P/REFERENCES OF DESIGN

SPELLING 'GENDER-NEUTRAL': A COMPREHENSIVE OVERVIEW OF NON-GENDER-SPECIFIC PRODUCTS.

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ABSTRACT | This paper explores the evolving paradigm of gender-neutral products, a growing trend in product design, emphasising the lack of a shared understanding of their epistemological and ontological aspects. While researchers advocate for integrating gender neutrality in design practices to promote equality, achieving a consensus on defining and addressing these products remains challenging. We aim to provide a thorough overview of gender-neutral products through a scoping review methodology and the collection of a glossary of terms related to products without gender-specific connotations, outlining the semantical tensions among these. Our findings revealed that labelling practices impact product perception, thus influencing users. Affective attitudes, intricately tied to purchase intent, are shaped by aesthetic and functional perceptions. This exploration contributes to untangling the discourse around gender-neutral products through a gender-sensitive design framework. By advocating for a thoughtful and grounded approach to genderless design, our research seeks to encourage a design culture that challenges societal constraints and promotes the inclusivity of diverse identities.

1. Introduction

1.1 An Uprising Trend

A new category of products has gained a strong presence by challenging traditional gender norms: major brands and well-renowned designers have already adopted a neutral design approach to reach a broader audience, advocating for inclusivity and diversity (Esfahani, 2020). Moreover, scholars highlight the potential of non-gendered products, given their increasing popularity among consumers, who are increasingly prone to embrace them (Vieira, 2019).

Some scholars urge a shift towards a generation of products deprived of gender (Fugate & Phillips, 2010), while others cautiously advocate for a 'gender-tempered' design wave (Sandhu, 2021). More conservative and pragmatic views report gendered products as the lowest-risk option (Fugate & Phillips, 2010). Despite different positions, ubiquitous confusion about gender-neutral objects and their nature inundates the literature, potentially giving rise to unfounded statements and making the task of taking a stance seem like walking on quicksand. Numerous contradictions across publications exist. For instance, Vieira (2019) and Stilma (2010) interchange the terms 'gender-neutral1 and 1unisex1 to refer to counterparts of gendered products. On a similar view, Carpenter et al. (2005) use the word 'dual-sex' for gender-neutral brands, challenging the prevailing division between undifferentiated (i.e., without gender attributes) and androgynous (i.e., with feminine and masculine features) proposed by Bem (1981). Ehrnberger et al. (2012) imply that unisex products are susceptible to becoming aesthetically neutral, whilst Ludwig et al. (2016) declare them androgynous based on evidence of high levels of femininity and masculinity.

Domain experts broadly investigate gender perceptions and their impact on product design, education, and marketing. Still, specific guidelines on gender-neutral aesthetics and a shared glossary are lacking. We argue that the absence of a clear definition and categorisation of non-gendered products hinders the creation process, leading to unexpected and unpredictable consequences. Just as any competent chemist would not mislabel acids and bases, designers dealing with gender perceptions in products should be careful about confusing androgynous cues with gender-neutral ones, for instance. An unambiguous gender-based classification can serve as a foundation for making well-informed design decisions, preventing the unintentional marginalisation of individuals through design or the market failure of a product. Our research questions seek to analyse how the literature addresses non-gendered products, aiming to offer a comprehensive overview of this category and its implications for the design discipline and our society.

1.2 Gender Congruity to Foster Affective Attitudes

Despite the ongoing growth of the gender-neutral trend, resistance to gender neutrality is still nurtured by the need for gender congruity, i.e. the alignment between a product's gender connotations and the user's gender identity. For example, evidence suggests that male users are less receptive to products not targeted specifically for them than women and non-binary individuals (Avery, 2012; Fugate & Phillips, 2010). They are most likely to reject unisex-labelled products or those containing female connotations, fighting against any transformation of typically masculine cues (Avery, 2012; Ehrnberger et al., 2012; Esfahani, 2020).To preserve the male market share, Fugate and Phillips (2010) proposed relying solely on male cues, a solution that, in our view, may perpetuate the traditional gender hierarchy and fuel a masculinity culture not aligned with the social and cultural principles of the Sustainable Development Goals. Instead, Prochner (2018), from a feminist and queer perspective, advocated for gender-fair products by considering users' needs and adding diversity to design teams to increase the chances of all identities being represented. However, as an alternative to a reductionist view where men design for men and women design for women, the focus should be instead on a shared and widespread education on gender sensitivity.

It is undeniable that the preference for products not targeted at a specific social group is becoming more diffused across the entire gender spectrum, including the normative men-women binary (Canning, 2012). Still, the one-size-fits-all approach may be a long shot regarding market acceptance, potentially neglecting a significant portion of consumers based on gender. As part of the design community, we must carefully acknowledge and accommodate the diverse and wide range of femininities and masculinities. Tilburg et al. (2015) highlighted the role of affective attitude in increasing purchase intent, with a focus on products used for self-expression and with regard to gender considerations. They defined a positive affective attitude as the result of a seamless translation of the product's (gender) identity and as a trigger for aesthetic value and functionality perceptions. The practical translation of a product's embedded meaning relies on "error-free processing of stimuli" (Tilburg et al., 2015, p. 426), determined by how easily and quickly the user perceives and identifies themselves with the product, i.e. how efficiently the gender congruity phenomenon takes place. Our goal is to create tools that promote gender identity congruity across the gender spectrum by facilitating the relationship between non-conforming identities and products.

2. Methodology: A Scoping Review

The discussion around gender-sensitive products, and especially non-gendered products, is still ongoing and calls for a more in-depth investigation. When the state of a research topic urges further development, resourceful researchers can choose to conduct a scoping procedure to examine these less-researched topics (Arksey & O'Malley, 2005). Therefore, we adopted this methodological framework to make sense of and create a coherent structure of the data we extracted and collected for further analysis. A scoping review consists of five consecutive steps and a sixth optional step (ibid.):

1. Identifying the research question;
2. Identifying relevant studies;
3. Study selection;
4. Charting the data;
5. Collating, summarising, and reporting the results;
6. Expert consultation.

2.1 Identifying the Research Questions

Our research aimed to discover how non-gendered products are called in the literature. The significance and urge to answer this question lie in the importance for designers of all kinds to develop a sensitive language to enter and contribute to the conversation on design and gender issues (Van Boeijen, 2022). Our scope was to unveil gaps and contradictions in the literature and pave the way for a shared approach within the product design field.

2.2 Identifying Relevant Studies

The second step of the scoping review was "identifying primary studies (published and unpublished) and reviews suitable for answering the central research question" (Arksey & O'Malley, 2005, p. 10). The answer to our research inquiry should provide a general overview and common ground around non-gendered design and stir up the conversation about gender issues within the design community. Hence, we aimed at studies discussing genderless cues across different disciplines, focusing on product design. We relied on electronic databases, reference lists, and hand-searching to collect an insightful yet manageable data sample.

Table 1. Scopus search query history.

N. Step	Scopus Query String	N. Results	Collected (Yes/No)
1	TITLE-ABS-KEY ("genderless object*" OR "genderless product*" OR "neutral gender product*" OR "unisex product*" OR "non-gender trend" OR "unisex design" OR "genderless market")	15	N
2	TITLE-ABS-KEY(("genderless object*" OR "genderless product*" OR "neutral gender product*" OR "unisex product*"OR" non-gender trend" OR "unisex design" OR "genderless market" OR "gendered object*" OR "gendered product*" OR "gender typ*" OR "gendering cue*" OR "gender polarisation" OR "gender operationalisation" OR "gender suitab*" OR "gendering" OR "gender-based")) AND EXACTSRCTITLE ("Design Issues" OR "Design Studies" OR "CoDesign" OR "International Journal of Design" OR "Design Journal" OR "She Ji")	3	Y
3	TITLE-ABS-KEY (("unisex" OR "*gender*") AND ("industrial design" OR "product design"))	474	N
4	TITLE (("unisex" OR "*gender*") AND ("industrial design" OR "product design")) OR KEY (("unisex" OR "*gender*") AND ("industrial design" OR "product design")	109	Y

We conducted a query search with Scopus, introducing gender-related terminology gathered in Table 1. We began with a simple query, feeding non-gendered terms such as ‘unisex’ or ‘genderless’. However, our search yielded just a few publications, thus suggesting a literature gap. Consequently, we continued with a more thorough second search, extending the range of gender-related vocabulary and including as input some of the Scopus-indexed design-focused journals (i.e., Design Issues, Design Studies, CoDesign, International Journal of Design, Design Journal, She Ji). As a result, we collected a small but relevant data set of three publications, confirming the scarcity of publication in these design journals mentioning (i.e., in the title, abstract or keywords) non-gender-specific terminology.

Given the relatively low number of documents in our previous searches, we broadened our following query by looking for publications involving gendered and non-gender-specific design discussions. In addition, we juxtaposed the gender-derived terms with ‘industrial design’ and ‘product design’ to draw the focus towards literature dealing with design issues, discarding other knowledge fields out of our scope. As a result, we obtained a substantially broader group of data, which made evident the predominance of the discourse around gendered design over non-gendered design. After further limiting our scope, we gathered a data collection of 112 publications. Then, scouring through our publications sample, we extracted new words such as ‘sex-typed’, ‘masculine’, and ‘feminine’. We enhanced our data collection by looking at the reference lists and expanding the inventory of documents to be analysed to 126.

2.3 Study Selection

Starting with a list of 126 publications, we established selection criteria to narrow it down to a more insightful and topic-focused data set. We examined each title, abstract, and keyword and applied the following necessary conditions for further and more thorough analysis:

- The publication focused on a specific consumption product or a category of products;
- The publication discussed the influence of gender within the design discipline;
- The publication referenced the lack or presence of gender connotations within products and related processes, from creation to advertising.

The outcome consisted of a data sample of 64 documents, subdivided into 33 academic articles, 27 conference papers, three dissertations, and a technical report, all dating from 1981 to 2023. Figure 1 represents the sharp increase in publications about gender and product design over time.

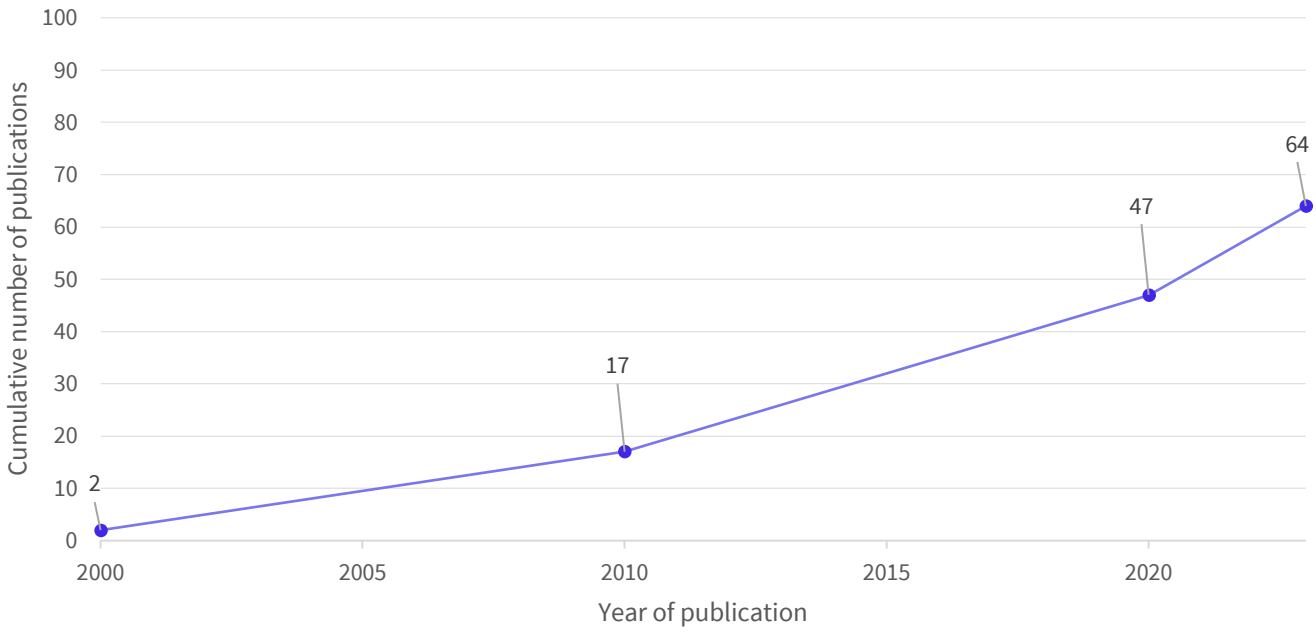

Figure 1. Graph displays the growth of publications related to non-gender-specific and gender-specific products. It indicates the cumulative number of publications for each decade until 2023.

2.4 Charting the Data

In charting the data gathered so far, we intended to create an organised and systematic structure that would enable us to identify emerging themes and patterns within the literature (Levac et al., 2010). Following the multiple-cycle-based coding process described by Saldaña (2013), we first arranged our data corpus aiming at specific gender categorisations of products. This way, we discovered a set of different clusters:

- Masculine, Feminine, Androgynous, or Undifferentiated;
- Masculine, Feminine, Gender-neutral, or Unisex;
- Female, Male, or Gender-neutral;
- Sex-typed or Cross-typed;
- Sex-congruent or Sex-incongruent;
- Non-gendered or Gendered.

The resulting sorting system gave us a clear insight into the various existing approaches to non-gender-specific products.

Next, we used our preliminary category system as a starting point for finding out specific terms and their potential synonyms. We created a glossary of 38 terms found in 42 documents referring to non-traditional gendered products and their inherent processes, continuously updating it during our scoping procedure. We reduced the glossary count to 16 by grouping semantically identical terms (e.g., 'gender neutral', 'neutral gender', and 'gender-neutral') to simplify our analysis. Moreover, some of our initial terms were re-categorised as 'gender-sensitive practices' widely employed by designers and other stakeholders, such as advertisers (i.e. 'universal design', 'pluralist design', 'transparent approach', 'mute gender', 'neutral design', 'de-gendering', 'gender-bending', and 'gender contamination').

2.5 Collating, Summarising and Reporting the Results

The concluding phase of our scoping review involved synthesising and identifying thematic and conceptual categories for our glossary. Our analysis of gender-neutral products extended beyond establishing clear categories and delved into their respective attributes and interconnected processes. We created a framework, the Gender-Sensitive Design Framework, that outlines the interpretation of the overall findings. We built our framework on three pivotal pillars, each connected to a different product outcome in terms of gender traits and acceptance. These pillars are the product's attributes, the product's alignment with the user's gender identity, and the product's response to social expectations. Our framework can assist designers and practitioners in assigning or removing gender attributes from products while raising awareness of such complexities.

3. Findings

3.1 A Non-Gender-Specific Glossary

By approaching our work through the scoping review methodology, we identified contradictions and tensions across our data corpus and gained a glance at the gender-based climate in product design over the past decades. This section unveils the literature's wide variety of gendered vocabulary, emphasising the prevailing terminology.

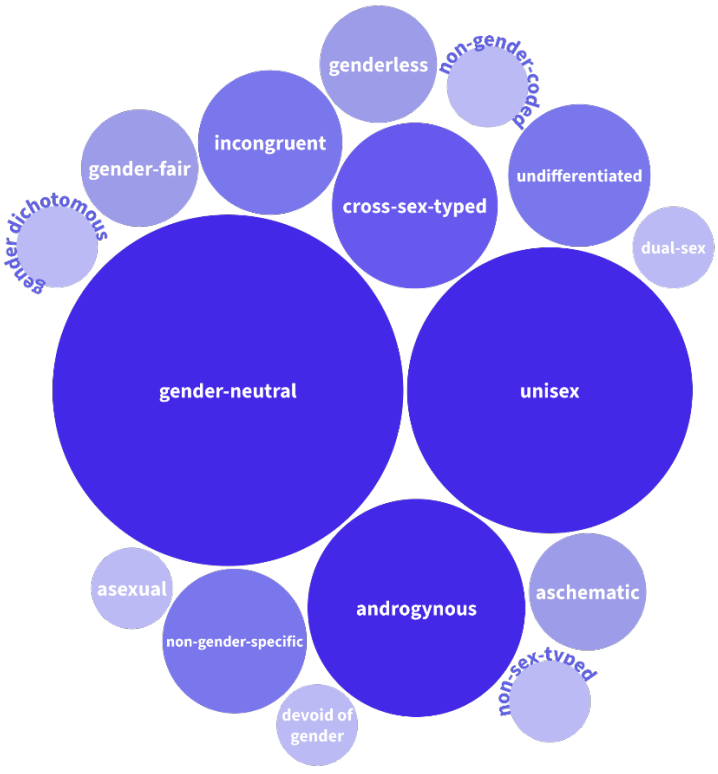

Figure 2. The Word Cloud displays the most common keywords in the literature. ‘Gender-neutral’, ‘unisex’, and ‘androgynous’ are the most frequent, represented by the most prominent circles. The size of each circle is directly proportional to the occurrence of each keyword per number of publications.

From our scoping review, we assembled a collection of 16 words symbolising and conveying non-conventional gendered attributes. Our findings revealed a preference for a small group of terms, illustrated in Figure 2, and three of them arose as predominant for sorting products from a non-gender-specific perspective: ‘gender-neutral’, ‘unisex’, and ‘androgynous’. We observed that the defining aspect is whether

gender-specific aesthetic connotations are present or absent. However, in the case of unisex products, concerns about gender biases affecting usability emerged as well.

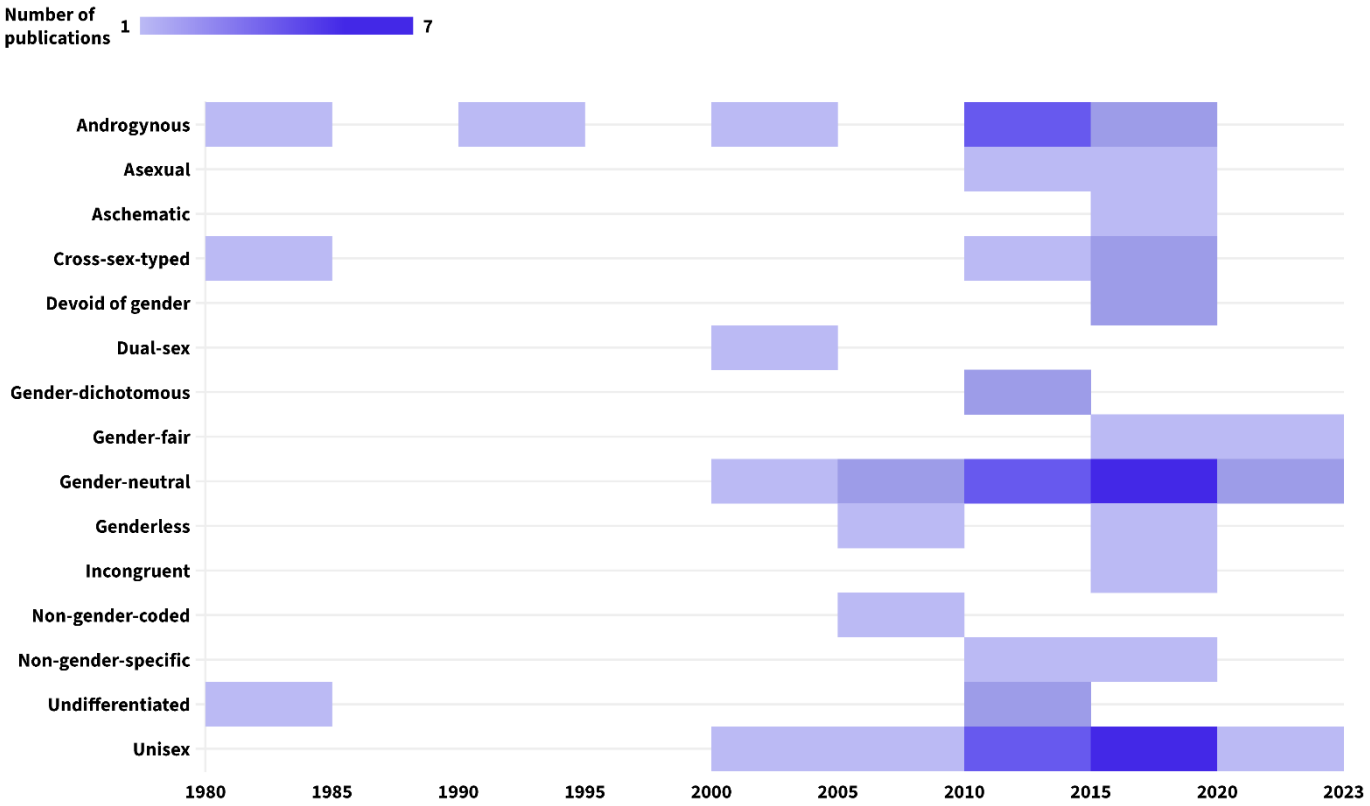

Figure 3. The graph illustrates the emergence and prevalence of non-gender-specific terminology across time, with darker hues representing a higher number of publications containing a particular term.

By analysing the historical evolution of terminology describing artefacts with no specific gender (Figure 3), we discovered how certain terms consistently appear across time while others became obscure and how newer terms have gained popularity in recent years. The aforementioned widespread categories (i.e., androgynous, unisex, and gender-neutral) have proven persistent since their first appearance and have become widely diffused ever since, with androgynous being the most enduring. On the other hand, we hypothesised that due to an explicitly binary cue, ‘dual-sex’ did not stick within the discourse on non-gender-specific products. The remaining terms, such as 'devoid of gender', ‘gender-fair’, or ‘incongruent’, encompass a broader range of meanings, providing little information on the specific gender connotations they convey, which might justify their lower frequency.

Our findings revealed that both androgynous and gender-neutral associations are well-defined and can be easily identified regarding aesthetic values and gender connotations. They are depicted as an unmistakable and straightforward dichotomy, where binary gender cues are either constantly present or missing. On the other hand, unisex products appear to exist somewhere in between. Unisex products target both men and women, resembling androgynous products yet displaying a genderless and anonymous formal language that is similar to gender-neutral products. If we aim to provide a comprehensive framework for characterising products within the controversial and complex topic of gender, we suggest letting go of ambiguous terms. Next, we delve into the aforementioned predominant terms (i.e., ‘gender-neutral’, ‘unisex’, and ‘androgynous’).

Gender-Neutral: With No Masculine and No Feminine Attributes

A gender-neutral product is described in the literature as “devoid of gender” (Prochner, 2018, p. 243) or ‘genderless’ (Bardzell, 2010; Vieira, 2019), i.e. neither masculine nor feminine (Oudshoorn et al., 2002;

Stilma, 2010; Vieira, 2019). Moreover, when referring to gender traits, we intend more than mere aesthetic appearance. Oudshoorn et al. (2002) implicitly suggested that functionality that does not distinguish between men's and women's capabilities is also gender-neutral. However, Stilma (2006) has expressed certain scepticism, claiming that achieving complete and pure gender neutrality is unattainable and criticising it as an approach for potentially safeguarding hegemonic masculinity.

A more realistic and conservative approach towards gender-neutral products could consist of minimising gender differences rather than eliminating them to target both men and women equally. According to Esfahani (2020), this solution might nevertheless generate the risk of reinforcing traditional feminine and masculine values based on stereotypical norms and biased ideologies. Supporting this viewpoint, Kaygan (2014) drew attention to the fact that normative masculinity and femininity still surface in objects presented as gender-neutral. A product's attributes should be considered neutral "where the gender of design is invisible" (Esfahani, 2020, p. 825), as demonstrated in Figure 4. In addition, as anticipated, some authors have briefly referred to the term 'undifferentiated' to address those products that lack a well-defined gender identity (Fugate & Phillips, 2010; Tilburg et al., 2015).

Figure 4. Georganics bamboo toothbrush embodies gender neutrality. The product's function is indifferent to gender, and we do not identify specific stereotypical gender cues. The toothbrush is available in different colour options to appeal to a broader audience. Photo by Toa Heftiba on Unsplash.

Many scholars have investigated the social implications of gender-neutral design, and it is a widespread stance that gender-neutral products can play a significant role in advancing the cause of gender equality (Oudshoorn et al., 2002; Prochner, 2018; Spain, 1995; Stilma, 2010; Vieira, 2019; Vorvoreanu et al., 2019). Their design strives to eliminate traditional roles based on what socio-cultural norms dictate as appropriate and take down ill gender stereotypes (Prochner, 2018; Spain, 1995; Stilma, 2010). Contrary to what we might expect from a categorical and unique solution, gender neutrality can open a broader range of behaviours and characteristics (Avery, 2012) and serve as a valuable asset to the unified and inclusive design cause that refuses the exclusion of non-conforming identities and bodies (Canlı, 2018).

Unisex: With Feminine, Masculine, and Neutral Attributes

The category of unisex products is often challenging due to its ambiguous nature. Drake & Radford (2018) outlined that the primary scope of unisex design is to provide an alternative and separate version from the men's and women's categories. In this respect, they can be considered equivalent to androgynous products, as they target both men and women, allowing for an alternative and more flexible range of behaviours (Ludwig et al., 2016). In addition, Carpenter et al. (2005) introduced the term 'dual-sex' to refer to products that carry both-gender-specific connotations. However, it may not have gained widespread acceptance as it implies a gender division rather than promoting unity like 'unisex' aims to do.

Figure 5. Prototype of a unisex ski boot designed by students from the Luleå University of Technology. The authors categorised it as unisex for its lack of traditional feminine or masculine colours and its versatility in sizing (Öhrling et al., 2018).

Regarding aesthetic aspects, the general approach to unisex design is to unify the choice of colours and shapes to fit everyone's preferences (Esfahani, 2020), as exemplified in Figure 5. In addition, to convey the perception of unisex through product representation, there is a common tendency to display it on both men and women (Rasmussen & Petersen, 2011). Ehrnberger et al. (2012) pointed out that choosing pale and bland aesthetics to appeal to a broader audience may be counterproductive and lead to a weakened product identity with low quality in terms of aesthetic value.

Our findings revealed more concerning drawbacks of unisex design. G. J. M. Read et al. (2022) discovered how developing unisex Personal Protective Equipment (PPE), primarily designed around the standard Western male body, can negatively affect women's performance, potentially endangering their lives. We could state that the key to successful, conscious, and thoughtful unisex design is to blend many preferences while acknowledging gender differences strictly in terms of biological and ergonomic requirements (Drake & Radford, 2018).

Androgynous: With Masculine and Feminine Attributes

Despite some authors drawing similarities between androgyny and gender neutrality (Carpenter et al., 2005), most agree to disagree. Androgynous-designed products are distinctive for evoking augmented perceptions of femininity and masculinity, enhanced by their unambiguous, simultaneous, and equitable representation of typically male and female traits (Bem, 1981; Ludwig et al., 2016; Tilburg et al., 2015).

Figure 6. E-bike Tour Pro Wave by Advanced® CC BY-ND 4.0 DEED. The e-bike embodies both traditionally masculine and feminine cues. In terms of morphology, the open frame geometry has historically been related to female riders, whereas, in terms of formal design language, the aesthetic attributes (e.g., colour, shapes, and finishes) can be identified as masculine.

From a social perspective, and just like gender neutrality, androgyny contributes to transcending traditional gender boundaries (Avery, 2012; Drake & Radford, 2018) and “is associated with a larger repertoire of behavioural options” (Tilburg et al., 2015, p. 427). Furthermore, researchers like Blythe and Monk (2002) advocated for an ‘androgynous society’ with no inequitable division of labour, urging product designers to challenge established patterns of gender roles, particularly those related to the domestic environment. For example, Fugate and Phillips (2010) exposed the microwave's case, which shifted from an undifferentiated to an androgynous product after the alignment of men's and women's lifestyles, with women increasingly joining the workforce. They also exemplified how toothpaste went from masculine to androgynous after being associated with cosmetic aspects, which were more commonly related to women in the past. In Figure 6, we present an example of a product embodying an androgynous character. The e-bike represented is constituted by a wave frame, historically associated with female riders (Wong & Wu, 2010), and an overall masculine aesthetics characterised by dark colours and primary sharp shapes, hence coupling traditionally masculine and feminine attributes.

3.2 Existing Gender-Based Categorisation

After identifying how the literature addresses non-gendered products according to their distinctive traits and gender character, we looked at the bigger picture by investigating how these products are typically categorised and grouped.

Eriksson & Jerregård (2010) opposed non-gender-coded toys to gender-labelled toys, and Prochner (2018) polarised gendered design and design with no gender. While one might assume that all products not explicitly labelled as gendered fall into the category of non-gendered, this simplistic dichotomy falls short of grasping the nuanced aspects of identifying and conferring gender identity onto products. The term ‘non-gendered’ suggests that an object lacks gender cues and is not embedded with masculine or feminine attributes. Supporting that viewpoint, Ehrnberger et al. (2012) defined non-gender-specific categories as those not specifically targeted at a particular gender identity or whose function does not rely on the gender attributes of the user. However, the debate appears to be more complex.

On a more in-depth exploration of gender perceptions, Bem (1981) navigated the concept of ‘sex congruity’, referring to the alignment between an individual's sex identity and an external stimuli's gender markers. Extending this taxonomy to consumption products, Drake & Radford (2018) identified ‘sex congruity’ when a product aligns with stereotypical expectations and ‘sex incongruity’ when it deviates from the user's socially or self-assigned gender identity.

Shifting the focus to the inherent gender associations of individuals, Bem (1981) enhanced her contribution with a four-category framework according to the level of femininity or masculinity conveyed:

- ‘Sex-typed’ (i.e. male with high levels of masculinity and female with high levels of femininity);
- ‘Cross-sex-typed’ (i.e. male with high levels of femininity and female with high levels of masculinity);
- ‘Androgynous’ (i.e. high levels of masculinity and high levels of femininity);
- ‘Undifferentiated’ (i.e. low levels of masculinity and low levels of femininity).

Therefore, products displaying high levels of femininity or masculinity with little ambiguity are considered ‘sex-typed’ and defined as feminine or masculine (Fugate & Phillips, 2010). Moreover, we could argue that ‘cross-sex-typed’ products are born as the result of actively seeking sex incongruity. On the other hand, ‘androgynous’ products can represent both spectrums of gender simultaneously, nevertheless following pre-established stereotypes (Fugate & Phillips, 2010; Ludwig et al., 2016). Last, ‘undifferentiated’ products are impermeable to social impositions and expectations of gender behaviour and preferences and deprived of any typically feminine or masculine connotation (Fugate & Phillips, 2010; Tilburg et al., 2015). Nevertheless, discerning between androgynous and undifferentiated products—the latter being a less diffused term analogous to gender-neutral—from one another remains somewhat unclear.

3.3 Gender-Sensitive Design Practices

Designers should establish a specific design strategy based on the direction for translating, perceiving, and interpreting gender characteristics in products. During the scoping process for new product alternatives that disrupt gendered design, we identified a group of widespread design approaches to re-thinking conventional methods. The gender-sensitive techniques collected can be employed to react to unjustifiably gendered products or as a first approach to creating gender-fair designs. As per Figure 7, we clustered them into ‘cue-free design’, ‘gender-shift design’, and ‘flexible design’.

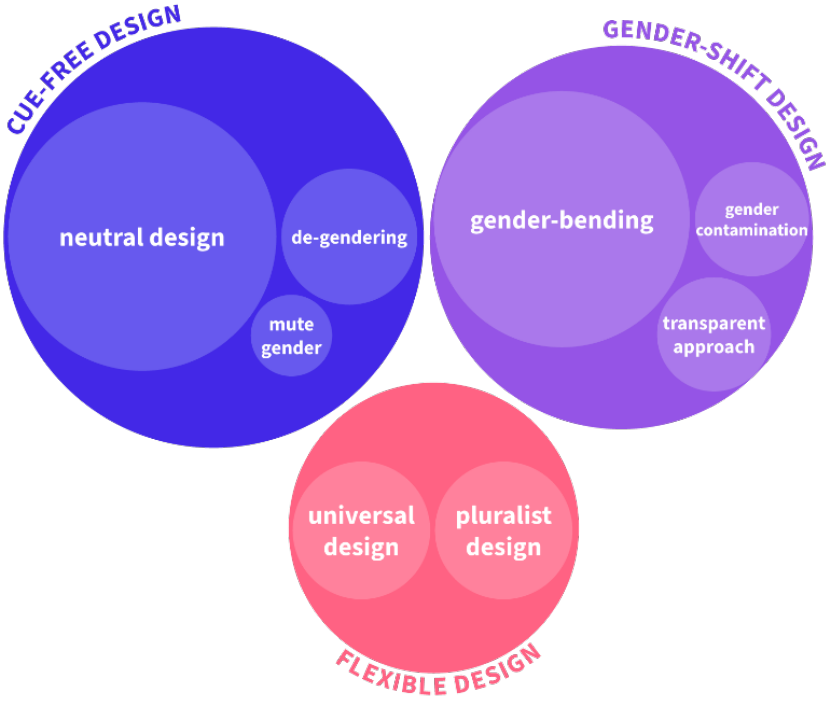

Figure 7. The three clusters contain specific practices challenging gendered design. The circle area size depends on the prevalence within the literature, assigning greater areas to the most widespread practices.

Cue-Free Design

When the goal is creating gender-neutral products free from gender markers, earlier research suggested ‘de-genderising’ or ‘re-genderising’ their attributes (Stuteville, 1971, as cited in Fugate & Phillips, 2010) or designing cue-free products. In certain instances, when an object is perceived as illicitly gendered, the unconscious response is to ‘mute gender’, i.e. ignore any gender connotations (Drake & Radford, 2018). However, de-constructing a design archetype takes time to unfold.

Our research revealed that the specific cultural lens applied throughout the design process influences the promotion of diversity. DaMaren & Olechowski (2022) emphasised that an open-culture environment fosters inclusivity more than a closed-group culture. De-gendering practices provide a second chance to start from scratch, bringing into the fold those usually neglected—women and non-binary—and assembling more diverse design teams, enhancing creativity (ibid.).

Figure 8. Unisex wristwatch Once Again by Swatch. Photo by the authors (2024).

The idea of 'neutrality' in design is pivotal in the conversation on de-gendering practices. Vieira (2019) claimed that neutral design can meet multiple personalities and needs, aligning with gender-neutral and unisex outcomes. However, it likely leads to anonymous aesthetics with no character (Prochner, 2018), typical of unisex products. Furthermore, colours and shapes are commonly referred to as neutral (Rajapakse et al., 2012; Rasmussen & Petersen, 2011) when we cannot identify traditional gender associations (Canlı, 2018). For instance, Ehrnberger et al. (2012) exemplified this approach by referring to the wristwatch Once Again by Swatch (Figure 8), whose function—timekeeping—is indifferent to gender and whose appearance is aesthetically neutral. Nevertheless, it is essential to acknowledge that apparently neutral things can contain cultural and social biases. This is necessary to avoid propagating traditional and prevailing stereotypes with a new uniform solution that takes a single standard pattern as a rule, e.g. white colour as the neutral option in Western cultures (Öhrling et al., 2018).

Gender-Shift Design

'Gender-shift' practices are intended to focus solely on connecting with men and women, not considering the non-normative gender identities. Hence, we believe this approach requires an evolution towards including alternative realities.

One of these practices is 'gender-bending', where a typically masculine or feminine typed product is reversed in its formal language to match the opposite sex's (Avery, 2012). Gender-bending unlocks the experimentation with self-expression and the exploration of "new understandings of gender through humour and provocation in design" (Prochner, 2018, p. 161), disobeying normative constrictions (Canlı, 2018). Figure 9 depicts an illustrative example of gender-bending.

'Gender contamination' emerged as another term indicating the appropriation of typically feminine or masculine brands by the opposite sex. The gender contamination phenomenon gives rise to products imbued with opposite gender cues to attract a broader public (Avery, 2012). It is worth noting that, statistically, women are more inclined towards gender contamination than men, who often feel threatened and perceive their gender schema performances as affected (ibid.). The term 'gender contamination' itself conveys a negative connotation, viewing gender inclusivity as an invasion rather than positive progress towards gender equality. In response, a more transparent approach proposes addressing gender blending practices without stigmatising marginalised identities, connecting with men and women and drawing inspiration from women's needs (Enga & Diana, 2019). We acknowledge that the ever-changing social and cultural gender matrix requires a comprehensive approach that addresses the needs of both women and non-binary individuals.

Figure 9. Students from the Luleå University of Technology re-designed weight training equipment with a 'Gender-bending' approach, challenging gender stereotypes at gyms. The degree of stereotypical feminine cues increases as the weight increases (Öhrling et al., 2018).

Flexible Design

We have coined the ‘flexible design’ category as a collection of design practices that understand gender as blind, meaning that the primary objective is to include everyone, regardless of gender identity. Universal design (Figure 10), for example, challenges normativity through a zero-tolerance to discriminating markers (Öhrling et al., 2018) and by designing artefacts that “are more equitable, intuitive, and thoughtful in anticipating collective and individual needs” (Vostral & McDonagh, 2010, p. 114). On the other hand, pluralist design disputes the idea of artefacts adhering “to a single, totalising, and universal point of view” (Bardzell, 2010, p. 1305). Bardzell (2010) explained how pluralism focuses on cultural differences, promotes constructive interaction with diversity, and utilises marginalised elements as resources for design solutions. In other words, this approach aims to create a more inclusive design that benefits from diversity rather than ignoring it.

Figure 10. OXO Good Grip Potato Peeler was initially designed to ease peeling for people with arthrosis—an example of universal product design © Charlie Sorrel on Wired. CC BY-NC-SA 3.0 DEED.

4. Discussion

Here, we present the interpretation of our findings and offer a conceptual and holistic Gender-Sensitive Design Framework to help navigate gender considerations throughout the product design process. As a disclaimer, our research faced some limitations. Firstly, due to limited time and resources, the sixth step of the scoping review procedure (i.e., the validation and further insights from an external domain expert) is missing (Arksey & O'Malley, 2005; Levac et al., 2010). Moreover, a more in-depth literature review by collecting a more significant number of publications could have provided more soundly proven results. However, we are confident that our work provides a reasonable overview of our main focus on non-gender-specific products.

4.1 Interpretative Framework of the Finding: Advancing Gender Sensitivity in Design

To guide the discussion and our interpretation of the results, we developed a comprehensive gender characterisation framework, namely the Gender-Sensitive Design Framework (Figure 11), to shed light on the dilemma of gender product vocabulary. We argue that products can be systematically classified considering three critical aspects: the product's gender attributes, its alignment with the user's gender identity, and its response to societal gender expectations.

Product's Attributes

Products' aesthetic and functional values highly depend on their gender character, and vice versa. Our research revealed three subcategories that suggest non-traditional gender-related implications: ‘gender-neutral’, ‘androgynous’, and ‘unisex’. However, the term 'unisex' proved quite ambiguous, displaying a neutral design but being associated with androgynous cues and potentially leading to dangerous inequalities (G. Read et al., 2022). For this reason, we propose a more straightforward and updated division which distinguishes between ‘androgynous’, ‘gender-neutral’, and ‘gender-specific’.

Our research uncovered how tangible traits (i.e. form, colours, shapes, and finishes) are crucial in embedding gender meanings into objects. A specific colour choice can drastically change gender perceptions of products since we attach values to aesthetic features based on personal experience, preferences, and socio-cultural biases. An androgynous product blends high levels of typically feminine and masculine cues (Tilburg et al., 2015). On the opposite perspective, gender-neutral products should not express any stereotypical constructs of femininity or masculinity, targeting a broader audience rather than the limited gender binary.

Product's Alignment with the User's Gender Identity

The gender characterisation of products is intrinsically linked to the user seeking self-expression (Oudshoorn et al., 2002; Prochner, 2014; Rasmussen & Petersen, 2011). The interpretation of a product's gender can dramatically change once it enters the ‘naïve realm’ (Prochner, 2014), where the reasoning, motivations, and justifications behind every design choice are not always explicitly communicated to users. Therefore, products serve as a means for self-expression (Oudshoorn et al., 2002; Prochner, 2014; Rasmussen & Petersen, 2011), and users have the power to change their gender script through creativity and critical thinking (Avery, 2012; Prochner, 2014). However, misaligning gender connotations can hinder the re-interpretation process (Bem, 1981; Tilburg et al., 2015). The synchronisation between self-identity and product gender character can either be a seamless and smooth activity or a challenging and unattainable task. A congruent product will instantly pair with the target user's gender identity, whereas an incongruent item will result in utter frustration and unfulfillment (Bem, 1981).

Tilburg et al. (2015) introduced the concept of positive affective attitude as a determining factor in encouraging gender congruity between individuals and products. However, experts emphasised how particular social groups—generally males—are more rigid than others regarding openness to alternative gender associations (Avery, 2012; Ehrnberger et al., 2012; Esfahani, 2020) and, therefore, tend to be prioritised over those who are more flexible. By considering gender congruity within the Gender-Sensitive Design Framework, we aim to extend a positive affective attitude across the whole gender spectrum and seek to manoeuvre the possible resistance from dominant groups without neglecting others.

Product's Response to Societal Expectations

The dynamic system built around products leverages the interaction among users, objects, and socio-cultural considerations. Gender associations are imbued and instilled in us since birth based on historic social standards, cultural beliefs, and doctrines. Individuals are expected to follow the predefined path regarding their socially assigned roles and identity. These associations are not exclusively found within the human dimension but are also transferred onto objects. Technology is often influenced by biased gender assumptions about the appropriate behaviour for specific social groups (Whalen, 2000).

When responding to societal expectations, products fall into a specific categorisation depending on the extent to which they follow predetermined rules. A sex-typed product represents normative constraints of what is socially accepted as masculine or feminine. Conversely, a cross-sex-typed product willingly challenges societal rules by defying the established meanings of femininity or masculinity. Last, a non-sex-typed product ignores any relation to traditional concepts of femininity and masculinity, exploring the whole spectrum of gender.

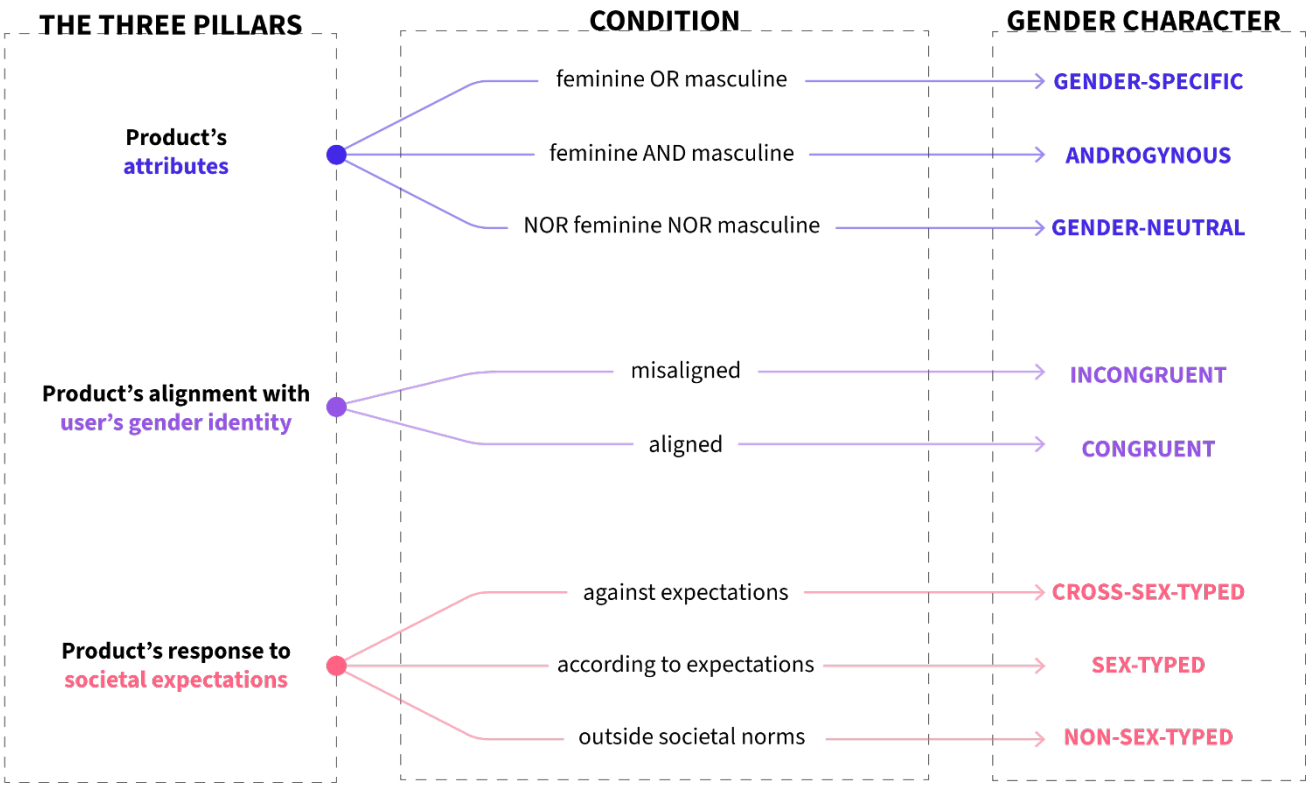

Figure 11. Conceptual Framework for Gender-Sensitive Design. Each pillar is connected to the predominant gender-related terms from our analysis.

4.2 Framework Application to the Design Process

Designers possess the skills and ability to shape “the initial forms, functions and meaning of objects” (Oudshoorn et al., 2002, p. 417). Their perceptions can directly influence the aesthetical value that designed objects evoke. However, designers often project their assumptions, experiences, and biases onto products, drifting away from an inclusive approach (Ehrnberger et al., 2012).

Our framework offers designers insights to make informed choices on gender-sensitive issues. We advise proactively implementing our framework from the beginning of the design journey. We argue that defining and understanding the context and empathising with the target user's needs and desires is essential for a successful outcome. Only after identifying the social and cultural context and the user's demands based on their gender identity can designers start defining the product's general requirements and attributes. A second approach to our framework could involve challenging already designed products and validating their compliance and coherence within the three pivotal pillars (i.e., attributes, alignment with the user's gender identity, and response to societal expectations). By proposing these two approaches, we aim to guide designers through a comprehensive process, ensuring gender sensitivity from the initial stages of design conception to the evaluation of existing products.

Table 2. Design strategies evaluated through the Gender-Sensitive Design framework.

Gender-sensitive design strategy	Product's attributes	Product's alignment with user's gender identity	Product's response to social expectations
Cue-free design	Gender-neutral	Congruent	Non-sex-typed
Gender-shift design	Androgynous	Congruent/Incongruent	Cross-sex-typed
Flexible design	Gender-neutral/Androgynous	Congruent	Non-sex-typed

The Gender-Sensitive Design Framework provides a new perspective for analysing the previously introduced gender-sensitive design approaches and assessing their influence on product outcomes within the context of the three main pillars (Table 2). These emerging design practices aim to promote gender sensitivity in product design and development, each taking a unique approach. First, cue-free design favours gender-neutral products to empower users to express themselves freely without subscribing to traditional gender rules. Furthermore, gender-shift methods intentionally include cross-sex-typed features, creating an androgynous mixture that may align or conflict with users' gender identities, hence making visible the invisible and taking down barriers to gender equality (Ehrnberger et al., 2012). Finally, incorporating flexible design practices that are non-sex-typed provides a safe and inclusive environment for users to explore and express their gender identity.

5. Conclusion and Future Research

Our research results in a deeper understanding of how non-gender-specific products and their distinctive features are addressed within the design discipline. We unveiled contradictions regarding the terminology and classification of these products, proposing a standardised and concise organisation that will hopefully pave the way for a more gender-sensitive design culture. Designers are called to get involved in and kindle the conversation surrounding gender issues, take a step towards bringing to life profitable products in terms of revenues and improving life conditions, and navigate the environmental and social realms thoughtfully and respectfully. As design professionals, we bear the ethical agency and responsibility of creating artefacts engineered to disrupt, challenge, and reshape unfair, unwritten cultural and social rules. A detailed analysis and visual research should be conducted on non-gendered product categories to identify their varying environmental and social implications based on their material, aesthetic, and morphological differences

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