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Journal of Research in Gender Studies

Volume 14(2) • 2024

The Institute of Smart Big Data Analytics • New York

Journal of Research in Gender Studies

VOLUME 14(2) • 2024

ADDLETON ACADEMIC PUBLISHERS • NEW YORK

Journal of Research in Gender Studies
An international peer-reviewed academic journal
Volume 14 / Number 2 / 2024
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Journal of Research in Gender Studies is published twice a year (July and December) by Addleton Academic Publishers, 30-18 50th Street, Woodside, New York, 11377. All papers in this journal have undergone editorial screening and anonymous double-blind peer-review. ISSN 2164-0262, eISSN 2378-3524.

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Addleton Academic Publishers

Journal of Research in Gender Studies 14(2), 2024
pp. 9–37, ISSN 2164-0262, eISSN 2378-3524

Ahead or within a Gendered and Sexist Curve: A Critical Content Analysis of *Barbie* (2023)

Ziwei Qi* and April N. Terry*

ABSTRACT. The current research offers a critical discourse on the Barbie phenomenon, as seen in *Barbie* (2003), through the lens of feminist scholarship. Using Mattel's Barbie brand, *Barbie* (2023) was marketed as a film for exploring complex issues, including gendered and sexist forms of oppression. Reviews of the film are both overly glowing (e.g., promoting values of societal cohesion) and critical (e.g., further perpetuating marginalization of oppressed groups). Therefore, a critical content analysis of *Barbie* (2023) was conducted by examining its transcripts, cinematic content, and related lyrics. Through open coding, we explored themes to determine if and where *Barbie* (2023) held true to their marketed ideals, or if *Barbie* (2023) has further contributed to a social climate supportive of oppressive affairs. Three themes were uncovered, including patriarchy, hegemonic masculinity, and postfeminism (as well as three sub-themes) – with mixed findings regarding the intended messages *Barbie* aimed to convey. While acknowledging the positive momentum generated by the marketing of *Barbie* (2023), one should also recognize that words have impact, and *Barbie* (2023) may have spread anti-equitable messages to viewers as well.

Keywords: patriarchy; hegemonic masculinity; gender norms; postfeminist; intersectionality; film

How to cite: Qi, Z., and Terry, A. N. (2024). "Ahead or within a Gendered and Sexist Curve: A Critical Content Analysis of *Barbie* (2023)," *Journal of Research in Gender Studies* 14(2): 9–37. doi: 10.22381/JRGS14220241.

Received 4 October 2024 • Received in revised form 7 November 2024
Accepted 9 November 2024 • Available online 25 November 2024

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Introduction

"Pretty, intelligent, never sad, kool" – these lyrics support a common theme throughout the first half of *Barbie* (2023) (Lizzo, 2023). Warner Bros. spent a whopping $150 million to promote this brand of Barbie through an extensive marketing campaign – highlighting the historical themes of beauty coupled with brains. Brands and collaborators included Airbnb (rent the *Barbie Dreamhouse*), Gap, Inc., and Ulta, as well as promotions on channels such as HGTV (*Barbie Dreamhouse Challenge*) (Rubin, 2023). Prior to the release, pink billboards could be seen worldwide (*BBC News*, 2023), and with popular music sensations such as Nicki Minaj, Ice Spice, and Dua Lipa adding to the *Barbie* soundtrack, people were talking about the release. Yet, in the second half of the film, the narrative shifts away from women's empowerment by highlighting the downsides of a patriarchal real-world society, while attempting to challenge social norms surrounding Barbie (e.g., promote gender equality) (Lannamann, 2023; Peters, 2023). Following the film's release in July of 2023, reviews were divided. Burstein (2023), with the *Los Angeles Times*, said *Barbie* was one of the best films of the year, and "…an extraordinarily entertaining product that promotes the value of searching for a more cohesive society." Others disagreed that *Barbie* (2023) promoted a holistic view of gender and sex-based equality, or a more "cohesive society." Long (2023), with the *The Times*, gave the movie two out of five stars, entitling the article, "*Barbie is a hot pink, sexist mess of a film.*" She further describes the theme of the film as, "…men are stupid, go to the gym, run everything and don't care about women, while women are sensible, striving but ultimately conflicted victims. In trying to be comically ahead of the sexism curve, it's ended up feeling sexist itself" (Long, 2023). The remainder of this paper will highlight the historical image of the Barbie brand, and through use of a content analysis of *Barbie* (2023), highlight the film's overall themes – noting alignment to women's empowerment as well as statements and actions counterintuitive to an equitable narrative.

History of Barbie

Barbie, the iconic Mattel doll, has undergone significant transformations aligning with postfeminist ideals (Vered & Maizonniaux, 2017) since her introduction in 1959. These changes include diverse careers, body image improvements, representation of diverse identities, and a message of girl empowerment (Negra et al., 2007). While some celebrate these shifts as progress toward gender equality and diversity, critics argue they also reflect the doll's close connection to neoliberal capitalism, and more specifically, consumer culture, and the conflicting ideals of empowerment through consumer choices and media representation (Roberts, 2020). As a result,

Barbie's evolving role within the context of feminism and postfeminism sparks ongoing debate and analysis, with varying perspectives on her impact and significance. For instance, in 2021, Mattel launched the "You Can Be Anything" campaign to inspire girls to pursue their ambitions. The campaign used the color pink to signify femininity and empowerment, and it argued this advertising trend leveraged new empowerment movements and the online feminist space to reshape consumer behavior (Mishra & Bakry, 2021). However, by analyzing the campaign's message of women/girls' empowerment, researchers found it presented an ambiguous interpretation of empowerment. In this context, Barbie still adhered to gender stereotypes by emphasizing beauty first and success second, suggesting that women can only be truly successful if they meet traditional beauty standards (Rahmat & Tambunan, 2020).

Others argue that while there have been efforts to diversify the doll's appearance, the core image of Barbie still upholds certain beauty ideals that can be exclusionary (Worobey & Worobey, 2014). Both Barbie and Ken's body shapes have been criticized for their unrealistic proportions, especially since Barbie's proportions are more disproportionate than Ken's (Hains, 2021). Additionally, Barbies-of-color retail for a lower price and have less shelf appearance than stereotypical white Barbies. These issues, and others, highlight the ongoing debate regarding the influence of the Barbie brand on societal notions of beauty and associated gender norms. Overall, while the Barbie doll has become more inclusive, the changes appear incremental rather than radical (Driessen, 2016).

Barbie (2023)

Barbie (2023) is a live-action film directed and written by Greta Gerwig. According to Warner Bros., "To live in Barbie Land is to be a perfect being in a perfect place. Unless you have a full-on existential crisis. Or you're a Ken." The plot follows the main character, the Stereotypical Barbie, played by Margot Robbie. All Barbies reside in Barbie Land, a matriarchal society also inhabited by the Kens and discontinued Barbies (e.g., Pregnant Midge and Growing Up Skipper – breast developing doll). Kens are known for their job as "beach" while the Barbies hold prestigious positions (e.g., politics). Stereotypical Ken, or Beach Ken, played by Ryan Gosling, is only happy when he is with Barbie. Yet, Barbie portrays no romantic interest in Ken.

While the storyline initially seems one of happiness for all, during a dance party scene, Barbie is stricken with worries about her death. Her stereotypical "perfect" image is altered overnight, as she awakes with bad breath, cellulite, and flat feet. She is also unable to perform her usual morning routine (e.g., experiencing a cold shower and falling off her roof). Barbie receives advice from Weird Barbie, played by Kate McKinnon,

advising her that she must go into the Real World to see what issues have occurred with her Barbie handler (Gloria).[1] Barbie is told if she fails to fix the issue, she will remain in her current physical state – one that no stereotypical Barbie could accept. After sneaking into Barbie's car, Ken is allowed to enter the Real World alongside Barbie on her quest to speak with her human handler.

Once in the Real World, Barbie and Ken have different experiences and gain insights into the differences in Barbie Land and the Real World. Barbie realizes she has encouraged unrealistic beauty standards, perhaps causing the reproduction of identity issues for girls and women, while Ken learns about patriarchy and feels respected for the first time. Ken returns to Barbie Land with his knowledge of patriarchy and persuades the other Kens to take over Barbie Land. While Stereotypical Barbie remains in the real-world, the Barbies in Barbie Land are indoctrinated to take on submissive roles (e.g., overly agreeable girlfriends and maids). Barbie returns with her Barbie handler, Gloria, and her daughter, Sasha. They, along with Allan (another discontinued doll), help the Barbies regain their senses and power. The Barbies then regain their positions and identities, as do the Kens. Stereotypical Barbie encourages Beach Ken to find purpose without her and Stereotypical Barbie decides to seek purpose and identity, indefinitely, in the Real World.

The film blends humor and satire with incisive social commentary, demonstrating ideas of feminism and gender equality, and critiquing traditional gender roles and stereotypes. It also shows Barbie's journey of self-discovery and empowerment, the value of community and support, the critique of consumerism, and the complexity of identity. By drawing parallels between the movie's portrayal (of Barbie Land) and the Real World (Los Angeles, CA, USA), audiences are prompted to examine gender norms and expectations.

The latest scholarship on *Barbie* (2023) offers a rich tapestry of perspectives, each adding layers to the film's exploration of feminism, gender norms, and cultural critique. Do (2024) introduced the concept of "melancholy feminism" (p. 5) in the discussion, critiquing how *Barbie* reinforces Western-centric empowerment narratives that, while impactful, can inadvertently marginalize or overlook non-Western perspectives. Gillis and Pellegrini (2024) positioned *Barbie* within "marketplace feminism" (p. 2). They provided commentary on the film's extensive marketing campaign and noted how feminist ideals are packaged, branded, and commodified to appeal to mainstream audiences. Additionally, Byrnes (2024) examined how the film's aesthetic contrasts between the utopian *Barbie Land* and the complex *Real World* emphasized unresolved tensions around gender norms, leaving viewers with a blend of empowerment and critique.

Handyside (2024) positioned the film within a feminist theological framework, interpreting it as a reimagined creation myth that inverts traditional

narratives. She suggested that *Barbie* engages with themes of female self-creation, spirituality, and the divine feminine, contributing a unique philosophical dimension to the film's feminist commentary. Balsam (2024) added a critical perspective – *Barbie* burdens its protagonist with societal expectations to confront the demands of "real" womanhood, subtly challenging the idealized femininity that Barbie has historically embodied. Yakali (2024a) shifted focus to Ken, analyzing his character as a vehicle for deconstructing hegemonic masculinity. Through Ken's journey, Yakali (2024b) argued that *Barbie* satirizes traditional male ideals within a postfeminist framework, offering a critique of hypermasculinity and the "gender wars." Finally, Bradbury-Rance (2024) proposed a hypothetical "Butch Barbie," speculating on the potential of a character who would disrupt heteronormative femininity within Barbie Land. This "Butch Barbie" imagines a space for queer and non-traditional femininities, challenging the inclusivity of the film's feminist ideals and the limits of its representation.

Our study critically examined *Barbie* (2023) through the lenses of patriarchy, hegemonic masculinity, and commodified feminism, arguing that the film, despite its feminist intentions, inadvertently reinforces conventional beauty ideals and Western-centric portrayals of empowerment. Our research added a nuanced critique to the discourse, positioning *Barbie* (2023) as a cultural artifact that simultaneously critiques and upholds gender stereotypes.

Gender Norms and Expectations

"Make me walk, make me talk, do whatever you please, I can act like a star, I can beg on my knees. Come jump in, bimbo friend, let us do it again. Hit the town, fool around, let's go party" (Rasted et al., 1997). This excerpt from a popular pop music song includes sexualized lyrics and references to Barbie always belonging to Ken. The notion of Stereotypical Barbie is that one must adhere to mainstream gender norms, norms that encourage glamour, beauty, and sexual submission to men. Since West and Zimmerman's (1987) pivotal work on "doing gender," an agency-oriented approach that was introduced thirty years ago, scholars have attempted to explain the process of gendered social interactions. Barbie's perpetuation of narrow beauty standards is closely linked to the broader framework of gender norms and patriarchal ideologies. Barbie's depiction as the epitome of beauty not only mirrors but also perpetuates these standards, and a Western-centric concept of beauty that conforms to narratives rooted in patriarchy. Thus, Barbie's role in shaping beauty standards within the context of patriarchal norms emphasizes the complex nexus among gendered expectations, societal power dynamics, and the commodification of women's bodies.

The social construction of gender directly gives rise to gender norms and expectations and is a fundamental departure from the conventional belief

that gender is exclusively an outcome of biological or genetic factors (Andermann, 2010). Instead, it posits that gender predominantly arises from the influences of society, culture, and established social norms (Osmond & Thorne, 1993). This perspective emphasizes that definitions of "masculinity" and "femininity" are not universal but contingent upon specific cultural and temporal contexts (Cornwall & Lindisfarne, 1994). Across diverse societies worldwide, individuals are ascribed specific roles, behaviors, and expectations based on their perceived gender. These roles encompass various facets, including attire, conduct, occupation, and cognitive processes (Huffman et al., 2014). For instance, in many societies, men are expected to exhibit traits such as strength and assertiveness while women are often expected to embody qualities like nurturance, emotional expressiveness, and caregiving.

The social construction of gender can also be understood through the lens of socialization theories. From an early age, individuals undergo a process of socialization that introduces them to societal gender roles and expectations. This process occurs through various channels, including family, education, media, and peer interactions (Arnett, 1995). As a result, socialization perpetuates and reinforces established norms and expectations concerning gender. This concept profoundly influences the lives of individuals, encompassing aspects such as self-identity, self-esteem, and access to opportunities within society (Simpson & Elis, 1995). Furthermore, the social construction of gender is the recognition that gender norms and expectations are not static but can evolve over time (Lorber, 2018). As societies undergo transformation and cultural paradigms shift, perceptions of what it means to be a man, woman, or gender-fluid individual can undergo significant changes (Diamond, 2020), which is often observable in ongoing dialogues about gender roles, the increasing recognition of non-binary and transgender identities, and evolving societal attitudes (Bockting & Coleman, 2016).

Patriarchy

Patriarchy is a multifaceted system perpetuating gender-based inequalities and male dominance over women (Akgul, 2017). It encompasses social, political, and economic structures and practices that systematically oppress and exploit women as a group, though not all men and women are affected similarly (Strid & Hearn, 2022). There are various forms and historical manifestations of patriarchy across different societies and cultures, with specific attention to how it interacts with culture, violence, and masculinity (Wood & Eagly, 2002). Scholars have explored the intersections of patriarchy with other systems, including capitalism, neoliberalism, globalization, postcolonialism, imperialism, and racism (Phipps, 2019). This has led to the recognition of multiple simultaneous patriarchies, each with its own power dynamics and actors. Patriarchy is a structural and ideological phenomenon,

shaping social institutions and relationships while rationalizing and justifying gender-based hierarchies (Crenshaw, 1989). Violence is a tool used within this system to control and subordinate women, often with the sanction of societal norms and even legal systems (Namy et al., 2017).

Hegemonic Masculinity

Hegemonic masculinity constitutes a foundational concept within the discipline of gender studies, which denotes a specific culturally ingrained and idealized manifestation of masculinity prevailing within a particular society or cultural milieu (Jewkes et al., 2015). This construct epitomizes the standardized manner of embodying masculinity within a defined social framework (Yang, 2020). It is essential to emphasize that hegemonic masculinity primarily revolves around the aspired and socially endorsed attributes and characteristics associated with the male gender (Lusher & Robins, 2009). The study of hegemonic masculinity surfaced several decades ago but has continued to influence how we think about men, gender, and social hierarchies of power.

Earlier understandings of the concept included awareness of patterns of practice that allowed men to dominate women and for this domination to thrive (Connell & Messerschmidt, 2005). The defining traits frequently ascribed to hegemonic masculinity include dominance, physical prowess, emotional restraint, assertiveness, and adherence to heterosexual norms (Vigil, 2009). Notably, these characteristics may undergo variations contingent upon the specific cultural and historical contexts in which they are situated (Spector-Mersel, 2006). Therefore, what qualifies as hegemonic masculinity within one societal context may diverge markedly from another. As Connell and Messerschmidt (2005) note, what remained at the center, was a man's desire to be among this elite group, "It embodied the currently most honored way of being a man, it required all other men to position themselves in relation to it, and it ideologically legitimated the global subordination of women to men" (832). At times, this may include the active and passive reproduction of violence against women.

Most importantly, the notion of hegemonic masculinity does not assert that all men universally conform to this prescriptive ideal, nor does it assert its inherent desirability or intrinsic positivity (Christensen & Jensen, 2014). Instead, it reinforces the influential and authoritative role of this specific form of masculinity in shaping prevailing gender norms and hierarchies within a given society. Thus, within the landscape of masculinity studies, it coexists with other forms of masculinity referred to as subordinate masculinities, which may deviate from or challenge the dominant ideal (Brescoll et al., 2012).

Postfeminism

Before delving into the assertion that the postfeminism era entered the U.S. around 1990, it is essential to acknowledge the paradox of postfeminism. Postfeminism is depicted as a "historical shift" and "backlashes" (Gill, 2016) that undermines the progress achieved by feminism during the 1970s and 1980s, with contemporary popular culture subtly eroding feminist principles while ostensibly endorsing them. Moreover, the portrayal of concepts such as freedom and choice as intrinsic to young women contributes to sidelining feminism, relegating it to a less significant position and rendering it seemingly obsolete (McRobbie, 2004). It critiques the second-wave feminist movements of the 1960s and 1970s, often seen as a reaction against what some perceive as liberal feminism (Coppock et al., 2014). Postfeminism emphasizes individualism and personal choice, arguing that women now have the freedom to make diverse life choices (Lazar, 2011). It is closely tied to media and popular culture, portraying women as empowered and self-assured individuals navigating life without necessarily challenging existing power structures (Lewis, 2014), though critics argue these portrayals may reinforce traditional gender roles (Gill, 2016). There are also concerns that postfeminism is linked to consumerism and the commodification of feminism, simplifying complex feminist ideas for mass consumption. Some scholars argue that it overlooks intersectionality and promotes a limited perspective on gender, race, class, and power structures (Shifman & Lemish, 2011). Postfeminism raises questions about its approach to challenging traditional gender roles, promoting empowerment, and expanding women's identities. While it advocates for transitioning from objectification to subjectivity, it prompts inquiry into whether its methods effectively address the complexities of gender dynamics or inadvertently perpetuate them (Gill, 2007). Additionally, its portrayal as a reformation of feminism sparks debate about the extent to which it aligns with or diverges from feminist principles. Similarly, its characterization as a backlash or a neoliberal interpretation invites scrutiny of its potential implications for broader societal structures and power dynamics (McRobbie, 2004).

Intersectionality

Most gender scholars agree that gender alone cannot fully explain forms of oppression. Rather, *systems* of power result in certain social beliefs, situations, discourses, and forms of oppression (Anderson & Collins, 2007; Crenshaw, 1989); this body of scholarship refers to the intersectionality of such differences. Intersectional research examines many layers of identity and gender diversity, and how certain intertwining forms of identity mold experience. Typically, layers of difference include gender, race/ethnicity, sexual orien-

tation, gender identity, age, ableness, and class. Intersectionality, introduced by Crenshaw (1989; 1991), is a framework that examines how overlapping social identities such as race, gender, and class interact to create distinct experiences of discrimination and marginalization. Crenshaw argued that single-axis approaches in legal and social justice frameworks fail to capture the compounded nature of oppression faced by individuals at these intersections, especially women of color, thereby proposing an approach that addresses structural, political, and representational dimensions of inequality. Building on this foundation, Lowery (2017) categorized intersectionality into personal, cultural, and institutional levels and recommended enhancing its application across diverse contexts and emphasizing the need for comprehensive analyses that address both individual and systemic dimensions of inequality. Together, these works emphasize intersectionality as a critical tool for understanding the complexities of social marginalization within broader societal structures and identities. Points of difference are not merely additive but complex, intertwining, and dependent on other situational factors. Various formations of identity then affect how girls experience their social contexts and, ultimately, how they respond.

Barbie (2023) has sparked much attention in the Western world, including conversations surrounding complex issues such as gender norms and expectations, patriarchy, and feminism. Supporters highlight the intentional efforts to call out entrenched standards allowing patriarchy to thrive while encouraging resistance to such power structures. However, critics note recurring themes of beauty standards, lack of representation for diversity, and continued sponsorship of Western-centric ideals supportive of patriarchy. As such, the current study was conducted with the guiding question of:

Does *Barbie* (2023) depict examples of its marketed campaign to challenge norms (Peters, 2023) and build community (Badich, 2023) or is there more evidence supportive of perpetuating sexism (Long, 2023) and unequitable relations (Link & Parahoo, 2023)?

Current Study

The current study engaged in a content analysis to examine the *Barbie* (Gerwig, 2023) narrative, visual scenes, and select soundtrack songs, to uncover themes in response to mixed reviews of the film's marketed intent (e.g., expose issues of equity and inclusion) with that of critics' reviews (e.g., further promoted gender divide and inequality). We sought to analyze how the film portrayed and challenged traditional gender roles, evaluating the presence of patriarchy and power dynamics within the narrative. This study sets itself apart by providing a thorough content analysis that goes beyond just textual content, incorporating visual elements and cinematic sequences from *Barbie* (2023). Additionally, we take a reflexive approach to add depth

and transparency, acknowledging our positionalities and biases, which enhances the credibility and rigor of the analysis.

Methodology

The researchers performed a comprehensive content analysis of *Barbie* (2023) by reviewing three main elements associated with *Barbie* (2023). First, we reviewed the *Barbie* (2023) transcript; second, we utilized the film's visual imagery to enhance the depth and breadth of the content analysis; and third, we coded the lyrics for three songs from *Barbie* (2023): 1) *I'm just Ken* (Gosling, 2023); 2) *What was I made for?* (Eilish, 2023); and 3) *Barbie World* (Ice Spice et al., 2023). To ensure interrater reliability, two researchers independently coded the transcript, the film's scenes, and the three songs from the film. A comparison of themes unveiled three commonalities: patriarchy (sub-themes of gender norms and beauty standards), hegemonic masculinity (sub-theme of violence against women), and post-feminism.

Data Management and Analysis

When engaging in qualitative open-coding, options include looking for exact language within the data set, interpretation of meaning, and utilizing the reflexive approach (Welsh, 2002). Such strategies follow Laudel and Gläser's (2013) suggestion of linking empirical information to categories. Mason (1996) recommends indexing themes and content, followed by extraction. In the current study, the researchers engaged in a combination of all of these approaches – exact language (e.g., patriarchy), interpretation of meaning (e.g., Black Barbie for President), and reflexivity (e.g., the influence of one researcher being an avid lifelong Barbie collector).

As noted above, three themes were identified, including patriarchy, hegemonic masculinity, and postfeminism. The three themes were further broken down into a total of three sub-themes, including gendered norms (patriarchy theme) and beauty standards (patriarchy theme), and violence against women (hegemonic masculinity theme), yielding a total of 170 coded quotes and comments. The findings section captures only some of the identified quotes aligned with each theme while many additional references can be heard.

Findings

Patriarchy

"*Everything exists to expand and elevate the presence of men*" (Gerwig, 2023, 00:59:00). As this quote indicates, *Barbie* (2023) utilizes Ken's character (among others) to demonstrate patriarchal power structures. When Ken enters the Real World, he is confronted with his own confusion regarding gendered power structures, as Barbie Land is a microcosm depicting women in power. Ken and Barbie then explore the new world, and Ken uncovers a power structure where men dominate all institutions. He later rejoins Barbie to share what he learned – "*Men rule the world!!!!*" (Gerwig, 2023, 00:34:00). Ken had this revelation after viewing masculine behaviors such as men working out, fist bumping, retrieving beers from a mini fridge, riding horses, being on the phone wearing a formal suit, as well as depictions of men at war. Ken also learns that men dominate the currency and only the faces of men exist on national monuments such as Mount Rushmore. After exploring patriarchy, Ken is asked by a stranger to share the current time. Ken replies with, "*You respect me?!*" (Gerwig, 2023, 00:42:04), as he grapples with comprehending the patriarchal power structures in their society – a form of power never given to the Kens in Barbie Land. As film reviewers have noted, such scenes embed humor alongside attention seeking for real issues surrounding patriarchy.

Almost immediately upon learning about patriarchy, Ken is observed using his status as a man to obtain what he wants, including demanding a high-paying job although he did not have the stated qualifications. This scene brings to light the issue of entitlement in a patriarchal society. Ken says to the employer that he thought being a man was enough and that, "*You guys are clearly not doing patriarchy very well.*" The man laughs loudly, looks around, and says, "*No, uh, we're doing it well. We just hide it better now*" (Gerwig, 2023, 00:42:28), implying the Real World operates under the authority of patriarchal norms. Ken is then seen speaking with a woman in the medical field, who, due to his perceptions of patriarchy, refuses to believe is a doctor. Upon seeing a man, he yells, "*There's a doctor!*" (Gerwig, 2023, 00:42:40). In both examples, the film demonstrates the covert examples of patriarchy – those embedded into the everyday attitudes and values of the power given primarily to men when to achieve social status.

Throughout *Barbie* (2023), there are references to patriarchal dynamics in business settings. For instance, Barbie's entrance into Mattel reveals a power dynamic where "important" businessmen stand while other men with less power remain seated, indicating hierarchical structures (Gerwig, 2023, 00:45:26). The CEO of Mattel, another man in a business suit, discusses the role of women in their organization, shedding light on the gendered nature of their corporate culture. When Barbie asks about the role of women at Mattel,

the only man who remained seated stated, "*I'm a man with no power, does that make me a woman?*" (Gerwig, 2023, 00:46:30). This scene begins to highlight the role of intersectionality, and not just gendered power struggles. The man who remained seated was previously seen working in a small cubicle answering phones – he was even denied permission to speak with the powerful men of Mattel. Although he was allowed to remain in the room, he is seen seated while all other men are standing.

Gender Norms

As previously discussed, when Barbie visits Mattel's headquarters she learns of men fulfilling all corporate roles. While the CEO addresses the company's past inclusion of women in leadership roles (e.g., "*We had a woman CEO in the 90s.*"), he makes many defensive responses highlight the stark under-representation of women in leadership positions. He asserts a message that "men love women," but also incorporates a touch of hostility with a demeaning tone: "*Get in the box, you Jezebel*" (Gerwig, 2023, 00:47:00). This statement may suggest that challenging traditional gender norms is met with resistance or demonstrate the use of terms that further oppress and harm women-of-color.[2] The CEO also uses this time to randomly mention gender-neutral bathrooms, to downplay any gender-related issues or concerns hinted to by Barbie. Additionally, the reference to "*Jezebel*" and "*Can't I say 'Jezebel' anymore?*" suggests a reluctance to adapt to changing norms and language, yet little attention is given to the significance of this choice word. The CEO also discussed personal experiences and perceptions of gender roles such as being the "*son of a mother*" and the "*mother of a son*" (Gerwig, 2023, 00:47:00), highlighting familial connections and the idea that everyone is somehow connected to women. However, this can be seen as a somewhat reductionist view of gender roles. This scene is commendable in noting both gender and racial/ethnic forms of oppression, but we must question whether viewers know the rooted historical meaning of words such as Jezebel.

The character of Allan is an intriguing contrast to the more traditional portrayals of Kens and Barbies. The dialogue, "*Hello, Allan! There are no multiples of Allan, he's just Allan.*" Allan, "*Yes... This confuses me*," (Gerwig, 2023, 00:08:40) highlights the idea that the character Allan is unique and does not conform to the typical patterns or stereotypes associated with the stereotypical Kens, and especially not Beach Ken. This statement emphasizes that Allan's less stereotypical Ken characteristics may be perplexing or challenging for others to comprehend. Allan's isolation from both Barbies and Kens can be seen as a reflection of how society often reinforces gender norms, dominance, and popularity and marginalizes those who do not confirm. When Gloria and Sasha enter Weird Barbie's house, Weird Barbie notes that humans, not the Kens, have entered. Allan chimes in, "*And Allan*" (Gerwig, 2023, 01:12:06). In another scene, Barbie President says, "*I don't*

think that things should go back to the way that they were. No Barbie or Ken should be living in the shadows," and Allan adds, "*Or Allan*" (Gerwig, 2023, 1:38:10). Once again, the non-confirming Ken, known as Allan, is left out of this conversation, forced to live in the shadows. Allan's non-conformity to traditionally masculine traits associated with Kens, as well as non-adherence to the glamour and beauty of the Barbies, sets him apart from the more dominant and popular characters. Allan is clearly marginalized, but the film does not demonstrate avenues to promote his inclusion.

In addition to Allan, Earring Magic Ken – the best-selling Ken doll in Mattel's history – makes a brief debut in *Barbie* (2023). After just six months on shelves in 1993, Earring Magic Ken was removed, due to backlash that Ken represented a non-heterosexual version of the stereotypical Ken. Spokespersons for Mattel said they were trying to keep Ken updated (e.g., sporting an earring), but others say this was a demonstration of gender bending, not accepted by the masses (Lawson, 1993). Intersectionality prompts us to contemplate the interplay of different facets of an individual's identity, acknowledging that a person cannot be reduced to a single dimension of their identity, and while some characters made their way into *Barbie* (2023), without reflective and intentional demonstration of their worth, *Barbie* (2023) viewers may have missed their significance.

In the concluding scenes, as the Barbies plotted their takeover of Barbie Land, Sasha strategically advised, "*distract them (Kens) by appearing helpless and confused. Kens cannot resist a damsel in distress*" (Gerwig, 2023, 1:17:30). Gloria reiterated this approach by emphasizing, "*You have to make them believe you're complacent. That they have the power*" (Gerwig, 2023, 1:17:36). In these final scenes, the movie explored the prevailing gender norms where men were traditionally expected to exhibit strength and competence, while women felt compelled to conform to gender roles associated with submission and incompetence, even if it meant settling for mediocrity. Yet, *Barbie* (2023) also depicts deep emotion, as can be seen and heard in the lyrics of the, "*What was I made for?*" song. In one scene, Barbie realizes what being human is all about, and footage is shown of women, girls, mothers, and daughters playing in a flashback-like sequence. The tone of the song evokes a deep, sad feeling, yet it is not hopeless ("*I don't know how to feel, but someday I might*"). It expresses a longing to know one's purpose ("*What was I made for?*") (Eilish, 2023) but deep analysis of one's purpose is not shown as an expectation for the Kens.

Beauty Standards

The initial portrayal of Barbie clad in a revealing swimsuit, makeup, and high heels immediately emphasizes the conventional beauty ideals commonly associated with this iconic character. This portrayal is a precursor to a more in-depth examination of societal beauty standards. Barbie's efforts to conceal

her challenging morning and project an image of flawless perfection exemplify the societal pressure placed on individuals to maintain an impeccable appearance. In one song lyric, "*...just something you paid for*" (Eilish, 2023), Barbie realizes she represents the impossible beauty standards for women. For Barbie and viewers, this scene may invoke a realization of the disconnect between one's innocence in youth with that of growing up realizing the world is not what it once promised ("*I used to know, but I'm not sure now…When did it end? All the enjoyment?*") (Eilish, 2023). This scene emphasizes the unreasonable expectations imposed on women regarding their grooming and presentation and their place in the world. When Barbie encounters the issue of flat feet, the reactions of her fellow Barbies, marked by expressions of disgust and even vomiting, accentuate the social stigmatization surrounding physical dysphoria. One Barbie screams, "*FLAT FEET!!!*" (Gerwig, 2023, 00:18:08), while in another scene, Weird Barbie observes the flat feet and says, "*Ugh*" (Gerwig, 2023, 00:20:20). These scenes vividly illustrate society's inclination to reject or ridicule individuals who deviate from conventional beauty norms. Additional evidence of this standard is seen throughout other scenes with the character of Weird Barbie. Weird Barbie sports a face colored with markers and a chopped and unkempt hairstyle, alongside bulky boots, and a self-admission that she smells like basement.

As Barbie navigates her flat feet, cellulite, and thoughts of death, she seeks the advice of Weird Barbie and Weird Barbie shares the following: "*Look at your upper thigh. That's cellulite. That'll spread everywhere. And it'll start to get sad and mushy and complicated*" (Gerwig, 2023, 00:21:28). Weird Barbie encourages Barbie to fix the issues with her Barbie handler (Gloria) and says, "*If you do not find her and fix things, what's ugly will become uglier, what's weird will become weirder. And then you'll look like me*," to which Stereotypical Barbie screams (Gerwig, 2023, 00:24:00). The repeated use of "perfect" prioritizes features such as youthfulness, slimness, and conventional Western-centric beauty traits, setting a standard that can be unattainable and unrealistic for many. These underlying messages highlight the pressure placed on Barbie, girls, and women, to embody and project this perfection, which can influence the perception of beauty and body image among those who interact with these dolls. *Barbie* (2003) seems to accurately depict this societal expectation.

During the time the Kens have taken over Barbie Land, the portrayal of a patriarchal society in which women's worth is primarily measured by their attractiveness to men is a central theme that resonates throughout the monologue delivered by America Ferrera's character (Gloria). This poignant and introspective conversation effectively captures the complex web of societal expectations that women often find themselves entangled in. For instance, the dialogue articulates the pervasive feeling of inadequacy many

women experience due to the relentless pressure to conform to contradictory standards: "*Like, we have to always be extraordinary, but somehow we're always doing it wrong*" (Gerwig, 2023, 01:13:15). The confession of the character not feeling smart, skilled, or attractive enough reflects a profound insecurity regarding her abilities and physical appearance. This vulnerability exposes the emotional toll of living in a society that constantly evaluates, and judges women based on their conformity to narrow beauty ideals and prescribed roles: "*You have to say you want to be healthy, but also you have to be thin*" (Gerwig, 2023, 01:13:15). Women are not only expected to excel in various domains of life, including career, motherhood, and personal appearance. Age is also underrepresented as Barbies lack in age diversity. Barbie dolls typically represent youthful beauty ideals, which can contribute to unrealistic beauty expectations and body image issues. The absence of older Barbie dolls excludes older women, implying that beauty diminishes with age, and limits role models and educational opportunities, hindering inclusive attitudes. Perhaps *Barbie* (2023) could speak to the aging of Stereotypical Barbie, upon her decision to remain in the Real World, where she will be subjected to the aging process.

Hegemonic Masculinity

Barbie Land displays a mixture of Western ideals of hegemonic masculinity. Early in the movie, Beach Ken seeks to impress Stereotypical Barbie, by engaging in a daring "beach" move into the plastic ocean. Upon injuring himself, he asks Barbie how much she witnessed – assuming he was embarrassed as he sought to impress Barbie through his physical moves. Two Barbies then help Ken off the ground, and Ken is heard saying, "*You guys are so strong*" (Gerwig, 2023, 00:09:33). Another Ken then seeks to further embarrass Beach Ken by saying it was "*too much beach*." A verbal dispute between the two Kens unfolds and one Ken says, "*Why are you getting emotional??!!*" (Gerwig, 2023, 00:10:00). In the "*I'm just Ken*" song, Ken speaks to a man's masculine status and how the Barbies perceive his emotional vulnerability by singing, "*Am I not hot when I'm in my feelings?*" Ken expresses frustration that some Kens are viewed as less attractive if they are emotional while Barbie also believes men are not "made" to deal with women's' emotions, as depicted in the following song lyrics, "*I'm sad again, don't tell my boyfriend, it's not what he's made for*" (Eilish, 2023).

Upon returning from the Real World, there is a shift in power dynamics from Barbie Land to one focused on the power of the Kens. However, a sense of disappointment and betrayal is expressed by Beach Ken who felt respected and valued in the Real World and "Kendom." Ken shares his experiences in the Real World, noting that, "*I don't need any of those things here [e.g., degrees]. Here I'm just a dude. And you know what? [Seen doing a pull-up]. That's enough*" (Gerwig, 2023, 01:03:04). These messages touch

on the idea of simplicity and contentment in contrast to the pursuit of titles, degrees, and achievements. It also hints at potential political changes and the possibility of altering the Constitution through elections in Kendom. In the 'takeover plan' from Kendom back to Barbie Land, the Barbies plan to turn one group of Kens against another and make them question whether their power reflects a struggle for dominance and control, which aligns with the idea of hegemonic masculinity where men strive to assert dominance over others. Additionally, suggesting the start of a "war" or conflict with another group can be interpreted as an assertion of power and a demonstration of dominance, aligning with characteristics often associated with hegemonic masculinity, where power is linked to violence and dominance.

Violence against Women

In the movie's opening scenes, when multiple Kens compete for Barbie's attention, the phrase "*beach off*" in the dialogue may imply the term "*beat you off*" (Gerwig, 2023, 00:10:00), although perceptions on social media posts remain divided on the underlying reference. This linguistic twist creates a lighthearted and non-threatening atmosphere. However, it is important to note that beneath the humor lies a commentary on how violence can be normalized among men in the Real World, especially in competition for romantic partners. These excerpts subtly highlight the harsh reality of how aggression and physical confrontation are sometimes used to express affection and attraction, shedding light on toxic relationships and violence against women. In a later scene, Barbie speaks to Sasha. Barbie says, "*I love women. I want to help women*," but Sasha says, "*Oh, come off it. Everybody hates women. Women hate women and men hate women. It's the one thing we can all agree on*" (Gerwig, 2023, 00:54:17).

These depictions highlight the potential normalization and trivialization of serious issues like stalking and promoting non-consensual romantic situations. The catcalling and objectification of Barbie in Real World scenes can be harmful for perpetuating gender stereotypes and fostering a culture of harassment. For example, when Barbie and Ken enter the Real World, Barbie says, "*I feel kind of ill at ease*" while Ken says, "*there's no undertone of violence*." Barbie says, "*Mine is very much an undertone of violence"* (Gerwig, 2023, 00:28:00). They spot a construction crew and Barbie assumes there will be women workers and approaches the group. The construction workers are all men and say, "*You got fries with that shake*?" "*If I said you had a hot body, would you hold it against me?*" "*Is that a mirror in your pocket, because I can see myself in your shorts*" (Gerwig, 2023, 00:28:36). Barbie is then smacked on her butt and arrested for defending herself. While at the police station, filled with all men law enforcement officers, one says, "*She looks even better in more clothes, because you can imagine more*" (Gerwig, 2023, 00:29:52). While *Barbie* (2023) uses humor to highlight

these scenes, more intentional efforts to call out the various forms of violence (e.g., sexualized comments) should be made.

Throughout the movie, Ken's behavior is romantically insistent, even after Barbie has made it clear that she is not romantically interested. When Barbie leaves Barbie Land for the Real World, Ken sneaks into her car. When Barbie sees him, she screams and says, "*Please get out!*" (Gerwig, 2023, 00:26:20) but Ken begs, and Barbie allows him to stay. In another scene, Ken leans in for a kiss and Barbie says, "*Wow. You can go now.*" Ken then says he thought he may stay the night since that is what girlfriends and boyfriends do. Barbie replies, "*Oh, but I don't want you here*" (Gerwig, 2023, 00:14:25). Yet, Ken continues to be obsessed with Barbie and demonstrates unhealthy boundaries and behaviors. Additionally, in the "*I'm just Ken*" lyrics, the song alludes to the underlying expectation that if men are nice enough, women will/should have sex with them. This sentiment is demonstrated in the following lyric: "*All my life, been so polite, but I'll sleep alone tonight*" (Gosling, 2023). The chorus puts into words the complaints of men in the "friend zone," ("*where I see love, she sees a friend*"), as if being *just* friends with women would not be tolerable. These scenes contribute to normalizing problematic behaviors and attitudes toward women, reinforcing harmful stereotypes that can influence how viewers perceive and treat women in real life. Media creators are urged to be mindful of their messages and their potential impact, particularly on sensitive issues such as violence against women and unhealthy relationship dynamics.

Postfeminism

Based on our analysis, we believe *Barbie* (2023) tried to convey themes associated with postfeminism, though its execution falls short in several areas. Postfeminism emphasizes challenging traditional gender roles, promoting empowerment and choice, and expanding women's identities beyond mere appearance. However, the film's portrayal of these themes often falls short, perpetuating rather than subverting conventional notions of femininity and beauty. While it may claim to champion empowerment, its focus on surface-level attributes like appearance ultimately reinforces narrow and unrealistic standards of womanhood. An opening statement is given, stating, "*Barbie can be anything, women can be anything*" (Gerwig, 2023, 00:03:18); this reinforces the empowering message of Barbie, encouraging women to break free from limited roles and define their own identities. This idea is further promoted within the first ten minutes of the movie, when Barbies are depicted in legislature and one Barbie says, "*I have no difficulty holding both logic and feeling at the same time. And it does not diminish my powers, it expands them*" (Gerwig, 2023, 00:07:30). This statement sets the tone that Barbie's worth is not about looks, and that Barbie can be a powerful leader and yet remain in touch with her feelings. Song lyrics by Ice Spice and Nicki

Minaj also point to the independent and possible successes of women, "*We got money, but we ain't lendin' out. We got bars, but we ain't bailin' out*" (Ice Spice et al., 2023).

Barbie (2023) does alternate within the ideals that Barbie, and women, must be perfect, always, while also suggesting that it is okay to not be okay. For example, in the opening scenes, it is said that "*Barbie has a great day every day*" (Gerwig, 2023, 00:08:00) but later, Gloria, draws, "*Irrepressible thoughts of death Barbie. Full body cellulite Barbie. Crippling shame Barbie*" (Gerwig, 2023, 00:35:40) and encourages Mattel to normalize Barbies. In one song, the lyrics mirror this position: "*Think I forgot how to be happy, something I'm not, but something I can be. Something I wait for, something I'm made for*" (Eilish, 2023).

Furthermore, the movie excerpts highlight the significance of women's achievements and the idea that women can excel in any field they choose. While the statement about Barbie solving all feminism and equal rights issues is likely satiric, it emphasizes the ongoing struggle for gender equality. The portrayal of Barbie as the winner of Noble Prizes, President, pilot, and astronaut reinforces the message that women can thrive in STEM (science, technology, engineering, and mathematics) fields traditionally dominated by men. However, the implication that women need to enter male-dominated fields to attain positions of power can be seen as a reflection of societal norms that continue associating power and dominance with traditionally masculine roles. This duality in portraying women's empowerment, both breaking gender norms and conforming to certain stereotypes, reflects the complex and ongoing nature of the struggle for gender equality. Yet, the undertones of *Barbie* (2023) may suggest unhealthy and unsupported means of becoming successful. For example, one Barbie wins a journalism award and says, "*I worked really hard, so I deserve it*" (Gerwig, 2023, 00:07:00). Such messages imply that by buckling down and working hard, one can achieve *anything*. Again, "*Barbie can be anything, women can be anything*" (Gerwig, 2023, 00:03:18). This sentiment ignores forms of oppression that keep marginalized groups from gaining agency and promotes the notion of success if one were to pull themselves up by their bootstraps.

The discourse surrounding postfeminism extends into the lives of the Kens. Ken is encouraged to be "just" Ken, rather than in addition to Barbie. When Ken discovers that Barbie has reclaimed her home, he says, "*I'm a liberated man, I know crying's not weak*" (Gerwig, 2023, 01:32:58). As the Kens have a dance off, many verbal and non-verbal scenes hint at representation and support for non-heterosexual groups. For example, Ken sings, "*I'm just Ken, and so am I. Put that manly hand in mine*," and giggles as he holds hands with the other Kens (Gerwig, 2023, 01:30:46). Also during the singing of the Kens, Beach Ken sings, "*I'm just Ken. Anywhere else I'd be a ten. Is it my destiny to live and die a life of blonde fragility?*" (Gosling,

2023). At this time, he is kissed on each cheek by another Ken, and once again, giggles. This may have been an attempt to depict more inclusion of the Barbie label, including those who identify as LGBTQIA+, similar to the appearance of Earring Magic Ken. Yet, the movie highlights the discomfort of having a pregnant doll, Midge, as, "*Midge was Barbie's pregnant friend. She was actually discontinued by Mattel because a pregnant doll is just too weird*" (Gerwig, 2023, 00:06:20). In sum, while *Barbie* (2023) challenges mainstream normative assumptions regarding patriarchy, hegemonic masculinity, violence against women, and beauty norms, to name a few, the movie also contributes to further perpetuating unhealthy ideas.

In the culmination of the cinematic narrative, an important exchange unfolds between the Barbie President and one of the two Kens. Ken's earnest inquiry "*Madam President, please may the Kens have one Supreme Court Justice?*" (Gerwig, 2023, 01:38:37). Barbie President lamentedly responded, "*Oh, I can't do that.., maybe a lower circuit court judgeship*" (Gerwig, 2023 01:38:38). Ken's plea, effectively advocating for an augmented gender equilibrium within the judiciary, symbolizes a fervent desire for greater inclusivity. However, the Barbie President's response, characterized by a calculated concession suggesting a lower circuit court judgeship, reveals a measured willingness to mitigate the prevailing gender disparity without fully endorsing comprehensive equity. This negotiation prompts introspection regarding whether postfeminism, as manifested in this specific context, accentuates the preservation of entrenched power structures at the expense of their transformational reform. Moreover, Ken's commentary "*We accept! As long as we can wear robes*" (Gerwig, 2023, 01:38:37) concerning the attire of Supreme Court Justices alludes to enduring gender stereotypes that subtly permeate the collective consciousness of society. This remark stressed the association of particular roles with gender-specific norms, potentially countering the core principles of postfeminist ideology, which advocates for liberation from these constraining stereotypes. Postfeminism, as a conceptual framework, champions the empowerment of marginalized and underrepresented individuals by acknowledging their autonomy to make choices that align with their individual preferences. In this scenario, Barbie, exercising her authority as Madam President, makes a decision that appears to run counter to the promotion of gender equity. This raises questions about whether *Barbie* (2023) contradicts the principles of postfeminism, which often allows individuals in positions of power to perpetuate existing inequalities without facing criticism.

Limitations

While *Barbie* (2023) provides a platform to explore critical themes related to gender and social hierarchy, it is crucial to approach this analysis with a

discerning eye toward its potential Western-centric biases and anti-feminism standpoint. For instance, when analyzing the portrayal of feminism and empowerment in the film, one must consider whether the film addresses the experiences and struggles of women from various cultural backgrounds. Feminism is not a monolithic concept, and different cultures have their own unique challenges and perspectives on gender as not only an identity but also a socially constructed framework. Additionally, as scholars, we too, present with our own experiences which may bias how we perceive and interpret the themes of *Barbie* (2023). As a result, the examination of power dynamics and patriarchy within the narrative should take into account the broader cultural contexts in which these themes operate.

Discussion

The extensive analysis of *Barbie* (2023) reveals the researchers' desire to analyze a complex and nuanced exploration of various societal themes, including patriarchy, hegemonic masculinity, postfeminism, and the intersectionality of gender, power, and social hierarchy, and the use of millions of dollars to promote a film depicting such concepts. *Barbie*'s (2023) portrayal of patriarchy is thought-provoking, as it emphasizes the striking contrast, on the surface, between Barbie Land's female-dominated society and the Real World's male-dominated power structures, while also revealing their underlying similarities – power, control, and hierarchy. Ken's journey of self-discovery and his initial confusion regarding gendered norms are noteworthy in terms of the pervasive nature of patriarchy and its influence on various aspects of life, from employment opportunities to societal norms.

Gendered norms and beauty standards are explored in-depth, as sub-themes of patriarchy, emphasizing the unrealistic expectations placed on individuals, particularly girls and women, to conform to narrowly defined ideals of beauty and behavior. The portrayal of Barbie's struggles with self-image and their (her) realization that it is okay not to be perfect sends a powerful message about self-acceptance and the need to challenge societal norms prioritizing appearance over substance. However, while the film uses humor to draw attention to these unhealthy societal expectations, without additional narrative to explicate these issues, viewers are unlikely to dissect the harm being masked by humor.

Hegemonic masculinity was a central theme within *Barbie* (2023). For example, the characters of Ken and Allan represent contrasting perspectives on traditional gender roles and norms. Ken's insistence and obsession over Barbie, even in the face of her clear disinterest, reflects toxic aspects of masculinity and unhealthy relationships. On the other hand, Allan's unique character challenges traditional stereotypes, highlighting the importance of embracing diverse expressions of gender identity and rejecting rigid norms.

Yet, Allan is "*just Allan*" which also suggests his nonconventional masculine appearances, behavior, and beliefs cast him as an outsider to both the Kens and Barbies. The scenes depicting catcalling, objectification, and victim-blaming also serve as commentary on how these behaviors can harmfully perpetuate gender-based violence and contribute to rape culture. By addressing these issues, the film encourages viewers to critically examine societal attitudes toward women's lived experiences. However, many of these depictions were included as blatant harassment and/or violence (e.g., slapping Barbie's butt) when in the "real world" many subtle or covert forms of violence occur – forms that are much more difficult to detect and confront (e.g., gaslighting) that have less facetime in *Barbie* (2023).

Postfeminism is a prevalent theme in *Barbie* (2023), celebrating the idea that women can break free from limited roles and define their identities. However, the film also raises questions about the complexities of postfeminism, such as the negotiation for greater gender equity within the judiciary while perpetuating gender stereotypes related to attire. This prompts a critical examination of whether postfeminism, as portrayed in *Barbie* (2023), may sometimes prioritize individual choices over systemic change.

Compared to the current literature on *Barbie* (2023), our study offered a critical reappraisal that situates *Barbie* (2023) within both feminist and commercial frameworks. While existing analyses by Byrnes et al. (2024) and Rome (2024) celebrate *Barbie*'s (2023) satirical approach to patriarchy – particularly in its portrayal of Barbie Land as a female-dominated society – our study suggested that *Barbie*'s (2023) reliance on conventional beauty ideals and Western-centric norms limits the transformative scope of its feminist messaging. Barbie Land's utopian vision, while framed as a feminist critique of real-world gender imbalances, remains visually tied to traditional aesthetics and consumer expectations, a tension that complicates the film's potential as a subversive cultural text.

In addition to patriarchy, our study deepens the analysis of postfeminism in *Barbie* (2023) by extending Yakali's (2024a) critique that the film foregrounds individual empowerment over systemic critique. While *Barbie* (2023) advocates for female agency and self-empowerment, it does so within a framework that leans heavily on commodified feminist values, amplified by an expansive marketing campaign. This commercialized presentation risks reducing feminism to a marketable brand, reinforcing traditional gender roles through the use of beauty ideals and aspirational consumerism. The emphasis on individualism, coupled with consumer-driven representations, poses a challenge to *Barbie* (2023) positioned as a progressive feminist work. Therefore, our study echoes Yakali's (2024b) critique of the film's postfeminist narrative, suggesting that while *Barbie* (2023) seeks to promote empowerment, it ultimately reinforces traditional ideals of femininity and beauty.

Contrary to Hall's (2024) optimistic interpretation of Barbie's existential arc as a profound critique of societal pressures, our paper argues that the use of humor and lightheartedness obscures rather than illuminates its critiques of patriarchy and hegemonic masculinity. Ken's journey through hegemonic masculinity, though framed as a satirical critique, often reinforces stereotypical gender dynamics, as he struggles between dominance and confusion without fully deconstructing his role within patriarchal systems. This narrative approach, while humorous, undermines *Barbie*'s (2023) capacity to confront the deeper implications of gender norms and societal expectations.

Compared to our study, which critically examines *Barbie* (2023) through the frameworks of patriarchy, hegemonic masculinity, and postfeminism, Abdedaim (2024) emphasized the film's subversion of gender norms and stereotypes. While both analyses address *Barbie*'s (2023) feminist messaging, our study critiques its reliance on conventional beauty standards and Western-centric narratives, suggesting these may weaken its feminist impact. In contrast, Abdedaim (2024) views *Barbie* (2023) as an effective challenge to stereotypical femininity, presenting the film as a bold feminist reimagining. This difference underscores our focus on *Barbie*'s (2023) commercialized feminism, while Abdedaim's (2023) interpretation centers on its empowering potential.

Conclusion

We critique the absence of nuanced depictions of what it truly means to be equal or equitable in the message conveyed by *Barbie* (2023). Power is often multifaceted and can manifest unexpectedly, even when challenging existing power structures. While *Barbie* (2023) depicts a storyline supporting equality, the movie lacks a focus on equity, as noted in many film reviews. After the Barbies take back Barbie Land, they push the Kens back to their subordinate roles – offering only one low-ranking position within their legislature, while reclaiming all material goods, professional positions, and symbolic forms of power. In the spirit of equity demonstration, *Barbie* (2023) should have sought a compromise – a Barbie Land where both Barbies *and* Kens have power and are not pushed to the margins. So, while some film reviews are positive and supportive of a film that encourages communities to change, this narrative is not depicted throughout the film's entirety.

While *Barbie* (2023) brings attention to the disparity between fictional realms and the real world from a feminist and patriarchal perspective, it may fall short of acknowledging the concept that merely reversing power dynamics does not automatically result in true equality. We argue that the power shift from Barbie Land to Kendom, and then back to Barbie Land, mirrors a form of matriarchy, which, like patriarchy, perpetuates its own set of biases and inequalities and does not address the underlying issues of

systemic inequality. Similarly, Ken's portrayal, where men find themselves in a subservient role, highlights that flipping the power structure can also lead to its own problems.

We must acknowledge that *Barbie* (2023) does address important gender-related themes and challenges some stereotypes, yet, it does have notable limitations in terms of diversity, Western-centric beauty standards, and the explicit achievement of gender equality in its narrative. These shortcomings highlight the ongoing need for media to be more inclusive and thoughtful in their representation of diverse identities and to actively promote gender equality in their storytelling. We advocate for a more comprehensive and inclusive portrayal of gender equality and power dynamics by recognizing and investigating the varied experiences and difficulties confronted by individuals within diverse cultural milieus.

While *Barbie* (2023) offers a fresh take on feminist themes and societal expectations, it faces notable limitations that warrant further exploration. One of the primary limitations lies in its reliance on humor and satire, which, while engaging, may dilute the depth of its critiques on patriarchy and hegemonic masculinity. By packaging complex social issues in a light-hearted format, the film risks trivializing the very powerful structures it aims to challenge, leaving audiences with an ambiguous message about nature and impact of gendered norms. Additionally, the film's heavy emphasis on traditional beauty ideals and consumer-driven representations may reinforce, rather than subvert, the stereotypical images it attempts to critique.

Further research could benefit from a more comprehensive analysis of how audiences from diverse cultural backgrounds interpret and internalize the film's messages. Studies should examine the impact of *Barbie* (2023) on younger viewers' perceptions of gender roles, beauty standards, and empowerment, as well as its influence within different social and cultural contexts. Additionally, future scholarship should consider how the commercial motivations underlying the film's production and marketing affect its reception and effectiveness as a feminist commentary. Expanding this research to include a longitudinal approach could reveal how cultural artifacts like *Barbie* (2023) evolve in public perception over time and contribute to ongoing discussions within feminist discourse.

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Compliance with ethical standards
This article does not contain any studies with human participants or animals performed by the authors. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement
All data generated or analyzed are included in the published article.

Funding information
No.

Author contributions
All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication. The authors take full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

NOTES

1. Initially, Barbie believes her human handler is Sasha, Gloria's daughter. She later learns that Gloria is her human handler.

2. The historical use of Jezebel has meanings rooted in language such as wicked and shameless.

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Addleton Academic Publishers

Journal of Research in Gender Studies 14(2), 2024
pp. 38–50, ISSN 2164-0262, eISSN 2378-3524

Gender Gaps and Convergence: ASEAN Stakeholder Perspectives on Artificial Intelligence in Education

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ABSTRACT. This study investigates gender differences in the perceptions and adoption of Generative Artificial Intelligence (Gen-AI) in education among various stakeholders in the ASEAN context, including educators, students, policymakers, and industry partners. Using a quantitative cross-sectional design, data were collected from 661 stakeholders, including 363 females (54.9%) and 286 males (43.3%). The survey covered demographic information, frequency of Gen-AI tool use, perceptions of Gen-AI's potential, concerns about risks, perceived challenges, and beliefs about innovative uses. Statistical analyses, including Chi-square and Mann-Whitney U tests, revealed no significant gender differences in Gen-AI tool use, perceptions, or concerns. This suggests a shift towards gender parity in the adoption of advanced educational technologies in the region. The study highlights the need for further large-scale research to generalize these findings and discusses implications for policy and practice, emphasizing the potential for gender-neutral strategies in Gen-AI integration. The contributions of this study include providing empirical evidence on gender parity among key stakeholders in education in Gen-AI adoption, offering insights for policymakers to develop inclusive AI strategies, and identifying areas for future research on technology integration in education.

Keywords: generative AI; gender parity; ASEAN education; technology adoption; educator perceptions

How to cite: Raza, F. A., Singh, A. D., Kovilpillai, J. J. S., and Hamdan, A. (2024). "Gender Gaps and Convergence: ASEAN Stakeholder Perspectives on Artificial Intelligence in Education," *Journal of Research in Gender Studies* 14(2): 38–50. doi: 10.22381/JRGS14220242.

Received 24 October 2024 • Received in revised form 12 November 2024
Accepted 5 December 2024 • Available online 15 December 2024

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Introduction

The advent of Generative Artificial Intelligence (Gen-AI) is rapidly transforming the landscape of education globally, offering unprecedented opportunities for personalized learning, automated assessment, and innovative pedagogical approaches (Pinkwart, 2023). Gen-AI, characterized by its ability to autonomously create, manipulate, and enhance content, has shown potential to revolutionize curriculum design, student engagement, and administrative efficiency in educational settings (Holmes et al., 2023). Within the ASEAN region, these transformative technologies hold particular promise, as countries strive to modernize their educational systems in the face of diverse challenges. According to UNESCO (2021), these challenges include significant educational disparities, with student-teacher ratios varying widely across member states, and substantial differences in technological infrastructure. The Asian Development Bank (2021) reports that while some ASEAN nations have achieved high levels of digital connectivity, others struggle with basic technological infrastructure, creating a stark digital divide in educational resources. ASEAN (2021) further emphasizes that this digital divide particularly affects rural and disadvantaged communities, where access to both basic education and digital resources remains limited.

The urgency for technological modernization in ASEAN education systems is underscored by recent data. According to the Asian Development Bank (2021), ASEAN faces significant skills gaps in digital competencies, with employers across the region reporting difficulties in finding digitally skilled workers. The COVID-19 pandemic further exposed these challenges, as studies by Chung et al. (2020) revealed that many ASEAN higher education institutions struggled with digital learning infrastructure. The Google, Temasek, & Bain report (2021) highlights that while digital transformation presents significant economic opportunities for ASEAN, educational disparities could hinder this potential, particularly due to varying levels of digital literacy among educators.

Understanding gender differences in technology adoption is crucial for ensuring equitable implementation and maximizing the benefits of educational technologies like Gen-AI. Historical trends have shown disparities in how men and women perceive, adopt, and utilize new technologies in educational contexts, often exacerbating existing gender gaps in STEM fields and beyond (Venkatesh et al., 2003). However, recent studies suggest that these gender disparities may be narrowing, particularly in more developed regions of Asia, where digital literacy and access to technology are improving (Carolan et al., 2023). This shift highlights the need to explore whether traditional gender differences in technology adoption persist in the ASEAN region as it embraces Gen-AI.

The ASEAN region presents a unique context for studying the integration of Gen-AI in education. The region's diverse educational landscapes, varying

levels of technological infrastructure, and ambitious plans for digital transformation make it a critical area for examining how emerging technologies are adopted. The ASEAN Digital Masterplan 2025 emphasizes the importance of leveraging digital technologies to enhance education and skills development across the region (ASEAN, 2021). According to the OECD (2021), while some ASEAN countries have made significant progress in digital education implementation, many face substantial challenges in infrastructure development and teacher training. The Google, Temasek, & Bain report (2021) highlights varying rates of digital adoption across ASEAN countries, with significant disparities in educational technology implementation between urban and rural areas. The successful implementation of these plans requires a nuanced understanding of how different demographic groups, including gender groups, perceive and interact with these technologies.

This study aims to address the following research question: This study aims to address the following research question: Are there significant gender differences in how stakeholders in ASEAN countries perceive the benefits, risks, and challenges associated with integrating Gen-AI in education?

The objectives of this study are to:

1. Examine gender differences in the frequency of Gen-AI tool use among ASEAN stakeholders.
2. Analyze gender-based variations in perceptions of Gen-AI's potential to enhance teaching and learning.
3. Investigate whether male and female stakeholders differ in their concerns about the risks associated with Gen-AI integration.
4. Explore gender differences in perceived challenges and innovative uses of Gen-AI in education.

Given the dataset, which includes responses from 661 stakeholders across ASEAN countries, this research provides a comprehensive analysis of gender dynamics in the adoption of Gen-AI technologies. By focusing on the ASEAN region, this study contributes to the growing body of literature on AI in education, offering insights that are crucial for policymakers and educational leaders aiming to implement Gen-AI in a manner that is both effective and inclusive.

Literature Review

Gen-AI in Education: Potential Benefits and Risks

Gen-AI is transforming education by enabling personalized learning, automating administrative tasks, and enhancing curriculum design (Pinkwart, 2023). In the ASEAN region, these technologies can address challenges such as large class sizes and diverse student populations. According to recent data, student-to-teacher ratios remain high in several ASEAN countries –

Indonesia (28:1), Philippines (31:1), and Cambodia (38:1) (World Bank Education Statistics, 2023). A recent OECD study (2023) found that while 92% of Singapore's schools have integrated AI-powered learning tools, the adoption rate drops to below 15% in Myanmar and Laos, highlighting the regional digital divide in educational innovation (OECD-SEAMEO, 2023). Winkler and Söllner (2023) demonstrate how Gen-AI's ability to provide personalized learning experiences is particularly valuable in these contexts, where traditional educational resources are often stretched thin. However, the integration of Gen-AI poses risks, including data privacy concerns and algorithmic bias, which vary across cultural contexts (Holmes et al., 2023). These risks are particularly significant in regions with uneven access to quality education, potentially exacerbating existing inequalities.

Gender Differences in Educational Technology Adoption

Historically, research has shown gender disparities in technology adoption, with men often having more access to resources and more positive attitudes toward technology (Venkatesh et al., 2003). In Southeast Asia, these disparities are influenced by socio-cultural norms, economic factors, and policy environments (Lim et al., 2023). However, recent studies suggest that gender gaps in technology adoption are narrowing in more developed regions. For example, Carolan et al. (2023) found that women in countries like Singapore and South Korea are engaging with educational technologies at rates comparable to men, driven by policy interventions and changing societal attitudes.

ASEAN Educational Landscape and Technology Integration

ASEAN countries present a diverse educational landscape, with varying levels of technology integration. Singapore and Malaysia lead in the adoption of advanced educational technologies, supported by strong government initiatives and digital infrastructure (Rana & Aryani, 2023). The Asian Development Bank (2021) reports significant investments in educational technology across leading ASEAN nations, while the Google, Temasek, & Bain report (2021) highlights rapid growth in EdTech adoption across emerging markets like Vietnam and Indonesia. However, as noted by UNESCO (2021), substantial disparities persist, with some countries facing significant challenges in basic digital infrastructure and internet connectivity, particularly in rural areas. These variations in technological readiness, as documented by OECD (2021), create distinct challenges for implementing educational innovations across the region. In contrast, countries like Myanmar and Laos face significant challenges due to resource constraints and political instability. The ASEAN Digital Masterplan 2025 emphasizes digital transformation, particularly in underserved areas, yet implementing these goals faces obstacles like the digital divide and cultural resistance to AI-driven approaches (ASEAN, 2021; Lim et al., 2023). Despite these challenges, the potential for Gen-AI to contribute to educational innovation

in the region remains strong, provided that cultural, economic, and social contexts are carefully considered.

Gender Parity in ASEAN: Cultural, Educational, and Technological Factors
Recent research indicates a trend toward gender parity in technology adoption within the ASEAN region, particularly in education. This shift is driven by cultural changes, such as the erosion of traditional patriarchal structures in urban areas, and increased female participation in higher education (Yumarni & Amaratunga, 2021). Technologically, digital transformation across ASEAN has improved access to educational technology, with some countries achieving gender parity in internet use (Kemp, 2021). However, disparities persist, particularly in rural areas and among older generations, suggesting that gender parity may not be uniform across the region (Lim et al., 2023).

Gap in the Literature
Despite the growing body of research on AI in education, there remains a gap in understanding its adoption and impact in the ASEAN region, particularly concerning gender dynamics. Most studies have focused on Western contexts, where cultural, economic, and social factors differ significantly from Southeast Asia. This study aims to address this gap by examining gender differences in stakeholders' perceptions of Gen-AI within the ASEAN educational landscape, offering insights critical for policymakers and educational leaders seeking to ensure equitable integration of AI technologies.

Methodology

Research Design
This study employed a quantitative cross-sectional research design to explore gender differences in the adoption of Gen-AI among stakeholders in ASEAN countries. A cross-sectional approach was selected to capture a snapshot of attitudes and behaviors at a single point in time. The research aimed to identify gender-based variations in the frequency of Gen-AI tool use, perceptions of Gen-AI's potential, concerns about risks, perceived challenges, and beliefs about innovative uses of Gen-AI.

Participants and Sampling
The study sample consisted of 661 participants drawn from various ASEAN countries, with distribution aligned with the region's educational technology adoption patterns. The sampling frame considered the distinct characteristics of ASEAN's education sector, where engagement with digital learning tools varies significantly across countries (OECD, 2021). The sample size aligns with recommendations for educational technology research in Southeast

Asia (Cohen, 1988), and is comparable to similar regional studies on technology adoption in education (Lim et al., 2023). This sampling approach enabled comprehensive representation across different ASEAN member states while maintaining statistical validity.

The gender distribution included 363 females (54.9%), 286 males (43.3%), 7 individuals who preferred not to disclose their gender (1.1%), and 3 identifying as non-binary (0.5%). Participants were recruited through disproportionate stratified sampling to ensure representation from these diverse stakeholder groups. This sampling strategy helped capture diverse perspectives on Gen-AI integration across the region.

Instrumentation

Data were collected using a validated survey instrument specifically developed for this study. The survey included sections on demographic information, frequency of Gen-AI tool use, perceptions of Gen-AI's potential benefits, concerns about risks, perceived challenges, and beliefs about innovative uses of Gen-AI. The instrument demonstrated good internal consistency, with Cronbach's alpha coefficients ranging from 0.79 to 0.88 for different scales. The survey was piloted with a sample of 30 stakeholders, leading to minor adjustments for clarity and relevance.

Data Collection Procedure

The survey was administered online using the Microsoft Forms platform during the weeks leading up to and following the ASEAN Summit on Generative AI in Education. Participants accessed the survey via a secure link provided in advance of the Summit. Informed consent was obtained from all participants in accordance with ethical guidelines, and data were collected anonymously to protect participant confidentiality.

Data Analysis

Data were analyzed using IBM SPSS Statistics (version 29.0). Descriptive statistics were used to summarize the demographic characteristics and key variables. Chi-square tests of independence were employed to assess associations between gender and categorical variables, such as frequency of Gen-AI tool use and perceptions of Gen-AI's potential. Additionally, Mann-Whitney U tests were conducted to compare ordinal data between genders, given the non-parametric nature of Likert scale responses. A significance level of 0.05 was used for all statistical tests, and effect sizes were calculated to assess the magnitude of any differences found.

Limitations

The study acknowledges several limitations. The use of purposive sampling may limit the generalizability of the findings, as participants may represent a subset of stakeholders who are more technologically engaged. The reliance

on self-reported data could introduce bias, as participants might overestimate or underestimate their use and perceptions of Gen-AI. Lastly, the cross-sectional design captures perceptions at a single point in time, preventing the study from examining changes over time or establishing causal relationships.

Results

Descriptive Statistics

The final dataset included 661 respondents from across ASEAN countries. Table 1 provides a summary of the participants' demographic characteristics, including gender distribution and educational levels, as well as the frequency of Gen-AI tool use.

Table 1 Participant Demographics and Gen-AI Tool Use Frequency

Variable	**Category**	**N (%)**
Gender	Female	363 (54.9%)
	Male	286 (43.3%)
	Non-Binary/Prefer not to say	12 (1.8%)
	Total	**661 (100%)**
Educational Level	Primary/Secondary	242 (36.6%)
	Tertiary	388 (58.7%)
	Vocational/Other	31 (4.7%)
	Total	**661 (100%)**
Frequency of Gen-AI Tool Use	Never	33 (5.0%)
	Rarely	64 (9.7%)
	Sometimes	302 (45.7%)
	Most of the time	200 (30.3%)
	All the time	62 (9.3%)
	Total	**661 (100%)**

Chi-Square Test Results

Chi-square tests were conducted to examine the association between gender and categorical variables, such as Gen-AI tool use and perceptions of Gen-AI. The results are summarized in Table 2, indicating no significant associations between gender and the key variables.

Table 2 Chi-Square Test Results for Gender and Key Variables

Variable	χ^2	df	*p*-value	Cramer's V
Frequency of Gen-AI Tool Use	11.42	8	.178	0.066
Belief in Gen-AI's Potential	5.29	4	.260	0.089
Concerns about Gen-AI Risks	3.87	4	.424	0.077

The results indicate that there is no significant association between gender and the frequency of Gen-AI tool use, $\chi^2(8, N = 661) = 11.42$, $p = .178$. Similarly, no significant association was found between gender and belief in Gen-AI's potential to enhance teaching and learning, $\chi^2(4, N = 661) = 5.29$, $p = .260$, nor between gender and concerns about potential risks associated with Gen-AI integration, $\chi^2(4, N = 661) = 3.87$, $p = .424$.

Mann-Whitney U Test Results

Mann-Whitney U tests were used to compare ordinal data between genders. Table 3 summarizes the results, showing no significant differences between male and female stakeholders across all tested variables.

Table 3 Mann-Whitney U Test Results for Gender Differences in Perceptions

Measure	*U*	*z*	*p*-value	*r*
Perceived Enhancement by Gen-AI	113212	-1.21	.227	-0.047
Concerns about Potential Risks	118790	-0.63	.527	-0.025
Perceived Challenges in Integrating Gen-AI	114678	-0.94	.347	-0.036

The Mann-Whitney U tests revealed no significant gender differences in perceptions of Gen-AI's ability to enhance teaching and learning, $U = 113212$, $z = -1.21$, $p = .227$, $r = -0.047$. Similarly, there were no significant differences in concerns about potential risks, $U = 118790$, $z = -0.63$, $p = .527$, $r = -0.025$, or in perceived challenges in integrating Gen-AI, $U = 114678$, $z = -0.94$, $p = .347$, $r = -0.036$.

Effect Sizes

Effect sizes were calculated to assess the magnitude of the differences observed. Across all chi-square and Mann-Whitney U test results, the effect sizes were small, with Cramer's V values ranging from 0.066 to 0.089, and *r* values ranging from -0.016 to -0.047. These small effect sizes suggest that the observed differences between genders have limited practical significance.

Summary of Findings

Overall, the results indicate no significant gender differences in the adoption and perceptions of Gen-AI among stakeholders in the ASEAN region. Both male and female stakeholders use Gen-AI tools at similar rates and share

comparable views on the benefits, risks, challenges, and innovative uses of these technologies in education. The small effect sizes across all measures further support the conclusion of gender parity in this context.

Discussion

Interpretation of Findings

This study explored gender differences in the adoption and perceptions of Gen-AI among key stakeholders in the ASEAN region, including educators, students, education leaders, technology providers, and representatives from NGOs and government. The findings indicate no significant gender differences across various dimensions, including the frequency of Gen-AI tool use, perceptions of Gen-AI's potential to enhance teaching and learning, concerns about risks, and perceived challenges in integrating these technologies. Both male and female stakeholders engage with Gen-AI at similar rates and share comparable views on its benefits and challenges. These results suggest that gender parity in technology adoption is emerging within the ASEAN educational sector, reflecting broader societal changes towards gender equality in digital engagement (Yumarni & Amaratunga, 2021).

The small effect sizes observed in this study further reinforce the notion that gender plays a minimal role in shaping stakeholders' interactions with Gen-AI. This finding stands in contrast to earlier studies that documented significant gender gaps in technology adoption, particularly in contexts where male stakeholders were more likely to adopt new technologies due to greater access to resources and more positive attitudes towards technology (Venkatesh et al., 2003). The narrowing of these gender gaps within the ASEAN context may be attributed to improved digital access, targeted policies promoting gender equity, and shifting societal norms that increasingly support women's participation in technology and education across various stakeholder groups (ASEAN, 2021).

Comparison with Previous Research

The lack of significant gender differences in Gen-AI adoption aligns with recent studies suggesting that gender gaps in technology use are narrowing, particularly in more developed regions of Asia (Carolan et al., 2023; Yumarni & Amaratunga, 2021). These findings contrast with broader global trends documented by the World Economic Forum (2021), which indicate persistent gender gaps in technology adoption across many regions. The convergence towards gender parity observed in this study may be a result of targeted policy interventions, such as those outlined in the ASEAN Digital Masterplan 2025 (ASEAN, 2021), along with changing societal attitudes towards technology use in education (Lim et al., 2023).

Moreover, countries like Singapore and Malaysia, which have implemented robust digital infrastructure and progressive gender policies, are leading the way in reducing gender gaps in digital engagement (Rana & Aryani, 2023). This study's findings suggest that these broader regional trends are reflected in the educational sector, where male and female stakeholders demonstrate similar engagement with Gen-AI technologies. However, while gender parity appears to be emerging at the regional level, it is essential to consider that this parity may not be uniform across all ASEAN countries. Less developed nations, such as Myanmar and Laos, still face significant challenges in digital access and gender equality, which could result in localized disparities that are not captured in this study's aggregate data.

Implications for Policy and Practice

The results of this study have significant implications for educational policymakers and leaders in the ASEAN region. The observed gender parity suggests that gender-specific interventions may no longer be necessary for promoting Gen-AI adoption in education. Instead, policies can focus on creating inclusive environments that support all stakeholders, regardless of gender, in adopting and integrating Gen-AI technologies. Professional development programs should emphasize equitable access to training and resources for Gen-AI, ensuring that all stakeholders, irrespective of gender, can benefit from the potential of these technologies to enhance teaching and learning.

Furthermore, the findings underscore the success of ongoing efforts to promote digital inclusivity across the ASEAN region. Policymakers should continue investing in initiatives that bridge digital divides, particularly in regions and among subgroups where disparities may still exist. For example, targeted support may be necessary in rural areas or among older generations of stakeholders who may face more significant barriers to digital engagement. ASEAN's ongoing commitment to digital transformation, as evidenced by initiatives like the ASEAN Digital Masterplan 2025, positions the region to become a leader in gender-inclusive technology adoption in education.

Limitations and Future Research

While this study offers valuable insights, it also has several limitations that should be considered. The cross-sectional design provides a snapshot of perceptions at a single point in time, limiting the ability to observe changes over time. Longitudinal studies that track changes in Gen-AI adoption and perceptions over time could provide a more dynamic understanding of how gender dynamics in technology adoption evolve as these technologies become more embedded in educational practices.

Another limitation is the reliance on self-reported data, which may introduce biases. Participants might overestimate or underestimate their use

of Gen-AI tools or their perceptions of these technologies. Future research could incorporate objective measures of Gen-AI usage, such as usage logs or performance data, to complement the self-reported information and provide a more accurate picture of technology adoption.

Furthermore, this study focused primarily on gender as a demographic factor. Future research should explore how other variables, such as age, socioeconomic status, geographic location, and professional experience, intersect with gender to influence Gen-AI adoption and perceptions. An intersectional approach could uncover more nuanced insights into how different subgroups within the ASEAN region engage with educational technologies.

Conclusion

This study contributes to the growing body of literature on AI in education by providing evidence of emerging gender parity in Gen-AI adoption among key stakeholders in the ASEAN region, including educators, students, policymakers, and industry partners. The findings suggest that both male and female stakeholders are equally engaged with these emerging technologies, reflecting broader trends towards digital inclusivity in the region. As ASEAN countries continue to integrate Gen-AI into their educational systems, policymakers and educational leaders should focus on inclusive strategies that benefit all stakeholders, regardless of gender. Continued investment in digital infrastructure, training, and support, particularly in underserved areas, will be critical to ensuring that the benefits of Gen-AI are realized equitably across the region.

Future research should build on these findings by examining how other demographic factors shape technology adoption in education and by assessing the long-term impact of Gen-AI on teaching and learning outcomes. As the ASEAN region continues to evolve its digital landscape, understanding the intersection of gender with other social, cultural, and economic factors will be crucial for fostering an inclusive and equitable educational environment.

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Compliance with ethical standards

The study sample consisted of participants drawn from various ASEAN countries.

Data availability statement

All data generated or analyzed are included in the published article.

Funding information

No.

Author contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication. The authors take full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Journal of Research in Gender Studies 14(2), 2024
pp. 51–66, ISSN 2164-0262, eISSN 2378-3524

Bio-Inspired Artificial Perceptual and Aesthetic Self-Monitoring Devices, Augmented Reality-based Body-Enhancing and 3D Virtual Garment Simulation Technologies, and Emotion Recognition and Image Processing Algorithms for Body Image Self-Consciousness

Ramona Mihăilă*

ABSTRACT. The purpose of this study is to examine body image self-consciousness, social media photo manipulation, and thinness ideal internalization. In this article, previous research findings were cumulated indicating that augmented reality-based virtual try-on experiences can be achieved by use of neuromorphic vision sensor data, beauty apps and filters, and visual and haptic object recognition tools. The contribution to the literature on facial appearance dissatisfaction and body image disturbance is by showing that visually appealing self-presentations require 3D-rendered digital outfit, virtual beauty try-ons, and 3D body scanning and virtual reality-based visual perception technologies. Throughout June 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "body image self-consciousness" + "bio-inspired artificial perceptual and aesthetic self-monitoring devices," "augmented reality-based body-enhancing and 3D virtual garment simulation technologies," and "emotion recognition and image processing algorithms." As research published between 2020 and 2024 was inspected, only 169 articles satisfied the eligibility criteria, and 30 mainly empirical sources were selected. Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AXIS, CADIMA, DistillerSR, Eppi-Reviewer, Litstream, and Rayyan.

Keywords: body image self-consciousness; augmented reality; 3D virtual garment simulation; aesthetic self-monitoring; emotion recognition; image processing

How to cite: Mihăilă, R. (2024). "Bio-Inspired Artificial Perceptual and Aesthetic Self-Monitoring Devices, Augmented Reality-based Body-Enhancing and 3D Virtual Garment Simulation Technologies, and Emotion Recognition and Image Processing Algorithms for Body Image Self-Consciousness," *Journal of Research in Gender Studies* 14(2): 51–66. doi: 10.22381/JRGS14220243.

Received 12 July 2024 • Received in revised form 22 December 2024
Accepted 25 December 2024 • Available online 30 December 2024

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1. Introduction

Unrealistic beauty ideals integrate negative moods and emotions, appearance-focused social media use, perceived social validation, and harmful self-objectification processes. The purpose of my systematic review is to examine the recently published literature on body image self-consciousness and integrate the insights it configures on bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, and emotion recognition and image processing algorithms. By analyzing the most recent (2020–2024) and significant (Web of Science, Scopus, and ProQuest) sources, my paper has attempted to prove that body-image affective judgments, facial appearance dissatisfaction, and touch and haptic imagery develop on virtual makeover apps, augmented reality face makeup and sensor-based gesture recognition systems, and 3D scene generation techniques. The actuality and novelty of this study are articulated by addressing body image self-consciousness, social media photo manipulation, and thinness ideal internalization, that is an emerging topic involving much interest. My research problem is whether touch and haptic imagery, digitally mediated social presence, and cognitive and affective engagement require virtual makeup try-ons, realistic digitally-rendered humans, and 3D body sensory and computer vision technologies.

In this review, prior findings have been cumulated indicating that augmented reality-based virtual try-on experiences can be achieved by use of neuromorphic vision sensor data, beauty apps and filters, and visual and haptic object recognition tools. The identified gaps advance unrealistic beauty standards and marginalized body representations. My main objective is to indicate that visually appealing self-presentations require 3D-rendered digital outfit, virtual beauty try-ons, and 3D body scanning and virtual reality-based visual perception technologies. This systematic review contributes to the literature on facial appearance dissatisfaction and body image disturbance by clarifying that big data-driven facial retouching, augmented reality beautification filters, and realistic makeup simulation and anthropometric data capture tools further unrealistic societal beauty standards, appearance-related dissatisfaction, and social values and beliefs. This research endeavors to elucidate whether photo editing behaviors, marginalized body representations, and body image worry recognition (Rice, 2022; Schroeder and Behm-Morawitz, 2025; Watson, 2022) integrate artificial intelligence-powered mood detectors, neuromorphic vision sensor data, and spatial imagery processes. My contribution is by integrating research findings indicating that augmented reality try-on apps, artificial tactile sensory and convolutional neural network-based gesture recognition systems, and visual matching and affective computing algorithms optimize beauty ideal gendered representations.

2. Theoretical Overview of the Main Concepts

The manuscript is organized as following: theoretical overview (section 2), methodology (section 3), augmented reality-based body-enhancing and 3D virtual garment simulation technologies enabling perceived body attractiveness and face-specific visual self-representation (section 4), emotion recognition and image processing algorithms optimizing augmented reality filter-based self-face perception (section 5), 3D body scanning and virtual reality-based visual perception technologies configuring unrealistic beauty standards and marginalized body representations (section 6), discussion (section 7), synopsis of the main research outcomes (section 8), conclusions (section 9), limitations, implications, and further directions of research (section 10).

3. Methodology

Throughout June 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "body image self-consciousness" + "bio-inspired artificial perceptual and aesthetic self-monitoring devices," "augmented reality-based body-enhancing and 3D virtual garment simulation technologies," and "emotion recognition and image processing algorithms." As research published between 2020 and 2024 was inspected, only 169 articles satisfied the eligibility criteria, and 30 mainly empirical sources were selected (Tables 1 and 2). Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AXIS, CADIMA, DistillerSR, Eppi-Reviewer, Litstream, and Rayyan (Figures 1–6).

Table 1 Topics and types of scientific products identified and selected.

Topic	**Identified**	**Selected**
body image self-consciousness + bio-inspired artificial perceptual and aesthetic self-monitoring devices	60	11
body image self-consciousness + augmented reality-based body-enhancing and 3D virtual garment simulation technologies	56	10
body image self-consciousness + emotion recognition and image processing algorithms	53	9
Type of paper		
Original research	130	14
Review	29	16
Conference proceedings	8	0
Book	1	0
Editorial	1	0

Source: Processed by the author. Some topics overlap.

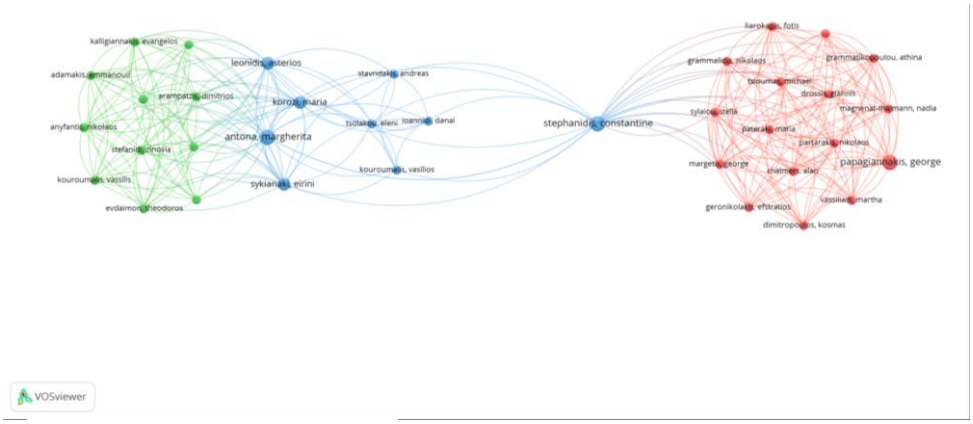


Figure 1. VOSviewer mapping of bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, emotion recognition and image processing algorithms for body image self-consciousness regarding co-authorship.

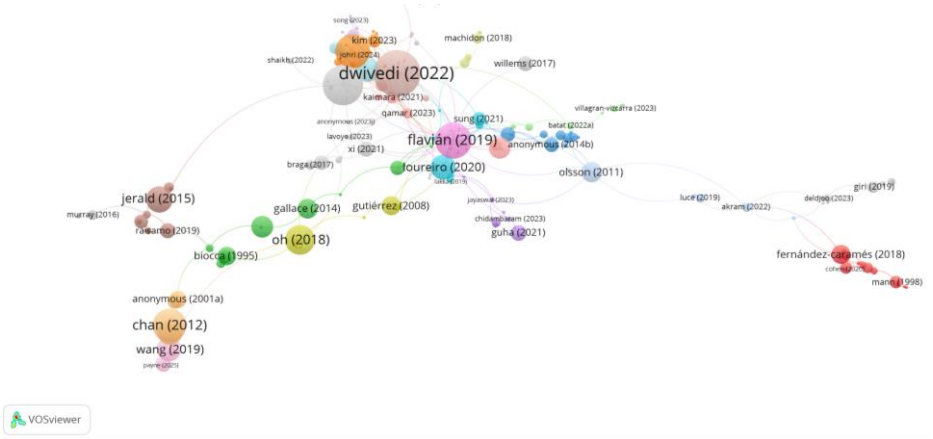


Figure 2. VOSviewer mapping of bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, emotion recognition and image processing algorithms for body image self-consciousness regarding citation.

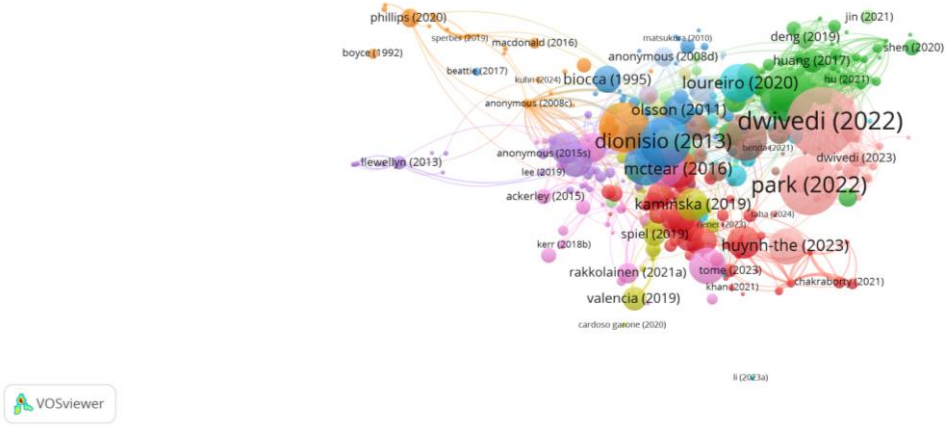


Figure 3. VOSviewer mapping of bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, emotion recognition and image processing algorithms for body image self-consciousness regarding bibliographic coupling.

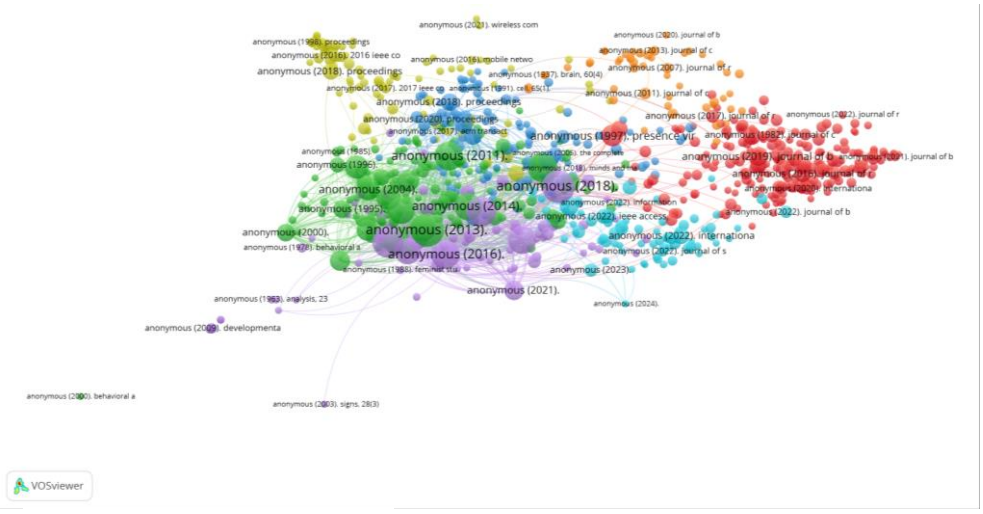


Figure 4. VOSviewer mapping of bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, emotion recognition and image processing algorithms for body image self-consciousness regarding co-citation.

Table 2 General synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Object grasping and manipulation tools, virtual clothing try-on simulations, and hyper-realistic augmented reality beauty and speech emotion recognition technologies further body image self-consciousness, social media photo manipulation, and thinness ideal internalization.	Anani et al., 2024; Hawker and Carah, 2020; Morikawa et al., 2021
Augmented reality-based virtual try-on experiences can be attained through augmented reality-based body-enhancing and 3D virtual garment simulation technologies, synthetic geospatial data, and neuromorphic and bio-inspired computing systems.	Ateq et al., 2024; Kandathil et al., 2020; Newell, 2022
Digitally mediated social presence, augmented reality makeup try-on and neuromorphic synthetic intelligence technologies, and artificial sensory neural network and real-time location tracking systems enable perceived body attractiveness and face-specific visual self-representation.	Beckett, 2022; Lăzăroiu et al., 2024; Oregi et al., 2024
Photoshopped and filtered images, virtual makeover apps and clothing try-on simulations, and computer-generated imagery and automated digital beauty technologies articulate facial appearance dissatisfaction and body image disturbance.	Bratu, 2022; Li and Sun, 2024; Padín et al., 2021
Emotion recognition and image processing algorithms, artificial intelligence clothing try-on and computer vision technologies, and 3D scene generation techniques optimize augmented reality filter-based self-face perception, contextual visual meanings, and digital social practices.	Carey, 2022; Maes and de Lenne, 2022; Park and Hong, 2021
Artificial intelligence beauty and deep learning-based virtual try-on technologies, 3D object recognition and path planning tools, and bio-inspired artificial perceptual and synthetic speech augmentation devices are pivotal in physical appearance ideals, low self-esteem and body satisfaction, and harmful self-objectification processes.	Corpodean et al., 2022; Mihăilă and Branişte, 2021; Popescu, 2023
Augmented reality filter-based self-face perception, artificial tactile sensing and clothing simulation technologies, and 3D facial avatar makeup simulation tools configure unrealistic beauty standards and marginalized body representations.	Cug et al., 2023; Mihăilă, 2022; Riccio et al., 2024
Artificial intelligence-powered mood detectors, 3D digital clothing and computer-generated imagery technologies, and eyewear frame digital twins shape toxic body image and gendered beauty ideals, perceived facial attractiveness, and self-rated emotional expressiveness.	Eldaly and Mashaly, 2022; Miller, 2024; Wang, 2024
Objectified body consciousness, body dissatisfaction development, and idealized online identities develop on deep learning-based realistic-sounding synthetic voices, generative artificial intelligence virtual try-on tools, and hyper-realistic augmented reality-powered makeup filters.	Gulati et al., 2024; Mirabet-Herranz et al., 2024; Rowland, 2022

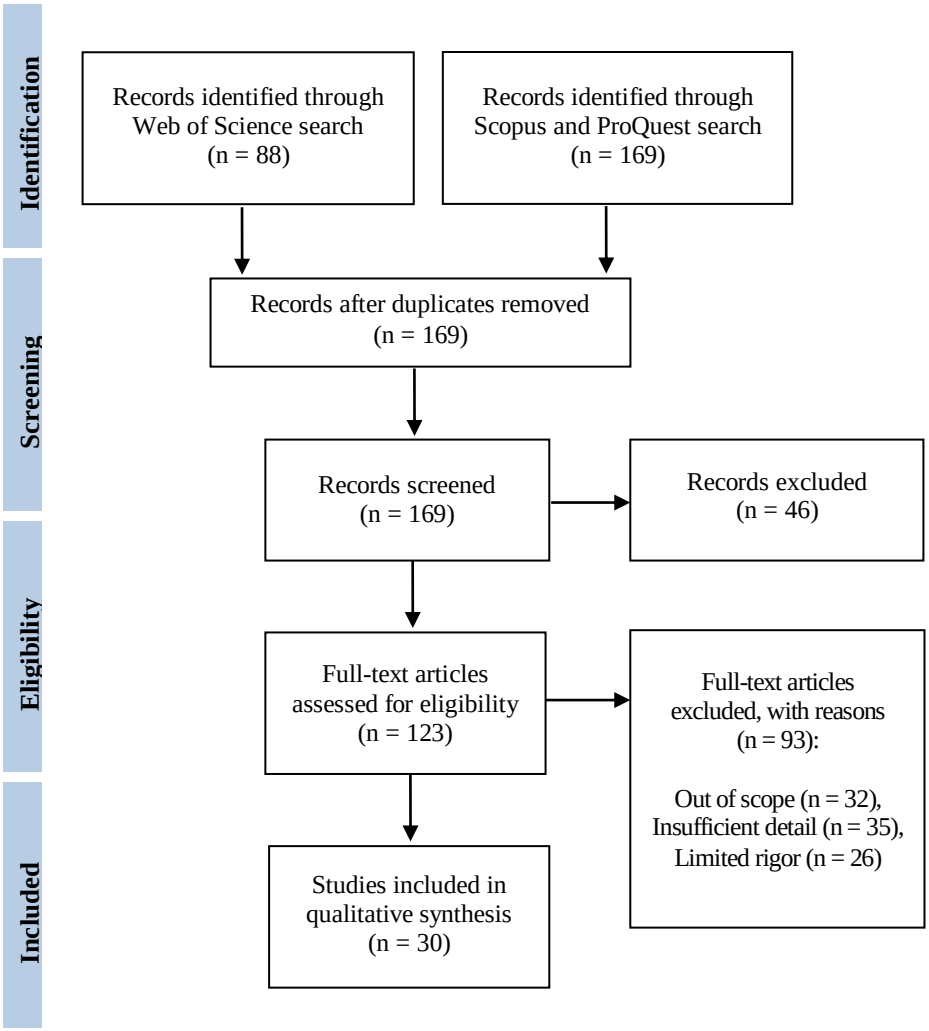


Figure 5 PRISMA flow diagram describing the search results and screening.

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used that ensure the literature review is comprehensive, transparent, and replicable. The flow diagram, produced by employing a Shiny app, presents the stream of evidence-based collected and processed data through the various steps of a systematic review, designing the amount of identified, included, and removed records, and the justifications for exclusions.
To ensure compliance with PRISMA guidelines, a citation software was used, and at each stage the inclusion or exclusion of articles was tracked by use of custom spreadsheet. Justification for the removal of ineligible articles was specified during the full-text screening and final selection.

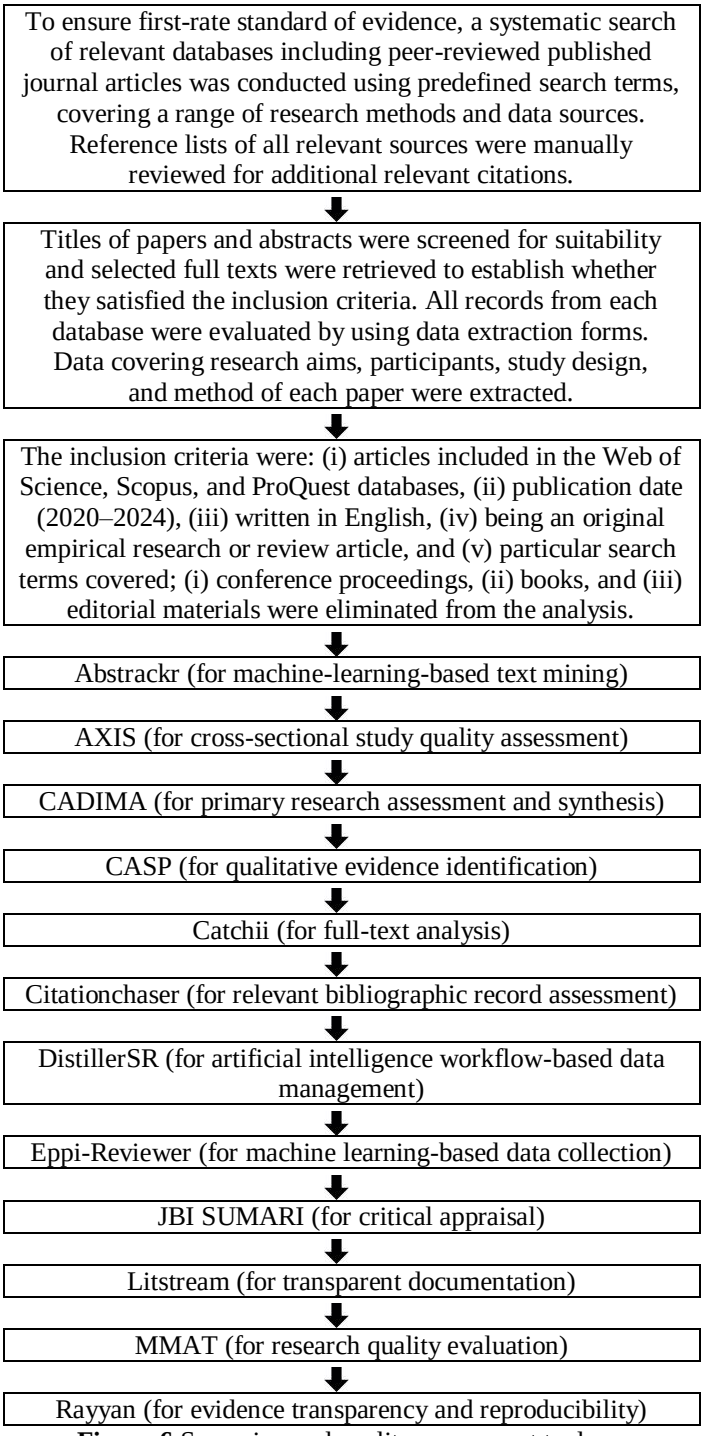


Figure 6 Screening and quality assessment tools

4. Augmented Reality-based Body-Enhancing and 3D Virtual Garment Simulation Technologies Enabling Perceived Body Attractiveness and Face-Specific Visual Self-Representation

Object grasping and manipulation tools, virtual clothing try-on simulations, and hyper-realistic augmented reality beauty and speech emotion recognition technologies (Anani et al., 2024; Hawker and Carah, 2020; Morikawa et al., 2021) further body image self-consciousness, social media photo manipulation, and thinness ideal internalization. Photo editing behaviors, marginalized body representations, and body image worry recognition integrate artificial intelligence-powered mood detectors, neuromorphic vision sensor data, and spatial imagery processes.

Augmented reality-based virtual try-on experiences (Ateq et al., 2024; Kandathil et al., 2020; Newell, 2022) can be attained through augmented reality-based body-enhancing and 3D virtual garment simulation technologies, synthetic geospatial data, and neuromorphic and bio-inspired computing systems. Touch and haptic imagery, digitally mediated social presence, and cognitive and affective engagement require virtual makeup try-ons, realistic digitally-rendered humans, and 3D body sensory and computer vision technologies.

Digitally mediated social presence, augmented reality makeup try-on and neuromorphic synthetic intelligence technologies, and artificial sensory neural network and real-time location tracking systems (Beckett, 2022; Lăzăroiu et al., 2024; Oregi et al., 2024) enable perceived body attractiveness and face-specific visual self-representation. Hyper-personalized beauty experiences can be achieved through virtual try-on apps, bio-inspired artificial perceptual and aesthetic self-monitoring devices, and avatar makeup wearables. (Table 3)

Table 3 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Object grasping and manipulation tools, virtual clothing try-on simulations, and hyper-realistic augmented reality beauty and speech emotion recognition technologies further body image self-consciousness, social media photo manipulation, and thinness ideal internalization.	Anani et al., 2024; Hawker and Carah, 2020; Morikawa et al., 2021
Augmented reality-based virtual try-on experiences can be attained through augmented reality-based body-enhancing and 3D virtual garment simulation technologies, synthetic geospatial data, and neuromorphic and bio-inspired computing systems.	Ateq et al., 2024; Kandathil et al., 2020; Newell, 2022
Digitally mediated social presence, augmented reality makeup try-on and neuromorphic synthetic intelligence technologies, and artificial sensory neural network and real-time location tracking systems enable perceived body attractiveness and face-specific visual self-representation.	Beckett, 2022; Lăzăroiu et al., 2024; Oregi et al., 2024

5. Emotion Recognition and Image Processing Algorithms Optimizing Augmented Reality Filter-based Self-Face Perception

Photoshopped and filtered images, virtual makeover apps and clothing try-on simulations, and computer-generated imagery and automated digital beauty technologies (Bratu, 2022; Li and Sun, 2024; Padín et al., 2021) articulate facial appearance dissatisfaction and body image disturbance. Augmented reality try-on apps, artificial tactile sensory and convolutional neural network-based gesture recognition systems, and visual matching and affective computing algorithms optimize beauty ideal gendered representations.

Emotion recognition and image processing algorithms, artificial intelligence clothing try-on and computer vision technologies, and 3D scene generation techniques (Carey, 2022; Maes and de Lenne, 2022; Park and Hong, 2021) optimize augmented reality filter-based self-face perception, contextual visual meanings, and digital social practices. Unrealistic beauty ideals integrate negative moods and emotions, appearance-focused social media use, perceived social validation, and harmful self-objectification processes.

Artificial intelligence beauty and deep learning-based virtual try-on technologies, 3D object recognition and path planning tools, and bio-inspired artificial perceptual and synthetic speech augmentation devices (Corpodean et al., 2022; Mihăilă and Braniște, 2021; Popescu, 2023) are pivotal in physical appearance ideals, low self-esteem and body satisfaction, and harmful self-objectification processes. Augmented reality-based virtual try-on experiences can be achieved by use of neuromorphic vision sensor data, beauty apps and filters, and visual and haptic object recognition tools. (Table 4)

Table 4 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Photoshopped and filtered images, virtual makeover apps and clothing try-on simulations, and computer-generated imagery and automated digital beauty technologies articulate facial appearance dissatisfaction and body image disturbance.	Bratu, 2022; Li and Sun, 2024; Padín et al., 2021
Emotion recognition and image processing algorithms, artificial intelligence clothing try-on and computer vision technologies, and 3D scene generation techniques optimize augmented reality filter-based self-face perception, contextual visual meanings, and digital social practices.	Carey, 2022; Maes and de Lenne, 2022; Park and Hong, 2021
Artificial intelligence beauty and deep learning-based virtual try-on technologies, 3D object recognition and path planning tools, and bio-inspired artificial perceptual and synthetic speech augmentation devices are pivotal in physical appearance ideals, low self-esteem and body satisfaction, and harmful self-objectification processes.	Corpodean et al., 2022; Mihăilă and Braniște, 2021; Popescu, 2023

6. 3D Body Scanning and Virtual Reality-based Visual Perception Technologies Configuring Unrealistic Beauty Standards and Marginalized Body Representations

Augmented reality filter-based self-face perception, artificial tactile sensing and clothing simulation technologies, and 3D facial avatar makeup simulation tools (Cug et al., 2023; Mihăilă, 2022; Riccio et al., 2024) configure unrealistic beauty standards and marginalized body representations. Big data-driven facial retouching, augmented reality beautification filters, and realistic makeup simulation and anthropometric data capture tools further unrealistic societal beauty standards, appearance-related dissatisfaction, and social values and beliefs.

Artificial intelligence-powered mood detectors, 3D digital clothing and computer-generated imagery technologies, and eyewear frame digital twins (Eldaly and Mashaly, 2022; Miller, 2024; Wang, 2024) shape toxic body image and gendered beauty ideals, perceived facial attractiveness, and self-rated emotional expressiveness. Body-image affective judgments, facial appearance dissatisfaction, and touch and haptic imagery develop on virtual makeover apps, augmented reality face makeup and sensor-based gesture recognition systems, and 3D scene generation techniques.

Objectified body consciousness, body dissatisfaction development, and idealized online identities (Gulati et al., 2024; Mirabet-Herranz et al., 2024; Rowland, 2022) develop on deep learning-based realistic-sounding synthetic voices, generative artificial intelligence virtual try-on tools, and hyper-realistic augmented reality-powered makeup filters. Visually appealing self-presentations require 3D-rendered digital outfit, virtual beauty try-ons, and 3D body scanning and virtual reality-based visual perception technologies. (Table 5)

Table 5 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Augmented reality filter-based self-face perception, artificial tactile sensing and clothing simulation technologies, and 3D facial avatar makeup simulation tools configure unrealistic beauty standards and marginalized body representations.	Cug et al., 2023; Mihăilă, 2022; Riccio et al., 2024
Artificial intelligence-powered mood detectors, 3D digital clothing and computer-generated imagery technologies, and eyewear frame digital twins shape toxic body image and gendered beauty ideals, perceived facial attractiveness, and self-rated emotional expressiveness.	Eldaly and Mashaly, 2022; Miller, 2024; Wang, 2024
Objectified body consciousness, body dissatisfaction development, and idealized online identities develop on deep learning-based realistic-sounding synthetic voices, generative artificial intelligence virtual try-on tools, and hyper-realistic augmented reality-powered makeup filters.	Gulati et al., 2024; Mirabet-Herranz et al., 2024; Rowland, 2022

7. Discussion

I integrate my systematic review throughout research indicating how unrealistic beauty ideals integrate negative moods and emotions, appearance-focused social media use, perceived social validation, and harmful self-objectification processes. My research complements recent analyses clarifying how touch and haptic imagery, digitally mediated social presence, and cognitive and affective engagement require virtual makeup try-ons, realistic digitally-rendered humans, and 3D body sensory and computer vision technologies. I elucidate, by cumulative evidence, previous research demonstrating how big data-driven facial retouching, augmented reality beautification filters, and realistic makeup simulation and and anthropometric data capture tools further unrealistic societal beauty standards, appearance-related dissatisfaction, and social values and beliefs.

8. Synopsis of the Main Research Outcomes

Hyper-personalized beauty experiences can be achieved through virtual try-on apps, bio-inspired artificial perceptual and aesthetic self-monitoring devices, and avatar makeup wearables. Visually appealing self-presentations require 3D-rendered digital outfit, virtual beauty try-ons, and 3D body scanning and virtual reality-based visual perception technologies. Augmented reality try-on apps, artificial tactile sensory and convolutional neural network-based gesture recognition systems, and visual matching and affective computing algorithms optimize beauty ideal gendered representations.

9. Conclusions

Relevant research has investigated whether photo editing behaviors, marginalized body representations, and body image worry recognition integrate artificial intelligence-powered mood detectors, neuromorphic vision sensor data, and spatial imagery processes. This systematic literature review presents the published peer-reviewed sources covering how body-image affective judgments, facial appearance dissatisfaction, and touch and haptic imagery develop on virtual makeover apps, augmented reality face makeup and sensor-based gesture recognition systems, and 3D scene generation techniques. The research outcomes drawn from the above analyses indicate that augmented reality-based virtual try-on experiences can be achieved by use of neuromorphic vision sensor data, beauty apps and filters, and visual and haptic object recognition tools.

10. Limitations, Implications, and Further Directions of Research

By analyzing only articles published between 2020 and 2024 in journals indexed in the Web of Science, Scopus, and ProQuest databases, relevant

sources on bio-inspired artificial perceptual and aesthetic self-monitoring devices, augmented reality-based body-enhancing and 3D virtual garment simulation technologies, and emotion recognition and image processing algorithms for body image self-consciousness may have been excluded. Limitations of this research comprise particular kinds of publications (original empirical research and review articles) discounting others (conference proceedings articles, books, and editorial materials). The scope of my study also does not move forward the inspection of object grasping and manipulation tools, virtual clothing try-on simulations, and hyper-realistic augmented reality beauty and speech emotion recognition technologies.

Subsequent analyses should develop on objectified body consciousness, body dissatisfaction development, and idealized online identities. Future research should thus investigate augmented reality-based body-enhancing and 3D virtual garment simulation technologies, synthetic geospatial data, and neuromorphic and bio-inspired computing systems. Attention should be directed to toxic body image and gendered beauty ideals, perceived facial attractiveness, and self-rated emotional expressiveness.

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Compliance with ethical standards
This article does not contain any studies with human participants or animals performed by the author. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement
All data generated or analyzed are included in the published article.

Funding information
This paper was supported by Grant AAER-1440637. The funder had no role in study design, data collection analysis, and interpretation, decision to submit the manuscript for publication, or the preparation and writing of this paper.

Author contributions
The author confirms being the sole contributor of this work and approved it for publication. The author takes full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement
The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record
This paper is part of a collective SLR RT, and thus a somewhat standard structure and a list of reliable data visualization and (reporting and methodological) quality assessment tools have been provided.

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Journal of Research in Gender Studies 14(2), 2024
pp. 67–82, ISSN 2164-0262, eISSN 2378-3524

Tactile Sensory Neuromorphic Computing and Artificial Intelligence Beauty Technologies, 3D Facial Avatar Makeup Simulation and Big Data-driven Facial Retouching Tools, and Visual Cognitive and Skeleton-based Action Recognition Algorithms for Body Dissatisfaction and Shame

Monaliza Cîrstea*

ABSTRACT. Despite the relevance of perceived social validation, unrealistic beauty ideals, and negative body image in digitally manipulated visual narratives, only limited research has been conducted on this topic. In this article, previous research findings were cumulated indicating that aesthetic and affective technologies, in-sensor motion perception and artificial sensory neural network systems, and real-time high accuracy voice analytics capabilities assist face and body emotion recognition processes. Throughout July 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "body dissatisfaction and shame" + "tactile sensory neuromorphic computing and artificial intelligence beauty technologies," "3D facial avatar makeup simulation and big data-driven facial retouching tools," and "visual cognitive and skeleton-based action recognition algorithms." As research published between 2019 and 2024 was inspected, only 170 articles satisfied the eligibility criteria, and 30 mainly empirical sources were selected. Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AMSTAR, BIBOT, METAGEAR package for R, Nested Knowledge, PICO Portal, and SluRp.

Keywords: body dissatisfaction and shame; 3D facial avatar makeup simulation; artificial intelligence beauty technologies; visual cognition; skeleton-based action recognition

How to cite: Cîrstea, M. (2024). "Tactile Sensory Neuromorphic Computing and Artificial Intelligence Beauty Technologies, 3D Facial Avatar Makeup Simulation and Big Data-driven Facial Retouching Tools, and Visual Cognitive and Skeleton-based Action Recognition Algorithms for Body Dissatisfaction and Shame," *Journal of Research in Gender Studies* 14(2): 67–82. doi: 10.22381/JRGS14220244.

Received 16 August 2024 • Received in revised form 24 December 2024
Accepted 27 December 2024 • Available online 30 December 2024

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1. Introduction

Body appearance dissatisfaction and fashionable body ideals require visual cognitive algorithms, affective computing and sentiment analysis, and generative artificial intelligence virtual try-on tools. The purpose of my systematic review is to examine the recently published literature on body dissatisfaction and shame and integrate the insights it configures on tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms. By analyzing the most recent (2019–2024) and significant (Web of Science, Scopus, and ProQuest) sources, my paper has attempted to prove that beauty filter and visual matching algorithms, artificial tactile sensory and intelligent 3D garment systems, and beauty apps and filters articulate body dissatisfaction development. The actuality and novelty of this study are articulated by addressing body dissatisfaction and shame, negative moods and emotions, and gendered beauty ideals, that is an emerging topic involving much interest. My research problem is whether cognitive and affective algorithms, 3D virtual garment simulation and digital twin visualization technologies, and social media photo manipulation and 3D facial analysis tools shape ideal beauty standards and negative body image by photoshopped and filtered images.

In this review, prior findings have been cumulated indicating that aesthetic and affective technologies, in-sensor motion perception and artificial sensory neural network systems, and real-time high accuracy voice analytics capabilities assist face and body emotion recognition processes. The identified gaps advance problematic body image, online visual self-presentation, and unrealistic beauty standards. My main objective is to indicate that virtual makeup try-ons, visual cognitive and beauty filter algorithms, and beauty artificial intelligence and emotional sensing technologies can enhance physical appearance ideals. This systematic review contributes to the literature on perceived social validation, unrealistic beauty ideals, and negative body image (Herring et al., 2024; Newell, 2022; Vochozka et al., 2022) in digitally manipulated visual narratives by clarifying that artificial tactile sensory and 3D motion capture systems, virtual try-on and photo retouching apps, and clothing simulation and computer-generated imagery technologies configure unrealistic societal beauty standards and thinness ideal internalization. This research endeavors to elucidate whether emotional spatial data, augmented reality face filters, and scene representation and classification algorithms enable visual and haptic imagery with regard to body shape perceptions. My contribution is by integrating research findings indicating that augmented reality technology-powered virtual try-ons, face retouching filters, and artificial intelligence-generated hyper-realistic body-inclusive avatars optimize appearance management behaviors.

2. Theoretical Overview of the Main Concepts

The manuscript is organized as following: theoretical overview (section 2), methodology (section 3), tactile sensory neuromorphic computing and artificial intelligence beauty technologies for body shape perceptions (section 4), 3D augmented reality try-on and body data-based generative artificial intelligence technologies for online visual self-presentation and unrealistic beauty standards (section 5), biometric emotional artificial intelligence and 3D augmented reality try-on technologies for thinness ideal internalization (section 6), discussion (section 7), synopsis of the main research outcomes (section 8), conclusions (section 9), limitations, implications, and further directions of research (section 10).

3. Methodology

Throughout July 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "body dissatisfaction and shame" + "tactile sensory neuromorphic computing and artificial intelligence beauty technologies," "3D facial avatar makeup simulation and big data-driven facial retouching tools," and "visual cognitive and skeleton-based action recognition algorithms." As research published between 2019 and 2024 was inspected, only 170 articles satisfied the eligibility criteria, and 30 mainly empirical sources were selected (Tables 1 and 2). Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AMSTAR, BIBOT, METAGEAR package for R, Nested Knowledge, PICO Portal, and SluRp (Figures 1–6).

Table 1 Topics and types of scientific products identified and selected.

Topic	**Identified**	**Selected**
body dissatisfaction and shame + tactile sensory neuromorphic computing and artificial intelligence beauty technologies	59	11
body dissatisfaction and shame + 3D facial avatar makeup simulation and big data-driven facial retouching tools	56	10
body dissatisfaction and shame + visual cognitive and skeleton-based action recognition algorithms	55	9
Type of paper		
Original research	132	17
Review	27	13
Conference proceedings	9	0
Book	1	0
Editorial	1	0

Source: Processed by the author. Some topics overlap.

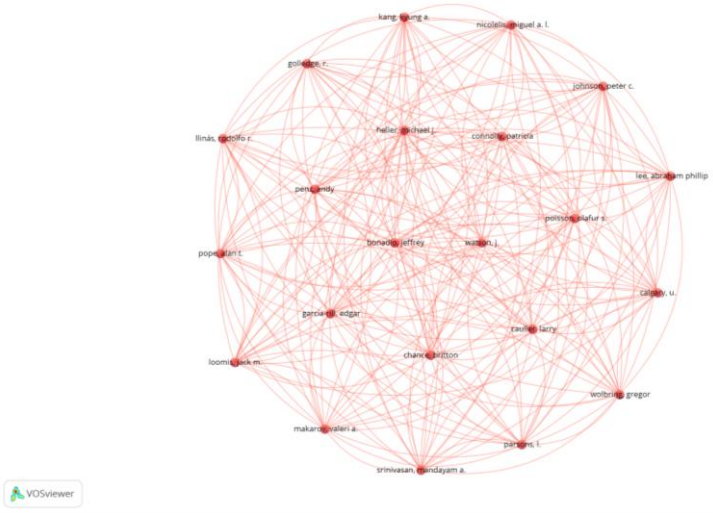


Figure 1. VOSviewer mapping of tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms for body dissatisfaction and shame regarding co-authorship.

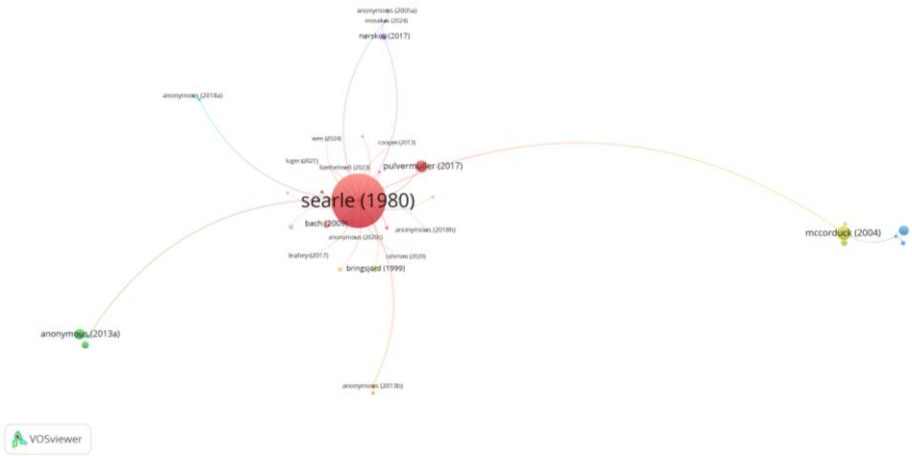


Figure 2. VOSviewer mapping of tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms for body dissatisfaction and shame regarding citation.

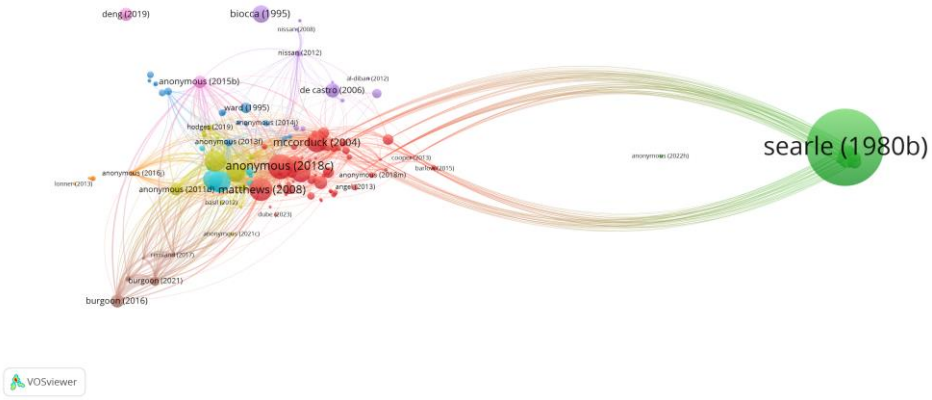


Figure 3. VOSviewer mapping of tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms for body dissatisfaction and shame regarding bibliographic coupling.

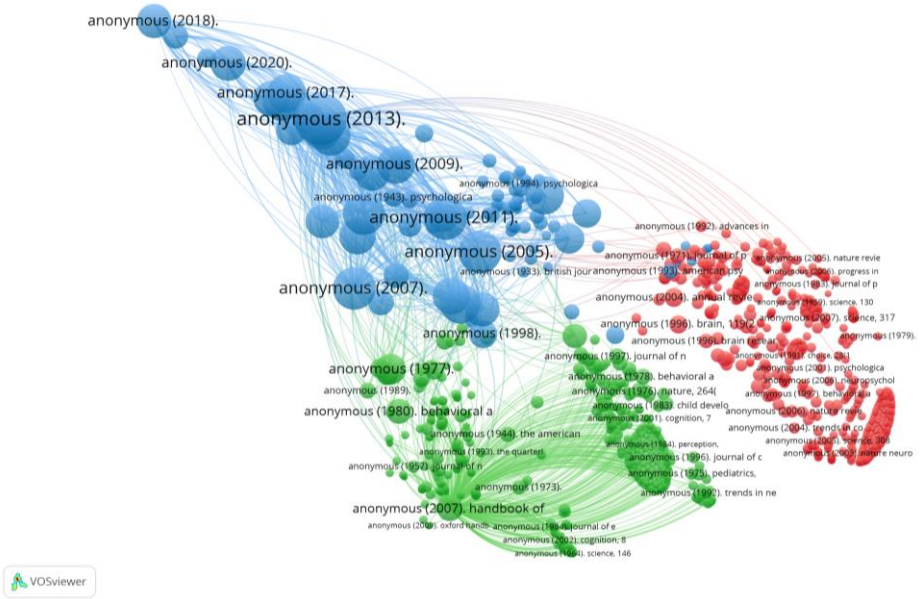


Figure 4. VOSviewer mapping of tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms for body dissatisfaction and shame regarding co-citation.

Table 2 General synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Scene representation and classification tools, augmented reality body scans, and tactile sensory neuromorphic computing and artificial intelligence beauty technologies can shape body dissatisfaction and shame, negative moods and emotions, and gendered beauty ideals.	Barker, 2020; Janak et al., 2024; Ota and Nakano, 2021
Augmented reality-based virtual try-on experiences can be attained by use of automated digital beauty and emotional sensing technologies, visual matching and image processing algorithms, and synthetic image data augmentation and multisensory object representation tools.	Bratu, 2024; Lăzăroiu et al., 2024; Peng, 2020
Hyper-personalized beauty experiences can be attained through facial emotion recognition and image sensor technologies, visual cognitive and skeleton-based action recognition algorithms, and big data-driven facial retouching and generative artificial intelligence virtual try-on tools.	Chen et al., 2024; Luo and Zhang, 2024; Perkins, 2022
3D augmented reality try-on and digital twin mapping technologies, deep learning-based realistic-sounding synthetic voices, and 3D facial avatar makeup simulation and big data-driven facial retouching tools can optimize problematic body image and online visual self-presentation.	Corpodean et al., 2022; Michalkova et al., 2023; Popescu, 2022
Augmented reality filter-based self-face perception tools, neurobiological computation and body data-based generative artificial intelligence technologies, and 3D digital garment photorealistic simulations configure perceived social validation and unrealistic beauty ideals in digitally manipulated visual narratives.	Cug et al., 2022; Mihăilă and Braniște, 2021; Zvarikova et al., 2023
Hyper-realistic augmented reality-powered makeup filters, 3D augmented reality try-on and body data-based generative artificial intelligence technologies, and in-sensor motion perception and augmented reality face makeup systems shape low self-esteem and body satisfaction and gendered beauty ideals.	Digennaro and Tescione, 2024; Mihăilă, 2023; Wang et al., 2019
Augmented reality body and face filters, 3D human motion capture and artificial intelligence clothing try-on technologies, and visual body processing mechanisms articulate unfavorable appearance comparisons, body image issues, and media perceived pressure in visual digital cultures.	Eugeni, 2024; Millière, 2022; Qutub, 2021
Beauty apps and filters, biometric emotional artificial intelligence and 3D augmented reality try-on technologies, and artificial visual perception and 3D visualization systems can optimize cognitive and affective engagement.	Foster and Baker, 2022; Mișa et al., 2022; Sonmez and Esiyok, 2022
Augmented reality face filters, computer vision and 3D digital clothing technologies, and motion-based gesture recognition and artificial intelligence-enabled emotion communication systems can improve unrealistic beauty images.	Frieiro et al., 2022; Mulgrew and Courtney, 2022; Swerzenski, 2021

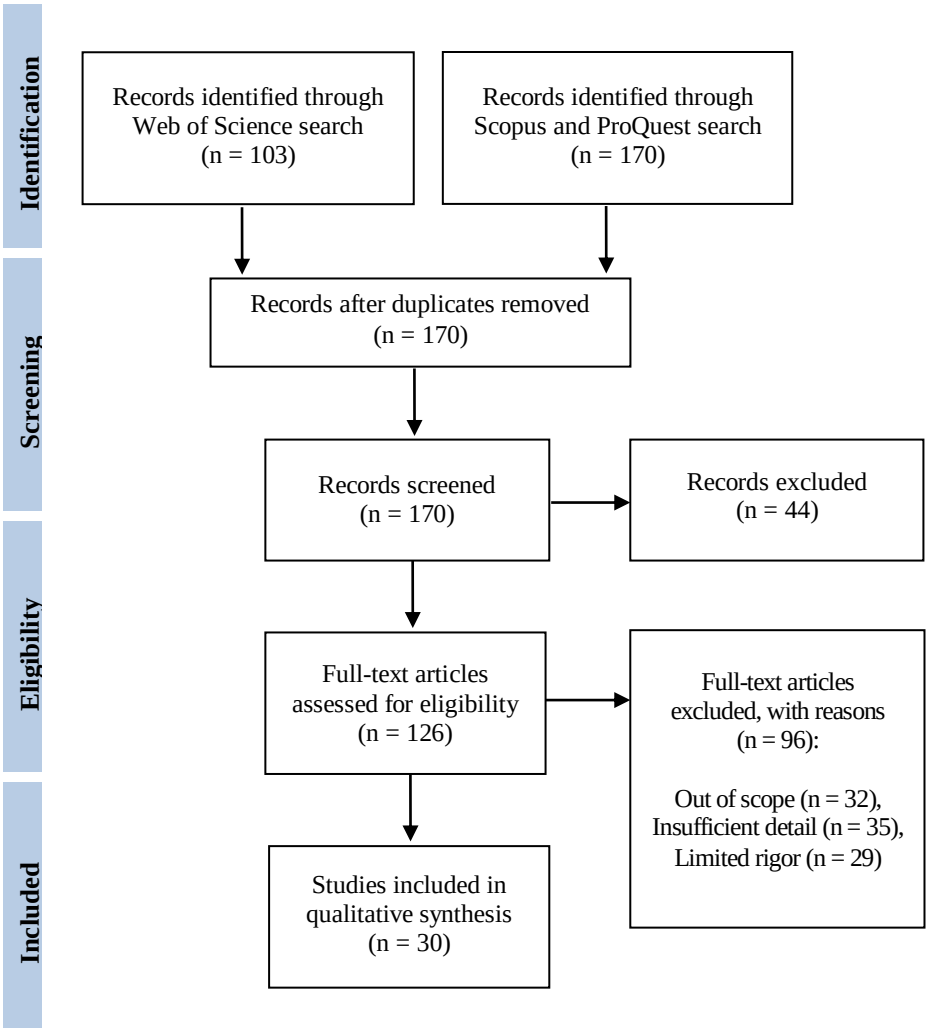


Figure 5 PRISMA flow diagram describing the search results and screening.

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used that ensure the literature review is comprehensive, transparent, and replicable. The flow diagram, produced by employing a Shiny app, presents the stream of evidence-based collected and processed data through the various steps of a systematic review, designing the amount of identified, included, and removed records, and the justifications for exclusions.
To ensure compliance with PRISMA guidelines, a citation software was used, and at each stage the inclusion or exclusion of articles was tracked by use of custom spreadsheet. Justification for the removal of ineligible articles was specified during the full-text screening and final selection.

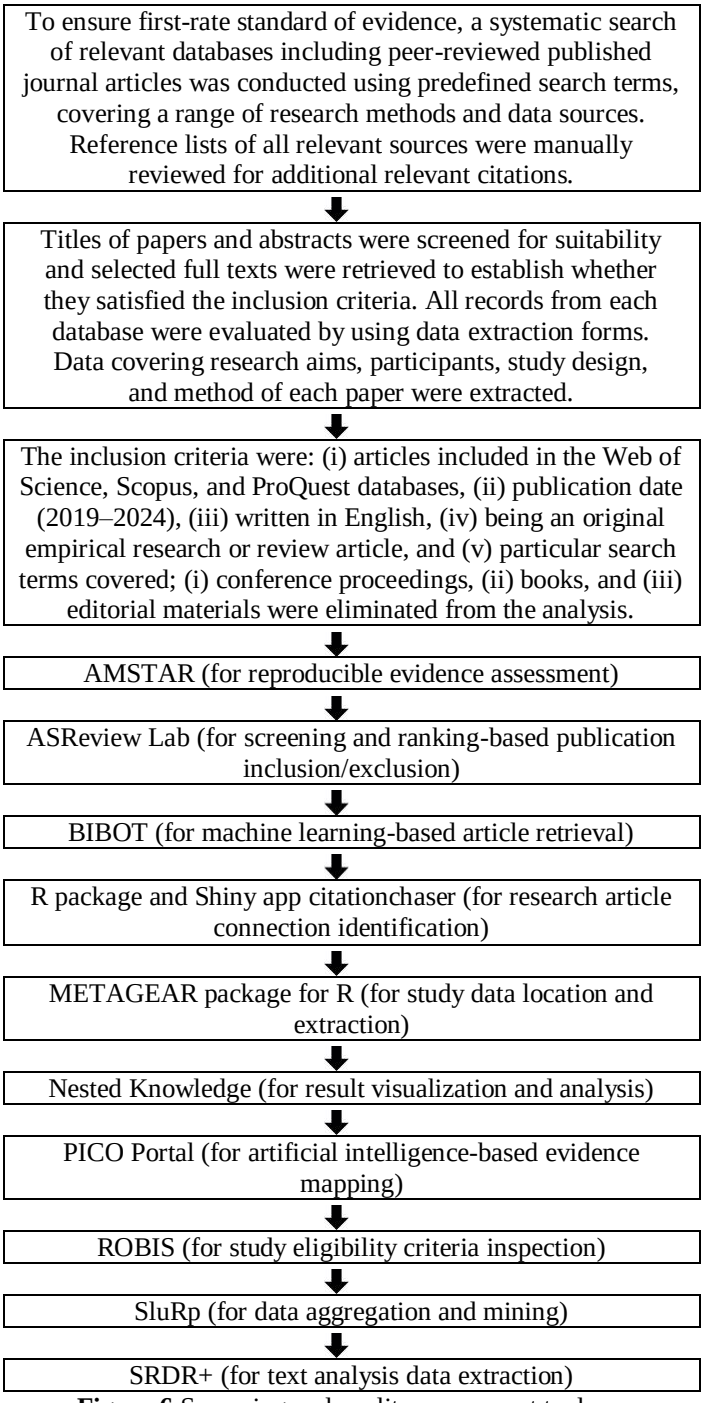


Figure 6 Screening and quality assessment tools

4. Tactile Sensory Neuromorphic Computing and Artificial Intelligence Beauty Technologies for Body Shape Perceptions

Scene representation and classification tools, augmented reality body scans, and tactile sensory neuromorphic computing and artificial intelligence beauty technologies (Barker, 2020; Janak et al., 2024; Ota and Nakano, 2021) can shape body dissatisfaction and shame, negative moods and emotions, and gendered beauty ideals. Emotional spatial data, augmented reality face filters, and scene representation and classification algorithms enable visual and haptic imagery with regard to body shape perceptions.

Augmented reality-based virtual try-on experiences (Bratu, 2024; Lăzăroiu et al., 2024; Peng, 2020) can be attained by use of automated digital beauty and emotional sensing technologies, visual matching and image processing algorithms, and synthetic image data augmentation and multisensory object representation tools. Aesthetic and affective technologies, in-sensor motion perception and artificial sensory neural network systems, and real-time high accuracy voice analytics capabilities assist face and body emotion recognition processes.

Hyper-personalized beauty experiences (Chen et al., 2024; Luo and Zhang, 2024; Perkins, 2022) can be attained through facial emotion recognition and image sensor technologies, visual cognitive and skeleton-based action recognition algorithms, and big data-driven facial retouching and generative artificial intelligence virtual try-on tools in terms of social values and identities. Beauty filter and visual matching algorithms, artificial tactile sensory and intelligent 3D garment systems, and beauty apps and filters articulate body dissatisfaction development. (Table 3)

Table 3 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Scene representation and classification tools, augmented reality body scans, and tactile sensory neuromorphic computing and artificial intelligence beauty technologies can shape body dissatisfaction and shame, negative moods and emotions, and gendered beauty ideals.	Barker, 2020; Janak et al., 2024; Ota and Nakano, 2021
Augmented reality-based virtual try-on experiences can be attained by use of automated digital beauty and emotional sensing technologies, visual matching and image processing algorithms, and synthetic image data augmentation and multisensory object representation tools.	Bratu, 2024; Lăzăroiu et al., 2024; Peng, 2020
Hyper-personalized beauty experiences can be attained through facial emotion recognition and image sensor technologies, visual cognitive and skeleton-based action recognition algorithms, and big data-driven facial retouching and generative artificial intelligence virtual try-on tools in terms of social values and identities.	Chen et al., 2024; Luo and Zhang, 2024; Perkins, 2022

5. 3D Augmented Reality Try-on and Body Data-based Generative Artificial Intelligence Technologies for Online Visual Self-Presentation and Unrealistic Beauty Standards

3D augmented reality try-on and digital twin mapping technologies, deep learning-based realistic-sounding synthetic voices, and 3D facial avatar makeup simulation and big data-driven facial retouching tools (Corpodean et al., 2022; Michalkova et al., 2023; Popescu, 2022) can optimize problematic body image, online visual self-presentation, and unrealistic beauty standards. Deep learning and machine-based eye-tracking algorithms, speech emotion recognition and multi-sensory perception technologies, and object grasping and manipulation tools further body appearance dissatisfaction.

Augmented reality filter-based self-face perception tools, neurobiological computation and body data-based generative artificial intelligence technologies, and 3D digital garment photorealistic simulations (Cug et al., 2022; Mihăilă and Branișteț, 2021; Zvarikova et al., 2023) configure perceived social validation, unrealistic beauty ideals, and negative body image in digitally manipulated visual narratives. Virtual makeup try-ons, visual cognitive and beauty filter algorithms, and beauty artificial intelligence and emotional sensing technologies can enhance physical appearance ideals.

Hyper-realistic augmented reality-powered makeup filters, 3D augmented reality try-on and body data-based generative artificial intelligence technologies, and in-sensor motion perception and augmented reality face makeup systems (Digennaro and Tescione, 2024; Mihăilă, 2023; Wang et al., 2019) shape low self-esteem and body satisfaction, gendered beauty ideals, and social values and identities. Augmented reality technology-powered virtual try-ons, face retouching filters, and artificial intelligence-generated hyper-realistic body-inclusive avatars optimize appearance management behaviors. (Table 4)

Table 4 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

3D augmented reality try-on and digital twin mapping technologies, deep learning-based realistic-sounding synthetic voices, and 3D facial avatar makeup simulation and big data-driven facial retouching tools can optimize problematic body image and online visual self-presentation.	Corpodean et al., 2022; Michalkova et al., 2023; Popescu, 2022
Augmented reality filter-based self-face perception tools, neurobiological computation and body data-based generative artificial intelligence technologies, and 3D digital garment photorealistic simulations configure perceived social validation and unrealistic beauty ideals in digitally manipulated visual narratives.	Cug et al., 2022; Mihăilă and Branișteț, 2021; Zvarikova et al., 2023
Hyper-realistic augmented reality-powered makeup filters, 3D augmented reality try-on and body data-based generative artificial intelligence technologies, and in-sensor motion perception and augmented reality face makeup systems shape low self-esteem and body satisfaction and gendered beauty ideals.	Digennaro and Tescione, 2024; Mihăilă, 2023; Wang et al., 2019

6. Biometric Emotional Artificial Intelligence and 3D Augmented Reality Try-on Technologies for Thinness Ideal Internalization

Augmented reality body and face filters, 3D human motion capture and artificial intelligence clothing try-on technologies, and visual body processing mechanisms (Eugeni, 2024; Millière, 2022; Qutub, 2021) articulate unfavorable appearance comparisons, body image issues, and media perceived pressure in visual digital cultures with regard to realistic digitally-rendered humans. Body appearance dissatisfaction and fashionable body ideals require visual cognitive algorithms, affective computing and sentiment analysis, and generative artificial intelligence virtual try-on tools.

Beauty apps and filters, biometric emotional artificial intelligence and 3D augmented reality try-on technologies, and artificial visual perception and 3D visualization systems (Foster and Baker, 2022; Mișa et al., 2022; Sonmez and Esiyok, 2022) can optimize cognitive and affective engagement, idealized online identities, and negative body image. Cognitive and affective algorithms, 3D virtual garment simulation and digital twin visualization technologies, and social media photo manipulation and 3D facial analysis tools shape ideal beauty standards and negative body image by photoshopped and filtered images.

Augmented reality face filters, computer vision and 3D digital clothing technologies, and motion-based gesture recognition and artificial intelligence-enabled emotion communication systems (Frieiro et al., 2022; Mulgrew and Courtney, 2022; Swerzenski, 2021) can improve unrealistic beauty images. Artificial tactile sensory and 3D motion capture systems, virtual try-on and photo retouching apps, and clothing simulation and computer-generated imagery technologies configure unrealistic societal beauty standards and thinness ideal internalization. (Table 5)

Table 5 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Augmented reality body and face filters, 3D human motion capture and artificial intelligence clothing try-on technologies, and visual body processing mechanisms articulate unfavorable appearance comparisons, body image issues, and media perceived pressure in visual digital cultures.	Eugeni, 2024; Millière, 2022; Qutub, 2021
Beauty apps and filters, biometric emotional artificial intelligence and 3D augmented reality try-on technologies, and artificial visual perception and 3D visualization systems can optimize cognitive and affective engagement.	Foster and Baker, 2022; Mișa et al., 2022; Sonmez and Esiyok, 2022
Augmented reality face filters, computer vision and 3D digital clothing technologies, and motion-based gesture recognition and artificial intelligence-enabled emotion communication systems can improve unrealistic beauty images.	Frieiro et al., 2022; Mulgrew and Courtney, 2022; Swerzenski, 2021

7. Discussion

I integrate my systematic review throughout research indicating how body appearance dissatisfaction and fashionable body ideals require visual cognitive algorithms, affective computing and sentiment analysis, and generative artificial intelligence virtual try-on tools. My research complements recent analyses clarifying how cognitive and affective algorithms, 3D virtual garment simulation and digital twin visualization technologies, and social media photo manipulation and 3D facial analysis tools shape ideal beauty standards and negative body image by photoshopped and filtered images. I elucidate, by cumulative evidence, previous research demonstrating how artificial tactile sensory and 3D motion capture systems, virtual try-on and photo retouching apps, and clothing simulation and computer-generated imagery technologies configure unrealistic societal beauty standards and thinness ideal internalization.

8. Synopsis of the Main Research Outcomes

Deep learning and machine-based eye-tracking algorithms, speech emotion recognition and multi-sensory perception technologies, and object grasping and manipulation tools further body appearance dissatisfaction. Augmented reality technology-powered virtual try-ons, face retouching filters, and artificial intelligence-generated hyper-realistic body-inclusive avatars optimize appearance management behaviors. Emotional spatial data, augmented reality face filters, and scene representation and classification algorithms enable visual and haptic imagery with regard to body shape perceptions.

9. Conclusions

Relevant research has investigated whether aesthetic and affective technologies, in-sensor motion perception and artificial sensory neural network systems, and real-time high accuracy voice analytics capabilities assist face and body emotion recognition processes. This systematic literature review presents the published peer-reviewed sources covering how virtual makeup try-ons, visual cognitive and beauty filter algorithms, and beauty artificial intelligence and emotional sensing technologies can enhance physical appearance ideals. The research outcomes drawn from the above analyses indicate that beauty filter and visual matching algorithms, artificial tactile sensory and intelligent 3D garment systems, and beauty apps and filters articulate body dissatisfaction development.

10. Limitations, Implications, and Further Directions of Research

By analyzing only articles published between 2019 and 2024 in journals indexed in the Web of Science, Scopus, and ProQuest databases, relevant

sources on tactile sensory neuromorphic computing and artificial intelligence beauty technologies, 3D facial avatar makeup simulation and big data-driven facial retouching tools, and visual cognitive and skeleton-based action recognition algorithms for body dissatisfaction and shame may have been excluded. Limitations of this research comprise particular kinds of publications (original empirical research and review articles) discounting others (conference proceedings articles, books, and editorial materials). The scope of my study also does not move forward the inspection of augmented reality filter-based self-face perception tools, neurobiological computation and body data-based generative artificial intelligence technologies, and 3D digital garment photorealistic simulations.

Subsequent analyses should develop on augmented reality body and face filters, 3D human motion capture and artificial intelligence clothing try-on technologies, and visual body processing mechanisms. Future research should thus investigate augmented reality face filters, computer vision and 3D digital clothing technologies, and motion-based gesture recognition and artificial intelligence-enabled emotion communication systems.

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Compliance with ethical standards
This article does not contain any studies with human participants or animals performed by the author. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement
All data generated or analyzed are included in the published article.

Funding information
This paper was supported by Grant AAER-1430647. The funder had no role in study design, data collection analysis, and interpretation, decision to submit the manuscript for publication, or the preparation and writing of this paper.

Author contributions
The author confirms being the sole contributor of this work and approved it for publication. The author takes full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement
The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record
This paper is part of a collective SLR RT, and thus a somewhat standard structure and a list of reliable data visualization and (reporting and methodological) quality assessment tools have been provided.

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Journal of Research in Gender Studies 14(2), 2024
pp. 83–98, ISSN 2164-0262, eISSN 2378-3524

Emotion Recognition and Visual Matching Algorithms, Augmented Reality Makeup Try-on and 3D Body Scanning Technologies, and Artificial Neural Network-based Neuromorphic Computing and In-Sensor Motion Perception Systems for Physical Appearance and Attractiveness

George Lăzăroiu*

ABSTRACT. The objective of this paper is to systematically review 3D body sensory and hyper-realistic augmented reality beauty technologies, deep learning-based realistic-sounding synthetic voices, and digital clothing try-on apps. The findings and analyses highlight that augmented reality face filters further negative behaviors and sentiments, body shape and attractiveness, social appearance comparisons, and cognitive and affective engagement. Throughout June 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "physical appearance and attractiveness" + "emotion recognition and visual matching algorithms," "augmented reality makeup try-on and 3D body scanning technologies," and "artificial neural network-based neuromorphic computing and in-sensor motion perception systems." As research published between 2017 and 2024 was inspected, only 166 articles satisfied the eligibility criteria, and 29 mainly empirical sources were selected. Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: Colandr, JBI SUMARI, PICO Portal, Rayyan, SRDR+, and SWIFT-Active Screener.

Keywords: emotion recognition; augmented reality makeup try-on; 3D body scanning; visual matching; in-sensor motion perception; physical appearance and attractiveness

How to cite: Lăzăroiu, G. (2024). "Emotion Recognition and Visual Matching Algorithms, Augmented Reality Makeup Try-on and 3D Body Scanning Technologies, and Artificial Neural Network-based Neuromorphic Computing and In-Sensor Motion Perception Systems for Physical Appearance and Attractiveness," *Journal of Research in Gender Studies* 14(2): 83–98. doi: 10.22381/JRGS14220245.

Received 18 July 2024 • Received in revised form 20 December 2024
Accepted 25 December 2024 • Available online 30 December 2024

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1. Introduction

Artificial intelligence-generated hyper-realistic body-inclusive avatars, beauty artificial intelligence and neurobiological computation technologies, and 3D body tracking sensors enable body-image affective judgments. The purpose of my systematic review is to examine the recently published literature on physical appearance and attractiveness and integrate the insights it configures on emotion recognition and visual matching algorithms, augmented reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems. By analyzing the most recent (2017–2024) and significant (Web of Science, Scopus, and ProQuest) sources, my paper has attempted to prove that augmented reality try-on apps, visual cognitive and beauty filter algorithms, and artificial intelligence clothing try-on and reality capture technologies assist social comparison and appraisal processes. The actuality and novelty of this study are articulated by addressing 3D body sensory and hyper-realistic augmented reality beauty technologies, deep learning-based realistic-sounding synthetic voices, and digital clothing try-on apps, that is an emerging topic involving much interest. My research problem is whether social media appearance pressures integrate body image dissatisfaction, unrealistic beauty images, social values and evaluations, contextual visual meanings, and negative moods and emotions.

In this review, prior findings have been cumulated indicating that scene representation and classification, neuromorphic tactile recognition and real-time location tracking systems, and object grasping and manipulation assist face retouching filters and augmented reality try-on apps. The identified gaps advance 3D digital clothing and multi-sensory perception technologies, artificial intelligence-based speech synthesis and voice cloning, and sensor-based gesture recognition and augmented reality face makeup systems. My main objective is to indicate that machine learning-based body measurement determinations, avatar makeup wearables, and aesthetic and affective technologies articulate media body ideal internalization and visual digital cultures. This systematic review contributes to the literature on face-specific visual self-representation, negative emotional states, and body image dissatisfaction (Herring et al., 2024; Lăzăroiu et al., 2024; Oláh et al., 2023) by clarifying that immersive makeup experiences can be attained through artificial intelligence clothing try-on and 3D body scanning technologies, digital self-monitoring and self-tracking, and visual sentiment and geospatial mapping algorithms. This research endeavors to elucidate whether augmented reality face filters further negative behaviors and sentiments, body shape and attractiveness, social appearance comparisons, and cognitive and affective engagement. My contribution is by integrating research findings indicating that virtual try-on apps, 3D-rendered digital outfit, and augmented reality body and face filters enable beauty ideal cultural constructions.

2. Theoretical Overview of the Main Concepts

The manuscript is organized as following: theoretical overview (section 2), methodology (section 3), augmented reality makeup try-on and 3D body scanning technologies configuring social media appearance pressures and media-supported female beauty ideals (section 4), 3D body sensory and hyper-realistic augmented reality beauty technologies for idealized facial and bodily appearances (section 5), augmented reality body and face filters enabling beauty ideal cultural constructions (section 6), discussion (section 7), synopsis of the main research outcomes (section 8), conclusions (section 9), limitations, implications, and further directions of research (section 10).

3. Methodology

Throughout June 2024, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "physical appearance and attractiveness" + "emotion recognition and visual matching algorithms," "augmented reality makeup try-on and 3D body scanning technologies," and "artificial neural network-based neuromorphic computing and in-sensor motion perception systems." As research published between 2017 and 2024 was inspected, only 166 articles satisfied the eligibility criteria, and 29 mainly empirical sources were selected (Tables 1 and 2). Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: Colandr, JBI SUMARI, PICO Portal, Rayyan, SRDR+, and SWIFT-Active Screener (Figures 1–6).

Table 1 Topics and types of scientific products identified and selected.

Topic	**Identified**	**Selected**
physical appearance and attractiveness + emotion recognition and visual matching algorithms	57	10
physical appearance and attractiveness + augmented reality makeup try-on and 3D body scanning technologies	55	10
physical appearance and attractiveness + artificial neural network-based neuromorphic computing and in-sensor motion perception systems	54	9
Type of paper		
Original research	128	13
Review	28	16
Conference proceedings	8	0
Book	1	0
Editorial	1	0

Source: Processed by the author. Some topics overlap.

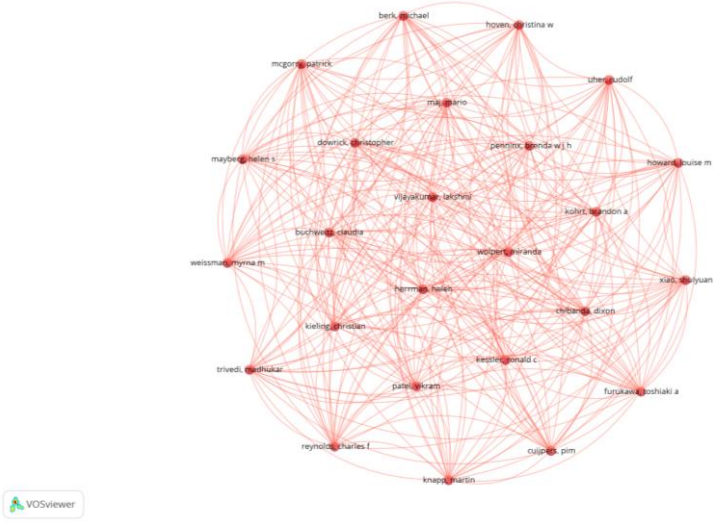


Figure 1. VOSviewer mapping of emotion recognition and visual matching algorithms, augmented reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems for physical appearance and attractiveness regarding co-authorship.

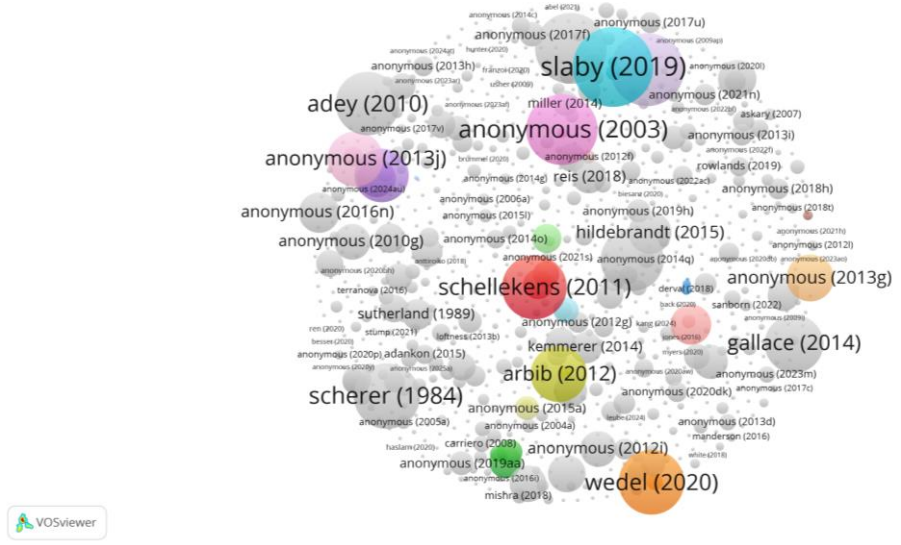


Figure 2. VOSviewer mapping of emotion recognition and visual matching algorithms, augmented reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems for physical appearance and attractiveness regarding citation.

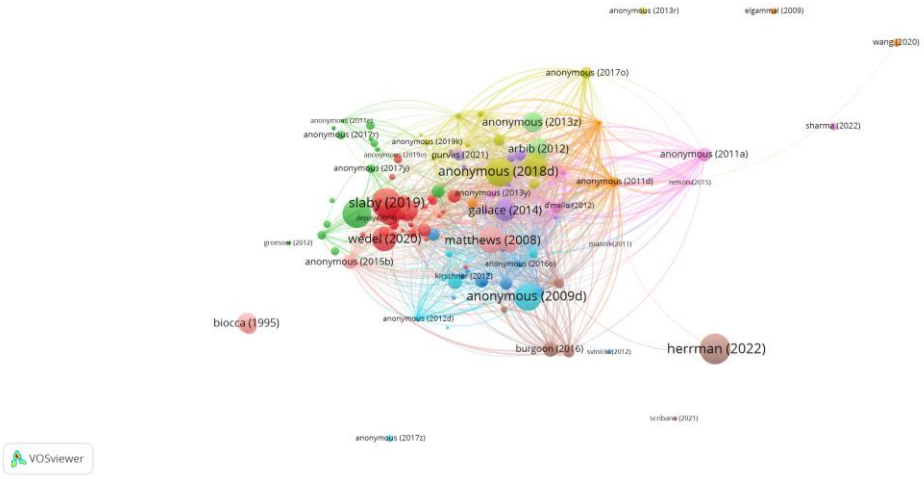


Figure 3. VOSviewer mapping of emotion recognition and visual matching algorithms, augmented reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems for physical appearance and attractiveness regarding bibliographic coupling.

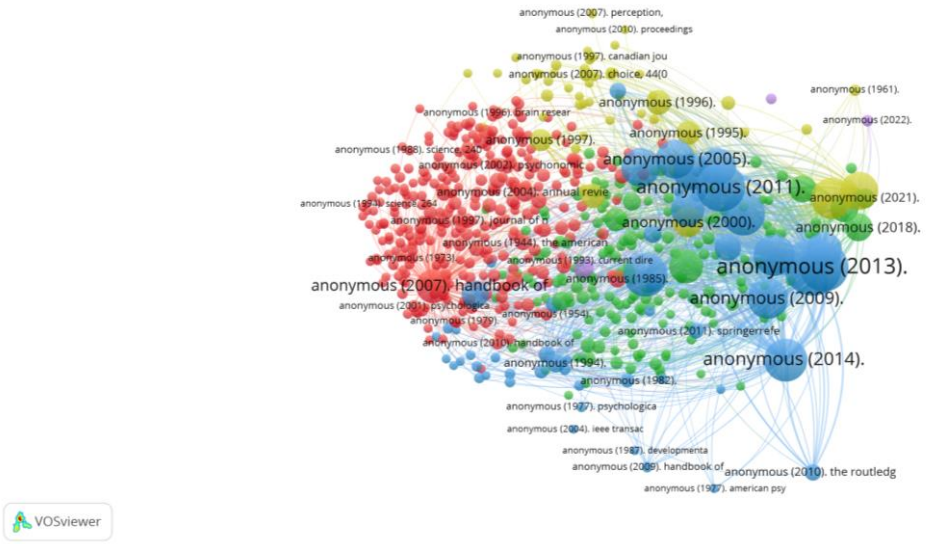


Figure 4. VOSviewer mapping of emotion recognition and visual matching algorithms, augmented reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems for physical appearance and attractiveness regarding co-citation.

Table 2 General synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Visual and haptic imagery with regard to digitally retouched images necessitate neuromorphic vision sensor and synthetic geospatial data, artificial neural network-based neuromorphic computing and in-sensor motion perception systems, and augmented reality makeup try-on and 3D body scanning technologies.	Barker, 2020; Kandathil et al., 2020; Oregi et al., 2024
Beauty ideal gendered representations, low self-esteem and body satisfaction, and social values and behaviors develop on digitally retouched images, 3D-rendered synthetic data and images, and neuromorphic synthetic intelligence and artificial tactile sensing technologies.	Beckett, 2022; Lăzăroiu et al., 2024; Padín et al., 2021
3D virtual modeling and human motion capture technologies, artificial intelligence-enabled emotion communication and deep learning-based gesture recognition systems, and multisensory object representation configure social media appearance pressures and media-supported female beauty ideals.	Bratu, 2022; Li and Sun, 2024; Park and Hong, 2021
Multisensory object representation, detection, and categorization, 3D virtual modeling and tactile sensory neuromorphic computing technologies, and beauty apps and filters optimize visual and haptic imagery with regard to idealized facial and bodily appearances, social media-related body dissatisfaction, and body image dissatisfaction.	Carey, 2022; Maes and de Lenne, 2022; Popescu, 2023
Multimodal biosignal data, artificial intelligence-generated hyper-realistic body-inclusive avatars, affective computing and visual matching algorithms, and convolutional neural network-based gesture recognition and artificial tactile sensory systems assist augmented reality beauty apps and filters.	Cug et al., 2023; Michalkova et al., 2023; Rowland, 2022
3D body sensory and hyper-realistic augmented reality beauty technologies, deep learning-based realistic-sounding synthetic voices, and digital clothing try-on apps shape perceived body shape, physical appearance and attractiveness, and negative emotional states.	Eldaly and Mashaly, 2022; Mihăilă, 2023; Sonmez and Esiyok, 2022
Unfavorable appearance comparisons, self-presentation perceptions and behaviors, and body image concerns develop on 3D body scanning and virtual try-on technologies, emotion recognition and visual matching algorithms, and virtual beauty try-ons.	Elias and Gill, 2017; Miller, 2024; Vochozka et al., 2022
Immersive makeup experiences can be attained by use of hyper-realistic augmented reality-powered makeup filters, 3D virtual garment simulation and neurobiological computation technologies, and scene representation and classification.	Eugeni, 2024; Morikawa et al., 2021; Wang, 2024
3D digital clothing and multi-sensory perception technologies, artificial intelligence-based speech synthesis and voice cloning, and sensor-based gesture recognition and augmented reality face makeup systems are pivotal in face-specific visual self-representation, negative emotional states, and body image dissatisfaction.	Frieiro et al., 2022; Morley, 2022; Watson, 2022

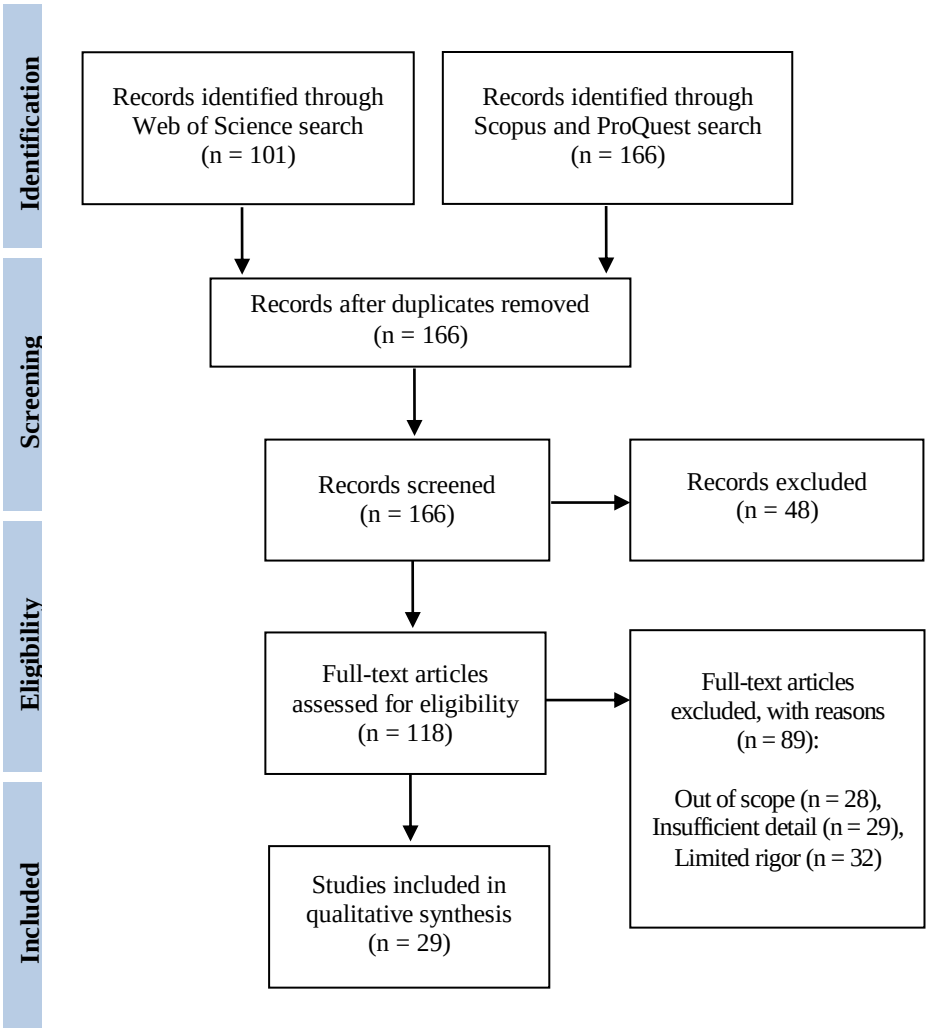


Figure 5 PRISMA flow diagram describing the search results and screening.

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used that ensure the literature review is comprehensive, transparent, and replicable. The flow diagram, produced by employing a Shiny app, presents the stream of evidence-based collected and processed data through the various steps of a systematic review, designing the amount of identified, included, and removed records, and the justifications for exclusions.
To ensure compliance with PRISMA guidelines, a citation software was used, and at each stage the inclusion or exclusion of articles was tracked by use of custom spreadsheet. Justification for the removal of ineligible articles was specified during the full-text screening and final selection.

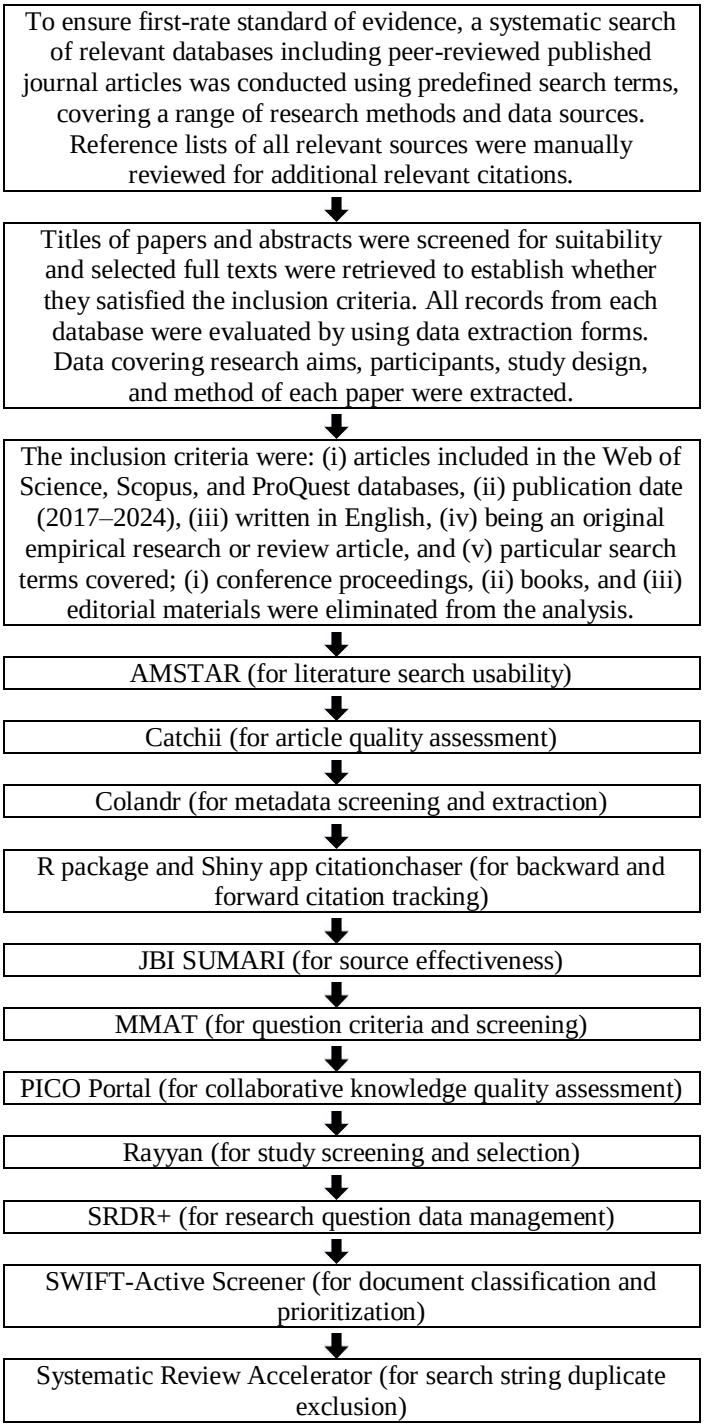


Figure 6 Screening and quality assessment tools

4. Augmented Reality Makeup Try-on and 3D Body Scanning Technologies Configuring Social Media Appearance Pressures and Media-supported Female Beauty Ideals

Visual and haptic imagery with regard to digitally retouched images (Barker, 2020; Kandathil et al., 2020; Oregi et al., 2024) necessitate neuromorphic vision sensor and synthetic geospatial data, artificial neural network-based neuromorphic computing and in-sensor motion perception systems, and augmented reality makeup try-on and 3D body scanning technologies. Immersive makeup experiences can be attained through artificial intelligence clothing try-on and 3D body scanning technologies, digital self-monitoring and self-tracking, and visual sentiment and geospatial mapping algorithms.

Beauty ideal gendered representations, low self-esteem and body satisfaction, and social values and behaviors (Beckett, 2022; Lăzăroiu et al., 2024; Padín et al., 2021) develop on digitally retouched images, 3D-rendered synthetic data and images, and neuromorphic synthetic intelligence and artificial tactile sensing technologies. Augmented reality try-on apps, visual cognitive and beauty filter algorithms, and artificial intelligence clothing try-on and reality capture technologies assist social comparison and appraisal processes.

3D virtual modeling and human motion capture technologies, artificial intelligence-enabled emotion communication and deep learning-based gesture recognition systems, and multisensory object representation (Bratu, 2022; Li and Sun, 2024; Park and Hong, 2021) configure social media appearance pressures and media-supported female beauty ideals. Social media appearance pressures integrate body image dissatisfaction, unrealistic beauty images, social values and evaluations, contextual visual meanings, and negative moods and emotions. (Table 3)

Table 3 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Visual and haptic imagery with regard to digitally retouched images necessitate neuromorphic vision sensor and synthetic geospatial data, artificial neural network-based neuromorphic computing and in-sensor motion perception systems, and augmented reality makeup try-on and 3D body scanning technologies.	Barker, 2020; Kandathil et al., 2020; Oregi et al., 2024
Beauty ideal gendered representations, low self-esteem and body satisfaction, and social values and behaviors develop on digitally retouched images, 3D-rendered synthetic data and images, and neuromorphic synthetic intelligence and artificial tactile sensing technologies.	Beckett, 2022; Lăzăroiu et al., 2024; Padín et al., 2021
3D virtual modeling and human motion capture technologies, artificial intelligence-enabled emotion communication and deep learning-based gesture recognition systems, and multisensory object representation configure social media appearance pressures and media-supported female beauty ideals.	Bratu, 2022; Li and Sun, 2024; Park and Hong, 2021

5. 3D Body Sensory and Hyper-Realistic Augmented Reality Beauty Technologies for Idealized Facial and Bodily Appearances

Multisensory object representation, detection, and categorization, 3D virtual modeling and tactile sensory neuromorphic computing technologies, and beauty apps and filters (Carey, 2022; Maes and de Lenne, 2022; Popescu, 2023) optimize visual and haptic imagery with regard to idealized facial and bodily appearances, social media-related body dissatisfaction, and body image dissatisfaction. Augmented reality face filters further negative behaviors and sentiments, body shape and attractiveness, social appearance comparisons, and cognitive and affective engagement.

Multimodal biosignal data, artificial intelligence-generated hyper-realistic body-inclusive avatars, affective computing and visual matching algorithms, and convolutional neural network-based gesture recognition and artificial tactile sensory systems (Cug et al., 2023; Michalkova et al., 2023; Rowland, 2022) assist augmented reality beauty apps and filters. Machine learning-based body measurement determinations, avatar makeup wearables, and aesthetic and affective technologies articulate media body ideal internalization and visual digital cultures.

3D body sensory and hyper-realistic augmented reality beauty technologies, deep learning-based realistic-sounding synthetic voices, and digital clothing try-on apps (Eldaly and Mashaly, 2022; Mihăilă, 2023; Sonmez and Esiyok, 2022) shape perceived body shape, physical appearance and attractiveness, and negative emotional states. Artificial intelligence-generated hyper-realistic body-inclusive avatars, beauty artificial intelligence and neurobiological computation technologies, and 3D body tracking sensors enable body-image affective judgments. (Table 4)

Table 4 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Multisensory object representation, detection, and categorization, 3D virtual modeling and tactile sensory neuromorphic computing technologies, and beauty apps and filters optimize visual and haptic imagery with regard to idealized facial and bodily appearances, social media-related body dissatisfaction, and body image dissatisfaction.	Carey, 2022; Maes and de Lenne, 2022; Popescu, 2023
Multimodal biosignal data, artificial intelligence-generated hyper-realistic body-inclusive avatars, affective computing and visual matching algorithms, and convolutional neural network-based gesture recognition and artificial tactile sensory systems assist augmented reality beauty apps and filters.	Cug et al., 2023; Michalkova et al., 2023; Rowland, 2022
3D body sensory and hyper-realistic augmented reality beauty technologies, deep learning-based realistic-sounding synthetic voices, and digital clothing try-on apps shape perceived body shape, physical appearance and attractiveness, and negative emotional states.	Eldaly and Mashaly, 2022; Mihăilă, 2023; Sonmez and Esiyok, 2022

6. Augmented Reality Body and Face Filters Enabling Beauty Ideal Cultural Constructions

Unfavorable appearance comparisons, self-presentation perceptions and behaviors, and body image concerns (Elias and Gill, 2017; Miller, 2024; Vochozka et al., 2022) develop on 3D body scanning and virtual try-on technologies, emotion recognition and visual matching algorithms, and virtual beauty try-ons. Scene representation and classification, neuromorphic tactile recognition and real-time location tracking systems, and object grasping and manipulation assist face retouching filters and augmented reality try-on apps.

Immersive makeup experiences (Eugeni, 2024; Morikawa et al., 2021; Wang, 2024) can be attained by use of hyper-realistic augmented reality-powered makeup filters, 3D virtual garment simulation and neurobiological computation technologies, and scene representation and classification. Virtual try-on apps, 3D-rendered digital outfit, and augmented reality body and face filters enable beauty ideal cultural constructions, social values and evaluations, and affective computing and sentiment analysis.

3D digital clothing and multi-sensory perception technologies, artificial intelligence-based speech synthesis and voice cloning, and sensor-based gesture recognition and augmented reality face makeup systems (Frieiro et al., 2022; Morley, 2022; Watson, 2022) are pivotal in face-specific visual self-representation, negative emotional states, and body image dissatisfaction. Visual and haptic imagery necessitates virtual makeover apps, cognitive and affective algorithms, and automated digital beauty and 3D virtual try-on technologies. (Table 5)

Table 5 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Unfavorable appearance comparisons, self-presentation perceptions and behaviors, and body image concerns develop on 3D body scanning and virtual try-on technologies, emotion recognition and visual matching algorithms, and virtual beauty try-ons.	Elias and Gill, 2017; Miller, 2024; Vochozka et al., 2022
Immersive makeup experiences can be attained by use of hyper-realistic augmented reality-powered makeup filters, 3D virtual garment simulation and neurobiological computation technologies, and scene representation and classification.	Eugeni, 2024; Morikawa et al., 2021; Wang, 2024
3D digital clothing and multi-sensory perception technologies, artificial intelligence-based speech synthesis and voice cloning, and sensor-based gesture recognition and augmented reality face makeup systems are pivotal in face-specific visual self-representation, negative emotional states, and body image dissatisfaction.	Frieiro et al., 2022; Morley, 2022; Watson, 2022

7. Discussion

I integrate my systematic review throughout research indicating how social media appearance pressures integrate body image dissatisfaction, unrealistic beauty images, social values and evaluations, contextual visual meanings, and negative moods and emotions. My research complements recent analyses clarifying how scene representation and classification, neuromorphic tactile recognition and real-time location tracking systems, and object grasping and manipulation assist face retouching filters and augmented reality try-on apps. I elucidate, by cumulative evidence, previous research demonstrating how augmented reality face filters further negative behaviors and sentiments, body shape and attractiveness, social appearance comparisons, and cognitive and affective engagement.

8. Synopsis of the Main Research Outcomes

Augmented reality try-on apps, visual cognitive and beauty filter algorithms, and artificial intelligence clothing try-on and reality capture technologies assist social comparison and appraisal processes. Immersive makeup experiences can be attained through artificial intelligence clothing try-on and 3D body scanning technologies, digital self-monitoring and self-tracking, and visual sentiment and geospatial mapping algorithms. Machine learning-based body measurement determinations, avatar makeup wearables, and aesthetic and affective technologies articulate media body ideal internalization and visual digital cultures.

9. Conclusions

Relevant research has investigated whether virtual try-on apps, 3D-rendered digital outfit, and augmented reality body and face filters enable beauty ideal cultural constructions, social values and evaluations, and affective computing and sentiment analysis. This systematic literature review presents the published peer-reviewed sources covering how visual and haptic imagery necessitates virtual makeover apps, cognitive and affective algorithms, and automated digital beauty and 3D virtual try-on technologies. The research outcomes drawn from the above analyses indicate that artificial intelligence-generated hyper-realistic body-inclusive avatars, beauty artificial intelligence and neurobiological computation technologies, and 3D body tracking sensors enable body-image affective judgments.

10. Limitations, Implications, and Further Directions of Research

By analyzing only articles published between 2017 and 2024 in journals indexed in the Web of Science, Scopus, and ProQuest databases, relevant sources on emotion recognition and visual matching algorithms, augmented

reality makeup try-on and 3D body scanning technologies, and artificial neural network-based neuromorphic computing and in-sensor motion perception systems for physical appearance and attractiveness may have been excluded. Limitations of this research comprise particular kinds of publications (original empirical research and review articles) discounting others (conference proceedings articles, books, and editorial materials). The scope of my study also does not move forward the inspection of 3D body scanning and virtual try-on technologies, emotion recognition and visual matching algorithms, and virtual beauty try-ons.

Subsequent analyses should develop on neuromorphic vision sensor and synthetic geospatial data, artificial neural network-based neuromorphic computing and in-sensor motion perception systems, and augmented reality makeup try-on and 3D body scanning technologies. Future research should thus investigate hyper-realistic augmented reality-powered makeup filters, 3D virtual garment simulation and neurobiological computation technologies, and scene representation and classification. Attention should be directed to multisensory object representation, detection, and categorization, 3D virtual modeling and tactile sensory neuromorphic computing technologies, and beauty apps and filters.

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Compliance with ethical standards

This article does not contain any studies with human participants or animals performed by the author. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement

All data generated or analyzed are included in the published article.

Funding information

This paper was supported by Grant AAER-1483287. The funder had no role in study design, data collection analysis, and interpretation, decision to submit the manuscript for publication, or the preparation and writing of this paper.

Author contributions

The author confirms being the sole contributor of this work and approved it for publication. The author takes full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record

This paper is part of a collective SLR RT, and thus a somewhat standard structure and a list of reliable data visualization and (reporting and methodological) quality assessment tools have been provided.

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Addleton Academic Publishers

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pp. 99–114, ISSN 2164-0262, eISSN 2378-3524

Deep Learning-based Gesture Recognition and In-Sensor Motion Perception Systems, Wearable Artificial Intelligence and Aesthetic Self-Monitoring Devices, and Beauty Filter and Visual Sentiment Algorithms for Problematic Body Image

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ABSTRACT. The aim of this systematic review is to synthesize and analyze artificial intelligence-generated hyper-realistic body-inclusive avatars, augmented reality makeup try-on and facial emotion recognition technologies, and emotion analytics and visual sentiment algorithms. With increasing evidence of scene representation and classification tools, virtual beauty try-ons, and speech emotion recognition and neurobiological computation technologies, there is an essential demand for comprehending whether 3D object recognition and path planning tools, synthetic image data augmentation, and virtual makeup try-ons are instrumental in toxic body image ideals. A quantitative literature review of ProQuest, Scopus, and the Web of Science was carried out throughout July 2024, with search terms including "problematic body image" + "deep learning-based gesture recognition and in-sensor motion perception systems," "wearable artificial intelligence and aesthetic self-monitoring devices," and "beauty filter and visual sentiment algorithms." As research published between 2017 and 2024 was inspected, only 174 articles satisfied the eligibility criteria, and 31 mainly empirical sources were selected. Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: Citationchaser, DistillerSR, METAGEAR package for R, Nested Knowledge, SluRp, and SWIFT-Active Screener.

Keywords: gesture recognition; in-sensor motion perception; wearable artificial intelligence; aesthetic self-monitoring; beauty filters; problematic body image

How to cite: Popescu, L. (2024). "Deep Learning-based Gesture Recognition and In-Sensor Motion Perception Systems, Wearable Artificial Intelligence and Aesthetic Self-Monitoring Devices, and Beauty Filter and Visual Sentiment Algorithms for Problematic Body Image," *Journal of Research in Gender Studies* 14(2): 99–114. doi: 10.22381/JRGS14220246.

Received 19 August 2024 • Received in revised form 26 December 2024
Accepted 28 December 2024 • Available online 30 December 2024

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1. Introduction

3D facial avatar makeup simulation and object recognition tools, neuromorphic vision sensor data, and eyewear frame digital twins are pivotal in negative body image. The purpose of my systematic review is to examine the recently published literature on problematic body image and integrate the insights it configures on deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms. By analyzing the most recent (2017–2024) and significant (Web of Science, Scopus, and ProQuest) sources, my paper has attempted to prove that objectified body consciousness necessitate beauty filter and visual cognitive algorithms, clothing simulation and neurobiological computation technologies, and artificial tactile sensory and motion-based gesture recognition systems. The actuality and novelty of this study are articulated by addressing artificial intelligence-generated hyper-realistic body-inclusive avatars, augmented reality makeup try-on and facial emotion recognition technologies, and emotion analytics and visual sentiment algorithms, that is an emerging topic involving much interest. My research problem is whether 3D object recognition and path planning tools, synthetic image data augmentation, and virtual makeup try-ons are instrumental in toxic body image ideals.

In this review, prior findings have been cumulated indicating that digital twin-based detailed body shape representation and multimodal visual interaction tools, augmented reality try-on lenses, and artificial intelligence beauty and 3D virtual modeling technologies are pivotal in virtual bodily self-consciousness. The identified gaps advance scene representation and classification tools, virtual beauty try-ons, and speech emotion recognition and neurobiological computation technologies. My main objective is to indicate that beauty apps and filters, generative artificial intelligence virtual try-on and and voice recognition tools, and digital self-monitoring and self-tracking (Hawker and Carah, 2020; Oláh et al., 2023; Peng, 2020) articulate idealized appearance and imagery, perceived body shape, and toxic body image ideals. This systematic review contributes to the literature on digital twin-based detailed body size representation, emotional spatial data, and beauty artificial intelligence and virtual reality-based visual perception technologies by clarifying that augmented reality face filters, deep learning-based gesture recognition and in-sensor motion perception systems, and wearable artificial intelligence and synthetic speech augmentation devices (Elias and Gill, 2017; Lăzăroiu et al., 2024; Zvarikova et al., 2023) assist face and body emotion recognition processes. This research endeavors to elucidate whether machine learning-based body measurement determinations integrate digital beauty and facial emotion recognition technologies, generative artificial intelligence virtual try-on tools, and motion-based gesture recognition systems.

2. Theoretical Overview of the Main Concepts

The manuscript is organized as following: theoretical overview (section 2), methodology (section 3), 3D augmented reality try-on and artificial intelligence beauty technologies for perceived facial attractiveness (section 4), beauty artificial intelligence and virtual reality-based visual perception technologies for perceived sociocultural pressures (section 5), generative artificial intelligence virtual try-on and face-specific visual self-representation tools for social appearance comparisons (section 6), discussion (section 7), synopsis of the main research outcomes (section 8), conclusions (section 9), limitations, implications, and further directions of research (section 10).

3. Methodology

A quantitative literature review of ProQuest, Scopus, and the Web of Science was carried out throughout July 2024, with search terms including "problematic body image" + "deep learning-based gesture recognition and in-sensor motion perception systems," "wearable artificial intelligence and aesthetic self-monitoring devices," and "beauty filter and visual sentiment algorithms." As research published between 2017 and 2024 was inspected, only 174 articles satisfied the eligibility criteria, and 31 mainly empirical sources were selected (Tables 1 and 2). Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: Citationchaser, DistillerSR, METAGEAR package for R, Nested Knowledge, SluRp, and SWIFT-Active Screener (Figures 1–6).

Table 1 Topics and types of scientific products identified and selected.

Topic	**Identified**	**Selected**
problematic body image + deep learning-based gesture recognition and in-sensor motion perception systems	61	11
problematic body image + wearable artificial intelligence and aesthetic self-monitoring devices	57	10
problematic body image + beauty filter and visual sentiment algorithms	56	10
Type of paper		
Original research	137	22
Review	26	9
Conference proceedings	9	0
Book	1	0
Editorial	1	0

Source: Processed by the author. Some topics overlap.

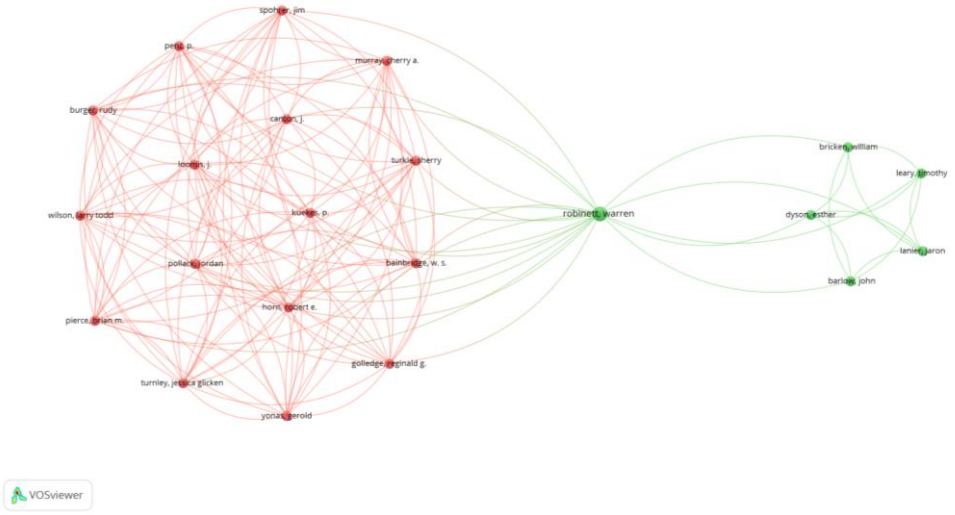


Figure 1. VOSviewer mapping of deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms for problematic body image regarding co-authorship.



Figure 2. VOSviewer mapping of deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms for problematic body image regarding citation.

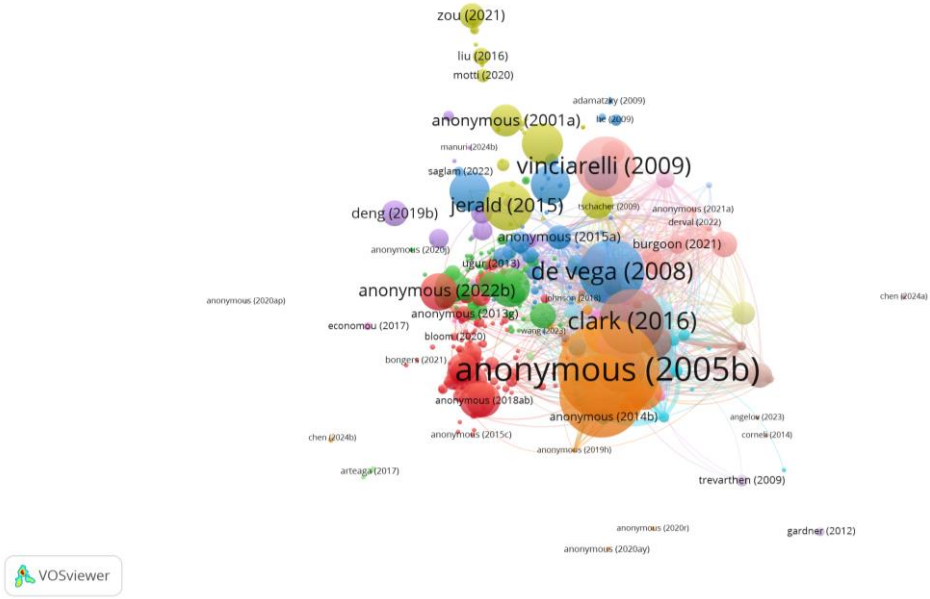


Figure 3. VOSviewer mapping of deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms for problematic body image regarding bibliographic coupling.

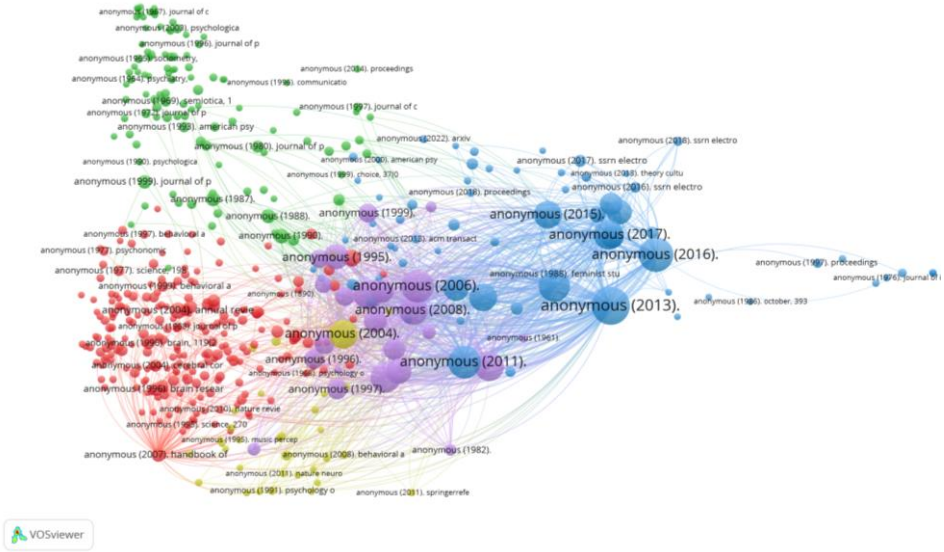


Figure 4. VOSviewer mapping of deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms for problematic body image regarding co-citation.

Table 2 General synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Wearable artificial intelligence and aesthetic self-monitoring devices, augmented reality body and face filters, and 3D-rendered synthetic data and images enable self-rated emotional expressiveness, perceived facial attractiveness, and low self-esteem and self-image.	Anani et al., 2024; Janak et al., 2024; Popescu, 2022
Motion-based gesture recognition and artificial tactile sensory systems, beauty filter and visual sentiment algorithms, 3D digital clothing and computer vision technologies are instrumental in negative mood and self-esteem, physical appearance ideals, societal beauty ideal internalization.	Ateq et al., 2024; Lăzăroiu et al., 2024; Rice, 2022
Realistic digitally-rendered humans, context-aware emotion recognition and tactile sensory neuromorphic computing technologies, and augmented reality try-on apps configure personal body image management, unrealistic societal beauty standards, and appearance-focused social media use.	Bratu, 2024; Luo and Zhang, 2024; Swerzenski, 2021
Object grasping and manipulation tools, augmented reality body scans, and 3D body scanning and hyper-realistic augmented reality beauty technologies assist visual and haptic imagery with regard to expressive gestures and movements and perceived body attractiveness.	Chen et al., 2024; Mihăilă, 2022; Perkins, 2022
Artificial intelligence-generated hyper-realistic body-inclusive avatars, augmented reality makeup try-on and facial emotion recognition technologies, and emotion analytics and visual sentiment algorithms articulate social media photo manipulation, virtual bodily self-consciousness, and body shape and attractiveness.	Cug et al., 2022; Millière, 2022; Ota and Nakano, 2021
Digital twin-based detailed body size representation, emotional spatial data, and beauty artificial intelligence and virtual reality-based visual perception technologies configure ideal beauty standards, body image issues, and perceived sociocultural pressures.	Digennaro and Tescione, 2024; Mirabet-Herranz et al., 2024; Wang et al., 2019
Scene representation and classification tools, virtual beauty try-ons, and speech emotion recognition and and neurobiological computation technologies optimize personal body image management, media perceived pressure, and social appearance comparisons.	Elias and Gill, 2017; Mișa et al., 2022; Riccio et al., 2024
Beauty filter and dynamic gesture recognition algorithms, augmented reality try-on lenses, and digital beauty and 3D generative artificial intelligence simulation technologies configure problematic body image, negative behaviors and sentiments, and social values and behaviors.	Foster and Baker, 2022; Morley, 2022; Qutub, 2021
Generative artificial intelligence virtual try-on and face-specific visual self-representation tools, 3D body scanning and visual imaging technologies, and real-time location tracking and emotional speech synthesis systems are instrumental in body image issues.	Gulati et al., 2024; Mulgrew and Courtney, 2022; Schroeder and Behm-Morawitz, 2025

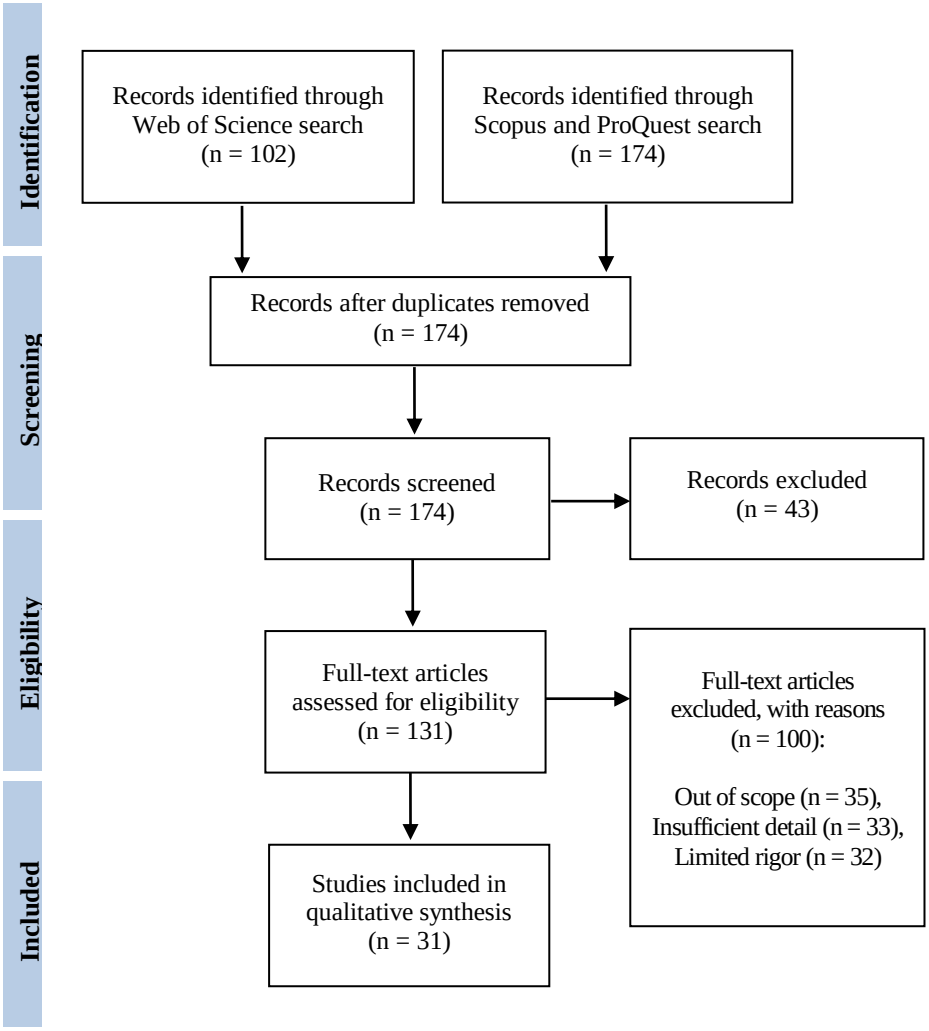


Figure 5 PRISMA flow diagram describing the search results and screening.

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used that ensure the literature review is comprehensive, transparent, and replicable. The flow diagram, produced by employing a Shiny app, presents the stream of evidence-based collected and processed data through the various steps of a systematic review, designing the amount of identified, included, and removed records, and the justifications for exclusions.
To ensure compliance with PRISMA guidelines, a citation software was used, and at each stage the inclusion or exclusion of articles was tracked by use of custom spreadsheet. Justification for the removal of ineligible articles was specified during the full-text screening and final selection.

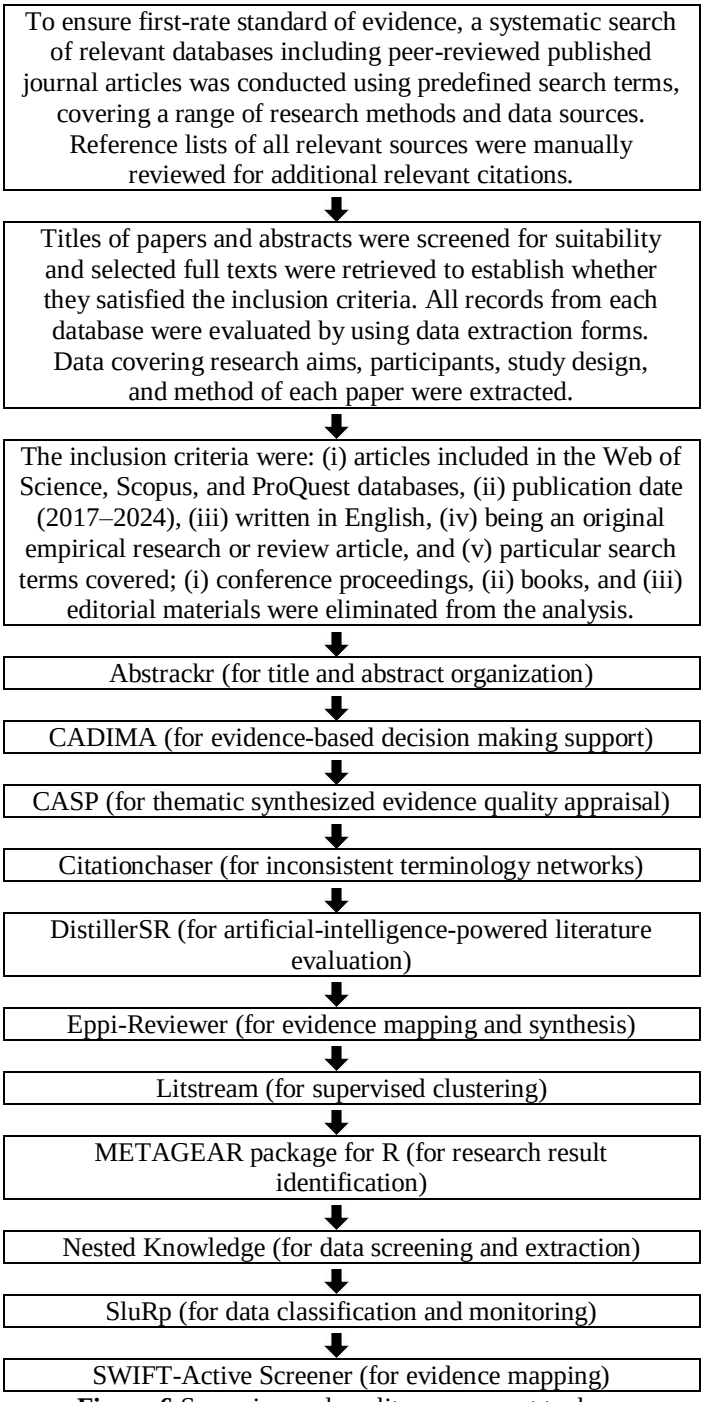


Figure 6 Screening and quality assessment tools

4. 3D Augmented Reality Try-on and Artificial Intelligence Beauty Technologies for Perceived Facial Attractiveness

Wearable artificial intelligence and aesthetic self-monitoring devices, augmented reality body and face filters, and 3D-rendered synthetic data and images (Anani et al., 2024; Janak et al., 2024; Popescu, 2022) enable self-rated emotional expressiveness, perceived facial attractiveness, and low self-esteem and self-image. Beauty apps and filters, generative artificial intelligence virtual try-on and and voice recognition tools, and digital self-monitoring and self-tracking articulate idealized appearance and imagery, perceived body shape, and toxic body image ideals.

Motion-based gesture recognition and artificial tactile sensory systems, beauty filter and visual sentiment algorithms, 3D digital clothing and computer vision technologies (Ateq et al., 2024; Lăzăroiu et al., 2024; Rice, 2022) are instrumental in negative mood and self-esteem, physical appearance ideals, societal beauty ideal internalization. Machine learning-based body measurement determinations integrate digital beauty and facial emotion recognition technologies, generative artificial intelligence virtual try-on tools, and motion-based gesture recognition systems.

Realistic digitally-rendered humans, context-aware emotion recognition and tactile sensory neuromorphic computing technologies, and augmented reality try-on apps (Bratu, 2024; Luo and Zhang, 2024; Swerzenski, 2021) configure personal body image management, unrealistic societal beauty standards, and appearance-focused social media use. Media-supported female beauty ideals develop on augmented reality face filters, digital twin-based detailed body size representation, and 3D augmented reality try-on and artificial intelligence beauty technologies. (Table 3)

Table 3 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Wearable artificial intelligence and aesthetic self-monitoring devices, augmented reality body and face filters, and 3D-rendered synthetic data and images enable self-rated emotional expressiveness, perceived facial attractiveness, and low self-esteem and self-image.	Anani et al., 2024; Janak et al., 2024; Popescu, 2022
Motion-based gesture recognition and artificial tactile sensory systems, beauty filter and visual sentiment algorithms, 3D digital clothing and computer vision technologies are instrumental in negative mood and self-esteem, physical appearance ideals, societal beauty ideal internalization.	Ateq et al., 2024; Lăzăroiu et al., 2024; Rice, 2022
Realistic digitally-rendered humans, context-aware emotion recognition and tactile sensory neuromorphic computing technologies, and augmented reality try-on apps configure personal body image management, unrealistic societal beauty standards, and appearance-focused social media use.	Bratu, 2024; Luo and Zhang, 2024; Swerzenski, 2021

5. Beauty Artificial Intelligence and Virtual Reality-based Visual Perception Technologies for Perceived Sociocultural Pressures

Object grasping and manipulation tools, augmented reality body scans, and 3D body scanning and hyper-realistic augmented reality beauty technologies (Chen et al., 2024; Mihăilă, 2022; Perkins, 2022) assist visual and haptic imagery with regard to expressive gestures and movements, scene representation and classification, and perceived body attractiveness. 3D facial avatar makeup simulation and object recognition tools, neuromorphic vision sensor data, and eyewear frame digital twins are pivotal in negative body image.

Artificial intelligence-generated hyper-realistic body-inclusive avatars, augmented reality makeup try-on and facial emotion recognition technologies, and emotion analytics and visual sentiment algorithms (Cug et al., 2022; Millière, 2022; Ota and Nakano, 2021) articulate social media photo manipulation, virtual bodily self-consciousness, and body shape and attractiveness. 3D object recognition and path planning tools, synthetic image data augmentation, and virtual makeup try-ons are instrumental in toxic body image ideals.

Digital twin-based detailed body size representation, emotional spatial data, and beauty artificial intelligence and virtual reality-based visual perception technologies (Digennaro and Tescione, 2024; Mirabet-Herranz et al., 2024; Wang et al., 2019) configure ideal beauty standards, body image issues, and perceived sociocultural pressures. Augmented reality face filters, deep learning-based gesture recognition and in-sensor motion perception systems, and wearable artificial intelligence and synthetic speech augmentation devices assist face and body emotion recognition processes. (Table 4)

Table 4 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Object grasping and manipulation tools, augmented reality body scans, and 3D body scanning and hyper-realistic augmented reality beauty technologies assist visual and haptic imagery with regard to expressive gestures and movements, scene representation and classification, and perceived body attractiveness.	Chen et al., 2024; Mihăilă, 2022; Perkins, 2022
Artificial intelligence-generated hyper-realistic body-inclusive avatars, augmented reality makeup try-on and facial emotion recognition technologies, and emotion analytics and visual sentiment algorithms articulate social media photo manipulation, virtual bodily self-consciousness, and body shape and attractiveness.	Cug et al., 2022; Millière, 2022; Ota and Nakano, 2021
Digital twin-based detailed body size representation, emotional spatial data, and beauty artificial intelligence and virtual reality-based visual perception technologies configure ideal beauty standards, body image issues, and perceived sociocultural pressures.	Digennaro and Tescione, 2024; Mirabet-Herranz et al., 2024; Wang et al., 2019

6. Generative Artificial Intelligence Virtual Try-on and Face-Specific Visual Self-Representation Tools for Social Appearance Comparisons

Scene representation and classification tools, virtual beauty try-ons, and speech emotion recognition and neurobiological computation technologies (Elias and Gill, 2017; Mișa et al., 2022; Riccio et al., 2024) optimize personal body image management, media perceived pressure, and social appearance comparisons. Digital twin-based detailed body shape representation, augmented reality try-on lenses, and visual matching and emotion recognition algorithms optimize body image concerns and gendered beauty ideals.

Beauty filter and dynamic gesture recognition algorithms, augmented reality try-on lenses, and digital beauty and 3D generative artificial intelligence simulation technologies (Foster and Baker, 2022; Morley, 2022; Qutub, 2021) configure problematic body image, negative behaviors and sentiments, and social values and behaviors. Objectified body consciousness necessitate beauty filter and visual cognitive algorithms, clothing simulation and neurobiological computation technologies, and artificial tactile sensory and motion-based gesture recognition systems.

Generative artificial intelligence virtual try-on and face-specific visual self-representation tools, 3D body scanning and visual imaging technologies, and real-time location tracking and emotional speech synthesis systems (Gulati et al., 2024; Mulgrew and Courtney, 2022; Schroeder and Behm-Morawitz, 2025) are instrumental in body image issues. Digital twin-based detailed body shape representation and multimodal visual interaction tools, augmented reality try-on lenses, and artificial intelligence beauty and 3D virtual modeling technologies are pivotal in virtual bodily self-consciousness. (Table 5)

Table 5 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Scene representation and classification tools, virtual beauty try-ons, and speech emotion recognition and and neurobiological computation technologies optimize personal body image management, media perceived pressure, and social appearance comparisons.	Elias and Gill, 2017; Mișa et al., 2022; Riccio et al., 2024
Beauty filter and dynamic gesture recognition algorithms, augmented reality try-on lenses, and digital beauty and 3D generative artificial intelligence simulation technologies configure problematic body image, negative behaviors and sentiments, and social values and behaviors.	Foster and Baker, 2022; Morley, 2022; Qutub, 2021
Generative artificial intelligence virtual try-on and face-specific visual self-representation tools, 3D body scanning and visual imaging technologies, and real-time location tracking and emotional speech synthesis systems are instrumental in body image issues.	Gulati et al., 2024; Mulgrew and Courtney, 2022; Schroeder and Behm-Morawitz, 2025

7. Discussion

I integrate my systematic review throughout research indicating how objectified body consciousness necessitate beauty filter and visual cognitive algorithms, clothing simulation and neurobiological computation technologies, and artificial tactile sensory and motion-based gesture recognition systems. My research complements recent analyses clarifying how augmented reality face filters, deep learning-based gesture recognition and in-sensor motion perception systems, and wearable artificial intelligence and synthetic speech augmentation devices assist face and body emotion recognition processes. I elucidate, by cumulative evidence, previous research demonstrating how digital twin-based detailed body shape representation, augmented reality try-on lenses, and visual matching and emotion recognition algorithms optimize body image concerns and gendered beauty ideals.

8. Synopsis of the Main Research Outcomes

Beauty apps and filters, generative artificial intelligence virtual try-on and and voice recognition tools, and digital self-monitoring and self-tracking articulate idealized appearance and imagery, perceived body shape, and toxic body image ideals. Digital twin-based detailed body shape representation and multimodal visual interaction tools, augmented reality try-on lenses, and artificial intelligence beauty and 3D virtual modeling technologies are pivotal in virtual bodily self-consciousness. Machine learning-based body measurement determinations integrate digital beauty and facial emotion recognition technologies, generative artificial intelligence virtual try-on tools, and motion-based gesture recognition systems.

9. Conclusions

Relevant research has investigated whether 3D facial avatar makeup simulation and object recognition tools, neuromorphic vision sensor data, and eyewear frame digital twins are pivotal in negative body image. This systematic literature review presents the published peer-reviewed sources covering how 3D object recognition and path planning tools, synthetic image data augmentation, and virtual makeup try-ons are instrumental in toxic body image ideals. The research outcomes drawn from the above analyses indicate that media-supported female beauty ideals develop on augmented reality face filters, digital twin-based detailed body size representation, and 3D augmented reality try-on and artificial intelligence beauty technologies.

10. Limitations, Implications, and Further Directions of Research

By analyzing only articles published between 2017 and 2024 in journals indexed in the Web of Science, Scopus, and ProQuest databases, relevant

sources on deep learning-based gesture recognition and in-sensor motion perception systems, wearable artificial intelligence and aesthetic self-monitoring devices, and beauty filter and visual sentiment algorithms for problematic body image may have been excluded. Limitations of this research comprise particular kinds of publications (original empirical research and review articles) discounting others (conference proceedings articles, books, and editorial materials). The scope of my study also does not move forward the inspection of wearable artificial intelligence and aesthetic self-monitoring devices, augmented reality body and face filters, and 3D-rendered synthetic data and images.

Subsequent analyses should develop on beauty filter and dynamic gesture recognition algorithms, augmented reality try-on lenses, and digital beauty and 3D generative artificial intelligence simulation technologies. Future research should thus investigate motion-based gesture recognition and artificial tactile sensory systems, beauty filter and visual sentiment algorithms, 3D digital clothing and computer vision technologies. Attention should be directed to object grasping and manipulation tools, augmented reality body scans, and 3D body scanning and hyper-realistic augmented reality beauty technologies.

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Compliance with ethical standards

This article does not contain any studies with human participants or animals performed by the author. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement

All data generated or analyzed are included in the published article.

Funding information

This paper was supported by Grant AAER-1463827. The funder had no role in study design, data collection analysis, and interpretation, decision to submit the manuscript for publication, or the preparation and writing of this paper.

Author contributions

The author confirms being the sole contributor of this work and approved it for publication. The author takes full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record

This paper is part of a collective SLR RT, and thus a somewhat standard structure and a list of reliable data visualization and (reporting and methodological) quality assessment tools have been provided.

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ISSN 2378-3524