Research Article

Slimming shades: investigating the allure of black clothing on women's aesthetics

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ABSTRACT

Colours play a significant role in sexual selection among nonhuman animals. As trichromatic primates, humans lack the pronounced skin colouration observed in certain primates. However, they expand their colour preferences by embracing various hues and styles through clothing and fashion. The attractiveness associated with black lacks a known biological basis but appears to derive from its perceived fashionable nature. One mechanism contributing to the allure of black is its slimming effect. Black absorbs visible light, creating shadows that obscure contours and the illusion of reduced distinctiveness in shapes. This visual effect can give a slimmer appearance than wearing lighter or brighter colours, which may accentuate curves or shapes more prominently. In Study 1, conducted by means of an online questionnaire, women wearing black clothing were perceived as slimmer than those wearing yellow and green clothing. However, the slimming effect was significant when comparing black with yellow and green but not significant when comparing black with white, red, and purple. Study 2 involved tracking the colours of the clothing worn by women for 30 days. The results revealed a significant positive correlation between wearing black clothes and the participants' body mass index (BMI). Our research suggests that the perceived attractiveness of the black colour is due in part to its slimming effect and that women with higher BMI may opt for black clothing to visually mitigate their weight.

Keywords: colour preference; human mating; human sexual selection; diary study

1. Introduction

More than 150 years passed since Darwin[1,2] introduced the concept of sexual selection to explain certain traits that do not directly contribute or even impair survival. Humans are also subjects of sexual selection research by evolutionary psychologists and behavioural ecologists. As many other primates, humans possess trichromatic vision which allows us to fully discriminate the visible light spectrum[3]. The evolution of trichromatic vision in humans as well as in nonhuman primates is believed to be linked to the foraging abilities of our ancestors, providing them with an advantage in identifying and locating a wider range of edible food

sources[4]. However, evidence suggests that once trichromatic vision evolved, it promoted the evolution of colour preferences through sexual selection[5].

In terms of sexual selection, the use of colours in clothing and accessories serves as a powerful mechanism for attracting the attention of the opposite sex[6]. Colours can indicate various traits that may enhance reproductive fitness, including fertility, health, and emotional states. For instance, research has shown that specific colours can signal fertility, with red wearing by women being particularly effective in attracting men[7,8]. Elliot and Niesta[9] found that red significantly increases attractiveness in social contexts. Elliot et al.[10] expanded on this by showing that colour choices can affect perceptions of competence and desirability. This suggests that individuals may consciously select colours that enhance their appearance and social standing, ultimately improving their chances of reproductive success[11]. This phenomenon is not limited to humans; in many species, such as nonhuman primates, displaying vibrant colours during mating seasons is linked to reproductive readiness[12].

Moreover, colours in clothing can also communicate health status. Studies have indicated that individuals wearing colours associated with vitality and health, such as green and yellow, are often perceived as more attractive[13,14]. This suggests that visual cues related to health can influence mate selection, as healthier individuals are typically more desirable partners. Colours also play a significant role in expressing emotions, further impacting social interactions and attractiveness. Darwin[15] initially posited that colour could convey emotional states, a notion supported by contemporary research demonstrating that colours can influence perceived emotional expressions[16]. For example, warm colours like red and orange are often associated with excitement and passion, while cooler colours like blue and green can evoke calmness and serenity.

Most of the examples regarding intersexual attraction cited above come from attractiveness of the colour red. The colour red is displayed by females of certain nonhuman primates during ovulation, and genitalia of fertile females are sexually attractive to males[17,18]. It is believed that humans inherited these preferences from our ancestors[9]. However, research on humans also showed that the colour black for men and women viewing women is attractive, sometimes identical to the colour red[19,20].

Black has a rich history and diverse symbolic meanings across various cultures worldwide. Historically, black was one of the first colours used in art, with early humans utilizing black pigments derived from crushed charcoal and iron minerals to create cave paintings[21]. Symbolically, black represents strength and minimalism, often associated with power, elegance, and luxury[22]. However, it also carries connotations of mourning and death, linked to sadness and the unknown in many cultures[23]. For instance, in ancient Rome, black was associated with mourning, while in India, it is viewed as a protective colour against evil[24]. In religious contexts, black has been historically perceived as a colour of humility and penance, often worn by clergy during liturgical ceremonies[25]. The cultural history of the colour black in women's fashion does not have a definitive beginning, but it has long been associated with mourning, dating back to ancient Greece. John Harvey[26] notes that the Romans dyed clothing black for funerary purposes, suggesting that they valued this colour for its stylishness. By the 16th century, black garments were already present in fashion, often prohibitively expensive and accessible only to the wealthy, from the Spanish nobility in the south to Dutch merchants in the north[26]. A pivotal moment for black clothing they occurred in the early 20th century when renowned designer Coco Chanel popularized the "Little Black Dress" (LBD), marking a significant shift in its perception from a colour of mourning to one of sophistication and elegance. Chanel's designs, particularly the LBD showcased on the cover of *Vogue* in 1926, elevated black to a symbol of chicness and versatility[26]. Additionally, the influence of cinema, mainly through iconic figures like Audrey Hepburn in *Breakfast at Tiffany's*, further cemented the LBD's status as a wardrobe staple for women. The black dress is often credited with creating a streamlined

silhouette, as Hollander[27] noted, who argued that black garments can create an illusion of a slimmer, more harmonious body shape, appealing to many women seeking to enhance their appearance. In contrast, black has also been associated with rebellion and counterculture, becoming a symbol for various movements, including the Beat Generation and punk subcultures, and the Black Power movement in the 1970s, which embraced the slogan "Black is Beautiful"[27]. Today, black remains a popular choice for both men and women at formal events, valued for its adaptability and timeless appeal, often paired with contrasting colours to achieve a visually striking effect. Using data from 546 daters on the "First Dates" television series, Kramer and Mulgrew[28] found that daters wore more red and black clothing during dates than pre-date interviews. Notably, black clothing was worn more frequently than red, and the difference in frequency between pre-date interviews and dates was more pronounced for black than for red[28]. Pazda et al.[20] showed that in contrast to the colour red, which increases the perceived sexual receptivity of its wearer, the black colour increases attractiveness through perceived fashionableness. However, different pathways of attractiveness for the colours black and red do not explain why black is considered a fashionable colour in society[28]. It seems that the attractiveness of the colour black for men viewing women has no biological basis, but instead it lies in its physical properties. Black absorbs visible light rather than reflecting it[29]. This lack of reflection creates shadows that can obscure contours and make shapes appear less distinct. This can create a visual illusion of slimness by hiding or minimizing certain features. Finally, black creates a strong contrast with other colours, which can draw attention away from specific body parts. The contrast may divert attention from areas that a person might feel less confident in, making them appear slimmer overall.

In this study, we examine whether the black colour makes a person appear slimmer compared to wearing other colours, which might highlight curves or shapes more prominently. Although this association is universally believed by people, we are not aware of any study explicitly examining this topic. We predict that if the colour black visually slims down the human body, then 1) women dressed in black clothes should be perceived slimier than women dressed in nonblack clothes, 2) women with higher BMI should wear black clothes more frequently than women with lower BMI. The first prediction was tested with an online questionnaire, showing a series of colourful pictures of slimy and plump women. The second prediction was tested with a diary study, where we correlated wearing black clothes with the participant's body mass index.

2. Materials and Methods

2.1. Study 1. Does wearing black enhance perceived slimness?

2.1.1. Participants

The participants were 130 heterosexual Slovak volunteers aged 18 to 63 years (M = 26, SE = 0.62), selected based on their age (being older than 18 years) and reporting a heterosexual orientation. 75 of the participants were women. Participants were recruited for the study online via the university website and the study was conducted online.

2.1.2. Research Instruments

Self-reported height and weight

Participants were asked to provide their actual height (in cm) and mass (in kg). The body mass index (BMI) was calculated as the weight of a person in kilograms divided by the square of height in meters.

2.1.3. Photographic stimuli

The photographic stimuli were freely available images of fifteen women downloaded from Google. Women were visually classified as slimy (N = 9 stimuli) and plump (N = 6 stimuli). Their wearing was

classified as clothes and T-shirts. The same women were presented in both T-shirts and clothing. We used Adobe Photoshop to manipulate the colours of wearing and presented them in black, red, white, green, purple, yellow, and green versions. We used the Object Selection Tool, which we used to outline the clothing items to isolate them from the background. Then, we added a Hue/Saturation Adjustment Layer. This adjustment layer allows for precise control over the colour properties of the selected clothing. We ensured the layer was clipped to the selection, meaning any adjustments would only affect the clothing. Within the Hue/Saturation settings, we adjusted the Hue slider to change the clothing colour to black, red, white, green, purple and yellow. Each participant rated 60 pictures presented in random order.

2.1.4. Procedure

The study was conducted online. Participants signed an informed consent and proceeded with demographic questions (age, sex, and sexual orientation). Only heterosexuals were involved in the study because the samples of self-reported homosexuals and bisexuals were very low. Participants rated each picture according to perceived slimness (how much slimy is the woman in the picture?) and perceived attractiveness (how much attractive is the woman in the picture?) on a 7-point Likert scale (1 = absolutely not, 7 = extremely much).

2.1.5. Statistical Analysis

The perceived slimness and attractiveness ratings were treated as dependent variables in the generalized linear mixed model. Participant ID was defined as random effect and self-reported BMI was a continuous predictor. Categorical predictors were the gender of the rater, colour of wearing (black, red, white, green, purple, yellow and green), type of wearing (clothes vs. T-shirt), and type of woman's figure (slim or plump). Nonsignificant interaction terms were removed from the model. All calculations were performed with IBM SPSS ver. 26.

Ethical approval was obtained from the Institutional Board of Trnava University in accordance with the principles of the Declaration of Helsinki. All participants provided informed consent before completing the survey.

2.2. Study 2. The influence of the BMI of the participant on the wearing of black

Study 1 showed that wearing black contributes to perceived slimness. We predict that women with a higher BMI should wear black more frequently than women with a lower BMI.

2.2.1. Participants

Twelve university volunteers (all were women) agreed to participate in a diary study. Participants were recruited using the same procedure as for Study 1.

2.2.2. Procedure

Participants were asked to provide information about their age, weight, and height. The women were then provided with a diary and asked to provide information about their clothing for the next 30 days. Specifically, we asked participants whether they predominantly wore these types of clothing and what kind of colour these clothes were for each of the 30 days. T-shirt, shirt/blouse, jacket, sweater/hoodie, clothes, skirt, trousers/jeans, leggings, stocking, and coat. We identified 16 colours of clothing recorded by participants: white, orange, yellow, pink, burgundy, red, purple, turquoise, light blue, dark blue, green, olive, mustard, brown, grey, and black. It was impossible to accurately calculate what part of the body covers black colour compared with other colours, because the covering of the body could change over the day. For example, wearing a black coat means having covered an upper part of the body with black, but it could easily be changed in indoor conditions, when

the coat is changed with a shirt. Therefore, we calculated the total number of all clothes identified by participants as black and compared the relative frequency of black clothing against all other colours.

2.2.3. Statistical analyses

The percentages of black wear calculated from all clothes of various colours were submitted to statistical analyses. We calculated the correlations (Pearson) between the black dress and the self-reported BMI of the women who participated. To further analyse whether the results are not influenced by the effect of age, we also performed an additional partial correlation where the age was controlled.

Ethical approval was obtained from the Institutional Board of Trnava University in accordance with the principles of the Declaration of Helsinki. All participants provided informed consent before completing the survey.

3. Results

3.1. Study 1

Self-perceived slimness and attractiveness significantly correlated (r = 0.57, P < 0.001). Descriptive data regarding self-reported weight, height and calculated BMI are shown in **Table 1**. Men reported to have overall greater height and mass than women.

Table 1. Self-reported height and weight with respect to gender.

	Mean	**Min**	**Max**	**SE**
Women N = 75				
Height (cm)	169.01	153	183	0.77
Weight (kg)	66.79	47	167	1.93
BMI	25.21	20	33	0.41
Men N = 55				
Height (cm)	179.91	165	198	0.93
Weight (kg)	81.56	60	105	1.39
BMI	23.37	18	59	0.66

3.1.1. Self-perceived slimness

The clothing colours significantly influenced self-perceived slimness; as predicted, black colour influenced slimness the most (**Table 2**). However, these differences were significant only between black vs. yellow and green (**Figure 1**).

The gender differences were not statistically significant. Participants with a higher BMI perceived targets on the screen as slimmer than participants with a lower BMI (β = 0.03, **Table 1**). The targets in clothes were perceived as slimmer than the targets in T-shirts. Slimmer targets were perceived as slimmer than plump targets. This latter result is not surprising, but it adds to the reliability of the research instrument.

A significant interaction term in the figure Wearing × Figure suggests that slimy targets wearing clothes were perceived as slimmer than those wearing T-shirts. The slimness scores for plump targets did not differ with respect to the wear of clothing or T-shirts (**Figure 2**).

Table 2. Results of GLMM on self-perceived slimness.

|	F	df1	df2	P
BMI	10.03	1	7780	.002
Wearing	36.21	1	7780	<.0001
Colour	2.85	5	7780	.014
Stature (slimy/plump)	9600.09	1	7780	<.0001
Sex	.08	1	7780	.780
Wearing × Figure	70.54	1	7780	<.0001

3.1.2. Self-perceived attractiveness

Outfit colours significantly influenced self-perceived attractiveness; As predicted, the colour black and red influenced attractiveness the most (**Table 3**). These differences were statistically significant (**Figure 2**).

Women rated the targets as significantly more attractive than men. The participant's BMI did not alter the attractiveness ratings (**Table 3**). Targets in clothing were perceived significantly more attractive than targets in T-shirts. Slimer targets were perceived to be more attractive than plump targets. This latter result is, again, not surprising, but it also adds to the reliability of research instrument.

A significant interaction term in the figure Wearing × Figure suggests that plump targets in clothing were perceived more attractive than when wearing T-shirts, but this effect was not significant for slimy targets (**Figure 2**).

Table 3. Results of GLMM on self-perceived attractiveness.

	F	df1	df2	P
BMI	0.37	1	7780	0.54
Wearing	234.77	1	7780	<0.0001
Colour	7.34	5	7780	<0.0001
Stature (slimy/plump)	2700.21	1	7780	<0.0001
Sex	6.47	1	7780	0.011
Wearing × Figure	47.87	1	7780	<0.0001
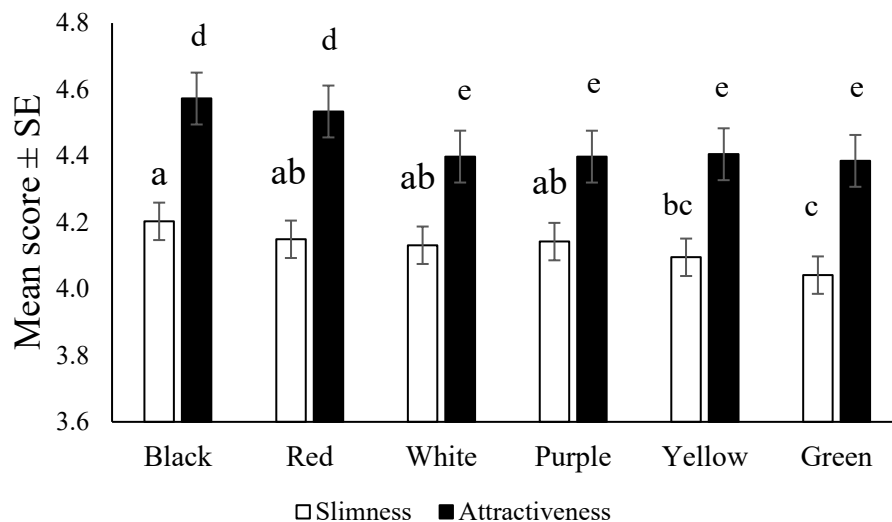
Figure 1. Ratings of slimness and attractiveness of women targets. Letters denote significant differences based on contrast analysis. a vs ab and ab vs bc not significant, a vs bc (P = 0.01), a vs c (P < 0.001). d vs. e (P < 0.01).
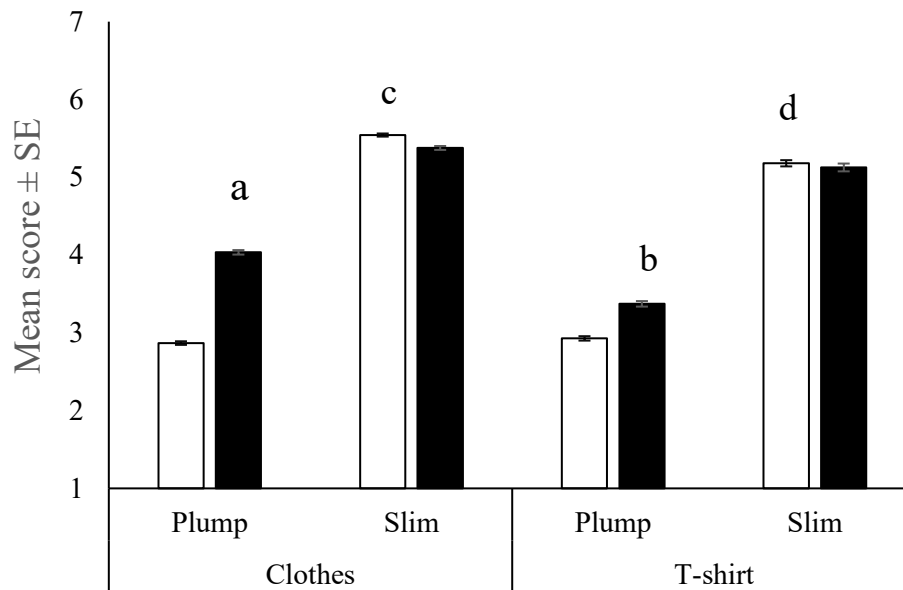

Figure 2. Ratings of slimness (open bars) and attractiveness (black bars) of women's targets with respect to their wear and figure. Letters denote significant differences based on contrast analysis. a vs. b (P < 0.01), c vs. d (P < 0.05). The unmarked comparisons were not statistically significant.

3.2. Study 2

The self-reported age of women (mean = 26 years, SE = 3.2, range: 18 – 55 years), self-reported weight (mean = 62.8 kg, SE = 2.09, range: 50 – 80 kg) and height (mean = 169 cm, SE = 0.008, range: 164 – 175 cm) was similar to in Study 1. The BMI ranged between 17.93 and 26.12 (mean = 21.94, SE = 0.62).

Women with a higher BMI wore black more than women with a lower BMI (Pearson r = 0.75, P = 0.005) (Fig. 3). An additional partial correlation showed that when age was controlled, the correlation became stronger (r = 0.84, P = 0.001). Therefore, these results were not confounded by the effect of age.
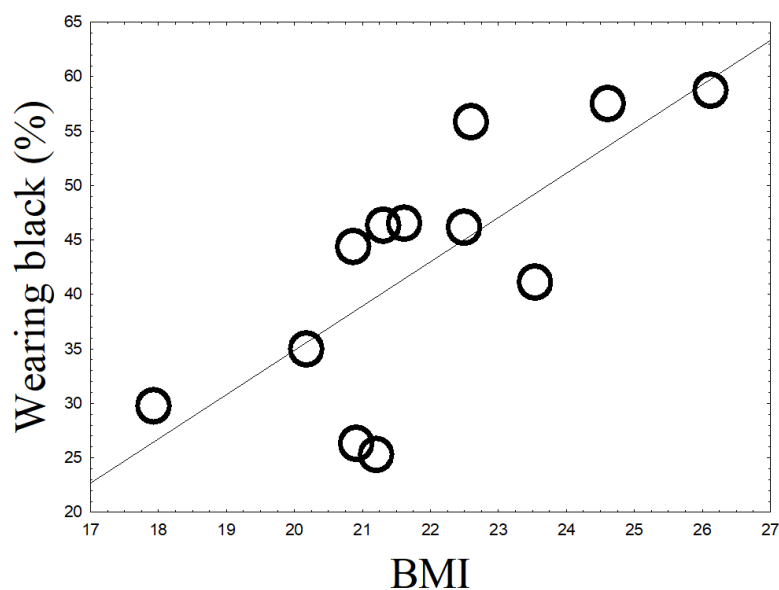
Figure 3. Relationship between BMI and wearing black clothing.

4. Discussion

In this research, two complementary studies investigated a possible cause of why black is considered attractive to men and women viewing women. Both men and women have similar standards of female beauty[30]; this is why we did not expect strong gender differences in this issue. However, the functional perceptual mechanisms explaining why black is considered attractive and fashionable remain unclear[28]. Our hypothesis suggested that the physical properties of black, such as absorption of visible light and production of strong contrast with other colours, produce the slimming effect, which contributes to the perceived attractiveness of women wearing black. Study 1 based on self-reported ratings of slimness and attractiveness partly confirmed our hypothesis, while Study 2 based on self-reported behavioural data provided full support of our hypothesis.

Study 1 showed that, on average, women in black clothes were perceived as slimmer than women in other colours. However, this difference was significant only when black was compared with yellow and green, but not with red, white, and purple. It is not clear why a significant difference did not occur for all colours. According to previous research, both red and black clothing on women is perceived as more attractive to men than other colours[19], and both sexes wear these colours more frequently on actual dates[28]. We fully agree with the original explanation of Pazda et al.[20] and Kramer and Mulgrew[28], who suggested that black is perceived fashionable and, therefore, attractive. Given that the functional mechanisms behind black's enhanced attractiveness have been unclear, our approach contributes to this debate by examining whether black clothing contributes to perceived slimness and whether perceived slimness correlates with perceived attractiveness. From an evolutionary perspective, men consider slimmer women to have greater perceived reproductive value. Medical research in this field complements these findings by showing that obese women experience longer conception times, lower fertility rates, and higher rates of miscarriage[31].

While red increases approach-oriented behaviour (e.g., men sit closer to women wearing red)[32,33] and perceived sexual receptivity[9,20], no similar effects have been investigated using black. When Prokop and Hromada[34] found that heterosexual women prefer red in situations where the chance of encountering the opposite sex is high, they did not find a similar effect for blacks. This further underscores the different functional pathways of attraction between these two attractive colours[20,28]. However, black, in contrast with red, can be perceived as double-edged sword[20,35], because it is also associated with negative traits and aggressiveness[36,42]. It would therefore be not surprising if future research did not uncover similar approach motivations in the context of black.

Perceived slimness was weakly but significantly influenced by the participants' own BMI. As the BMI of the observer increased, the underestimation of body mass increased. These associations were also found by others[38,39], although the mechanism responsible for such correlation remains unclear. Possibly, misperception of others' weight could stem from a need to feel better about one's own weight or the result of a general distorted view of the weight of others[39]. We suggest that higher BMI is associated with lower self-confidence[40], and the low self-confidence could idealize portrayals of others higher than the participant's own value.

Overall, the targets in clothes were perceived as slimmer than the targets in T-shirts and this effect was significant for slimy targets rather than for plump targets. Furthermore, clothes targets were also perceived to be more attractive than T-shirts targets. The latter effect was, in this case, significant, particularly for plump targets but not for slimy targets. Attractive clothing probably contributed to the overall physical attractiveness of the targets, and this is why the targets in clothing were perceived more attractive than the targets in T-shirts. Indeed, priming humans' faces with attractive objects increases facial attractiveness[41]. According to previous research, women enhance their physical attractiveness by wearing red, especially during cold weather when

they cannot reduce their clothing to increase their sexual appeal[42]. Thus, women in T-shirts should be considered sexually attractive because they expose more skin than when fully clothed; this effect may be particularly pronounced for women who are naturally more sexually attractive. In contrast, clothing can mask or even enhance less sexually attractive aspects of women's bodies. The higher sliming effect observed for slimy targets dressed in clothes could be explained by a significant correlation between facial adiposity of the target and her BMI[43]. In other words, the BMI of women with high facial adiposity scores could be easily estimated by the raters regardless of their clothes. On the contrary, the sliming effect of dresses can be more visible for slimy targets and cannot be faked due to their low facial adiposity. This idea can be further explored by investigating the perceived attractiveness of models wearing various clothing styles, both with and without a masked face.

The second study was based on self-reported behavioural data that tracked the daily colour preferences of twelve women. Although we agree that this sample size is limited, the results are still informative, given that we analysed self-reported data from 360 days, which is not a trivial value. Women's preferences fully corroborated our hypothesis that a higher BMI is associated with wearing black-coloured clothes. It probably also confirms the widespread beliefs that wearing black makes people slimmer. Our research suggests that women with a higher BMI actively use black clothing to increase their perceived slimness. In a similar vein, women use makeup to increase their facial attractiveness[44,45] or wear high heels to visually elongate their leg and add length[46,47]. Enhanced physical attractiveness can exploit male preferences for young and fertile women, which ultimately can increase female reproductive success. Wearing black by overweight women can be an additional strategy to increase their own physical attractiveness. It remains to be studied whether a woman's BMI contributes to the use of makeup or leg elongation techniques to enhance women's perceived attractiveness. Considering that high BMI is associated with low physical attractiveness[48,49] and low fertility in women[31,50], slim figure is a desirable cue in mating market.

5. Limitations

In light of the limitations posed by our sample size of 12 women, we acknowledge that this study may not generalize broadly; however, it still offers detailed and ecologically valid data that enhance our understanding of participants' daily experiences and preferences over the 30 days. This pilot study highlights the need for more extensive and more diverse samples. We encourage future research to build upon our work by incorporating larger sample sizes and diverse populations, providing a more comprehensive understanding of the relationships between BMI and preferences for black clothing.

To conclude, women dressed in black are perceived similarly attractive as women dressed in red, but the attraction to black seems to have a different origin than the attraction to red. Our study provided partial support for the hypothesis that black makes women's bodies slimmer than certain other colours (yellow and green) and that slimness correlates with attractiveness. Women with a higher BMI prefer black dresses more than women with a low BMI, probably to mask their actual body mass in the eyes of other people. If black contributes to slimer effect via strong contrast with other colours, future research should manipulate colour background of women targets to see whether more contrasting backgrounds produces stronger slimer effect than less contrasting backgrounds.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Trnava University (protocol code KEIV 2/2023, 22. 6. 2023).

Conflict of interest

The authors declare no conflict of interest.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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