention deficit hyperactivity disorder (ADHD) is the most prevalent condition, affecting 16.5% of participants, followed by dyslexia and autism spectrum disorder (ASD).

The majority of participants reside in Bahia (65.4%), followed by Sergipe (23.3%) and other Brazilian states (11.3%), as well as Brazilians living in other countries (3.8%). Regarding self-declaration of color or race/ethnicity, the sample is diverse, with 63.2% of participants identifying as non-white. Three participants (2.3%) chose not to declare their color or race/ethnicity.

Table 1. Participants' Demographic Data. The 'Frequency' column presents the absolute values corresponding to the sample (n=133).

Variable	Frequency	F (%)
Age Group (years)		
Below 18	17	12.8
18 - 28	70	52.6
29 - 39	36	27.1
40 - 50	4	3.0
Above 50	6	4.5
Gender		
Male (cisgender)	69	51.9
Female (cisgender)	60	45.1
Non-binary	2	1.5
Fluid	1	0.8
Prefer not to say	1	0.8
Conditions		
Person with Hearing Impairment	2	1.5
Person with Visual Impairment	4	3.0
Person with Vitiligo	1	0.8
Neurodivergence		
Autism Spectrum Disorder (ASD)	4	3.0
ADHD	22	16.5
Dyslexia	5	3.8
Others	2	1.5
Location		
Bahia	87	65.4
Sergipe	31	23.3
Other states	15	11.3
Other countries	5	3.8
Race/Ethnicity		
White	46	34.6
Brown skinned	49	36.8
Black	33	24.8
Yellow	2	1.5
Prefer not to say	3	2.3
Total	133	100.0

4 Results

This section presents the analysis of the questionnaire data, organized into thematic clusters: virtual environment usage, the dynamics of identity and self-expression, contextual influences, and perceptions of discrimination.

4.1 Usage Patterns in Virtual Environments

The digital landscape for avatar creation is diverse, as evidenced by the preferences summarized in Table 2 (Q4.1). Our findings indicate that Traditional Social Networks (90 mentions) and Social Virtual Worlds (89 mentions) are the primary arenas for digital self-representation. This dominance suggests that avatars are no longer confined to niche gaming spaces but have become central to mainstream social interaction and identity formation [Lee *et al*., 2023].

Similarly, the representation of *Multiplayer Online Games*, such as World of Warcraft and Final Fantasy, underscores the integration of avatar customization as a core feature of the gaming experience, reflecting the interplay between gameplay and digital self-representation [Szolin *et al*., 2023b]. Additionally, the substantial mentions of *Text Messengers*, including WhatsApp, Snapchat, and Telegram, reveal the pivotal role of personal communication platforms in providing accessible and versatile spaces for avatar creation.

Table 2. Virtual environments used for avatar creation and customization.

Environment Type	n	Examples
Trad. Social Networks	90	Facebook, Instagram, Twitter, TikTok, Reddit
Social Virtual Worlds	89	Second Life, Roblox, The Sims, Discord, Twitch
Online Multi. Games	86	MMORPGs (WoW, Final Fantasy)
Text Messengers	82	WhatsApp, Snapchat, Telegram
Educational	42	Moodle, Duolingo, Classroom
Teleconferencing	31	Zoom, Teams, Google Meet
Collaboration	26	Teams, Canvas, Workspace
Immersive Soc. Net.	23	VRChat, Horizon, Zepeto, Spatial
AI Applications	19	Lensa, YouCam, Dawn AI, Remini
Health & Therapy	3	Woebot, Talkspace, BetterHelp

Source: Elaborated by the authors.

The utilization of "Educational Environments" (Moodle, Duolingo and Google Classroom) emphasizes the presence of these avatars in learning contexts, possibly indicating an increasing integration of digital elements in education [Chen *et al*., 2023]. The adoption of "Teleconferencing" and "Collaboration Environments" (Microsoft Teams, Google Meet, Microsoft Teams, Canvas, and Google Workspace) suggests an expansion of digital presence into professional and remote work contexts.

On the other hand, "Immersive Social Networks" and "AI Applications" recorded fewer mentions, with 23 and 19, respectively, indicating that environments such as VRChat, Horizon Worlds, Zepeto, and Spatial, as well as AI-based photo editing applications like Lensa AI, YouCam, Facetune, Dawn AI, and Remini, play a more limited role in this context. The limited mention of "Immersive Social Networks" and "AI Applications" underscores potential areas for innovation and future research.

4.2 Challenges and Opportunities in Customization

As detailed in Table 3 (Q4.2 and Q4.3), the user experience in these environments is characterized by a significant tension between creative aspirations and inherent technical limitations:

- The Representation Gap: A primary hurdle identified by 81 respondents is the "Lack of suitable customization tools," closely followed by the "Difficulty in finding avatars that represent user identity" (72 mentions). This underscores a critical "representational friction" where the available software fails to capture the complexity of human diversity;
- Safety and Standards: Beyond technical tools, users are concerned with "Unrealistic beauty standards" (36 mentions) and "Inappropriate user behavior" (27 mentions), highlighting that social and aesthetic biases are as much a barrier as software limitations;
- Empowerment: Despite these challenges, the "Freedom to customize" remains the most significant opportunity (113 mentions). This indicates that when platforms provide flexible tools, users feel empowered to explore virtual worlds and foster social connections, which are key drivers for continued engagement.

Table 3. Challenges and opportunities of avatars in virtual environments.

Challenge/Opportunity	Responses
Challenges	
Lack of suitable customization tools	81
Difficulty finding avatars I identify with	72
Inappropriate user behavior	27
Unrealistic beauty standards or stereotypes	36
Complexity of customization (difficult)	26
Technological barriers	19
Privacy and security concerns	22
Opportunities	
Freedom to customize avatars	113
Exploration of virtual worlds or 3D environments	79
Social interaction and communication with other users	71
Collaboration on projects or activities	46

Source: Elaborated by the authors.

A significant challenge highlighted by 81 respondents is the "Lack of suitable customization tools." Additionally, 72 participants noted the challenge of "Difficulty in finding avatars that represent users' identity."

On the other hand, virtual environments offer significant opportunities for the use of avatars. The *Freedom to customize avatars* is identified as the primary opportunity, highlighted by 113 respondents, allowing users to personalize their virtual representations according to their preferences. The *Exploration of virtual worlds or 3D environments* garnered considerable attention, with 79 mentions, followed by *Social interaction and communication with other users* (71 mentions) and *Collaboration on projects or online activities* (46 mentions).

4.3 Identity, Self-expression, and Demographic Disparities

The results presented in Table 4 reflect the agreement and disagreement among various respondent profiles regarding

three specific questions related to the use of avatars in virtual environments. These inquiries, denoted as Q5.1, Q5.2, and Q5.3, delve into participants' perceptions concerning their capacity to convey their gender identity, cultural nuances, and racial/ethnic attributes through avatars, all while considering the contextual backdrop.

The core of our analysis examines how comfortable users feel representing their gender, culture, and race (Q5.1–Q5.3). While the general population shows high levels of comfort (ranging from 78.2% to 83.5%), a demographic breakdown reveals significant disparities.

- Q5. 1 I feel comfortable using an avatar that reflects my gender identity, depending on the context of use;
- 5.2. I feel comfortable using an avatar that represents aspects of my culture, depending on the context of use;
- 5.3. I feel comfortable using an avatar that represents certain aspects of my race/ethnicity, depending on the context of use.

Regarding question Q5.1, scrutinizing whether respondents feel at ease deploying avatars reflective of their gender identity, the majority within the General Profile (n=133) evidenced a noteworthy concordance rate, reaching 80.5%, juxtaposed against a discordance level of 9.0%. Question Q5.2, probing respondents' comfort in adopting avatars emblematic of their cultural affiliations, yielded akin results, showcasing a concordance of 78.2% and a discordance of 6.0%. In the domain of question Q5.3, examining the utilization of avatars embodying racial/ethnic facets, the concordance levels escalate further, reaching 83.5%, coupled with a discordance rate of 7.5%.

Nonetheless, a granular examination of the results stratified across diverse respondent profiles discloses noteworthy differentials. For instance, among respondents identifying with a non-white race/color (n=85), the agreement concerning the use of avatars encapsulating racial/ethnic attributes diminishes, registering a concordance of 81.2% and a discordance of 8.2%, intimating a heightened sensitivity to this matter in contrast to the overall profile. Conversely, the "White Race/Color Profile" (n=46) manifests elevated concordance across all inquiries, ranging from 84.8% to 91.3%, underscoring a heightened inclination of these respondents to embrace avatars representing their gender identity, cultural background, and racial/ethnic identity.

Conversely, the "Non-white and Non-male (cis) Profile" (n=41) manifests a more pronounced discordance, particularly concerning the question of race/ethnicity (Q5.3), where discordance ascends to 14.6%. This suggests that this subgroup might grapple with more pronounced challenges associated with the representation of racial/ethnic dimensions in avatars, conceivably attributable to heightened cultural sensitivity. Within the "Under 18 years old" cohort (n=19), the most conspicuous discordance emerges across all inquiries, spanning from 16.7% to 22.2%, indicative of a developmental phase marked by exploration and identity evolution among these respondents.

In contrast, the "40 years old or older" cohort (n=10) manifests elevated concordance rates, achieving 100% concordance concerning gender identity and race/ethnicity, and 90.0% concordance concerning cultural facets, hinting at a more defined and stable self-perception among these respondents. These findings highlight the nuanced and complex landscape of participants' perceptions and attitudes regarding the representation of identity through avatars in virtual environments.

Table 4. Concordance (C) and Discordance (D) by Profile regarding Identity Dimensions (Q5.1-Q5.3).

Profile / Dimension	C (%)	D (%)
General (n=133)		
Q5.1. Gender identity	80.5	9.0
Q5.2. Cultural aspects	78.2	6.0
Q5.3. Racial/ethnic aspects	83.5	7.5
Non-white Race/Color (n=85)		
Q5.1. Gender identity	74.1	10.6
Q5.2. Cultural aspects	75.3	7.1
Q5.3. Racial/ethnic aspects	81.2	8.2
White Race/Color (n=46)		
Q5.1. Gender identity	91.3	6.5
Q5.2. Cultural aspects	84.8	4.3
Q5.3. Racial/ethnic aspects	89.1	6.5
Non(white and male) (n=41)		
Q5.1. Gender identity	75.6	14.6
Q5.2. Cultural aspects	75.6	9.8
Q5.3. Racial/ethnic aspects	78.0	14.6
Below 18 years old (n=19)		
Q5.1. Gender identity	44.4	16.7
Q5.2. Cultural aspects	61.1	22.2
Q5.3. Racial/ethnic aspects	66.7	22.2
40 years old or older (n=10)		
Q5.1. Gender identity	100.0	0.0
Q5.2. Cultural aspects	90.0	0.0
Q5.3. Racial/ethnic aspects	100.0	0.0

Source: Elaborated by the authors.

The examination of question 5.4 (*Have you ever felt compelled to create an avatar that aligns with other people's expectations instead of reflecting your personal preferences?*) revealed that the majority of participants (55.2%) have never experienced the obligation to shape an avatar that deviates from their personal preferences due to external expectations. Conversely, a noteworthy proportion (28.4%) acknowledged having encountered such pressure. Moreover, 16.4% of participants expressed uncertainty or a lack of clarity regarding this situation.

4.4 Analysis of Avatar Preferences Across Demographic Groups

To identify systemic patterns in how different demographics navigate digital self-representation, we conducted a comparative analysis focusing on three primary dimensions: gender identity, cultural aspects, and racial/ethnic attributes. A one-way Analysis of Variance (ANOVA) [Ståhle and Wold, 1989] was employed to compare the mean agreement levels between groups, with data normalized using z-scores to facilitate direct comparison.

Before the analysis, we validated the statistical assump-

tions. The Shapiro-Wilk test [Razali and Wah, 2011] confirmed the normality of the distribution ($p = 0.3679$), and Levene's test [Glass, 1966] confirmed the homogeneity of variances ($p = 1.0000$). With all assumptions met ($p > 0.05$), the ANOVA was applied to two distinct sets: (1) Race/Color (non-white vs. white) and (2) Age Group (under 18 vs. 40+ years).

4.4.1 Statistical Findings and Interpretations

As synthesized in Table 5, the racial comparison revealed significant differences in preferences regarding gender identity ($p = 0.0461$) and racial/ethnic aspects ($p = 0.0461$). Interestingly, cultural aspects showed a marginal trend toward significance ($p = 0.0582$), suggesting that while racialized experiences deeply impact gender and ethnic expression, cultural representation may be perceived through more varied lenses.

Table 5. Consolidation of ANOVA results and Group Comparisons.

Dimension	*F*	*p*-value	Significance
Race/Color (Non-white vs. White)			
Gender Identity	4.00	0.0461	Significant
Cultural Aspects	3.60	0.0582	Tendency
Racial/Ethnic Aspects	4.00	0.0461	Significant
Age Group (Below 18 vs. 40+ years)			
Gender Identity	8.00	0.0047	Highly Sig.
Cultural Aspects	8.00	0.0047	Highly Sig.
Racial/Ethnic Aspects	8.00	0.0047	Highly Sig.

Source: Elaborated by the authors.

The normalized data in Table 6 illustrates a stark contrast: the white group consistently exhibited a positive z-score across all dimensions, whereas the non-white group showed a negative trend. In the context of our theoretical framework, this suggests that non-white users face higher "representational friction", a greater difficulty in finding or feeling comfortable with avatar features that align with their physical and social identities.

Table 6. Normalized Data (Z-scores.)

Group	Gender	Culture	Race
Non-white	-0.5000	-0.4737	-0.5000
White	0.5000	0.4737	0.5000
Below 18 years	-0.7071	-0.7071	-0.7071
40 years or older	0.7071	0.7071	0.7071

Source: Elaborated by the authors.

A striking finding of this study is that age appears to be a more decisive factor than race in shaping avatar preferences. The age-based comparison yielded highly significant results across all three dimensions ($p = 0.0047$), indicating more pronounced discrepancies than those observed between racial groups.

For racial groups, the most pronounced differences were found in the representation of gender identity and racial/ethnic aspects, while cultural aspects showed a marginal trend toward significance but did not reach statistical significance. In contrast, age-based comparisons showed highly significant differences across all dimensions, indicating that age has a stronger influence on avatar preferences.

The z-scores for the Under 18 cohort (-0.7071) versus the 40+ cohort (0.7071) highlight a significant gap in representational comfort. Younger users reported the lowest levels of comfort, which may stem from a combination of ongoing identity development and a higher susceptibility to the social conventions and "gaze", prevalent in online spaces. Conversely, the strong positive trend in the 40+ group suggests a more settled self-perception or perhaps a different set of expectations regarding digital tools. Ultimately, these results underscore that avatar preferences are not neutral. They are deeply mediated by the user's demographic position, with age and race acting as critical determinants of how individuals navigate—and are restricted by virtual environments.

4.5 Contextual Dynamics in Self-Representation

The data from question 6.1 explores how participants fluctuate their representational choices based on the nature of the online activity. As illustrated in Figure 5, preferences for avatar similarity versus divergence are highly sensitive to the social and professional "weight" of the environment.

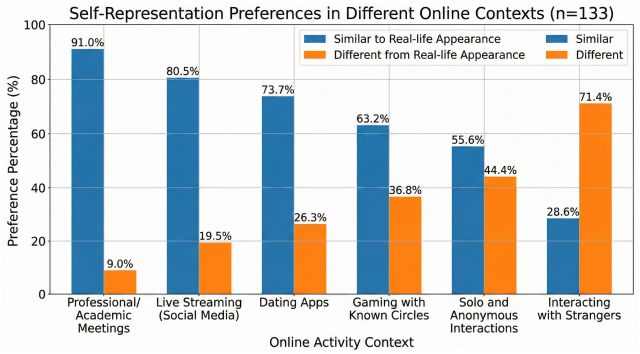

Figure 5. Avatar customization preferences across different online activity contexts ($n = 133$). The data illustrate a clear shift from similarity in formal settings to divergence in anonymous interactions.

Source: Elaborated by the authors.

In scenarios where real-world accountability or social "presence" is paramount, participants exhibited a strong preference for avatars that closely approximate their physical appearance:

- Professional and Academic Meetings: This context presented the highest demand for realism, with 91.0% of respondents favoring similarity. This underscores the role of the avatar as a digital "proxy" for the professional self, where authenticity is tied to visual fidelity;
- Live Streaming and Dating: Even in more social or intimate settings, such as social media broadcasts (80.5%) or dating apps (73.7%), the preference for similarity remains dominant. This suggests that in environments where building trust or personal branding is key, users prioritize a "true-to-life" digital persona.

As the social context shifts toward leisure and interactions with unknown parties, the inclination toward "Different" avatars increases:

- Gaming with Known Circles: When playing with friends, the preference for similarity drops to 63.2%, with more

than a third of participants (36.8%) exploring divergent identities. This reveals a "safe space" for identity play among trusted peers;
- Solo and Anonymous Interactions: In solitary play, the gap narrows further (55.6% similar vs. 44.4% different). However, the most striking shift occurs when interacting with strangers, where 71.4% of participants choose avatars that differ from their real-life appearance. This clear preference for divergence highlights the pursuit of anonymity and the desire to decouple the digital experience from real-world social constraints.

These findings align with the "Presentation of Self" theory Ferguson [2009]; Drummond [2021] and support contemporary studies emphasizing how environmental cues dictate virtual representation [Wu *et al*., 2023; Koscieszа, 2025; Ki *et al*., 2025]. While formal settings demand a "high-fidelity" self to maintain professional decorum, anonymous or ludic contexts empower users—especially those from vulnerable groups—to experiment with identities that transcend their physical limitations or societal stereotypes. This contextual fluidity is a cornerstone of digital identity, allowing users to navigate between authenticity and protective anonymity.

4.5.1 Diversity and Representation of Vulnerable Groups

In Question 7.1, which examines the representation of Indigenous people, 81.3% of participants reported not encountering avatars representing Indigenous individuals, while 18.7% indicated they had seen such representations, highlighting a significant gap in ethnic diversity. In Section 7.2, concerning the representation of vitiligo, albinism, or dwarfism, the majority (80.6%) of participants reported not finding avatars with these characteristics. Lastly, in Section 7.3, which addresses the representation of people with disabilities, 66.4% of participants stated they had not encountered avatars with disabilities, while 33.6% had found such representations.

In question 7.4, participants' affirming responses from 7.1 to 7.3 expressed diverse perspectives on avatar representation and encountered virtual tools/platforms. One participant stated:

> I find avatars that represent diverse individuals very interesting because they allow people to feel more included in that environment. I've seen instances where games added skins with vitiligo, for example, which stood out to me because it's something I, unfortunately, don't see often. I recall encountering this only in Fortnite. I've also observed cases where these features weren't predefined in a skin but instead offered as customization options in the avatar creation section. For instance, I saw options to replace body parts with prosthetics, enabling individuals who use prosthetics to feel represented.

Indigenous representation was also a notable topic for some participants. One remarked:

> I found Indigenous avatars in the game Red Dead Redemption Online. It's important to note that these represented North American Indigenous people, consistent with the game's Wild West setting and theme.

Nonetheless, participants also identified challenges and limitations in representation. Some noted that avatars often lack detail, as one participant commented: "They're good but not very detailed, and I don't think they would work well in an immersive system." The realistic depiction of physical disabilities, such as wheelchairs, emerged as another area for improvement. A participant observed: "The only time I saw representation of physical disabilities, like a wheelchair user, was in Roblox."

Specific platforms were highlighted for their efforts in inclusivity. One participant shared:

> I find avatars representing diversity very interesting because they can feel more represented in that environment. In both Habbo Hotel and The Sims 4, I've seen avatars representing people with disabilities.

Another noted "that, in an online game similar to Bomberman, I came across avatars with Indigenous appearances."

In the analysis of question 7.5 from the questionnaire, participants provided insights to enhance the representation of diverse identities and groups in the context of Vlibras, a tool dedicated to translating into Brazilian Sign Language (Libras). As highlighted by one participant, a key need is the inclusion of "Avatars with more skin tone options to represent the Brazilian population better". Additionally, another participant expressed the opinion that "People from other races are essential; having three white people is unacceptable, especially in Brazil."

Another aspect mentioned by participants was the inclusion of avatars representing people with disabilities (PWD). One participant stated that:

> Avatars representing people with disabilities would be a great idea for inclusion, allowing the freedom to show what the disability is, if the person feels comfortable displaying it.

Furthermore, a participant emphasized the need for avatars representing a wide variety of physical and ethnic characteristics, suggesting that Vlibras avatars should include "Black avatars, avatars with curly/kinky hair, comprehensive colors, different skin tones, Asian avatars, Indigenous avatars." The suggestion to include avatars representing a broad age range was also raised, with the inclusion of elderly and child avatars to ensure that people of all age groups feel represented in Vlibras.

Also, there was a suggestion to introduce a "customization screen," where users could configure features such as skin color and accessories, including those related to disabilities, such as wheelchairs, white canes, and hearing aids. One participant highlighted this idea, stating:

> A customization screen would solve this, allowing each person to choose the character's color and accessories, including options related to disabilities, such as wheelchairs, white canes, and hearing aids.

The proposal for avatar customization was further emphasized, with one participant arguing that "Vlibras should allow avatar customization, enabling each person to choose

the features they like most." This underscores the importance of providing flexible options so users can tailor their avatars to their personal needs and preferences.

In this context, VLibras avatars may be conceived as communication agents rather. This perspective aligns with the initiative presented by Santos *et al*. [2026], in which a photorealistic avatar performs Libras translation, providing an experience closer to human interaction than that offered by animated characters.

4.5.2 Ethics and the Reality of Virtual Discrimination

In the analysis of questionnaire question 7.6 (Table 7), which explores the consideration of ethical aspects when personalizing avatars in virtual environments, such as avoiding stereotypes or representations deemed offensive, approximately 29.9% indicated they had never thought about it but expressed the intention to start considering. About 14.2% mentioned considering ethics sometimes, indicating a possible variation based on context. Another 14.2% expressed never having reflected on this ethical issue and do not consider it important.

Notably, one participant highlighted that, after a personal experience, they recognized the importance of accurate representation in their avatars, following surgery that altered their physical appearance. This highlights how personal experiences can influence ethical perceptions in avatar customization. It is situational (2%): One of the participants (2%) mentioned that ethical consideration is situational, depending on the context. In a professional setting, they would have this concern, but in an informal environment, less so.

Table 7. Answers to Question 7.6 on Ethical Aspects in Avatar Customization.

Answers (n=133)	(Frequency %)
Always take into consideration	37.3%
Never thought about it, but will start considering	29.9%
Sometimes take into consideration	14.2%
Never thought about it and don't find it important	14.2%
Others	4%

Source: Elaborated by the authors.

4.5.3 Encounters with Harassment and Prejudice

The responses to Question 7.7 provide a sobering look at the risks associated with disclosing vulnerable identities in virtual spaces. Discrimination in these environments appears to follow three primary patterns:

- **Gender-Based Harassment:** Several participants reported being targeted or excluded when utilizing female-presenting avatars;
- **Racial Stigmatization:** Users who selected avatars with dark skin and curly hair reported recurring instances of mockery and derogatory jokes from other players;
- **Identity Divergence:** Paradoxically, users experienced prejudice when experimenting with identities that differ significantly from their real-life selves (e.g., a cisgender man using a female-presenting alien avatar).

The qualitative data reveal a wide range of exclusionary experiences. Regarding gender, one participant shared a transformative experience:

> Yes, when I used a female-looking avatar with a female name, I was harassed in the virtual environment of the game I was playing. Since then, I started using masculine traits and a masculine name.

Another respondent echoed this sentiment, stating that such interactions are particularly prevalent "in games where most players are men," often manifesting as "harassment and insults." These accounts emphasize how representation choices can directly lead to social disruption and the subsequent "masking" of identity for personal safety. Racial and ethnic characteristics also emerged as significant triggers for prejudice. One participant detailed a recurring experience:

> Yes, when I created a character in a virtual world game and chose dark skin, curly hair, and light blue clothing, several players mocked and made jokes about my character.

Similar reports were frequent, with another participant noting that "in games, racism based on the skin tone of your character is very common." These testimonials underscore how ethnic traits in avatar representation are often met with stigmatization rather than inclusion.

Furthermore, discrimination is not limited to those seeking realistic representation; it also affects those exploring atypical identities. One participant explained:

> Yes. Even though I consider myself a cisgender straight man, I enjoy having an avatar completely different from me in informal environments—sometimes even of non-existent races, like aliens, demons, or succubi, all of which are female. I have experienced discrimination for not having an avatar that looks like me and for using a female avatar while being male.

Additionally, a participant described an experience related to their avatar's appearance, stating: "*Yes, when I created a character in a virtual world game and chose dark skin, curly hair, and light blue clothing, several players mocked and made jokes about my character.*" This account underscores how the ethnic characteristics of avatar representation can also lead to mockery and discrimination by other players.

One participant also spoke about racism related to their avatar's skin tone: "Yes, in games, racism based on the skin tone of your character is very common." Another participant shared: "*Yes, when I created a character in a virtual world game with black skin, curly hair, and light blue clothing, several players mocked and made jokes about my character.*"

To synthesize these qualitative insights, Figure 6 illustrates the three primary categories of perceived discrimination identified in our analysis. The diagram visualizes the distinct mechanisms of gender-based harassment, racial stigmatization based on physical traits, and the social prejudice directed at atypical identity divergence. As highlighted in the figure's conclusion, these persistent patterns underscore that individual user strategies are insufficient.

This reflects how unique or atypical avatar choices can provoke prejudice when they violate established social expectations Shook [2025]; McKenna *et al*. [2024]. In the subset of data from non-white respondents, while the majority did

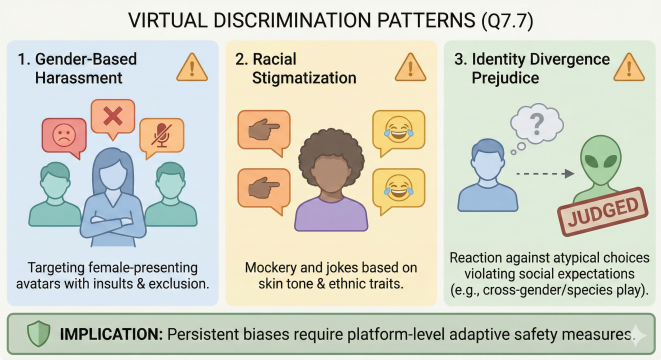

Figure 6. Visual summary of virtual discrimination patterns reported by participants (Q7.7), highlighting gender, racial, and identity-based prejudice.

Source: Elaborated by the authors.

not report direct discrimination, a specific group of six participants detailed targeted gender and ethnic harassment, including offensive comments directed at their digital personas.

Ultimately, these findings confirm that genders and ethnicities are frequently marginalized or portrayed in biased ways, particularly in environments with misogynistic traits or overly sexualized representations [Mack *et al.*, 2023; Araujo *et al.*, 2025; Vila *et al.*, 2024]. Such evidence supports the urgent need for developers to implement adaptive safety measures that respond to users' comfort levels and past experiences to mitigate threatening situations in virtual cultures [Singh *et al.*, 2025; Nascimento *et al.*, 2024; Maciel *et al.*, 2025; Han, 2024].

5 Discussion

The findings provide a nuanced understanding of how individuals navigate digital self-representation, reinforcing the notion that avatar customization is not merely a technical task but a complex psychosocial process. While previous literature suggests that users generally gravitate toward personalized avatars that align with their self-perception [Hepperle *et al.*, 2022; Zimmermann *et al.*, 2023; Bui *et al.*, 2024], our data reveal that this preference is heavily mediated by the specific digital ecosystem and the user's demographic background.

Some of the participants use avatars primarily in games and messaging apps or social networks, preferring avatars that require less customization. One of them expressed: "I don't use avatars because I find the setup process laborious, they don't reflect my characteristics, and my virtual appearance often varies." Furthermore, some participants questioned the relevance of avatars outside the context of games or virtual or augmented reality environments, raising the issue of when and where avatars are most pertinent and how they can gain greater significance in different scenarios.

Participants in the White Race/Color Profile and the 40+ Age Group reported the highest levels of comfort (up to 100% in some categories). This suggests a "representational harmony" for these groups, likely because digital platforms are often designed with "default" archetypes that align with their identities. For older users, this high concordance may also reflect a more stable and established self-perception.

In contrast, Non-white and Non-cisgender/Non-male participants exhibited lower concordance and higher discordance rates:

- Racial Sensitivity: Among non-white respondents (n=85), comfort with racial representation (Q5.3) dropped to 81.2%;
- The Intersectional Challenge: The "Non-white and Non-male" group reported a discordance of 14.6% regarding racial representation. This suggests that users at the intersection of marginalized race and gender face more pronounced challenges in virtual spaces, possibly due to a heightened awareness of cultural stereotypes or a lack of nuanced features that represent their specific identities.

The most striking discordance was observed in the Under-18 group, where discomfort reached up to 22.2%. This aligns with developmental theories suggesting that younger users are in a phase of active identity exploration and may feel more restricted by the static nature of current avatar systems or more vulnerable to the gaze of their peers.

Note on External Pressure (Q5.4): The findings regarding external expectations are telling: 28.4% of participants admitted to feeling compelled to create avatars that align with others' expectations rather than their own. This "social masking" indicates that virtual environments, despite their potential for freedom, are still heavily governed by real-world social pressures and stereotypes.

One participant observed: "I believe avatar customization should be inclusive, but I think their usefulness is limited outside the gaming environment or virtual or augmented reality environments." However, our results show that participants prefer to create and customize avatars in the most commonly used virtual environments, such as traditional social networks, social virtual worlds, and games, without significant differences between them.

Contextualization emerges as a pivotal element in comprehending the underlying motivations behind the selection of specific virtual representations. Certain participants lean towards utilizing avatars in fantasy scenarios, such as games and role-play. One participant articulated, "I have a strong affinity for role-playing games and often fashion avatars or characters that do not resemble me because I appreciate the role-playing experience." In tandem with preceding research [Salagean *et al.*, 2023; Park *et al.*, 2023], certain participants opted for the creation of more realistic or idealized avatars in online endeavors such as work and education through video conferencing tools. In such contexts, individuals may perceive the environment as more formal and serious in contrast to the more laid-back and informal atmosphere of social gaming, aligning with the findings by Zhang *et al.* [2022].

Corroborating studies on racial, age, and gender stereotypes in avatars Carrasco *et al.* [2017]; Lee *et al.* [2018]; Beltran *et al.* [2023]; Smith [2024] and [Han, 2024], participants' encounters signify that they frequently grapple with stereotypes during avatar creation, necessitating judicious decision-making to sidestep them. Researchers have proposed various strategies to mitigate bias, sexual harassment, and sexism in digital environments [Kosciesza, 2025].

These strategies include encouraging the use of diverse pronouns and eliminating clothing options that impose restrictions based on the avatar's gender [Whitehouse *et al.*, 2023]. Additionally, it is advisable to allow any combination of physi-

cal features, avoiding rigid gender dichotomies [Oliveira *et al.*, 2022].

The heightened challenges faced by the 'Non-white and Non-male' group in the construction of their virtual identity corroborate the need for institutional actions focused on empowerment and the mitigation of inequalities in information technology [Barino *et al.*, 2024; Maciel *et al.*, 2024; de Oliveira *et al.*, 2024].

The design of avatar creation software, rather than embracing the full diversity of human identities, often marginalizes social groups by reinforcing stereotypes. As noted by Zhang *et al.* [2023], individuals with disabilities expressed a desire to use avatars to better represent their disability experiences. While previous research has predominantly focused on individuals with visible disabilities, our survey included a significant proportion of neurodiverse participants (24.8%), offering new insights into the preferences of individuals with invisible disabilities. One participant remarked, "*In my limited experience with avatars, I noticed that the main aspect missing is the inclusion of people with disabilities.*" Additionally, the participant noted, "*The physical types tend to be overly stereotypical.*"

Another participant shared that they created a slimmer avatar due to body-shaming, highlighting the impact of societal pressures and beauty standards on virtual representation choices. As one participant expressed, "*Even though I have a generally standard appearance, I once made a slimmer avatar because I was ashamed to admit I was overweight.*" Overall, participant responses reveal the complexities of virtual representation, highlight the influence of social pressures, context of use, and the importance of simplifying the avatar creation process.

The analysis of representation in virtual environments is discussed by Shaw [2015], who argues that, for marginalized users, identification with avatars involves a negotiation of cultural relevance within dominant digital spaces. Complementarily, Malkowski and Russworm [2017] examines the social construction of race, gender, and sexuality, pointing to the persistence of systemic biases in the design of these environments. These perspectives corroborate the evidence found in this study regarding the influence of identity dimensions on participants' self-representation preferences.

5.1 Summary of Findings

The empirical evidence suggests that while both race/ethnicity and age significantly influence avatar representation preferences, age exerts a more profound and consistent impact on user choices. Specifically, the pronounced discrepancies found in age-based preferences indicate that "one-size-fits-all" avatar systems fail to support the diverse developmental and social needs of users across different life stages, necessitating more inclusive and age-adaptive representational frameworks.

Beyond demographic variables, participants' feedback illuminates the multifaceted nature of digital self-presentation, emphasizing a critical demand for equity, diversity, and accessibility in customization platforms. The analysis identified three dominant inhibitors to authentic representation: persistent social pressures (social masking), the rigid influence of environmental context (formal vs. informal), and the prohibitive complexity of current customization interfaces.

These findings suggest that fostering a true sense of digital identity requires a shift from advanced, yet cumbersome, tools toward intuitive, user-centric customization that proactively mitigates systemic biases [Hube *et al.*, 2024]. Ultimately, the data point toward a design imperative: developers must prioritize features that reduce the "representational friction" experienced by marginalized and neurodiverse groups, ensuring that virtual presence is a vehicle for empowerment rather than a reinforcement of real-world barriers.

5.2 Limitation and threats to the validity

The study's findings provide valuable insights, but it is important to acknowledge its limitations. The scope of this investigation was strictly confined to avatar customization interfaces. Other dimensions of virtual presence, such as non-verbal communication and social proximity, were not explored. Furthermore, the reliance on an online questionnaire, while effective for quantitative breadth, limits the depth of qualitative nuance.

The primary threat to external validity concerns the geographic and demographic concentration of the sample ($n = 133$). The participants are predominantly from the Brazilian Northeast (Bahia and Sergipe) and consist largely of young adults. Consequently, the findings should be interpreted as context-specific insights rather than universal generalizations. The sample size may not fully represent diverse age groups, gender identities, and individuals with disabilities, and expanding the sample would enable a more comprehensive analysis. Qualitative interviews could also offer deeper insights into participants' experiences.

While the sample ($n = 133$) exhibits a concentration of young adults from the Brazilian Northeast (Bahia and Sergipe), it provides a robust foundation for investigating marginalized identities. Departing from the predominant Western-centric samples in digital identity research, 63.2% of our participants self-identified as non-white, offering critical insights into racial representation from the perspective of the Global South. Although recruitment leveraged national academic mailing lists and diverse gaming servers to attenuate geographic bias, the regional concentration persists as a limitation to be addressed in future nationwide cross-sectional studies.

5.3 Ethical Considerations

While Research Ethics Committee (CEP) approval still encounters resistance and epistemological challenges within the Brazilian Computing community [Carvalho *et al.*, 2026], this study strictly adhered to national ethical standards, obtaining prior approval (CAAE: 77995424.6.0000.0348) to safeguard participants when addressing sensitive topics such as race and gender.

The study did not expose participants to exceptionally strong stimuli or involve risks of mental or physical harm, ensuring that all subjects were fully aware of the study's purpose and the guarantees of privacy and confidentiality.

The recruitment process was meticulously designed to address the sensitive nature of topics such as race, gender, and disability. To mitigate potential psychological discomfort, participants were informed via an Informed Consent Form that their participation was entirely voluntary and that they

could withdraw at any time without penalty. Regarding the analysis of sensitive issues, the research team adopted an intersectional perspective to avoid reinforcing stereotypes, treating data on race and gender as structural social variables rather than isolated traits.

To ensure participant comfort, particularly during the discussion of discrimination and prejudice (Q7.7), questions were framed as strictly optional, allowing respondents to skip any topic they found distressing. Furthermore, the survey utilized inclusive terminology and followed accessibility guidelines to prevent re-traumatization and ensure that individuals with disabilities could participate autonomously. All data were anonymized at the source, and no personally identifiable information was collected, adhering to the highest standards of data protection and ethical integrity.

5.4 Implications and Future Works

The findings of this research offer implications for the evolution of digital self-representation and the design of social virtual ecosystems. Platforms can move beyond mere "inclusive presets" toward environments that foster authentic digital belonging. For vulnerable groups, particularly the 24.8% of neurodiverse participants and those with physical disabilities, avatars should not only be customizable but also functionally inclusive, offering assistive devices and features that reflect their lived experiences without imposing social stigma.

Reducing the technical complexity of customization interfaces is essential to lowering the "barrier of entry" for authentic representation, ensuring that advanced identity-building tools provide frictionless agency rather than a laborious setup process.

In light of the findings and limitations discussed, this section delineates several strategic directions for future work that we consider essential:

- **Systemic Environmental Audits:** Conducting comprehensive mappings of current avatar design tools to identify exclusionary defaults and establish a repository of best practices for inclusive representation;
- **Intersectional Experience Studies:** Investigating how overlapping identities (e.g., the intersection of neurodiversity and marginalized ethnic backgrounds) influence user comfort and social masking within high-stakes virtual environments;
- **Participatory Design for Inclusion:** Designing and testing avatar customization options that address a wide range of user needs, including physical, cultural, and identity-based diversity, ensuring more personalized and inclusive representation;
- **Inclusive Design Frameworks:** Developing evidence-based guidelines and strategies for avatar customization that promote inclusivity, accessibility, and equity, fostering more meaningful and representative virtual interactions;
- **Specialized Fieldwork:** To ensure the inclusion of populations with unique accessibility needs, including older adults and neurodivergent groups, we propose a multimodal approach that combines digital outreach with in-person data collection.

These proposed pathways aim to address existing representational gaps and further explore the multifaceted nature of identity within diverse digital ecosystems.

6 Conclusion

Avatars play a significant role in virtual environments by facilitating the digital representation of users. The primary contribution of this study lies in its examination of self-representation through avatars, with a focus on the potential for making these representations more inclusive and representative. Engaging 133 participants through an online questionnaire, the research provides insights into user perceptions and experiences related to avatar customization. The findings indicate variations in avatar preferences based on demographic factors such as race, ethnicity, and age. Specifically, age appears to have a more consistent impact on avatar choices, implying that demographic diversity may warrant further attention in avatar design. Ultimately, these insights serve as a call to action for developers and designers to move beyond superficial inclusion.

Declarations

Acknowledgements

We extend our gratitude to the participants for their valuable time and contributions, which are sincerely appreciated. We would like to thank the members of the Laboratory for Hybrid and Collaborative Interaction (LA-IHC) and the UAware project.

Funding

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001 and the Fundação de Amparo à Pesquisa do Estado da Bahia (FAPESB).

Authors' Contributions

Ailton Ribeiro: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review and editing. **Murilo Guerreiro Arouca**, **Dafne Apolinário de Souza** and **Maria Clara Pestana:** review end editing. **Ana Maria Amorim:** Supervision, Writing – review and editing. **Vaninha Vieira:** Project administration, Supervision – review and editing.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Availability of data and materials

In accordance with Open Science principles, all research data and supplementary materials have been made publicly available to ensure transparency and support future academic reuse[7]. The repository is organized into distinct sections that provide a comprehensive overview of the study's methodology and findings:

- A1. Participant Demographic Dataset: A detailed breakdown of the 133 participants ($n = 133$), covering age groups, gender identity (including cisgender, non-binary, and fluid), race/ethnicity (following IBGE standards), geographic location, and specific conditions such as neurodivergence (ADHD, ASD, Dyslexia) or physical/visual impairments;
- A2. Challenges and Opportunities Analysis: Quantitative mapping of the primary obstacles to representation—such as the

[7] Supplementary Data - (Available URL)

lack of suitable customization tools and unrealistic beauty standards—alongside the perceived benefits of avatar use, including social interaction and creative freedom;
- A3 and A4. Virtual Environments and Platforms Mapping: Comprehensive lists of the digital spaces most frequently used by participants (e.g., traditional social networks, MMORPGs, and educational environments) and specific tools cited for their inclusive or exclusionary features;
- A5. Ethical Considerations Data: Statistical responses regarding Question 7.6, which explored how often participants consider ethical aspects (stereotypes and offensiveness) during the avatar customization process;
- A6. Research Instruments: The full documentation utilized in the study, including the Informed Consent Form and the complete 65-item questionnaire structure used to collect both quantitative and qualitative data.

Further relevant information

Approval by the Ethics Committee: This study was approved by the Research Ethics Committee of the Faculty of Education (CEP / FACED) / Federal University of Bahia (UFBA), with CAAE number 77995424.6.0000.0348, and by the National Research Ethics Committee (CONEP).

Statement on the Use of Generative AI Tools: Generative Artificial Intelligence tools were used to enhance the writing. All AI-generated content was reviewed and validated for accuracy and consistency. All authors read and approved the final version of the manuscript.

Citation Diversity Statement: We are concerned about citation diversity in terms of the representation of women in science and words originating from the Global South and local authors. Therefore, we have also included references with this perspective.

References

Araujo, A., Viegas, R., Salgado, L., Moro, M. M., Holanda, M., and Santana, T. (2025). Women in information technology: Desafios e oportunidades em 18 anos de história. *Computação Brasil*, 53:30–35. DOI: https://doi.org/10.5753/compbr.2025.53.5589.

Bailenson, J. N., Yee, N., Blascovich, J., Beall, A. C., Lundblad, N., and Jin, M. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. *The Journal of the Learning Sciences*, 17(1):102–141. DOI: https://doi.org/10.1080/10508400701793141.

Barino, R., Dornelas, N., Gomes, A., Gonçalves, G., Rodrigues, R., Santos, R., Boeres, C., Calaza, K., Martins, S., Nascimento, A., and Salgado, L. (2024). Sim, nós podemos. ações para empoderamento de meninas e mulheres na computação. In *Anais do XVIII Women in Information Technology*, pages 47–58, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/wit.2024.2361.

Beltran, K., Rowland, C., Hashemi, N., Nguyen, A., Harrison, L., Engle, S. J., and Yuksel, B. F. (2023). Using a virtual workplace environment to reduce implicit gender bias. *International Journal of Human–Computer Interaction*, 39(3):529–545. DOI: https://doi.org/10.1080/10447318.2022.2041902.

Bispo, A., Borges, L., Lima, V., Oliveira, T., Santos, F., and Araújo, V. (2025). Agentes conversacionais baseado em humanos virtuais em contextos universitários. In *Anais Estendidos do XXIV Simpósio Brasileiro de Jogos e Entretenimento Digital*, pages 438–443, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/sbgames_estendido.2025.14709.

Brito, L. S., França, J. B. d. S., and Vivacqua, A. S. (2025). Gênero e raça na computação sob o olhar do ods 18. *Revista Políticas Públicas Cidades*, 14(5):e2120. DOI: https://doi.org/10.23900/2359-1552v14n5-24-2025.

Bui, T. M., Kim, M., Jiang, Q., and Kim, K. H. (2024). The impact of public self-consciousness on purchase intentions: Roles of self-disclosure and avatar identification. *Journal of Global Scholars of Marketing Science*, 35(1):61–75. DOI: https://doi.org/10.1080/21639159.2024.2415624.

Carrasco, R., Baker, S., Waycott, J., and Vetere, F. (2017). Negotiating stereotypes of older adults through avatars. In *Proceedings of the 29th Australian Conference on Computer-Human Interaction*, pages 218–227. DOI: https://doi.org/10.1145/3152771.3152795.

Carvalho, L. P., Oliveira, J., and Santoro, F. M. (2026). Challenges and resistance: Computing and research ethics committees in brazil. In Ardito, C., Diniz Junqueira Barbosa, S., Conte, T., Freire, A., Gasparini, I., Palanque, P., and Prates, R., editors, *Human-Computer Interaction – INTERACT 2025*, pages 183–187, Cham. Springer Nature Switzerland.

Chen, X., Zou, D., Xie, H., and Wang, F. L. (2023). Metaverse in education: Contributors, cooperations, and research themes. *IEEE Transactions on Learning Technologies*, 16(6):1111–1129. DOI: https://doi.org/10.1109/TLT.2023.3277952.

Correia, M. C. (2022). Design de personagem e a representatividade feminina e lgbtqia+ nos desenhos animados: análise dos personagens de she-ra e as princesas do poder. Master's thesis, Universidade Tecnológica Federal do Paraná, Curitiba, PR, Brazil.

de Oliveira, L. C., Amaral, M. A. a., Bim, S. A., Valença, G., Almeida, L. D. A., Salgado, L. C. d. C., Gasparini, I., and da Silva, C. B. R. (2024). Grandihc-br 2025-2035 - gc3: Plurality and decoloniality in hci. In *Proceedings of the XXIII Brazilian Symposium on Human Factors in Computing Systems*, IHC '24, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3702038.3702056.

Drummond, J. J. (2021). Self-identity and personal identity. *Phenomenology and the cognitive sciences*, 20(2):235–247. DOI: https://doi.org/10.1007/s11097-020-09696-w.

Ducheneaut, N., Wen, M.-H., Yee, N., and Wadley, G. (2009). Body and mind: a study of avatar personalization in three virtual worlds. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 1151–1160. DOI: https://doi.org/10.1145/1518701.1518877.

Dwivedi, Y. K., Balakrishnan, J., Mishra, A., Bock, K. W. D., and Al-Busaidi, A. S. (2024). The role of embodiment, experience, and self-image expression in creating continuance intention in the metaverse. *Technological Forecasting and Social Change*, 203:123402. DOI: https://doi.org/10.1016/j.techfore.2024.123402.

Ferguson, H. (2009). The presentation of self in everyday life. In *Social Theory Re-Wired*, page 224. Routledge.

Freeman, G., Zamanifard, S., Maloney, D., and Acena, D. (2022). Disturbing the peace: Experiencing and mitigat-

ing emerging harassment in social virtual reality. *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW1):1–30. DOI: https://doi.org/10.1145/3512932.

Giddens, A. (2023). Modernity and self-identity. In *Social theory re-wired*, pages 477–484. Routledge. DOI: https://doi.org/10.4324/9781003320609-62.

Glass, G. V. (1966). Testing homogeneity of variances. *American Educational Research Journal*, 3(3):187–190. DOI: https://doi.org/10.2307/1161802.

Gualano, R. J., Jiang, L., Zhang, K., Shende, T., Won, A. S., and Azenkot, S. (2024). "i try to represent myself as i am": Self-presentation preferences of people with invisible disabilities through embodied social vr avatars. In *Proceedings of the 26th International ACM SIGACCESS Conference on Computers and Accessibility*, ASSETS '24, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3663548.3675620.

Han, Y. (2024). The gender expression influencing factors: Understanding the gender expression in avatar customization. In *Abstract Proceedings of DiGRA 2024 Conference: Playgrounds*. DOI: https://doi.org/10.26503/dl.v2024i2.2356.

Han, Y. and Ho, X. (2024). "more than just playing a character": Gender exploration and expression in avatar customization. *Games and Culture*, pages 1–23. DOI: https://doi.org/10.1177/15554120241307982.

Hatfield, H. R., Ahn, S. J., Klein, M., and Nowak, K. L. (2022). Confronting whiteness through virtual humans: a review of 20 years of research in prejudice and racial bias using virtual environments. *Journal of Computer-Mediated Communication*, 27(6):zmac016. DOI: https://doi.org/10.1093/jcmc/zmac016.

Hepperle, D., Purps, C. F., Deuchler, J., and Wölfel, M. (2022). Aspects of visual avatar appearance: self-representation, display type, and uncanny valley. *The Visual Computer*, 38(4):1227–1244. DOI: https://doi.org/10.1007/s00371-021-02151-0.

Hourcade, J. P., Braud, T., Zhou, P. Y., Wang, L., Xu, D., Lin, Z., Kumar, A., Bermejo, C., and Hui, P. (2024). All one needs to know about metaverse: A complete survey on technological singularity, virtual ecosystem, and research agenda. *Foundations and Trends in Human-Computer Interaction*, 18(2–3):100–337. DOI: https://doi.org/10.1561/1100000095.

Hube, N., Reinelt, M., Vidackovic, K., and Sedlmair, M. (2024). A study on the influence of situations on personal avatar characteristics. *Visual Computing for Industry, Biomedicine, and Art*, 7(1):23. DOI: https://doi.org/10.1186/s42492-024-00174-7.

Iantorno, M. and Consalvo, M. (2023). Background checks: Disentangling class, race, and gender in crpg character creators. *Games and Culture*, page 15554120221150342. DOI: https://doi.org/10.1177/15554120221150342.

Javier, M., Wheeler, S., Ni, Q., Drivas, M., Wong, K. G., Fitzsimmons, S., Panda, R., Burke, T., Salazar, S., Jiang, J., Miller, L. C., and Jeong, D. C. (2024). The alt-self: Investigating the inclusivity of self-avatar representations in social vr. In *Companion Proceedings of the 2024 Annual Symposium on Computer-Human Interaction in Play*, CHI PLAY Companion '24, page 131–138, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3665463.3678783.

Ki, C.-W. C., Chong, S. M., Aw, E. C.-X., Lam, M. M.-L., and Wong, C. W. (2025). Metaverse consumer behavior: Investigating factors driving consumer participation in the transitory metaverse, avatar personalization, and digital fashion adoption. *Journal of Retailing and Consumer Services*, 82:104094. DOI: https://doi.org/10.1016/j.jretconser.2024.104094.

Kopf, M., Omardeen, R., and Van Landuyt, D. (2023). Representation matters: The case for diversifying sign language avatars. In *2023 IEEE International Conference on Acoustics, Speech, and Signal Processing Workshops (ICASSPW)*, pages 1–5. DOI: https://doi.org/10.1109/ICASSPW59220.2023.10193409.

Kosciesza, A. J. (2025). Doing gender in game spaces: Transgender and non-binary players' gender signaling strategies in online games. *New Media & Society*, 27(1):5–23. DOI: https://doi.org/10.1177/14614448231168107.

Kvale, S. and Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. SAGE.

Leary, M. R. and Tangney, J. P. (2011). *Handbook of self and identity*. Guilford Press, New York, NY, USA.

Lee, H.-W., Chang, K., Uhm, J.-P., and Owiro, E. (2023). How avatar identification affects enjoyment in the metaverse: The roles of avatar customization and social engagement. *Cyberpsychology, Behavior, and Social Networking*, 26(4):255–262. DOI: https://doi.org/10.1089/cyber.2022.0257.

Lee, Y.-H., Xiao, M., and Wells, R. H. (2018). The effects of avatars' age on older adults' self-disclosure and trust. *Cyberpsychology, Behavior, and Social Networking*, 21(3):173–178. DOI: https://doi.org/10.1089/cyber.2017.0451.

Leitão, C. F. and Prates, R. O. (2017). A aplicação de métodos qualitativos em computação. *Jornadas de Atualização em Informática*, 2017:43–90.

Levitt, H. M. (2019). A psychosocial genealogy of lgbtq+ gender: An empirically based theory of gender and gender identity cultures. *Psychology of Women Quarterly*, 43(3):275–297. DOI: https://doi.org/10.1177/0361684319834641.

Lin, H. and Wang, H. (2014). Avatar creation in virtual worlds: Behaviors and motivations. *Computers in Human Behavior*, 34:213–218. DOI: https://doi.org/10.1016/j.chb.2013.10.005.

Lu, X., Shi, Z., Zhang, X., Cao, L., and Liang, S. (2024). Exploring the field of virtual avatar: A bibliometric and content analysis. *International Journal of Human–Computer Interaction*, 41(12):7825–7841. DOI: https://doi.org/10.1080/10447318.2024.2400405.

Maciel, C., Guzman, I. R., Berardi, R. C. G., Rodriguez-Rodriguez, N., Salgado, L., Frigo, L. B., Branisa, B., and Jimenez, E. (2024). An open data platform to advance gender equality in stem in latin america. *Communications of the ACM*, 67(8):90–92. DOI: https://doi.org/10.1145/3653294.

Maciel, C., Guzman, I. R., Ribeiro, K. d. S. F. M., Suni-Lopez, F., Frigo, L. B., Salgado, L., Berardi, R. C. G., Bim, S. A.,

Branisa, B., and Jimenez, E. (2025). Fostering open data on women in stem across latin america: The ellas network. In Dipieri, M. and Whitehead, H., editors, *Dismantling Gender Barriers in STEM: Perspectives from the Global South*, pages 117–130. African Minds / African Books Collective, Cape Town, South Africa.

Mack, K., Hsu, R. C. L., Monroy-Hernández, A., Smith, B. A., and Liu, F. (2023). Towards inclusive avatars: Disability representation in avatar platforms. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, pages 1–13. DOI: https://doi.org/10.1145/3544548.3581481.

Makled, E., Abdelrahman, Y., Mokhtar, N., Schwind, V., Abdennadher, S., and Schmidt, A. (2018). I like to move it: Investigating the effect of head and body movement of avatars in vr on user's perception. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI EA '18, page 1–6, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3170427.3188573.

Malkowski, J. and Russworm, T. M., editors (2017). *Gaming Representation: Race, Gender, and Sexuality in Video Games*. Indiana University Press, Bloomington, IN, USA.

Marinho, I., Ribeiro, A., Vieira, V., Pestana, M., and Amorim, A. (2025). Avatar-mediated interaction and collaboration: Perceptions of individuals with adhd in the metaverse context. In *Anais do XX Simpósio Brasileiro de Sistemas Colaborativos*, pages 290–299, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/sbsc.2025.7023.

Marranita, M. F. P. (2019). Representação de género nos ecrãs digitais computacionais: auto e heteroidentificação na interação com avatares. Master's thesis, Universidade de Lisboa, Lisboa, Portugal.

McArthur, V., Teather, R. J., and Jenson, J. (2015). The avatar affordances framework: mapping affordances and design trends in character creation interfaces. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY)*, pages 231–240. DOI: https://doi.org/10.1145/2793107.2793121.

McKenna, J. L., Wang, Y.-C., Williams, C. R., McGregor, K., and Boskey, E. R. (2024). "you can't be deadnamed in a video game": Transgender and gender diverse adolescents' use of video game avatar creation for gender-affirmation and exploration. *Journal of LGBT Youth*, 21(1):29–49. DOI: https://doi.org/10.1080/19361653.2022.2144583.

Mello, J. C., de Albuquerque Rodrigues, F. P. M., and Silveira, M. S. (2025). Saúde mental na educação física: uma proposta pedagógica para crianças e adolescentes com tdah. *Dialogia*, 1(55):e29681. DOI: https://doi.org/10.5585/55.2025.29681.

Moga, D. A. and Rughiniş, C. (2023). Idealized self-presentation through al avatars. a case study of lensa al. In *2023 24th International Conference on Control Systems and Computer Science (CSCS)*, pages 426–430. DOI: https://doi.org/10.1109/CSCS59211.2023.00073.

Moreira, G. and Cassanego Jr., P. (2025). A violência de gênero e a representatividade de minorias lgbtqia+ nos jogos eletrônicos. *Anthropologica*, 43(54):328–361. DOI: https://doi.org/10.18800/anthropologica.202501.012.

Morris, M. E., Rosner, D. K., Nurius, P. S., and Dolev, H. M. (2023). "i don't want to hide behind an avatar": Self-representation in social vr among women in midlife. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference*, DIS '23, page 537–546, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3563657.3596129.

Nascimento, T., Neves, M., Mendes, H., Assolari, C., Reis, C., Lyra, K., and Reis, R. (2024). Uma história que está só começando: Primeiros passos de uma iniciativa para aumentar a representatividade feminina na computação. In *Anais do XVIII Women in Information Technology*, pages 421–426, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/wit.2024.2634.

Neris, V. P. A., Rosa, J. C. S., Maciel, C., Pereira, V. C., Galvão, V. F., and Arruda, I. L. (2024). Grandihc-br 2025-2035 - gc4: Sociocultural aspects in human-computer interaction. In *Proceedings of the XXIII Brazilian Symposium on Human Factors in Computing Systems*, IHC '24, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3702038.3702057.

Ning, H., Wang, H., Lin, Y., Wang, W., Dhelim, S., Farha, F., Ding, J., and Daneshmand, M. (2023). A survey on the metaverse: The state-of-the-art, technologies, applications, and challenges. *IEEE Internet of Things Journal*, 10(16):14671–14688. DOI: https://doi.org/10.1109/JIOT.2023.3278329.

Oliveira, W., Hamari, J., Ferreira, W., Toda, A. M., Palomino, P. T., Vassileva, J., and Isotani, S. (2022). The effects of gender stereotype-based interfaces on users' flow experience and performance. *Journal of Computers in Education*, pages 1–26. DOI: https://doi.org/10.1007/s40692-022-00249-5.

Oliver, M. (2013). The social model of disability: thirty years on. *Disability & Society*, 28(7):1024–1026. DOI: https://doi.org/10.1080/09687599.2013.818773.

Oyedokun, O., Mubarrat, S. T., Joshi, A., Mousas, C., and Kao, D. (2024). Exploring the influence of avatar skin tone in vr educational games. In *Companion Proceedings of the 2024 Annual Symposium on Computer-Human Interaction in Play*, CHI PLAY Companion '24, page 227–234, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3665463.3678799.

Park, I., Sah, Y. J., Lee, S., and Lee, D. (2023). Avatar-mediated communication in video conferencing: Effect of self-affirmation on debating participation focusing on moderation effect of avatar. *International Journal of Human–Computer Interaction*, 39(3):464–475. DOI: https://doi.org/10.1080/10447318.2022.2041897.

Park, J. and Kim, S. (2022). How do people with physical disabilities want to construct virtual identities with avatars? *Frontiers in Psychology*, 13:994786. DOI: https://doi.org/10.3389/fpsyg.2022.994786.

Ratan, R. and Sah, Y. J. (2015). Leveling up on stereotype threat: The role of avatar customization and avatar embodiment. *Computers in Human Behavior*, 50:367–374. DOI: https://doi.org/10.1016/j.chb.2015.04.010.

Razali, N. M. and Wah, Y. B. (2011). Power comparisons of shapiro–wilk, kolmogorov–smirnov, lilliefors and an-

derson–darling tests. *Journal of Statistical Modeling and Analytics*, 2(1):21–33. Available online via institutional repositories.

Ribeiro, A., Arouca, M., Amorim, A., Pestana, M., and Vieira, V. (2024a). Towards inclusive avatars: A study on self-representation in virtual environments. In *Proceedings of the 19th Brazilian Symposium on Collaborative Systems*, pages 13–27, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/sbsc.2024.238056.

Ribeiro, A., Vieira, V., Alves, L., and Maciel, C. (2024b). Vishnu: An approach to support the personalization of self-expressive avatars using context-awareness. *International Journal of Human-Computer Studies*, 185:103243. DOI: https://doi.org/10.1016/j.ijhcs.2024.103243.

Rodrigues, C. S. C., Nazareth, V., Azevedo, R. O., Barbosa, P., and Werner, C. (2025). Unseen: Advancing digital accessibility with binaural audio technology in an immersive gaming prototype. *Journal on Interactive Systems*, 16(1):98–108. DOI: https://doi.org/10.5753/jis.2025.4439.

Salagean, A., Crellin, E., Parsons, M., Cosker, D., and Stanton Fraser, D. (2023). Meeting your virtual twin: Effects of photorealism and personalization on embodiment, self-identification and perception of self-avatars in virtual reality. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, pages 1–16. DOI: https://doi.org/10.1145/3544548.3581182.

Santos, A. C. R. d., Vignoli, R. G., and Ferneda, E. (2025). Building digital identities: ontology development for avatars in the metaverse. *Encontros Bibli*, 30:e98985. DOI: https://doi.org/10.5007/1518-2924.2025.e98985.

Santos, N. S., de Souza, L. A. S., da Silva Filho, A. G., Coelho, P. H. d. S., Ferreira, M. C. d. A., Pereira, C. M., Lages, B. d. S., Cordeiro, R. A. A., Bernardino, E. L. A., Marcolino, M. S., Nepomuceno, R. C. S., da Silva, M. M., Gomes, T. L., do Nascimento, E. R., Macharet, D. G., Prates, R. O., and Campos, M. F. M. (2026). Captar-libras: A bidirectional translator with a photorealistic avatar for medical pre-consultation of deaf patients. In Ardito, C., Diniz Junqueira Barbosa, S., Conte, T., Freire, A., Gasparini, I., Palanque, P., and Prates, R., editors, *Human-Computer Interaction – INTERACT 2025*, pages 117–121, Cham. Springer Nature Switzerland.

Shaw, A. (2015). *Gaming at the Edge: Sexuality and Gender at the Margins of Gamer Culture*. University of Minnesota Press.

Shook, S. (2025). 7 bisexual representation in games: Erasure, stereotypes, and independent game development. In Wysocki, M. and Shook, S., editors, *The Bloomsbury Handbook of Sex and Sexuality in Game Studies*, pages 89–105. Bloomsbury Publishing, London, UK.

Silva, I., Lyra, L., and Barbosa, H. (2023). Contra-hegemonia lgbtqia+ nos jogos digitais. In *Anais Estendidos do XXII Simpósio Brasileiro de Jogos e Entretenimento Digital*, pages 412–424, Porto Alegre, RS, Brasil. SBC. DOI: https://doi.org/10.5753/sbgames_estendido.2023.234164.

Singh, N. K., Ray, R. K., Silayach, N., Dash, D. P., and Singh, A. (2025). Avatars at risk: Exploring public response to sexual violence in immersive digital spaces. *Computers in Human Behavior*, 163:108500. DOI: https://doi.org/10.1016/j.chb.2024.108500.

Smith, X. (2024). *An Exploratory Model of Avatar Creation and Identification for Transgender, Nonbinary, and Gender Diverse Video Game Players*. PhD thesis, Indiana University, Bloomington, IN, USA.

Ståhle, L. and Wold, S. (1989). Analysis of variance (anova). *Chemometrics and Intelligent Laboratory Systems*, 6(4):259–272. DOI: https://doi.org/10.1016/0169-7439(89)80095-4.

Sung, Y., Moon, J., mihyun Kang, and Lin, J.-S. (2011). Actual self vs. avatar self: The effect of online social situation on self-expression. *Journal of Virtual Worlds Research*, 4(1).

Szolin, K., Kuss, D. J., Nuyens, F. M., and Griffiths, M. D. (2023a). Exploring the user-avatar relationship in videogames: A systematic review of the proteus effect. *Human–Computer Interaction*, 38(5-6):374–399. DOI: https://doi.org/10.1080/07370024.2022.2103419.

Szolin, K., Kuss, D. J., Nuyens, F. M., and Griffiths, M. D. (2023b). "i am the character, the character is me": A thematic analysis of the user-avatar relationship in videogames. *Computers in Human Behavior*, 143:107694. DOI: https://doi.org/10.1016/j.chb.2023.107694.

Takano, M. and Taka, F. (2022). Fancy avatar identification and behaviors in the virtual world: Preceding avatar customization and succeeding communication. *Computers in Human Behavior Reports*, 6:100176. DOI: https://doi.org/10.1016/j.chbr.2022.100176.

Vila, A., Ardoy-Cuadros, J., Romero-Moreno, R., Nogales-Gonzalez, C., Ritchey, A. J., Sansoni, M., and Riva, G. (2024). Body, emotions, and sexuality in the metaverse: A randomized control trial exploring the use of second life for an avatar-based intervention to support women with female orgasmic disorder. *Computers in Human Behavior*, 161:108390. DOI: https://doi.org/10.1016/j.chb.2024.108390.

Visseren-Hamakers, I. J. (2020). The 18th sustainable development goal. *Earth System Governance*, 3:100047. DOI: https://doi.org/10.1016/j.esg.2020.100047.

Wan, Q. and Lu, Z. (2024). Investigating vtubing as a reconstruction of streamer self-presentation: Identity, performance, and gender. *Proc. ACM Hum.-Comput. Interact.*, 8(CSCW1). DOI: https://doi.org/10.1145/3637357.

Whitehouse, K., Hitchens, M., and Matthews, N. (2023). Trans* and gender diverse players: avatars and gender-alignment. *Entertainment Computing*, 47:1–12. DOI: https://doi.org/10.1016/j.entcom.2023.100584.

Wolfendale, J. (2007). My avatar, my self: Virtual harm and attachment. *Ethics and Information Technology*, 9(2):111–119. DOI: https://doi.org/10.1007/s10676-006-9125-z.

Wu, S., Xu, L., Dai, Z., and Pan, Y. (2023). Factors affecting avatar customization behavior in virtual environments. *Electronics*, 12(10):2286. DOI: https://doi.org/10.3390/electronics12102286.

Ye, J., Chen, C., Huang, Y., Ye, Y., Li, T. J.-J., and Zhang, X. (2026). My favorite streamer is an llm: Discovering, bonding, and co-creating in ai vtuber fandom. In *Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems*, CHI '26, New York,

NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3772318.3790891.

Yee, N. and Bailenson, J. (2007). The proteus effect: The effect of transformed self-representation on behavior. *Human Communication Research*, 33(3):271–290. DOI: https://doi.org/10.1111/j.1468-2958.2007.00299.x.

Zent, M. (2023). Anonymous online support: Investigations of identity and heterogeneous groups in online recovery support. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems*, CHI EA '23, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3544549.3583947.

Zhang, K., Deldari, E., Lu, Z., Yao, Y., and Zhao, Y. (2022). "it's just part of me:" understanding avatar diversity and self-presentation of people with disabilities in social virtual reality. In *Proceedings of the 24th International ACM SIGACCESS Conference on Computers and Accessibility*, ASSETS '22, New York, NY, USA. Association for Computing Machinery. DOI: https://doi.org/10.1145/3517428.3544829.

Zhang, K., Deldari, E., Yao, Y., and Zhao, Y. (2023). A diary study in social virtual reality: Impact of avatars with disability signifiers on the social experiences of people with disabilities. In *Proceedings of the 25th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '23)*, pages 1–17. DOI: https://doi.org/10.1145/3597638.3608388.

Zimmermann, D., Wehler, A., and Kaspar, K. (2023). Self-representation through avatars in digital environments. *Current Psychology*, 42(25):21775–21789. DOI: https://doi.org/10.1007/s12144-022-03232-6.