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Bridging gender and human-centered design: a design verification study

Bahar Khayamian Esfahani*

School of Architecture, Computing, and Engineering, University of East London, London, E16 2RD, UK

* Corresponding author. Tel.: +44020 8223 7548. E-mail address: Bkhayamian@uel.ac.uk

Abstract

This article highlights the importance of adding gender awareness in human-centered design. Aspects of both paradigms are presented, and a lack of understanding of gender in the human-centered design approach was identified. Human-centered design sees gender as static and stable regarding male or female such that the implication of principles in products, systems or services appeals to one gender or another linking gender differences, and stereotypes. Evidence is provided through a design verification study, conducted in the context of fostering sun protection behavior in young men age 18 to 24. The results verify gender-aware sun protection interventions for young men. It also shows the inclusion of gender has great potential to bridge the gap between the world of designers and users. It also presents a discussion of the analytical procedures and the findings which emerged in this investigation led to the verification of design recommendations for sun protection interventions. Evidence is further presented for increasing emphasis on the influence of the designer's own gender and their gendered perceptions in their designs. Finally, the implication of gender-aware human-centered design would address the low levels of sun protection in young men.

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Keywords: Human-Centered Design; Gender; Design Verification Study; Sun Protection Behavior, Young Men

1. Introduction

The primary aim of the human-centered design (HCD) approach is to identify the user needs. However, we argue that there is a lack of understanding of, and even awareness of, gender in HCD. This approach sees gender as static and stable regarding male or female such that the implication of principles in products, systems or services appeals to one gender or another linking gender differences, and stereotypes.

To illustrate this, the investigation was conducted in the context of fostering sun protection behavior in young men. To reduce the risk of developing skin cancer, attitudinal factors associated with engagement in a range of sun protection behaviors such as using sunscreen and wearing protective clothing is necessary as well as avoiding sunburn through wearing a hat and staying in the shade. According to the National Institute for Health and Care Excellence [1]: "sun protection behavior plays a crucial role in the prevention and the treatment of skin cancer". Also, the UK Government's Health and Safety Executive [2] suggests wearing protective clothing and sunscreen with UVA and UVB protection to prevent sun overexposure and sunburn.

However, despite the growth in the market for sun protection products produced by the sunscreen and cosmetic industries which aimed to raise awareness about the risks associated with exposure to sunlight, young men age 18 to 24 are more at risk of developing skin cancer due to the low levels of sun protection behavior [3]. This situation translates into a greater number of deaths amongst men primarily due to the lack of health-related beliefs and behaviors [4].

To tackle this health-related problem that aims to achieve behavior change we need to look for another position that results in the desired healthy behavior. The latest skin cancer statistics for the UK show at least 100,000 new cases of skin

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cancer are diagnosed each year and kills over 2,500 people which is seven people every day [3]. This is an important task as the rates of skin cancer and mortality incidence can be reduced and ultimately prevented in young men through the enhancement of their sun protection behavior.

This article reflects on how the combination of HCD approach and understanding gender, and particularly masculinity, results in an increase in sun protection behavior in young men. The evidence verifies gender-aware sun protection interventions for young men.

2. Literature review

2.1. Human-centered design

Human-centered design (HCD) is a term coined by Donald Norman and Stephen Draper in 1986 [5]. This term was initially originated in the field of human-computer interaction (HCI) underpinning that user needs are central to the design process.

Over time, this term expanded rapidly and evolved beyond the field of HCI and alternative terms emerged related to the degree of user involvement such as User-Centered Design, People-Centered Design and User Experience (UX) [6]. For example, often the term user is referred to subjects, stakeholders and consumers. The term user is expanded towards user-product interactions interpreted within the context of use, and the motivated actions to understand the user experience [7]. The diverse nature of design approaches expanded in a range of disciplines, underpins user needs whilst understanding user experience is open to interpretation. Although the areas of application differ, there is a common underlying principle that underpins all these terms: to optimize the design for human use so must always stem from a human-centered design (HCD) approach. What distinguishes HCD from other design terms is the link between HCD and social psychology. HCD is concerned with understanding the meanings people attach in their interactions with products. This approach has a set of principles which provides an understanding of the meanings in human interaction with products and how people perceive the knowledge in the world that forms meanings and experiences [8]. The interpretation of meanings and values in relation to how people approach products is central to the HCD philosophy and understanding gender.

2.2. Design and gender

The relationship between design and gender and its implications in design research has a long history from critical gender perspectives related to the design of objects and products. The current literature on gender and design is centered on power relations and gender equalities embedded implicitly and explicitly in design. This debate increasing the shift in light of recent consideration to avoid gender inequalities embedded in the products' characteristics. This led to design of products that are targeted at both male and female genders which are advertised as gender-neutral and unisex by the most popular brands such as Apple and Google. The key feature of unisex products is the same properties such as colors, shapes, and attributes advertised for both male and female gender. However, the stated characteristics in products are only considered as gender-neutral where the gender of design is invisible [9]. In contrast, products targeted towards male gender or female gender take account of stereotypical gender norms in the product properties. This category of products continues to result in producing designs that highlight the differences in products characteristics such as 'pink for girls' and 'blue for boys' [10].

Examples of such designs are cosmetic products targeted specifically at male gender and female gender such as Dove, Lynx, Nivea and Gillette. The visible differences in product properties highlight the 'product language' inspired by Gros in 1976 [11]. Product language plays a significant role in the meanings and the possible actions to interact with products through colors, shapes, and attributes. This means understanding the product and also how we perceive the product to interact. Product language is also an important factor in marketing to create new segments to expand market growth by traditional gender stereotypes in design [10]. However, further understanding of the relationship between design and gender and its implications for design is mostly underexplored from the design research perspective. In 2006, an exhibition called Formgivning/Normgivning displayed product categories with invisible normative gender stereotypes from perspectives of market segmentation [12]. This exhibition focused on visualizing gender perspective in design through the embedded marketing strategies. A range of products was presented from automotive safety design based on men's body measurements to heavy industry clothing designed towards men, where design goes beyond product categories and shift towards stereotypical gender norms in the society.

As discussed earlier, the shift towards gender-neutral products is growing in the lead brand companies. However, the language embedded in these products is evoked and interpreted as normative and gendered [10]. For example, the product line of Apple watch is designed for men and women of different sizes by Marc Newson, one of the leading designers worldwide popular for non-gender specific products [13].

Similarly, Karim Rashid is a famous designer with a gender-neutral brand identity towards "Design should be for everyone". He attempts to minimize gender differences in his designs, so they are applicable to both male and female genders [14]. One of his successful designs is the 'Bobble' water bottle in various colors that filters tap water. His design has contributed to various leading brands for everyday products such as 'Alessi' targeting gender-neutral designs. For example, a very popular kettle by Alessi designed by Michael Groves in 1985 is still one of the most popular kettles with a specific shape and material design for both genders. However, a range of critical gender studies argues invisible meanings and values in the gender-neutral product language according to the traditionally male or female domain [15]. We also lack research into how designers can take advantage of such knowledge in practice related to the ways the products can be seen and interpreted. It seems that a critical gender perspective on the design process has not so far been widely incorporated in design research. A critical perspective on gender as a social

construction of performative acts and not a given fixed concept is needed to be considered in design research.

It is necessary here to clarify exactly what is meant by gender as a 'performance'. Butler's theory of gender performativity is a principal determining factor that goes beyond normative gender categories established in society [16]. According to Jackson & Mazzei [17], Butler sees gender as a repetition of performative acts, and we enact our gender all the time. This viewpoint destabilizes the normative structures on gender roles and highlights the importance of going beyond a process of repetition that produces gendered subjectivity. Butler clarifies gender is a performance reproduced all the time as subjective acts of 'doing'. The performative dimension of gender is accounted not only as a performance but as Butler suggests: "gender is performative in the sense that it constitutes as an effect the very subject it appears to express" [17].

Butler points out that the repetition related to performativity is not a set of performative acts by a subject but that it constitutes a subject that then produces subjectivities. In other words, gender is performed and produced by a subject but not by a pre-identified gendered subject who consciously directs their own activities such as actions and gestures. The act of 'doing' or gender performance is produced by the repetition of actions, body gestures which portray an individual's gender identity. For Butler, gender only exists without prior intention to perform. Gender is a set of performative acts as a lived experience produced through the interplay of acts by subjective experience. The theory of gender performativity destabilizes categorizing gender performances that produce a particular normative identity being a man or women, but the gender performance is related to the interplay of natural, cultural and social structure in the society.

In line with the debates concerning the notion of gender and performativity by Judith Butler, Frosh et al. [18] describe the construction of gender as not a biological sense or genetically formed but a social construction of actively 'doing gender' with a relational nature. Gender as a social and cultural construction is also what Erving Goffman [19] describes gender as a performance of identity. According to Goffman, we perform our gender all the time through our gender roles and acting to present our gender to the world in ways such as clothing, ideology, actions, and words. This viewpoint is influenced majorly from the theory of gender performativity discussed earlier by Judith Butler [20].

Various leading brands have embedded masculine or feminine attributes in their advertisements that feature female or male gender subjects. Erving Goffman in 1974 refers to these adverts in Gender Advertisements and he discusses the way gender advertisements portrayed popular gender representations focused on displaying gender differences between men and women based on normative gender performance in the society. In this context, the most prominent account of gender is based on portraying the culturally established feminine and masculine characteristics in society [19]. In holding this view, Frank Mort in the Cultures of Consumption [21] also discussed the gendered process in commercial advertising in terms of objects and products aimed at men through advertising particular masculine attributes associated with young men' gender and needs. Mort refers to the transformation of men's identities and meanings of masculinities through advertising and marketing as 'the portrayal of the world as a masculine playground' [21].

2.3. Sun protection behavior

The current campaigns and studies on exploring men's and women's attitudes towards sun protection behavior reveal that women are more likely to use sunscreen and seek shade in an effort to protect themselves from the sun than men [22]. Also, young men are less likely to cover up their upper body parts in the sun than women [23]. The current skin cancer incidence for the UK are rising by 7% between 2014 and 2035 which includes a larger increase for males than for females. The contribution of the current studies including 'Sun Smart UK' by the UK Health Department, Cancer Research UK, British Skin Foundation [24] on the health-related behaviors and prevention of skin cancer have driven considerable growth at raising awareness about the risks associated with exposure to sunlight. In addition to the stated campaigns, there has been a considerable growth in digital wearable products that aim sun protection awareness. These wearable products aim to monitor daily UV exposure and alert the user to apply sunscreen or seek shade.

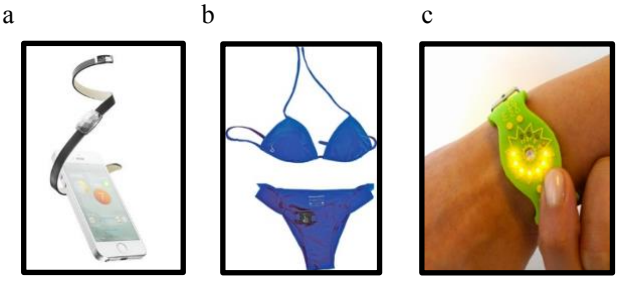

Fig. 1. Wearable UV sensors by (a) Netamo; (b) Spinali Design; (c) SunFriend

In 2014, a French company Netatmo, specializing in connected objects, released a sun awareness bracelet, designed by Louis Vuitton designer Camille Toupet using technology that measures the level of UV exposure. This wearable product can connect to smartphones through Bluetooth to alert the user about the level of their exposure to the sun and alerts the user to protect their skin and re-apply sunscreen (Figure 1) [25].

A wearable UV meter wristband called 'SunFriend' consists of a NASA-inspired UV sensor with LED indicators to alert users the maximum sun exposure time compatible to the user's type of the skin (Figure 1). This wristband was selected as the best consumer product by NASA and their aim is to encourage people to get enough vitamin D as well as reducing the rates of skin cancer [26]. In 2015, a French company called 'Spinali Design' designed smart swimwear for men and women that communicates levels of sun exposure with smartphones. The embedded UV sensor in the swimwear transfers data to the 'Spinali' mobile phone application to alert the user about sun over-exposure [27].

Similarly, a research project at the University of Brighton in 2013 called the "Barrier Solutions" has been focused on the development and testing of wearable prototypes which alerts people by giving increased information of danger which in turn increases the subjects' awareness of exposure to the sun using the existed technology. The Barrier Solution is a Beach-based web and visual communication platform measuring sun safety based on the user's skin type and UV radiation. The mobile application itself has been developed in Javascript which runs on smartphones [28].

Overall, the results from the discussed outcomes demonstrate a gap between awareness and actions in young men. Despite the increasing awareness of young men related to the risks associated with sun over-exposure and sunburn, the least changes in young men's behavior are in terms of covering up, using sunscreen and reducing the time spent in the sun [29]. As discussed earlier in this section, men's endorsement of gender characteristics and masculinity conflict their health-related behaviors and results in greater health risks. Gender as set of performative acts involves how individuals are perceived by others rather than how they think of themselves. Masculinity is related to the endorsement of behaviors that indicates toughness and the opposite of vulnerability associated with the enactments of superiority into behavioral patterns [4].

The current HCD model is unable to consider gender relations and reproduction regarding different modes of masculinities in men. As discussed, the concept of gender is not static as male or female but how people are perceived as masculine or feminine in relation to their experiences. The combination of HCD with understanding gender regarding masculinities would address a different range of gender identity. This can be achieved through the use of the interpretive approach to reveal the emerged masculinities in the perceptions, beliefs of young men. The interpretation of these factors reveals their performance of masculinities from the perceptions and experiences of participants. The identified gaps in the literature indicated the research question followed by the research objective outlined in the following.

Research question: *How can we improve young men's sun protection behavior through the human-centered design approach?*
Objective: *To verify the design of new sun protection concepts for young men and gender-aware HCD approach.*

3. Method

3.1. Design verification study

A design verification study attempts in verifying user expectations within a small sample (4 to 6 participants) through direct user involvement in the HCD process [30]. This method is focused on human expectations as the potential user interacts with products or prototypes. Norman describes this approach as 'user testing' which is an approach for evaluating products aligned with the user's needs [8]. This method provides an opportunity for the implications of the user's feedback focused primarily on the elements of usability and desirability.

Initially, participatory design sessions were deployed mainly focused on the act of participation, where the user was involved in all the stages of the HCD process going beyond the traditional concepts of 'design for users' to 'design with users'. A total of eight groups with four to six participants took part in this study for 120 minutes. In total, 23 male participants and seven female participants participated. During this stage, the participants were encouraged to ideate new sun protection concepts to improve young men's sun protection behavior.

The design outcomes were a range of sun protection concepts including Sunscreen bottles, Sunscreen applicators and Smart wearable products based on the participants' description underpinning their preferences in terms of the application of sunscreen, the shape of the sunscreen bottles, the spray feature of sunscreen bottles and various aesthetical elements such as colors, lines, shapes [31]. The design outcomes were now at a stage where it was considered appropriate to get evaluated from young men's perspective.

Accordingly, the design verification study was guided with a focus on the participants' reflection and evaluation of the design outcomes. The brief for this study is strongly linked to the last research objective discussed in Section (1.2) in order to verify sun protection interventions to improve the sun protection behavior in young men. In accordance with the purpose of the design verification study and the given brief to the participants, printed images of the design outcomes were presented to the participants. This study focuses on the participants experience through their evaluations and interpretation of the images of design outcomes. In addition, to elicit the participants' interaction with the design outcomes a range of sample products with reference to the design outcomes were selected by the researcher from the existing products available in the public domain (Figure 3).

Fig. 3. The outlined sample products for the design verification study (author's photograph)

The sample products along with the printed images of the design outcomes were presented to the participants as a communication tool and as a guiding inspiration for the participants [32]. The selection criteria of the sample products were based on the key details described by the design outcomes regarding the physical appearance of their design related to form, application, color, lines, materials, and shape outlined above. The illustrated image above (Figure 3) outlines the sample products presented to the participants with the labels removed in order to avoid possible biases regarding the participants' interest towards a particular brand. The adopted visual approach increases the understanding and discoverability of the HCD characteristics such as affordances and signifiers for the participants discussed by Norman [8].

The envisaged participants were four male product design students, and the study took place at the Design and Creativity Studio at the University of Brighton. The primary inclusion criteria for these participants were based on their gender and age within 18 to 24. A small sample was chosen to facilitate a group dynamic according to the aim of the study. The Design Creativity Studio at the University of Brighton is the students' working space that provides a creative and collaborative environment [33]. This space was particularly selected, so the participants feel familiar and comfortable to design, create and engage in group activities.

The conducted study produced a range of data including images, audio, and video and observation notes. The session was recorded on the digital video recorder and an audio recorder and transcribed by the researcher. The video recording of the session enabled the researcher to interpret the participants' interactions in full details with the sun protection interventions. The following section describes and analyses the participants' response in full details using a deductive approach, based on the existing theoretical position of the research, discussed in Section 2.

3.2. Procedure

The design verification study was conducted on the 27/10/2017 for 20 minutes with George, Zac, Ollie and Mehmet. As anonymity and confidentiality of participants are central to this research, the participants are named through the use of pseudonyms in this article. Initially, the researcher welcomed the participants to the study, and they were introduced to the purpose of the study and the sample products along with the images of design outcomes placed on the table (Figure 4).

Fig. 4. The participants engaged with the sample products (author's photograph)

The session started by briefly showing the participants the sample products, then asking them to describe their opinion regarding the design outcomes that are appealing to them and motivate them to use for their sun protection. They were encouraged to assess the design outcomes in terms of visual design details such as colors, shape, lines, functionality.

The researcher encouraged the participants to engage and interact with each sample product. Each participant discussed their evaluation of sample products that motivates them to protect themselves from the sun on the beach. The analysis of the participants both opinion and behavior while interacting with the sample products guided by the key aspects of the design outcomes outlined in Figure 3 using a deductive approach [34]. This was achieved through the transcription of the participants' words encountered followed by extracting and categorizing the material according to the analytic account of the design outcomes. The following shows the way the participants discussed their opinion regarding the design outcomes. In their words:

[Mehmet]: *I prefer the silver-colored bottle on the table, metal finish, aluminum look that doesn't get damaged*

[George]: *I agree, the normal metal textured bottle looks very good, but the bottle might get too hot in the sun*

[Zac]: *I also agree, metal won't get damaged that easy and I feel more confident taking it to the beach*

Initially, Mehmet, George and Zac discussed their interest in silver and metal colored bottles. George also agreed but also, he expressed his awareness of dark colors as a stereotypical color designed for men. George associates colors with a particular gender, he identifies colors as gendered and also, he links dark colors to the male gender. This indicates that he is still attached to the products aligned with the construction of his masculinity. In his words:

[George]: *I really like the dark colored bottle that looks like a deodorant or a shower gel, it reminds me of my moisturizer which is grey and my aftershave, and my shampoo bottle is like dark grey or black*

[Mehmet]: *yes, I like it too, all the products for men are grey or black*

Mehmet showed his interested earlier regarding silver-colored bottles, he also said that all the products available in the market for men are usually grey or black. It seems silver and dark colors such as black means macho and masculine to Mehmet. Zac also said the metal textured bottles won't get damaged. George's preferences are described based on the characteristics highlighted in his cosmetic products targeted for the male market. These features reveal the characteristics and properties of the products targeted at men. These characteristics such as color are related to the previous experiences of the participants linked with the ways that product language is perceived in relation to masculinity and femininity. They want a material that is not vulnerable or damageable, strong and this is attached with the construction of masculinities through being strong. Therefore, the silver-colored bottles attach masculine elements to the product that would result in increasing their confidence. As we saw earlier regarding outcome six, the male participants used the color of silver in their design related to their current use of products designed specifically for men. We can infer there is a fragility about their masculinity because the male participants are constantly trying to defend it. Their preferences towards darker colored bottles contrast with the design of Nivea sunscreens using the blue and yellow color scheme.

Up to this point, we can relate the findings as expected around the purpose of the study originally designed. A range of elements constitute links with their protection of sexuality related to the meaning the participants attach when interacting with the provided sample products. These elements were particularly discussed related to the embedded language in the design of affordances and signifier through color, a form of the bottles, and the application of sunscreen.

Mehmet and George said they avoid same-sex body contact for applying sunscreen on the back areas of their body. Their words below verify the concept of sunscreen applicator for the back and shoulder areas. The male participants seem to have a struggle with being accepted and they don't want to be seen as different from others. This is also mentioned in the following comments:

[Mehmet]: *I would prefer to use a roller to apply sunscreen on my back, it's the whole masculine thing, and you don't want your mate to put sunscreen on your back*

[George]: *I like it too, putting sunscreen on your back around people is very intimate and not masculine*

[George]: *yes, you will get some looks, you have to be a confident man*

[Zac]: *I also don't like my friends applying sunscreen on my back especially in public*

[Ollie]: *This is the main reason why I burn all the time on my back, I also like the idea of sponge or something to put it on your back because recently I went on holiday with my mates and I didn't want anyone to put sunscreens on my back so I've got sunburnt from my back, I would use the sponge or roller, or something extendable*

Then Mehmet identified the roller application for sunscreen as useful to have it at home but not use it in front of his friends. This suggests, Mehmet is concerned about the potential sun damage, but this is overridden by pressure to conform to his gender role.

George and Mehmet comments infer as they want to be accepted by others and they want to protect their masculinity by not coming across as different. Mehmet continues with leading to the concept of peer-pressure and the ways he is identifying the need to conform in general:

[Mehmet]: *Boys make fun of each other for any excuse*

Ollie, Mehmet and George said, they all prefer spray sunscreens similar in design to the Dove Men and LYNX deodorants. As we saw earlier, the design outcomes regarding the perfume bottle design also linked with the products designed specifically for men. A number of popular brands such as Dove Men have successfully advertised gendered products aligned with male gender and masculinity. Perhaps, this provides evidence regarding their main concern linked with being like other men and being accepted. As the participants said in their words regarding their everyday products designed for men:

[Mehmet]: *I also like the applicator similar to spray deodorants like Dove or Lynx*

[George]: *I agree, I also prefer these bottles with a simple shape and darker colors*

[Mehmet]: *I also like them, they are chunky bottles that are Grey and blue, it looks more masculine and I prefer it*

The direction of the participants' discussion moved towards gendered products in terms of masculine and feminine attributes. Mehmet and George enacted idealized masculine positions by differentiating themselves from women. The group provides a social environment where masculinity can be performed and enacted. It seems that they want to be accepted by 'being' like others and differentiate themselves from women.

4. Results

Following the participants' assessment of the design outcomes, this section discusses the results which verify the designed sun protection interventions linked with the role of gender and masculinity. The discussed design outcomes outlined the participants' gender identity influences their perception and understanding of the appearance of products related to traditional male domain. While the design outcomes are associated with predictable gendered perceptions associated with traditionally male or female gender roles, we can see that gender is socially constructed and understanding young men's experience requires us to move beyond traditional, stereotypical and pre-identified gendered characteristics.

The results show that anything that threatens their gender identity contradicts the construction of their masculinity which explains the way they attach gendered values to their sunscreen application. For this research, this was a difficult task as the male participants expressed repeatedly, they avoid the application of sunscreens. However, the male participants said that it was appropriate for their girlfriends to apply sunscreen to their shoulders and back area of the body. This portrays their concerns related to the importance of sexual orientation due to the influence of social and cultural factors. This is also related to their preferences towards the appearance of popular male-targeted cosmetic products such as DOVE MEN+CARE, NIVEA MEN and LYNX FOR MEN. For our study, this shows how the male participants' values are connected to each product language associated with the masculine attributes portrayed to enact their gender roles and masculinity.

In this context, the visual and physical characteristics of products such as affordances and signifiers guide the user to understand how to interact with an object based on the designers' gendered perceptions associated with traditionally male or female gender roles. The designers' perceptions have a direct impact on how the product language is evoked, interpreted by the user, which can contradict their gender identity.

This suggests the way designers' gender identity plays a key role in the visual and physical features of products such as lines, form, material, shapes, and colours. Making the role of gender visible in designers' perceptions broadens the design of new products beyond the stereotypical perceptions of gender. This opens new avenues for the implementation of GAHCD for further development of gender-neutral products and the language embedded in these products. Taking this approach will move designers to consider gender aspects in HCD and raise awareness regarding the product language interpreted as normative and gendered.

5. Conclusion

In conclusion, the results show that the participants' enactment of gender and masculinity were embedded in their interaction, gestures, words, and meanings. Their fear of being seen as gay and avoiding same-sex contact for applying for

sunscreen shows they don't want anybody to question their sexuality. This clarifies their gendered perspectives related to their phobias and struggle to protect their masculinity and sexuality. The results also verify the gap in understanding gender in the HCD characteristics including affordances and signifiers. As discussed in Section 2, the HCD process lacks understanding of gender performances and sexuality. The inclusion of gender awareness in the HCD process has great potential to bridge the gap between the world of the designer and the user. A number of elements related to the physical characteristics of the outline products were repeatedly expressed with gendered values in the participants' interactions and responses. Therefore, the gendered values attached to the HCD characteristics became visible and were discussed from the participants' perspective.

6. Summary and future work

In summary, this paper verified sun protection interventions for young men and gender-aware HCD approach. Taken together, the results indicated the importance of adding gender awareness in the HCD process (GAHCD) which aimed to make the role of gender visible in two directions. First, it showed the production of gendered meanings identified in the design interventions embedded in the design of affordances and signifiers. Second, it showed the verification of sun protection interventions. In final, presented recommendations for design research for increasing emphasis on the influence of the designer's own gender and their gendered perceptions in their designs. As stated in Section 4, an important aspect of the findings relates to participants' idealized concept of masculinity, acting masculinity implied by their actions and responses as 'I want to be a real man'. It is therefore important to question how the product will affect the users' behavior that avoids conflict with the user's gender identity and address their needs.

This paper has opened new avenues for future research in considering the role of a gender-aware HCD approach for the wider design community. This would include academic design research, design education focused on HCD (product design and industrial design), and design agencies. Taking this approach will move designers to consider affordances and signifiers in new and innovative ways, and this will have considerable implications in areas beyond sun protection design. The implication of GAHCD approach for designers can result in addressing the gap between the world of designers and users. Bridging this gap requires designers to go beyond their gender perceptions and focus on the users' gender identities. Making the role of gender visible in designers' perceptions broadens the design of affordances and signifiers beyond the stereotypical perceptions of gender. Further exploration of designers' gender and the influence of their gendered perceptions in their designs is a starting point. This goes beyond deconstructing affordances and signifiers influenced by gender roles in product physical and visual qualities such as line, form, typography, colour, material, and use of details. This would avoid the mistakes of the previous design through an understanding of gender as a performance when designing new products. This lack of gender-awareness neglects the user's needs to be addressed as it is a crucial element of how the product is established as human-centered. We as designers must become more aware of our responsibility and our power to make a change and avoid the influence of own perceptions, preconceptions and past experiences.

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