

Color and Colorimetry Multidisciplinary Contributions

Vol. XX A

Edited by Filippo Cherubini and Andrea Siniscalco



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Introduction

The Color Conference, organized annually by the Italian Color Association (Gruppo del Colore - Associazione Italiana Colore), reached its Twentieth Edition in 2025.

The international two-day event took place on September 4th and 5th, 2025, at the University of Naples Parthenope in the beautiful city of Naples.

This milestone edition opened with three keynote presentations of exceptional breadth and inspiration. The conference began with Dr. Costanza Miliani from the CNR Institute of Heritage Science, who presented “Writing with Colors: Materials, Techniques, and Cultural Significance in Mesoamerican Codices”. The program continued with Studio Waldemeyer, featuring Farahbod Nazanin and Moritz Waldemeyer, and their evocative talk “Where Light Becomes Emotion”.

The morning session concluded with the Color Award 2025, conferred to Massimo Cantini Parrini in recognition of his extraordinary contribution to the world of costume and creativity.

The following day opened with an outstanding invited lecture by Dr. Massimiliano Guarnieri from ENEA, who presented “Artificial Intelligence and color features detection: some examples and future perspective”.

Sincere thanks go to the Chairs of the Conference, Giuliana Ramella (CNR – Institute for Applied Calculus “Mauro Picone”) Francesca Fragliasso (University of Naples Federico II) and Andrea Siniscalco (Dipartimento di Design, Politecnico di Milano), for their valuable guidance and coordination. A heartfelt appreciation also goes to the University of Naples Parthenope, host of this year’s edition.

We warmly thank Dr. Sofia Ceccarelli (CNR ISPC) for the local organization, the Program Committee, Professors Angelo Ciaramella and Emanuel Di Nardo (University of Naples Parthenope), Professors Laura Bellia and Francesca Diglio (University of Naples Federico II), as well as Dr. Filippo Cherubini, Secretary of the Association, and all the members of the Scientific Committee, for their fundamental contribution to the dissemination, review, and organization of the conference. Special thanks also go to Tectilia, the event sponsor, whose support helped make this conference both culturally enriching and welcoming.

The 2025 program once again confirmed the richness and interdisciplinarity that have always characterized the work of our community, spanning from design to education, and from cultural heritage to psychology.

These diverse perspectives continue to make the Conferenza del Colore a reference point for researchers, professionals, and enthusiasts working on the multifaceted study of color.

Finally, we extend our gratitude to all authors and speakers for the quality of their contributions, and to the institutions and associations that offered their patronage and collaboration, reinforcing the spirit of unity that defines this event.

The following pages collect the proceedings of the Twentieth Color Conference.

We wish you an inspiring read.

Alice Plutino

October 2025

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Color and Design

Colouring outside the (stereotypical) lines: Rethinking colour and gender in design

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Abstract

This paper investigates the role of colour in shaping gendered perceptions of consumer products and its implications for inclusive design. Drawing on a qualitative study with design students, it examines how all three colour properties—hue, saturation, and lightness—interact to reinforce or challenge binary gender associations. Findings indicate that lightness strongly signalled femininity or masculinity, saturation extremes reinforced binary readings, and mid-range values often fostered ambiguity and androgyny. The results also show how stereotypes persist when designers rely uncritically on cultural codes yet demonstrate colour's potential to disrupt gender norms and expand aesthetic possibilities. Building on these insights, the paper proposes the foundation of the *Colour + Gender Framework*—a tool to guide more intentional chromatic decisions in product design. The framework supports strategies that move beyond stereotypes, destabilise reductive binaries, and promote more inclusive and equitable design outcomes.

Keywords: colour and gender; gender-sensitive design; visual attributes; colour design; colour meaning

Introduction

In recent years, numerous studies have examined the complex interconnections between colour, gender, and product design. This relationship has been described as encompassing historical, social, psychological, and economic dimensions (Ben-Zeev and Dennehy, 2014; van Tilburg et al., 2015; Grisard, 2019; Dantas et al., 2021; Bideaux, 2022; Moshary, Tuchman and Vajravelu, 2023). Colour plays a central role in shaping the initial perception of gendered products, influencing consumer behaviour, and contributing to the social construction of identity. The gendering of colour affects consumer choices, reinforces societal stereotypes, and creates ongoing challenges for designers striving to produce inclusive and equitable products (Ehrnberger, Räsänen and Ilstedt, 2012; Ben-Zeev and Dennehy, 2014). Colour functions as a highly powerful and pervasive cue in design, frequently deployed to shape and perpetuate gender biases and stereotypes (Koller, 2008; Grisard, 2017; Canlı, 2018). Concerning hue, the cultural assignment of pink to girls and blue to boys has been historically constructed through toys, clothing, and mass media rather than reflecting innate preferences. This construct gradually normalised over time (Dantas et al., 2021). The association of pink with femininity and blue with masculinity gained dominance during the mid-20th century, particularly after World War II, as a byproduct of Western capitalist strategies aimed at segmenting markets and boosting consumption (Paoletti, 2012; Canlı, 2018; Grisard, 2019; Ma and Wang, 2024). Before the 1940s, however, pink was not firmly coded as feminine; it was even considered “stronger” and therefore more suitable for boys in the early 20th century (Paoletti, 2012; Ben-Zeev and Dennehy, 2014; Grisard, 2017). Today, pink is widely deployed to mark products as “for girls/women,” while the rest of a product line is implicitly framed as “neutral” or “masculine” (Bideaux, 2022). Examples range from razors and toolboxes to earplugs, pens, and even laxatives. The personal care market, for instance, is particularly gendered, with over 80% of its products explicitly targeted by gender (Moshary, Tuchman and Vajravelu, 2023).

Among product attributes, colour—especially hue—is the most common indicator (98%) consumers use to identify a product's gender target, followed by name and description (Ibid). Beyond hue, other

colour attributes also contribute to gendered coding. van Tilburg et al. (2015) argue that products with lighter tones, multiple colours, or shiny surfaces are generally associated with femininity. In contrast, darker tones, fewer colours, or matte finishes are linked with masculinity. Supporting this, a cross-cultural study in nine countries found that “feminine” was predominantly associated with light shades, while “masculine” was related to dark shades (Jung and Griber, 2019).

Designers, however, often rely on generalised beliefs and stereotypes about gender. Historically, design aimed at one sex has frequently been based on misleading assumptions (Stilma, 2006). Such reliance risks producing homogeneous solutions that reinforce narrow ideas of masculinity and femininity, overlooking the diverse needs of broad consumer groups, particularly women (McMahon and Kiernan, 2017). For this reason, it is essential that designers critically reflect on their gendered perceptions and the ways these influence their design decisions, moving beyond stereotypes to close the gap between designers and users (Esfahani, 2020).

Indeed, contemporary design practices increasingly need to challenge traditional gendered colour coding to appeal to broader and more diverse audiences. Addressing this issue requires a multi-faceted approach, ranging from rethinking colour symbolism to adopting more inclusive design methodologies and critically examining the biases embedded in product aesthetics. Several strategies have emerged in this regard. One is (i) the adoption and evolution of gender-neutral and unisex approaches, which move beyond dichotomous thinking and prioritise individual needs over rigidly defined gender roles (Ehrnberger, Räsänen and Ilstedt, 2012). This strategy deliberately avoids strongly gendered attributes in colours, forms, and other product characteristics (Esfahani, 2020). A second is (ii) the deconstruction of traditional pink marketing, which historically conditions female consumers from childhood to associate pink with femininity. Today, many women actively reject this association, and the strategy is widely criticised for instrumentalising feminist discourse while perpetuating inequalities (Bideaux, 2022). A third is (iii) the use of satire and reappropriation to subvert stereotypes, for instance by deploying pink ironically or humorously to symbolically undermine masculinity (Bideaux, 2018). Finally, a fourth strategy is (iv) the visualisation of gender norms through product language inversion. Applying the traditionally “male” design language of a drill to a hand blender, and vice versa, exposes the invisible meanings and values embedded in artefacts. Such inversions destabilise preconceptions and open new ways of valuing characteristics not conventionally associated with a product—for example, beauty and simplicity in the case of a drill (Ehrnberger, Räsänen and Ilstedt, 2012). In parallel, recent studies have advanced new frameworks for designing beyond the binary. Labarta, Ingaramo and Mattioli (2024) propose three categories of gender-sensitive strategies: (i) cue-free design, which removes explicit gender markers to avoid reinforcing stereotypes; (ii) gender-shift design, which plays with or inverts gendered scripts, often ironically; and (iii) flexible design, which embraces ambiguity and complexity to broaden inclusivity without erasing colour altogether.

Methodology

The study adopted qualitative methods across two phases: a five-day workshop on *Gender and Design* with design students, and a subsequent analysis of the collected data. The workshop generated insights into gender awareness in product design, while the analysis focused on colour as a key semantic element shaping perceptions of gender categories. Together, these phases informed five colour design assumptions, forming the basis of a forthcoming *Colour + Gender Framework* for design.

A. Data collection phase: the workshop

The workshop took place from March 3–7 at the University of Sassari, Italy, with 23 Bachelor of Design students across all years. It aimed to foster gender awareness in design processes by questioning stereotypical assumptions. Hence, the intended learning objective (ILO) of the workshop was meant to foster “awareness and knowledge of one’s own cognition” (Anderson, 2009, p. 46),

particularly concerning design decision-making. This overarching ILO was supported by a set of secondary ILOs, which progressed from lower- to higher-order thinking skills (i.e., from understanding to analysing and creating), and from concrete to abstract knowledge (i.e., factual to conceptual) (Ibid). Each activity was carefully crafted and structured around these secondary ILOs.

This paper focuses on the first part of the workshop, which explored how aesthetic choices—especially colour—shape a product’s gender character, either reinforcing or challenging stereotypes. The goal was to address the first and foundational secondary ILO, centred on factual knowledge and understanding as a thinking skill, enabling students to analyse the gendered nature of consumer products. An introductory lecture and mapping activity framed this exploration.

a.1. Introductory Lecture: A 25-minute lecture introduced the concept of gendered attributes of consumer products, presenting a taxonomy beyond the binary—feminine, masculine, androgynous, i.e., showing both masculine and feminine traits, and gender-neutral, i.e., where neither is present. (Labarta, Ingaramo & Mattioli, 2024). Conceived as a flexible tool rather than a rigid system, the taxonomy encouraged students to reflect on underlying biases. The lecture set the stage for the first activity: mapping product images on a two-axis diagram according to these four categories.

a.2. Mapping activity: Students, divided into six groups, worked on three product categories with gendered associations: electric razors (ER), hand blenders (HB), and electric screwdrivers (ES). These products were selected because they belong to categories often associated with stereotypically gendered imaginaries that intersect with self-identity and where there is a tension between the domestic and the professional or the private and the public (i.e., self-care, kitchen work, and handwork). Each group mapped 24 products of their assigned category onto a diagram structured by masculine–feminine (horizontal) and gender-neutral–androgynous (vertical) poles. Consequently, four borderline areas or quadrants are created on the map. The activity unfolded in three analogous and sequential steps: working with silhouettes only (Step 1), achromatic images (Step 2), and chromatic images (Step 3). Groups negotiated placements until reaching consensus. In addition to mapping, groups assigned to the same product category (e.g., Groups 1 and 2 for ER) were later encouraged to compare their canvases and discuss differences in product placement and perceptions. The activity concluded with a collective reflection on how shape, form, and colour influence perceptions of gender, when stereotypes dominate, and how products might be reimagined beyond binaries.

B. Data analysis and interpretation

This phase was initiated by preparing the collected data for analysis. The physical maps from Steps 2 and 3 were digitally reconstructed in Adobe Illustrator. Subsequently, colour palettes were derived from the images of each product to enable a more detailed chromatic analysis. The palettes were organised according to a Just Noticeable Difference (JND) criterion, aimed at minimising perceptual colour differences, while preserving the proportional distribution of colours originally present in each image. These proportions were qualitatively estimated based on visual dominance. Each palette's colours were therefore ordered from the most prevalent (dominant hue) to the least. Consequently, three categories of colour palettes were identified: (i) monochromatic, (ii) polychromatic with a dominant colour, and (iii) polychromatic with balanced proportions. Also, the corresponding RGB, CMYK, HEX, and HSB codes were extracted for each colour of the palette. Using the HSB model, five levels were defined to classify the colours according to their lightness and saturation (low, medium low, medium, medium high, and high). Products were assigned ID codes (e.g., HB01) for systematic tracking. Finally, in the reconstructed canvases, the product images were replaced with their corresponding colour palettes, thereby enhancing the visualisation of the chromatic dimension.

The analysis focused primarily on how colour properties—hue, saturation, and lightness—shaped gender perception along the defined axes. First, lightness (Workshop Step 2) was studied to identify patterns in the association between different levels of lightness in products and the gender categories defined in the canvas. This made it possible to determine how the lightness of the products positioned along the Masculine, Feminine, Gender-Neutral, and Androgynous axes—and their respective quadrants (1 to 4)—was perceived, and therefore, what role lightness played in these associations. Then, product placements were compared between Steps 2 and 3 to clarify the role of the chromatic component in product associations with the defined gender categories. The comparison enabled us to track movements of products from one canvas to the other, observing which products shifted position (axis or quadrant) once chromatic properties were added. It was also possible to analyse which products maintained their coordinates; which colour combinations were repeatedly associated with a specific quadrant or position; which dominant colours were primarily linked to the defined gender categories; which secondary colours were associated with those categories; and how hue, saturation, and lightness may serve as determining factors in the perception of gender categories, among other aspects. An intergroup analysis was also conducted on the results obtained by both groups who worked with the same product category, comparing the Step 2 and Step 3 canvases. This analysis identified consistencies and differences in product positioning and, consequently, in their association with the different gender categories defined in the canvases. Here, the focus was on examining which products were located in the same quadrant/axis/position according to both groups, as well as which were defined as “ambiguous” by both groups (that is, positioned in borderline zones between one axis and another). In some instances, corroborations were carried out using the Step 1 canvas (where products were represented only by their silhouettes, i.e., purely formal appearance), in order to determine whether form (in some cases archetypical) exerted a more substantial influence on the perception of specific products and therefore reinforced their association with the defined gender categories (e.g., an object resembling a weapon = masculine).

To better understand how the three colour properties affect gender perception, a matrix traced product reclassifications from Step 2 to Step 3. This relational structure highlighted which colour properties prompted changes and revealed broader tendencies in how hue, saturation, and lightness reinforce or challenge normative gender associations in product design.

Results

The insights from the analysis relate to general observations on students’ interpretive challenges and a set of assumptions describing the role of colour in gender perceptions.

A. Challenges in interpreting gender beyond the binary

Each group of students produced three maps, one for each step. Their progression revealed common interpretive challenges. First, many groups struggled to separate a product’s shape from its function, often assigning gendered meanings based on learned associations rather than formal qualities. For example, a screwdriver was frequently labelled as masculine—not for its appearance, but because its function is traditionally linked to male roles. This highlights the influence of internalised gender norms embedded in everyday products. A more significant difficulty emerged when students were asked to move beyond binary classifications. While readily identifying objects as feminine or masculine, they hesitated to position them along a broader, more diverse spectrum. Their hesitation was often accompanied by caution, especially during the early stages of the activity. Several students sought reassurance that their interpretations were respectful and appropriate, revealing a degree of anxiety and uncertainty around navigating gender issues through design. Despite growing awareness of gender diversity, they lacked confidence in engaging with it. Even so, their interpretations across the three mapping steps provided valuable insights. The following section examines how gendered meanings were gradually constructed through visual information, from shape to colour.

B. The role of colour in gender perceptions: assumptions on HSB relational patterns

This section examines how hue, saturation, and lightness (HSB) interact to convey gendered meaning across product categories, through five emerged assumptions:

b.1. Lightness by itself is a gender cue: Mapping results from Step 2 show that lightness strongly influences gender perception, both independently and in combination with formal features such as shape and finishing. Lighter neutrals consistently aligned with femininity, while darker tones clustered with masculinity. In Step 3 (chromatic images), this pattern persisted. Moreover, shifting the lightness of one of the colours in a palette from dark to light, and using it together with an accent of a saturated hue, often altered a product's gender reading. For example, in one case (HB03), a dark neutral combined with a pink accent produced an identity that leaned feminine but remained ambiguous. The comparison of desaturated and saturated maps confirmed the foundational role of lightness, though not an exclusive one. In four out of six groups, more than 60% of images shifted between steps, suggesting that while lightness and shape are influential, other HSB properties and their interplay often override them.

b.2. The relationship between colours contributes to genderisation and degenderisation: Beyond lightness, colour combinations within the palette—monochromatic, polychromatic with a dominant hue, or polychromatic with balanced proportions—also play a role in constructing gender perceptions. Feminine-coded palettes often paired a light neutral with a subtle accent, while masculine-coded ones tended to be monochromatic, dark, or polychromatic with vivid colours. Androgynous readings emerged when “feminine” accents contrasted with dark neutrals (e.g., HB16) or saturated primary colours were accompanied by light neutrals (e.g., HB08). Chromatic relationships also pushed degenderisation. Gender-neutral palettes leaned towards monochrome, often relying on extreme lightness or darkness (e.g., ES05), whereas androgynous ones involved more balanced or ambiguous polychromatic pairings. These cases demonstrate that gender coding depends not only on individual HSB values but also on how colours are paired and contrasted within the palette.

b.3. Low and high saturation are associated with binary assumptions: Extremes of saturation reinforced binary perceptions. Low saturation combined with high lightness produced the pastel and soft shades commonly linked to femininity (e.g., ER18). In this case, hue played a secondary role, as feminine-coded palettes appeared across the colour wheel—from violets and blues to reds and oranges. Lightness and saturation carried the weight of meaning in these cases, embedding stereotypical feminine scripts through delicate, pastel tones aligned with a Western-centric image of femininity. By contrast, masculine-coded products typically employed blue or red hues with high saturation and brightness, resulting in palettes that appeared more vivid and energetic than their feminine counterparts (e.g., ES24).

b.4. Medium-range values of lightness and saturation contribute to ambiguity, especially leaning towards androgyny: Ambiguous and androgynous perceptions most often stemmed from mid-range values of lightness and saturation. Across categories, chromatic images assigned to the androgynous axis pervasively displayed low-medium or high-medium values of both saturation and lightness (e.g., HB17). This differs from gender-neutral palettes, which were mainly monochromatic and located at the extremes of lightness (i.e., very light or very dark). Hence, while neutrality arises through the absence of chromatic contrast, androgyny emerges through mid-range combinations that blur binary boundaries without erasing colour.

b.5. Formal language can override colour in archetypical products: While colour properties significantly shaped perceptions, the analysis also highlighted the enduring influence of formal language—shape, surface treatment, and design details—on gender coding. In hand blenders (HB) and electric screwdrivers (ES) categories in particular, form often outweighed chromatic cues. ES products consistently borrowed from masculine-coded archetypes such as gun-like silhouettes and oversized ergonomic features, which anchored them firmly within the stereotypically masculine domain even when colour configurations might have suggested neutrality or ambiguity (e.g., ES01). Similarly, in HB, the association of strength and technical performance with certain forms reinforced masculinity regardless of the colour palette (e.g., HB19).

These results confirm that colour is better understood as the interplay of HSB properties rather than a hue-centred phenomenon. Each colour property—hue, saturation, and lightness—contributes differently, and to varying degrees, to the gendered perception of products.

Discussion

The analysis results shed light on the narrative and underlying mechanisms bridging colour systems and their role in shaping gender imaginaries embedded in consumer products. Here, we discuss (i) how colour is confirmed as a powerful and influential gender cue, (ii) the pressing need for designers to critically engage with the socio-cultural and historical dimensions of chromatic choices, and (iii) we propose the *Colour + Gender Framework* hoping it leads to a more critical and intentional relationship between design and gender awareness.

A. Colour remains central in shaping gender perceptions

Our findings supported and expanded the view that colour remains one of the most powerful cues in product gendering (Canlı, 2018). Lightness emerged as a primary signal, with lighter tones aligned with femininity and darker tones with masculinity. This pattern echoes cross-cultural associations reported in earlier studies, where “feminine” was predominantly linked with light shades and “masculine” with dark ones (Jung and Griber, 2019). In combination with saturation and hue, our analysis further showed that the pink–blue dichotomy continues to hold, reflecting the historical construction of these codes as market strategies (Paoletti, 2012; Canlı, 2018; Dantas et al., 2021).

By contrast, gender neutrality frequently appeared in “hue-less” palettes where saturation was near zero. These schemes drew on male-oriented aesthetics in which colour is deliberately erased to appeal to a broader audience while maintaining a masculine-coded baseline. This confirms critiques that “neutral” in design is rarely neutral, but often a disguised masculine default (Stilma, 2006; McMahon and Kiernan, 2017; Canlı, 2018). While marketed as universal, such palettes carry the symbolic weight of male-coded attributes presented as a silent norm. At the same time, our analysis highlighted that colour can be employed more strategically—not only as a marketing device but also as a tool for inclusivity. Used with intent, colour has the potential to destabilise stereotypes or blur binary lines that have long pigeonholed users into socially constructed gender identities. This finding aligns with recent calls for non-discriminatory design practices that critically reflect on bias and move beyond binary aesthetics (Esfahani, 2020).

The study also revealed that binary distinctions dispersed when lightness and saturation values shifted gradually within a medium range. These transitions opened a broader spectrum of gender perceptions—challenging stereotypes or erasing gender—without producing dull or lifeless aesthetics. This is particularly significant in light of concerns raised in the literature that gender-neutral products often result in bland or “numb” aesthetics (Ehrnberger, Räsänen and Ilstedt, 2012). Our findings demonstrate that vibrant chromatic combinations can emerge from intermediate HSB values that resist binary coding. Hence, colour—understood as the interplay of hue, saturation, and lightness—has the capacity either to reinforce cultural stereotypes or to subvert and reconfigure them. This dual potential underscores arguments that colour is not merely a decorative choice, but a cultural

code embedded in historical, social, and economic structures (Canlı, 2018). The central issue, then, is whether designers replicate existing codes uncritically, reinforcing imposed norms, or deliberately use colour to challenge them.

B. The implications for design

These findings have several implications for design. First, they expose the limitations of traditional gender segmentation strategies that reduce choice to the binary of pink for women and blue (or black) for men. As noted, such strategies emerged from capitalist market logic rather than innate preferences (Paoletti, 2012; Dantas et al., 2021). Today, they are increasingly misaligned with user realities, as many consumers reject gendered branding or resist stereotypical cues (Bideaux, 2022). Persisting with these strategies risks alienating diverse audiences who expect products to reflect fluid and non-normative identities. Moreover, the findings suggest that genuine neutrality cannot be achieved simply by defaulting to achromatic palettes. Black and grey tones—often paired with metallic finishes and marketed as “gender-neutral”—carry their own coded meanings and remain tied to archetypes. True neutrality must be constructed intentionally, avoiding both the masculine-as-default paradigm and the superficial use of pink accents as a form of “gender washing.”

Equally important is considering colour in relation to other elements of product language. Shape, surface finish, and design details frequently overrode chromatic cues in our analysis, confirming that colour operates in tandem with form. For instance, a hand blender with gun-like ergonomics remained masculine-coded even when paired with lighter and more complex palettes, while subtle shifts in the lightness of neutral tones could move a razor across gendered zones. Such examples reinforce the view that designers often rely on generalised assumptions and personal biases rather than critically reflecting on how form and colour jointly encode gender (Stilma, 2006; McMahan and Kiernan, 2017). As observed with design students, this tendency may stem from a lack of confidence and awareness. Hence, fostering critical reflection in both design education and practice is essential. Designers must be trained not only to approach colour technically and theoretically but also to recognise the cultural, social, and historical meanings attached to chromatic choices. As argued, design based on unexamined assumptions risks producing homogeneous and exclusionary outcomes (Stilma, 2006; Canlı, 2018). By contrast, approaches that situate colour within broader socio-cultural debates can promote more inclusive practices that transcend stereotypes. The implications also extend to marketing. Product portfolios could be restructured to address diverse audiences who resist narrow, prescriptive models of gendered consumption. Instead of multiplying gender-specific variants of the same product, companies could streamline their portfolios to offer aesthetics that speak to a broader spectrum of preferences. Such strategies are not only socially responsible but also economically advantageous, reducing unnecessary duplication while expanding the user base.

C. The Colour + Gender Framework

Based on these insights, we propose the development of a *Colour + Gender Framework* as a practical tool for designers. It addresses the need for a more conscious and intentional use of colour in product design, moving beyond biased or market-driven choices that reproduce stereotypes. The framework rests on three overarching goals. First, to avoid reinforcing stereotypes by preventing colour choices constrained to binary associations of femininity and masculinity. Second, to challenge “pink marketing” and gender segregation by exposing and destabilising reductive strategies that target women through superficial chromatic coding. Third, to promote the blurring of binary dichotomies, encouraging ambiguity through colour configurations that expand the spectrum of possible identities. Together with the gender-sensitive design strategies proposed by Labarta, Ingaramo, and Mattioli (2024)—cue-free, gender-shift, and flexible design—these goals will constitute the structural layer of the framework. The framework may also integrate the analytical parameters identified in our study, which can be directly applied in practice: (i) the modulation of lightness in neutral tones; (ii)

relationships between colours—monochromy, polychromy with a dominant hue, or balanced polychromy; (iii) the interplay of saturation and lightness, with extremes reinforcing binaries and medium values fostering ambiguity; and (iv) the influence of formal language. By combining these dimensions, the framework will support designers in recognising when colour choices risk reinforcing stereotypes, experimenting with strategies that subvert or reframe them, and employing colour purposefully to create non-discriminatory outcomes.

Conclusions

This study reaffirms colour as a central and highly influential cue in the gendering of products, operating not in isolation but through the interplay of hue, saturation, and lightness alongside form and function. By analysing how these chromatic properties shape perceptions of femininity, masculinity, gender neutrality, and androgyny, the findings reveal both the persistence of stereotypes and the potential of colour to destabilise them. Importantly, neutrality cannot be equated with the absence of colour, nor can superficial adaptations of pink or blue achieve inclusivity. Instead, colour must be engaged critically and intentionally in product design. The findings provide a base for the development of a *Colour + Gender Framework*, which may offer a pathway towards more inclusive and equitable design practices, equipping designers to navigate complexity beyond binary logics.

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