



# Dominance or Integration? Influence of Sexual Dimorphism and Clothing Color on Judgments of Male and Female Targets' Attractiveness, Warmth, and Competence

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Received: 23 October 2020 / Revised: 29 December 2021 / Accepted: 30 December 2021 / Published online: 6 June 2022  
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## Abstract

The face is an important source of information in social interactions. Prior studies exploring the mechanism of face perception were consistent with either dominance or integration theory. Studies have shown that both sexually dimorphic features and background cues play essential roles in the formation of impressions and the perception of facial attractiveness. In this study, we conducted two experiments to examine 539 participants' appraisal of attractiveness, warmth, and competence of the target faces of masculine and feminine men and women dressed in red, blue, or white. The results showed that: (1) feminized male/female faces were considered to have a higher degree of attractiveness, warmth, and competence, (2) people rated feminine faces wearing red higher in terms of attractiveness perception, while there was no significant effect of red on attractiveness perception of masculine faces, (3) when evaluating the warmth of targets, the promotion effect of red was found for feminine faces but not for masculine faces. This study, conducted in a pathogen disgust environment, provides direct evidence to support the integration theory over the dominance theory. Feminized red preference found in this study matches Chinese collectivism and the red cultural heritage, which has an important value for people's daily impression management and consumption decisions.

**Keywords** Sexual dimorphism · Clothing color · Facial attractiveness · The Big Two model of social cognition

## Introduction

Faces are an important source of information in social interactions. Facial features can help individuals judge group memberships and other people's personality traits spontaneously (Walker & Wänke, 2017; Yang et al., 2015). Studies have shown that under the presumption of gender stereotypes, the sexual dimorphic features of an individual's face are vital to form impressions and judge facial attractiveness (O'Toole & Deffenbacher, 1998). For example, for female faces, feminine features are considered warmer and more attractive than masculine features (Koehler et al., 2004; Perrett et al., 1998; Rhodes et al., 2003). However, facial features are not the only cues utilized in impression formation. The visual background of faces, such

as hairstyle and clothing colors, also plays an important role in social categorization and impression formation (Oh et al., 2019).

However, most previous studies had separately investigated the effects of facial features or background cues, while a few of them directly focused on the effect of the interaction between face shape cues (such as sexual dimorphic features) and the visual background of faces (such as clothing color) on face perception (Carrito et al., 2016; Wen et al., 2020; Young, 2015). Studies have shown that in face perception, some features can be described by a single feature, while others may be the result of the interaction between features, such as the face and the environment. Therefore, the present study further focused on the effect of the interaction between sexual dimorphic features of faces and clothing color on face processing and explored the effects of different sexual dimorphic cues (masculinity and femininity) and clothing colors (red, blue, and white) on the perception of warmth, competence, and attractiveness of faces.

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## The Effect of Gender Dimorphism on Face Perception

As an important evaluation dimension of face perception, face attraction is a positive and pleasant emotional experience induced by the target's face that drives others to develop a close relationship (Li & Chen, 2010; Patzer, 1985; Rhodes, 2006) and provides information on the potential health of the target (Buss, 1994; Gangestad, 1993; Symons, 1995). Meanwhile, according to the "Big Two" model of social cognition, people perceive others mainly through "warmth" and "competence" (Abele & Wojciszke, 2014; Fiske et al., 2007). Warmth emphasizes that the individual exists as a social being, indicating social-related characteristics of happiness in group interactions and personal contact. These characteristics include cooperation, morality, warmth, and trustworthiness. Meanwhile, competence represents the characteristics and attributes of individuals' abilities in the social environment, related to the effectiveness of task realization, including competence, goal achievement, personality, and confidence (Imbir, 2017). In addition, studies have found that the evaluation of facial attractiveness is strongly influenced by gender stereotypes (Wang et al., 2018a, 2018b); individuals tend to associate women with "high warmth and low competence" and men with "low warmth and high competence" (Jouini et al., 2018).

Facial sexual dimorphism can trigger trait inference and is one of the important factors influencing perception of facial attractiveness (Carrito et al., 2016; Rhodes, 2006; Wen & Zuo, 2012). It refers to the secondary sexual characteristics developed after puberty, which are manifested through a masculine or feminine face shape. Sexual dimorphism cues, also known as masculine–feminine cues, are often associated with attractiveness and reproductive success (Andersson, 1994), and face perception plays an important role (Enquist et al., 2002; Wang et al., 2020). In previous studies investigating the influence of sex-dimorphic cues on facial attractiveness, for female faces, the results consistently showed that feminized female faces are perceived as more attractive (Jones et al., 2018; Koehler et al., 2004; Perrett et al., 1998; Rhodes et al., 2003), but there has been a debate about whether masculine or feminine male faces are more attractive. Some studies suggest that masculine male faces are perceived by women as more attractive (DeBruine et al., 2006, 2010; Penton-Voak & Perrett, 2001). This may be because the masculinity of male faces implies good genetic health (Apicella et al., 2007; Fink et al., 2007; Little et al., 2011; Puts, 2005; Rhodes et al., 2005; Thornhill & Gangestad, 2006). Other studies suggest that feminine male faces are perceived as more attractive (Alharbi et al., 2020; Burriss et al., 2014;

DeBruine et al., 2010; Barra et al., 2013; Jones et al., 2018; Little et al., 2001; Little & Hancock, 2002; Perrett et al., 1998; Penton-Voak et al., 2003; Rhodes et al., 2000). This may be because feminized male faces are more likely to convey the characteristics of affinity, warmth, and honesty, thus affecting the evaluation of attractiveness (Alharbi et al., 2020; Perrett et al., 1998). Meanwhile, men with masculine faces are usually associated with undesirable negative personality traits (such as dishonesty, unfaithfulness, untrustworthiness, dominance, and aggressiveness) in long-term relationships (Boothroyd et al., 2007, 2008; Gangestad & Simpson, 2000; Geniole et al., 2015; Hughes & Dispenza, 2004; Perrett et al., 1998; Rhodes et al., 2005; Smith et al., 2009); such men may be considered bad fathers and unwilling to invest in future generations. In addition, other studies have shown that people have no obvious preferences for masculine or feminine male faces (Cornwell et al., 2004; Swaddle & Riersen, 2002).

According to the trade-off model of strategic pluralism in evolutionary psychology, there is a trade-off between the benefits of "good genes" and the costs of "bad fathers" in women's preference for masculine faces (Gangestad & Scheyd, 2005; Park et al., 2008; Wen & Zuo, 2012). Different cultural orientations also have an impact on this trade-off; compared to the individualistic western culture, in the typical Chinese collectivist culture, people care about the interests of groups and pay attention to relations and harmony, which are consistent with the cultural orientation of "feminization" (Wang & Cui, 2007). In the context of collectivism culture, feminized male faces are perceived to be more attractive (Wen & Zuo, 2012).

## The Psychological Effect of Red on Face Perception

In addition to the sex-dimorphic cues of face shape, previous studies have shown that the visual context around the face, especially clothing cues, can also affect people's perception (Oh et al., 2019; Ratcliff et al., 2011). Clothing color is often used to label the sex of an infant (Ben-Zeev & Dennehy, 2014), especially since clues from jawline, eyebrows, and hair length may not provide adequate information on the infant's sex (Brown & Perrett, 1993). Pink is often used for female infants and blue for male infants (Del Giudice, 2017; Jonauskaitė et al., 2019).

As one of the most important clothing cues, color has a considerable impact on individual cognition, emotion, and behavior (Elliot & Maier, 2014; Lichtenfeld et al., 2009). According to the color context theory, colors convey various interpretations for a piece of information depending on the context (Elliot & Maier, 2007). Among them, the psychological effect of red is widely known (Wen et al., 2014; Zhang & Han, 2013). In the context of a relationship, red indicates love and plays an important role in promoting the relationship (Hill & Burton, 2005). For example, studies have shown that men prefer women with red coats (Elliot & Daniela, 2008; Kayser et al., 2010).

Likewise, women also prefer men in red (Elliot et al., 2010; Elliot & Maier, 2014). This suggests that wearing red attracts the opposite sex, but whether it has the same effect on attraction toward the same sex is still unclear (Buechner et al., 2015; Seibt, 2015). Subsequent studies have found a similar effect of red on attraction (Buechner et al., 2015; Lin, 2014; Pazda et al., 2014), while other studies did not report this effect (Hesslinger et al., 2015; Peperkoorn et al., 2016; Seibt & Klement, 2015). According to the interpretation of the red-attraction effect, from an evolutionary point of view, red implies health and reproduction (Elliot & Maier, 2014). In addition, in the Chinese culture, red is a special color with a positive implication (Jiang et al., 2016). In China, red represents happiness, peace, and economic prosperity (Jiang et al., 2014).

### The Controversy Regarding the Dominance Theory and the Integration Theory

Based on the aforementioned findings, both face shape cues as an example of sexual dimorphic features, and face visual background (such as clothing color) can have noteworthy effects on face perception. In real life, the characteristics of individuals are diverse and complex, so it is of great significance to explore how people integrate multiple features to form their final impression (Goff & Kahn, 2013; Petsko & Bodenhausen, 2020). However, the dominance theory and integration theory provide conflicting explanations about how individuals process cues to form the final impressions.

The dominance theory asserts that when perceiving targets, some cues inevitably take precedence over others and have a higher influence. For example, gender, age, and race are considered to take higher precedence and are, therefore, called the “big three” dimensions of face perception (Sidanius et al., 2018; Zuo et al., 2019). In addition, this theory can help predict information with a higher influence on social perception, but it is difficult to explain the influence of changes on background factors (Petsko & Bodenhausen, 2020). In contrast, the integration theory suggests that when perceiving others, the individual will pay attention to all the features at the same time, based on which they form an overall psychological impression. Unlike the dominance theory, this theory does not predict which dimension of the cross-identity is more advantageous, but it asserts that people’s perception of others is formed based on the interactions of multiple features they have perceived (Hall et al., 2019; Wojnowicz et al., 2009).

Most previous studies investigated the dominance or integration of physical and social identities in face perception but paid less attention to the interaction between sex characteristics and background information. Thus, this study aimed to explore the interaction between sexual-dimorphic cues and face visual background cues existing simultaneously and to explore whether the impression

formed using the two types of cues conforms to the dominance theory or the integration theory.

Using two experiments, this study explored the influence of various sex-dimorphic cues and clothing colors on the evaluation of facial attractiveness, warmth, and competence, as well as the differences between the evaluation of same-sex and opposite-sex faces. Experiment 1 investigated the effects of different sex-dimorphic cues and clothing colors on attractiveness perception. Experiment 2, which was based on the Big Two model of social cognition, aimed to investigate the effects of various sex-dimorphic cues and clothing colors on the evaluation of warmth and competence of target faces. In addition, this study examined whether the influence of sex-dimorphic cues (physiological cues) and clothing colors (social cues) supports the dominance model or the integration model.

Thus, we hypothesized the following: (1) Feminine faces will be rated higher in terms of attractiveness perception, warmth, and competence than masculine faces; moreover, the targets’ sex and the participants’ sex will have no effect. (2) Targets wearing red clothes will be rated higher in terms of attractiveness perception, warmth, and competence than targets wearing blue clothes. Similarly, it is assumed that there is no difference between the target gender and the subject gender. (3) The effects of sex-dimorphic cues and clothing color on face perception will be consistent with the integration theory, just as in Hypotheses 1 and 2, where the targets’ sex and the participants’ sex will have no influence.

## Experiment 1: Effect of Sexual Dimorphism and Clothing Color on Attractiveness Perception

### Method

#### Participants

During the period from January 24 (18:00) to February 1, 2020 (12:00), 271 participants were recruited from an online platform ([www.wjx.cn](http://www.wjx.cn)). Among them, 92 (34%) were males and 179 (66%) were females. The average age of the respondents was 26.68 years ( $SD = 9.91$ ). The Ethics Committee of the Center for Studies of Social Psychology at Central China Normal University (CSSP-2020016) approved this study, and all participants enrolled in the experiments voluntarily. Informed consent was obtained prior to the study.

## Experimental Design

The experiment adopted a mixed 2 (feminization/masculinization of face: feminized and masculinized)  $\times$  3 (clothing colors: red, blue, and white)  $\times$  2 (targets' sex: female and male)  $\times$  2 (participants' sex: male and female) design. The between-subject variables were feminization/masculinization of face, clothing color, and participants' sex, and targets' sex were the within-subject variables. The dependent variables were the participants' assessment of the general attractiveness and sexual attractiveness of target faces. After calculating the internal consistency reliability coefficient, we found that the coefficient between general attractiveness and sexual attractiveness was 0.88. Therefore, the average score of general attractiveness and sexual attractiveness would be used as the indicator of overall attractiveness perception in the following analysis.

## Experimental Materials

The target faces—one female face (feminized/masculinized) and one male face (feminized/masculinized)—were adapted from Wen and Zuo's (2012) study, in which the sex-dimorphic cues of the faces were manipulated. The clothes of the targets in the photographs were red, blue, or white (Fig. 1).

## Experimental Procedure

The experiment was conducted online, and the target faces were presented randomly. Participants were presented with photographs of one male face and one female face with the same sexual dimorphism status (feminized or masculinized) and wearing clothes of the same color. Participants were asked to observe the photographs carefully and rate the target faces' general attractiveness and sexual attractiveness on a scale of 1 (not attractive at all) to 7 (very attractive). There was no time limit; the participants could

observe the target faces for as long as needed. After that, participants answered demographic-related questions. Upon completion of the experimental process, which took approximately five minutes, participants were rewarded three yuan.

## Statistical Analyses

The average score of general attractiveness and sexual attractiveness was used. We analyzed the data on attractiveness perception using linear mixed models with the following specifications: feminization/masculinization of face (feminized, masculinized; between-participants), clothing color (red, blue, white; between-participants), sex of target (female, male; within-participants), and sex of participants (female, male; between-participants). Since the age range of our sample was wide, participants' age was included as a covariate. Further, simple effects and post hoc tests were performed. SPSS Version 24 was used for all statistical analyses.

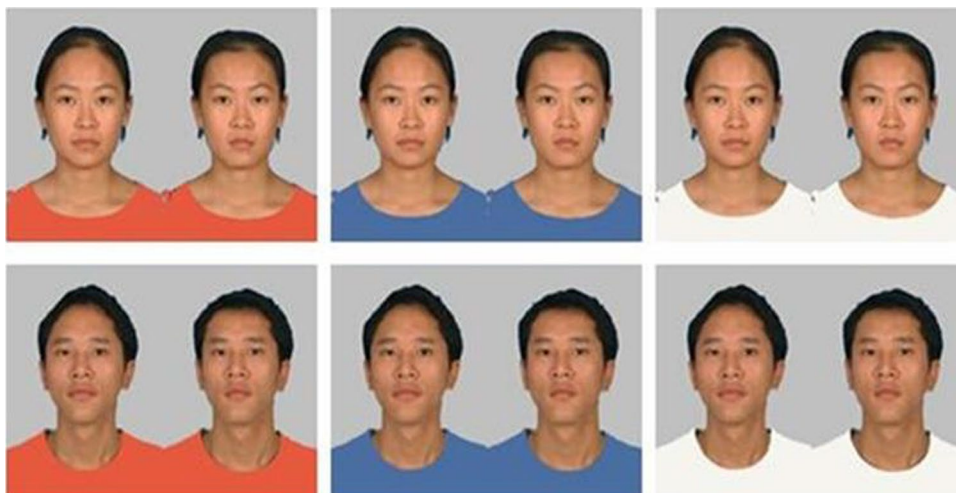
## Results

The descriptive statistics of participants' attractiveness perception of target faces with different sexual dimorphism and wearing different clothing colors are shown in Table 1. The results of linear mixed models are shown in Table 2.

### Effects of Sexual Dimorphism on Attractiveness Perception

The main effect of feminization/masculinization of faces was significant,  $F(1, 269) = 19.06, p < .001$ . Feminine faces ( $M = 3.09, SD = 1.40$ ) were rated as more attractive than masculine faces ( $M = 2.65, SD = 1.32$ ),  $t(540) = 3.79, p < .001$ , Cohen's  $d = 0.32$ . Besides, the rating of attractiveness in

**Fig. 1** Examples of face materials in experiment 1 and experiment 2. Among targets in same color, the faces on the left are feminized ones and that on the right are masculine





**Table 1** Descriptive statistical tables of attractiveness ( $M \pm SD$ )

Clothing color				Red	Blue	White
Attractiveness	Feminized face	Female target	Female participant	4.17 ± 1.39	3.08 ± 1.14	3.12 ± 1.08
			Male participant	3.94 ± 1.60	3.08 ± 1.02	2.96 ± 1.31
		Male target	Female participant	3.65 ± 1.82	2.42 ± 1.11	2.78 ± 1.44
			Male participant	3.97 ± 1.69	3.38 ± 1.37	2.54 ± 1.06
	Masculine face	Female target	Female participant	2.80 ± 1.11	2.39 ± 1.08	2.67 ± 1.46
			Male participant	2.40 ± 1.23	2.95 ± 1.04	2.78 ± 1.68
		Male target	Female participant	2.66 ± 1.39	2.64 ± 1.37	2.46 ± 1.29
			Male participant	2.80 ± 1.58	2.91 ± 1.45	2.72 ± 1.59

**Table 2** Mixed linear model analyzes results of attractiveness

	Numerator <i>df</i>	Error <i>df</i>	<i>F</i>	<i>p</i>
Feminization/masculinization of face	1	269	19.06	<.001
Clothing color	2	268	10.12	<.001
Targets' sex	1	269	0.69	.408
Participants' sex	1	269	2.10	.148
Feminization/masculinization of face × targets' sex	1	267	0.67	.413
Feminization/masculinization of face × participants' sex	1	267	0.01	.932
Clothing color × targets' sex	2	265	0.05	.955
Clothing color × participants' sex	2	265	1.57	.209
Feminization/masculinization of face × clothing color	2	265	8.32	<.001
Feminization/masculinization of face × clothing color × targets' sex	2	259	0.05	.952
Feminization/masculinization of face × Clothing color × Participants' sex	2	259	0.96	.386
Feminization/masculinization of face × clothing color × targets' sex × participants' sex	6	247	0.18	.981

feminine faces was higher, whether the faces were masculine or feminine, or the participants were male or female, which was consistent with Hypothesis 1. The results showed that interaction of feminization/masculinization of faces and targets' sex was not significant,  $F(1, 267) = 0.67$ ,  $p = .413$ , and interaction of feminization/masculinization of faces and participants' sex was not significant either,  $F(1, 267) = 0.01$ ,  $p = .932$ .

### Effects of Clothing Color on Attractiveness Perception

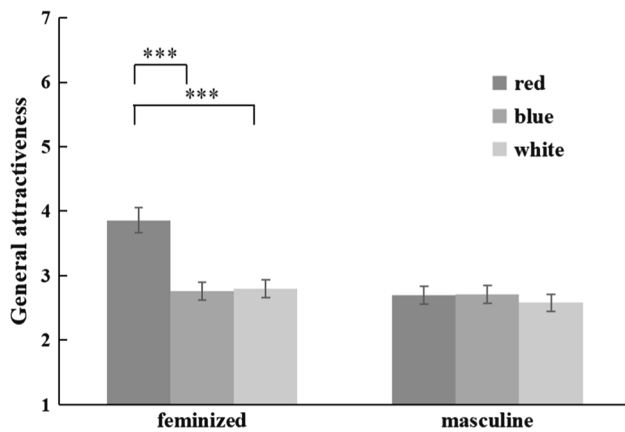
The main effect of clothing color was significant,  $F(2, 268) = 10.12$ ,  $p < .001$ . Attractiveness of targets wearing red clothing ( $M = 3.23$ ,  $SD = 1.58$ ) was rated higher than those wearing blue ( $M = 2.74$ ,  $SD = 1.17$ ) and white clothing ( $M = 2.68$ ,  $SD = 1.29$ ),  $p_{\text{blue}} = .001$ ,  $p_{\text{white}} < .001$ , while no significant difference was found between blue clothes and white ones,  $p = .686$ . Supporting Hypothesis 2, the above effect of clothing color did not change with regard to the sex of the targets or participants being different. Results showed that interaction of clothing color and targets' sex was not significant,  $F(2, 265) = 0.05$ ,  $p = .955$ , and interaction of clothing color and

participants' sex was not significant either,  $F(2, 265) = 1.57$ ,  $p = .209$ .

### Effects of Sexual Dimorphism and Clothing Color on Attractiveness Perception

The interaction effect between feminization/masculinization of face and clothing color was significant,  $F(2, 265) = 8.32$ ,  $p < .001$ , and such interaction effect would not be influenced by the sex of the targets or participants. Results showed that interaction of clothing color, feminization/masculinization of face and targets' sex was not significant,  $F(2, 259) = .05$ ,  $p = .952$ , and interaction of clothing color, feminization/masculinization of face and participants' sex was not significant,  $F(2, 265) = .96$ ,  $p = .386$ ; the interaction between the four independent variables was not significant either,  $F(6, 247) = 0.18$ ,  $p = .981$ .

Furthermore, for feminized faces, the simple effect analysis showed a significant difference in attractiveness perception between different clothing colors,  $F(2, 268) = 19.04$ ,  $p < .001$  (Fig. 2). The results of the post hoc comparison showed that among feminized faces, the attractiveness of targets wearing red clothes ( $M = 3.86$ ,  $SD = 1.63$ ) was rated significantly higher than that of targets wearing blue ( $M = 2.76$ ,  $SD = 1.13$ )



**Fig. 2** The interactive effect of feminization/masculinization of face and clothing color attractiveness perception. Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

and white clothes ( $M = 2.80$ ,  $SD = 1.20$ ),  $ps < .001$ , Cohen's  $d_{\text{blue}} = 0.78$ , Cohen's  $d_{\text{white}} = 0.74$ , but there was no significant difference between blue and white ones,  $p = .836$ . For masculine faces, there was no significant difference in attractiveness between the three clothing colors,  $F(2, 268) = 0.26$ ,  $p = .771$ . Based on the above results, feminization/masculinization of face and clothing color would interact to influence attractiveness perception, supporting Hypothesis 3.

## Discussion

In this experiment, it was found that clothing color affects the evaluation of attractiveness, and this evaluation is affected by face characteristics, participants' perceived higher attractiveness when those with feminine faces were dressed in red than in blue or white clothes. However, the promoting effect of red on attractiveness was not seen for masculine faces. In addition, feminized male/female faces were considered more attractive. Considering the lack of systematic research into face perception based on the perspective of social cognition, the second experiment aimed to explore the interactions between feminization/masculinization of face, clothing color, sex of target face, and sex of participants based on the Big Two model of social cognition, that is, perceptions of warmth and competence.

## Experiment 2: Effect of Sexual Dimorphism and Clothing Color on Evaluation of Warmth and Competence

### Method

#### Participants

From January 26 (10:00) to January 30, 2020 (24:00), 268 participants were recruited online. Participants included 93 (35%) men and 175 (65%) women; the average age of the participants was 26.45 years ( $SD = 9.94$ ). The Ethics Committee of the Center for Studies at \*\*\* (CSSP-2020016) approved this study, and all participants enrolled in the studies voluntarily. Written informed consent was obtained prior to the study. The design of this experiment was the same as that of Experiment 1. The dependent variables were the evaluation of the target face's warmth (i.e., warm and friendly) and competence (i.e., smart and capable). The experimental materials were the same as those in Experiment 1.

#### Experimental Procedure

As in Experiment 1, participants were presented with photographs of one male face and one female face. Then, participants were asked to rate the extent to which they perceived the target faces to be (1) warm and friendly, and (2) smart and capable, on a 7-point Likert scale from 1 = not warm/competent at all to 7 = very warm/competent. Then, participants' demographic data were obtained. Upon completion of the experiment, which took approximately five minutes, participants were rewarded three yuan.

#### Statistical Analyses

As in Experiment 1, we analyzed participants' perceptions of target faces' warmth and competence using linear mixed models with the same factors after adjusting for the covariates. SPSS Version 24 was used for all statistical analyses.

## Results

The descriptive findings of the evaluations of warmth and competence of the target faces are shown in Tables 3 and 4. The results of linear mixed models are shown in Tables 5 and 6.

**Table 3** Descriptive statistics of warmth ( $M \pm SD$ )

Clothing color				Red	Blue	White
Warmth	Feminized face	Female target	Female participant	4.44 ± 1.42	3.48 ± 1.17	3.52 ± 1.31
			Male participant	4.76 ± 1.34	3.25 ± 1.06	3.40 ± 1.24
		Male target	Female participant	3.64 ± 1.91	3.67 ± 1.43	3.35 ± 1.45
	Male participant		4.33 ± 1.35	3.67 ± 1.07	3.27 ± 1.28	
	Masculine face	Female target	Female participant	3.23 ± 1.43	3.07 ± 1.33	3.34 ± 1.21
			Male participant	3.05 ± 1.21	2.77 ± 1.42	3.70 ± 1.57
Male target		Female participant	3.13 ± 1.41	3.00 ± 1.00	3.19 ± 1.28	
		Male participant	3.41 ± 1.37	2.62 ± 1.39	3.60 ± 1.58	

**Table 4** Descriptive statistics of competence ( $M \pm SD$ )

Clothing color				Red	Blue	White
Competence	Feminized face	Female target	Female participant	4.40 ± 1.19	4.19 ± 1.29	3.74 ± 1.46
			Male participant	5.10 ± 1.26	3.33 ± 1.15	3.80 ± 1.26
		Male target	Female participant	3.80 ± 1.78	3.71 ± 1.31	3.55 ± 1.43
			Male participant	4.76 ± 1.37	4.08 ± 0.90	3.60 ± 1.18
	Masculine face	Female target	Female participant	3.70 ± 1.34	3.73 ± 1.58	3.41 ± 1.04
			Male participant	3.55 ± 1.34	3.15 ± 1.77	4.30 ± 1.16
		Male target	Female participant	3.50 ± 1.25	3.20 ± 1.32	3.47 ± 1.19
			Male participant	3.77 ± 1.27	3.08 ± 1.38	4.40 ± 1.18

**Table 5** Mixed linear model analyzes results of warmth

	Numerator <i>df</i>	Error <i>df</i>	<i>F</i>	<i>p</i>
Feminization/masculinization of face	1	266	17.98	<.001
Clothing color	2	265	5.82	.003
Targets' sex	1	266	0.14	.704
Participants' sex	1	266	0.76	.385
Feminization/masculinization of face × targets' sex	1	264	0.06	.813
Feminization/masculinization of face × participants' sex	1	264	0.12	.731
Clothing color × targets' sex	2	262	0.16	.850
Clothing color × participants' sex	2	262	1.98	.139
Feminization/masculinization of face × clothing color	2	262	6.39	.002
Feminization/masculinization of face × clothing color × targets' sex	2	256	0.51	.604
Feminization/masculinization of face × clothing color × participants' sex	2	256	1.50	.225
Feminization/masculinization of face × clothing color × targets' sex × participants' sex	6	244	0.06	.999

**Effects of Sexual Dimorphism on Warmth and Competence Perception**

For warmth, the main effect of feminization/masculinization of faces was significant,  $F(1, 266) = 17.98, p < .001$ . Feminine faces ( $M = 3.69, SD = 1.36$ ) were rated as warmer than masculine faces ( $M = 3.17, SD = 1.26$ ),  $t(540) = 4.54, p < .001$ , Cohen's  $d = 0.40$ . Consistent with Hypothesis 1, warmth was rated higher regardless of the faces being masculine or feminine or the participants being male or female. The results showed that interaction of feminization/masculinization of

faces and targets' sex was not significant,  $F(1, 264) = 0.06, p = .813$ , and interaction of feminization/masculinization of faces and participants' sex was not significant either,  $F(1, 264) = 0.12, p = .731$ .

For competence, the main effect of feminization/masculinization of faces was significant,  $F(1, 266) = 9.86, p = 0.002$ . Feminine faces ( $M = 3.93, SD = 1.34$ ) were rated as more competent than masculine faces ( $M = 3.55, SD = 1.22$ ),  $t(529.79) = 3.51, p < .001$ , Cohen's  $d = 0.30$ . Consistent with Hypothesis 1, the higher rating of competence in feminine faces was same regardless of whether the faces were

**Table 6** Mixed linear model analyzes results of competence

	Numerator <i>df</i>	Error <i>df</i>	<i>F</i>	<i>P</i>
Feminization/masculinization of face	1	266	9.86	.002
Clothing color	2	265	5.58	.004
Targets' sex	1	266	0.27	.607
Participants' sex	1	266	6.76	.010
Feminization/masculinization of face × targets' sex	1	264	0.05	.825
Feminization/masculinization of face × participants' sex	1	264	0.05	.823
Clothing color × targets' sex	2	262	0.06	.947
Clothing color × participants' sex	2	262	2.63	.073
Feminization/masculinization of face × clothing color	2	262	7.88	<.001
Feminization/masculinization of face × clothing color × targets' sex	2	256	0.34	.715
Feminization/masculinization of face × clothing color × participants' sex	2	256	4.17	.016
Feminization/masculinization of face × clothing color × targets' sex × participants' sex	6	244	0.25	.961

masculine or feminine. However, main effect of participants' sex was significant,  $F(1, 266) = 6.76, p = .010$ . Male participants ( $M = 3.97, SD = 1.30$ ) rated competence of targets higher than female participants ( $M = 3.65, SD = 1.29$ ),  $p = .006$ , Cohen's  $d = 0.25$ . The results showed that interaction of feminization/masculinization of faces and targets' sex was not significant,  $F(1, 264) = 0.05, p = .825$ , and interaction of feminization/masculinization of faces and participants' sex was not significant either,  $F(1, 264) = 0.05, p = .823$ .

### Effects of Clothing Color on Warmth and Competence Perception

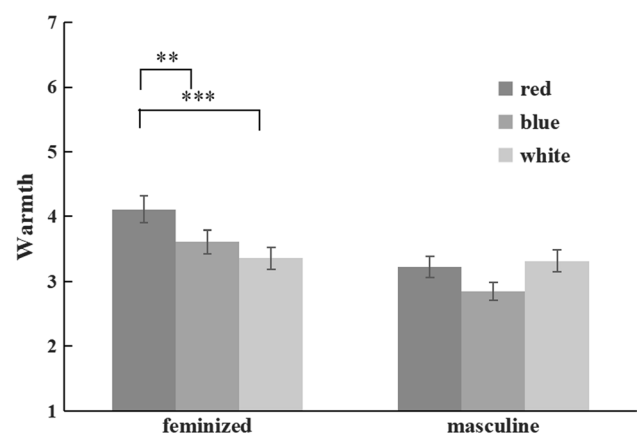
For warmth, the main effect of clothing color was significant,  $F(2, 265) = 5.82, p = .003$ . Warmth of targets wearing red clothing ( $M = 3.64, SD = 1.47$ ) was rated higher than those wearing blue ( $M = 3.35, SD = 1.25$ ) and white clothing ( $M = 3.34, SD = 1.26$ ),  $p_{\text{blue}} = .037, p_{\text{white}} = .031$ , but no significant difference was found between blue and white clothing,  $p = .979$ . This effect of clothing color did not change in different targets' sex or participants' sex, which supported Hypothesis 2. Results showed that interaction of clothing color and targets' sex was not significant,  $F(2, 262) = 0.16, p = .850$ , and interaction of clothing color and participants' sex was not significant either,  $F(2, 262) = 1.98, p = .139$ .

For competence, the main effect of clothing color was significant,  $F(2, 265) = 5.58, p = .004$ . Competence of targets wearing red clothing ( $M = 3.97, SD = 1.38$ ) was rated higher than those wearing blue ( $M = 3.63, SD = 1.26$ ) and white clothing ( $M = 3.64, SD = 1.21$ ),  $p_{\text{blue}} = .015, p_{\text{white}} = .016$ , but no significant difference was found between blue and white clothing,  $p = .955$ . The above effect of clothing color did not change in different targets' sex or participants' sex, which supported Hypothesis 2. Results showed that interaction

of clothing color and targets' sex was not significant,  $F(2, 262) = 0.06, p = .947$ , and interaction of clothing color and participants' sex was not significant either,  $F(2, 262) = 2.63, p = .073$ .

### Effects of Sexual Dimorphism and Clothing Color on Warmth and Competence Perception

For warmth, the interaction effect between feminization/masculinization of face and clothing color was significant,  $F(2, 262) = 6.39, p = .002$ . And such interaction effect would not be influenced by targets' sex or participants' sex. Results showed that interaction of clothing color, feminization/masculinization of face and targets' sex was not significant,  $F(2, 256) = 0.51, p = .604$ , and interaction of clothing color, feminization/masculinization of face and participants' sex was not significant,  $F(2, 262) = 1.50, p = .225$ , and the interaction



**Fig. 3** The interactive effect of feminization/masculinization of face and clothing color on judgments of warmth. Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$



between the four independent variables was not significant either,  $F(6, 244) = 0.06, p = .999$ .

Furthermore, for feminized faces, the simple effect analysis showed a significant difference in warmth between different clothing colors,  $F(2, 265) = 7.60, p = .001$  (Fig. 3). The results of the post hoc comparison showed that among feminized faces, the warmth of targets wearing red clothes ( $M = 4.11, SD = 1.54$ ) was rated significantly higher than that of targets wearing blue ( $M = 3.61, SD = 1.20$ ) and white clothes ( $M = 3.36, SD = 1.25$ ),  $p_{\text{blue}} = .008, p_{\text{white}} < .001$ , Cohen's  $d_{\text{blue}} = 0.36$ , Cohen's  $d_{\text{white}} = 0.53$ , and we found no significant difference between blue and white ones,  $p = .202$ . For masculine faces, there was no significant difference in attractiveness between the three clothing colors,  $F(2, 265) = 2.58, p = .078$ . Therefore, feminization/masculinization of face and clothing color would interact to influence warmth, supporting Hypothesis 3.

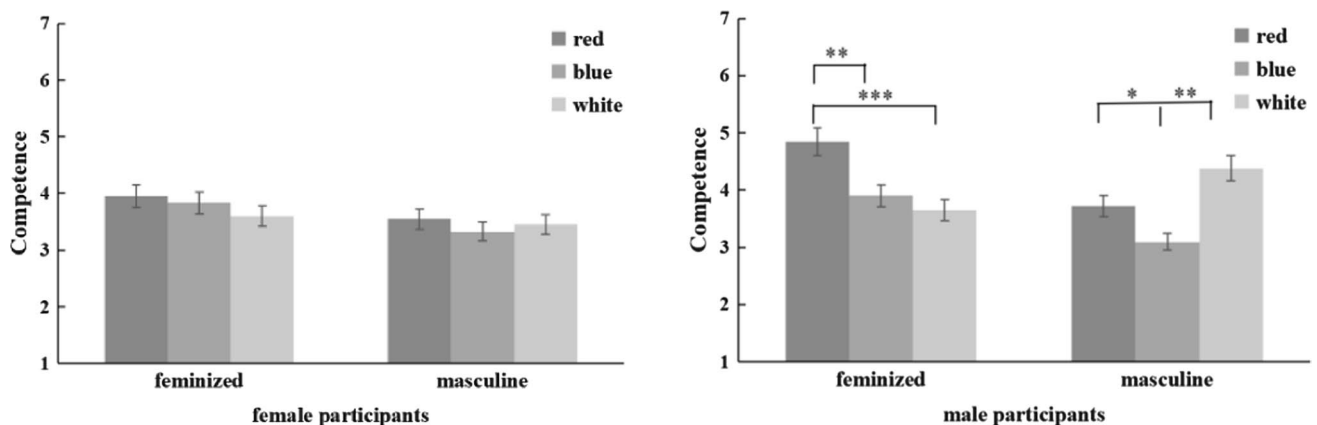
For competence, the interaction effect between feminization/masculinization of face and clothing color was significant,  $F(2, 262) = 7.88, p < .001$ , and such interaction effect would not be influenced by targets' sex. With interaction of clothing color, feminization/masculinization of face and targets' sex was not significant,  $F(2, 256) = 0.34, p = .715$ . However, the interaction of clothing color, feminization/masculinization of face and participants' sex was significant,  $F(2, 262) = 4.17, p = .016$ . Interaction between the four independent variables was not significant either,  $F(6, 244) = 0.25, p = .961$ .

Furthermore, we analyzed the interaction effect between feminization/masculinization of face and clothing color in female and male participants, respectively (Fig. 4). In female participants, for feminized faces, the simple effect analysis showed no significant difference in competence between

different clothing colors,  $F(2, 265) = 1.00, p = .368$ ; for masculine faces, the simple effect analysis also showed no significant difference in competence between different clothing colors,  $F(2, 265) = 0.36, p = .702$ . In male participants, for feminized faces, the simple effect analysis showed significant difference in competence between different clothing colors,  $F(2, 265) = 11.66, p < .001$ ; for masculine faces, the simple effect analysis showed significant difference in competence between different clothing colors,  $F(2, 265) = 5.96, p = .004$ . For data of male participants, we did the post hoc comparison and it showed that among feminized faces, the competence of targets wearing red clothes ( $M = 4.84, SD = 1.27$ ) was rated significantly higher than that of targets wearing blue ( $M = 3.90, SD = 0.83$ ) and white clothes ( $M = 3.65, SD = 1.06$ ),  $p_{\text{blue}} = .001, p_{\text{white}} < .001$ , Cohen's  $d_{\text{blue}} = 0.88$ , Cohen's  $d_{\text{white}} = 1.02$ , and no significant difference was found between blue and white ones,  $p = .420$ . Among masculine faces, the competence of targets wearing blue clothes ( $M = 3.10, SD = 1.44$ ) was significantly lower than that of white ( $M = 4.38, SD = 1.12$ ) and red clothes ( $M = 3.72, SD = 1.18$ ),  $p_{\text{white}} = .001, p_{\text{red}} = .048$ , Cohen's  $d_{\text{white}} = 1.00$ , Cohen's  $d_{\text{red}} = 0.47$ , and no significant difference was found between white and red ones,  $p = .054$ . Based on the results, only for male participants, their perception of competence would be influenced by the interaction of feminization/masculinization of face and clothing color. Specifically, male participants perceived feminized faces in red clothing as more competent, but masculine faces in blue clothing as the least competent.

## Discussion

In this experiment, targets in red clothes were rated higher in terms of warmth and competence. Specifically, the promoting effect of red on warmth perception was found for feminine faces but not for masculine faces. In addition, compared to



**Fig. 4** The interaction of feminization/masculinization of face and clothing color and judgments of competence. Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

masculine faces, feminine faces were considered to have a higher degree of warmth and competence.

## General Discussion

In this study, two experiments were conducted to investigate the effects of sexual dimorphism and clothing cues on participants' perceptions of target faces' facial attractiveness, warmth, and competence. The results showed that physiological and social cues played an integrated role in face perception. Consistent with our hypotheses, at the feminization level, both male and female participants rated attractiveness perception of faces of those wearing red higher than those wearing blue or white; however, at the masculinity level, there were no significant differences in participants' evaluation of attractiveness perception of targets wearing different clothing colors. Meanwhile, regardless of whether the faces were masculine or feminine, participants' perceptions of warmth and competence of targets wearing red were significantly higher than those of targets wearing blue and white. Moreover, the preference for feminine targets wearing red was more obvious than that for masculine targets wearing red. In addition, participants perceived targets wearing red as significantly more attractive, warm, and competent compared to targets wearing blue and white. Likewise, the perceptions of face attractiveness, warmth, and competence of feminine faces were also significantly higher than those of masculine faces. These findings enrich the existing theoretical understandings in the topic of face attractiveness, as well as provide evidence for the effects of physiological and social cues on face perception, and support the integration theory. In addition, we also found the difference of participants' gender in the competence evaluation of feminization/masculinization of face with different clothing colors.

### Preference for Targets with Feminine Faces Wearing Red

Experiment 1 focused on the effects of different sexual dimorphism cues and clothing color on the perception of facial attractiveness. The results showed that an integrated effect of clothing color and sexual dimorphism and the interaction between clothing color and gender dimorphism were significant. Compared to blue and white clothing, participants preferred targets with feminine faces wearing red, but there was no such effect of red for masculine faces. This finding is consistent with previous studies showing that sexual dimorphism moderates the effect of red, that is, men perceive feminine faces in red as more sexually attractive. This preference shows that with respect to avoidant and approaching

behaviors, feminine faces and red clothing have an approaching effect on people with a Chinese cultural background.

### Effect of Sexual Dimorphism and Clothing Colors on Warmth and Competence Evaluations

Experiment 2 further investigated the influence of sexual dimorphism and clothing color on the evaluation of warmth and competence based on the “Big Two” model of social cognition. The results showed that, similar to Experiment 1, sexual dimorphism and clothing color interacted in the evaluation of warmth. For warmth evaluation, participants rated targets wearing red clothes as warmer than those wearing blue and white, and there was a higher preference for red clothing for feminine faces than for masculine faces. However, for competence evaluation, the findings were different. Male participants rated targets with feminine faces, wearing red clothes as more competent than those wearing blue and white, which was similar to the result of warmth evaluation. However, they rated targets with masculine faces, wearing red and white clothes as more competent than those wearing blue. In other words, we found the dominant effect of red over blue in masculine faces, but this effect only existed when male participants evaluated the competence of the targets, and white has the same advantage. This is consistent with gender stereotypes, and competence is more closely related to males than females. What's more, data were collected during the COVID-19, in this period, people isolated at home because of serious epidemic, this may increase people's fear of anxiety and physical injury, further exacerbating their overall anxiety levels (Blasi et al., 2019; Duan et al., 2021). White is considered positive and related to purity, cleanliness, and simplicity (Saito, 1996), and they can effectively alleviate negative emotions like tension, depression, and panic (Wang et al., 2018a, 2018b), which matches people's emotional needs during the epidemic period (Hosen et al., 2021; Kayis et al., 2021). Besides, for female participants, there was no significant difference in the evaluation of feminization/masculinization of faces of targets wearing different clothing color. But in general, competence of targets wearing red clothing was rated higher than those wearing blue and white clothing. Compared to western people, who typically associate masculine faces with good genetics and the color red with failure and danger, Chinese people tend to establish harmonious relationships and have positive expectations from others. Previous studies have shown that warmth perception is more related to social connection, focusing on the perception of other people's communicative intention, while competence perception is more related to task realization and goal achievement. In addition, both Experiments 1 and 2 found that sexual dimorphism and clothing color showed significant main effects, that is, feminine faces were rated higher in terms of attractiveness perception, warmth, and

competence than masculine faces. Likewise, targets wearing red were rated higher in terms of attractiveness perception, warmth, and competence than those wearing blue and white, which is consistent with the preference for feminine faces and red clothing in the Chinese culture. This can be explained by China's cultural norms of collectivism and feminization and the positive significance of red in this culture.

### Integration Effect and Dominance Effect

In Experiment 1, there was an interaction between sexual dimorphism and clothing color in the evaluation of facial attractiveness. In Experiment 2, the interaction between sexual dimorphism and clothing color existed in the evaluations of warmth and competence, indicating that face perception is influenced by both sexual dimorphism and clothing. Specifically, when individuals perceive faces, they integrate two cues to form a global impression. This can be attributed to the dilution effect, which posits that an individual with multiple attributes would be perceived to be less prototypical, resulting in an integration effect.

### Theoretical and Practical Implications

Based on the “Big Two” model of social cognition, this study focused on the influence of sexual dimorphism and clothing color on the perceptions of attraction, warmth, and competence and explored the integration and dominance effects of sexual dimorphism and clothing color. Our findings suggest that sexual dimorphism as a physiological cue and clothing color as a social cue have an integrated effect on face perception. These findings have important theoretical and practical value. Theoretically, this study is the first to explore the effect of the interaction between social cues and physiological cues on face perception. The findings provide evidence to suggest the underlying mechanism of integration effect in face perception.

In practice, this study found that individuals prefer feminine faces and red clothing, which provide crucial information on individuals' daily impression management and suggest the clever application of sexual dimorphism and color in consumer decision making.

### Limitations and Future Directions

This study has some limitations that are worthy of further exploration in the future. We employed a self-report method in this study, which provides new evidence for the related measurement research of face perception and priming experimental paradigm, and further uses the situational experimental method of priming paradigm to directly investigate people's gender dimorphism and preference for red. Thus, future studies should use implicit methods to examine

whether the results could be replicated. Second, combining eye movement and cognitive neuroscience technology to provide objective indicators for the findings of this study will become the focus of future research. Third, due to COVID-19, our study was carried out in the context of the Chinese culture alone. Therefore, more research into the impact of sexual dimorphism and clothing color on facial cognition in western cultures is needed, to determine whether our results are universal or specific to the Chinese culture.

### Conclusion

This study examined the effects of sexual dimorphism cues and clothing color on perceptions of facial attractiveness, warmth, and competence perception. The results showed that participants highly rated the attractiveness perception and warmth of targets with feminine faces wearing red, but there was no such preference for masculine faces, and for competence, red has a dominant effect in both feminine and masculine faces. Our findings support the integration theory rather than the dominance theory. In addition, compared to blue and white, participants generally preferred red clothing. Similarly, compared to masculine faces, participants tended to prefer feminine faces. These findings have important implications for future studies on people's impression management and consumer decision making.

**Acknowledgements** We would like to thank our colleagues and students at Center for Studies of Social Psychology of Central China Normal University.

**Author Contributions** All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by YQ, and SM. The first draft of the manuscript was written by FW and YQ. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Funding** The research leading to these results received funding from later funded projects of National Social Science Foundation of China under Grant Agreement No. 20FSHB003 and Major Program of National Social Science Foundation of China under Grant Agreement No. 18ZDA331.

**Availability of Data and Materials** Data and materials could be accessed through sending email to the corresponding author.

**Code Availability** Code could be accessed through sending email to the corresponding author.

### Declarations

**Conflict of interest** The authors have no conflicts of interest to declare that are relevant to the content of this article.

**Consent to Participate** In order to dynamically track and evaluate the psychological state of the people under the current epidemic situation of new virus pneumonia, the Center of Social Psychology Research of Central China Normal University and the Key Laboratory of Behavioral Science of Chinese Academy of Sciences (Institute of Psychology, Chinese Academy of Sciences) jointly carried out the social survey. The survey will take you about 5 min. There is no right or wrong answer to the question. Please answer according to your real idea. Thank you for your participation and support!

**Consent for Publication** The author confirms (a) the work described has not been published before; (b) it is not under consideration for publication elsewhere; (c) its publication has been approved by all co-authors; (d) its publication has been approved by the responsible authorities where the work is carried out.

**Ethical Approval** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Central China Normal University (CSSP-2020016).

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