Personality and Individual Differences 185 (2022) 111275

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Mate-value moderates the function of make-up as a signal of intrasexual aggression

Danielle Sulikowski [a,b,*], Michelle Ensor [b], Danielle Wagstaff [c]

[a] Perception and Performance Research Group, School of Psychology, Charles Sturt University, Australia
[b] School of Psychology, Charles Sturt University, Australia
[c] School of Psychology, Federation University, Australia

ARTICLE INFO

Keywords:
Intrasexual competition
Female-female competition
Make-up
Interpersonal aggression

ABSTRACT

Make-up increases facial attractiveness. This may impress potential mates, but can also cause potential rivals to underestimate their own competitive potential. Such self-promotional behaviours may function even in the absence of potential mates, becoming signals of intrasexual competitive intent. Here we present data from two studies investigating the effects of digitally applied make-up on perceptions of intrasexual competitive intent, and on female perceivers' self-rated facial and body attractiveness, and self-esteem. In study 1, stimulus attractiveness moderated the impact of make-up: highly attractive women were perceived as more interpersonally aggressive when made-up, while less attractive women were perceived as having more leadership potential when made-up. In study 2, high mate-value participants who viewed made-up (compared to non-made-up) attractive faces subsequently reported lower own facial attractiveness. Low mate value participants and participants who viewed less attractive faces did not adjust their own facial attractiveness in response to make-up; and make-up did not impact ratings of body image or self-esteem. We suggest that self-promotional acts, such as wearing make-up, can signal competitive intent to rivals, independently of direct impacts on the wearers' own attractiveness. Make-up may function in this way primarily between high mate-value women, serving other social functions on less attractive women.

1. Introduction

Intrasexual competition is competition with same-sex others for preferential access to mates (Fisher & Cox, 2011). Four tactics of intrasexual competition have been identified: self-promotion, competitor derogation, competitor manipulation, and mate manipulation (Fisher & Cox, 2011). The implementation of these tactics tends to target the qualities most desired by the opposite sex. Men and women place differential value on qualities desired in the opposite sex (Buss, 1988; Thomas et al., 2020), and such desired qualities, in turn, determine the vehicles by which intrasexual competition occurs between individuals of the same sex. Men place more value than do women on a potential mate being physically attractive. Accordingly, women's self-promotion tactics frequently involve altering their appearance with sexy, stylish clothing, make-up, and hairstyles (Buss, 1988; Etcoff, Stock, Haley, Vickery, & House, 2011; Fisher & Cox, 2009; Walters & Crawford, 1994). Similarly, competitor derogation in women focuses heavily on the competitor's appearance (Schmitt & Buss, 1996; Schmitt & Buss, 2001). Mate and competitor manipulation both involve altering the behaviour of others to increase her own competitive edge. Verbal derogation of a rival's appearance, especially by an attractive woman, causes male bystanders to similarly lower their reported perception of the rival's attractiveness (Fisher & Cox, 2009). Verbal insults in the presence of a rival, regarding her physical appearance may be delivered subtly and strategically, (Hrdy, 1981), allowing the aggressor to maintain plausible deniability of any harmful intent, (Bjorkqvist, Lagerspetz, & Kaukiainen, 1992), but can also manifest directly and aggressively (Adler & Adler, 1995; Besag, 2006; Dellasega, 2009;). Either way, they aim to have the rival lower her own self-perceived mate value and withdraw herself from the extant competition (Cox & Fisher, 2008).

While much attention has been paid to what women do to improve their own appearance, and what they say to derogate and manipulate potential mates and rivals, less attention has been paid to potential non-verbal means of competitor manipulation. While self-promotional tactics might be primarily targeted towards members of the opposite sex, same-sex rivals are not immune to some of their effects. If one-on-one

* Corresponding author at: Perception and Performance Research Group, School of Psychology, Charles Sturt University, Australia.
E-mail address: dsulikowski@csu.edu.au (D. Sulikowski).

https://doi.org/10.1016/j.paid.2021.111275
Received 28 June 2021; Received in revised form 15 September 2021; Accepted 16 September 2021
Available online 24 September 2021

attempts at competitor manipulation aim to have a rival lower her value of herself such that she withdraws from a competition (Cox & Fisher, 2008), there is no reason that self-promotional tactics do not also serve the dual purpose of having any potential same-sex rival, whether they are explicitly known to the competitor or not, re-evaluate their own ability to compete. Indeed, there is ample evidence that women's self-perceived attractiveness is a relative judgement, lowering after exposure to highly attractive or idealised same-sex others (Cash, Cash, & Butters, 1983; Little & Mannion, 2006; Sherlock & Wagstaff, 2019; Thornton & Moore, 1993). The psychological impacts of viewing attractive others can also extend more broadly to lowered self-esteem (Grogan, Williams, & Conner, 1996; Thornton & Moore, 1993). There is, therefore, clear functional motivation for women to engage in self-promotional tactics in the presence of rivals (even in the absence of potential mates). In this manner, the self-promotional acts themselves can become reliable signals of competitive intent, warning rivals away. If this is the case it implies that self-promotional tactics in women should manipulate rivals' perceptions in two ways: increased perceived attractiveness, and increased perceived aggressive intent (Mafra et al., 2020).

In people, bodily adornments are a ubiquitous part of the extended phenotype (Etcoff et al., 2011). Such adornments can include clothing (Guéguen, 2012), cosmetics (Wagstaff, 2018), hairstyling and beards (Sherlock, Tegg, Sulikowski, & Dixson, 2017), and tattoos (Molloy & Wagstaff, 2021). Phenotypic extensions are presumed to enhance perceived biological value (Etcoff et al., 2011) by drawing attention to (or concealing) attractive (or unattractive) heritable phenotypic features. That make-up typically enhances the physical attractiveness of the wearer is well evidenced (Cash, Dawson, Davis, Bowen, & Galumbeck, 1989; Etcoff et al., 2011; Miller & Cox, 1982; Mulhern, Fieldman, Hussey, Leveque, & Pineau, 2003; Russell, 2009). The extent to which it can manipulate other womens' perceptions of their own facial attractiveness, however, is not yet known.

Whether phenotypic extensions ostensibly functioning to increase physical attractiveness, such as make-up, also independently signal competitive intent remains unclear, although self-reported intrasexual competitiveness does predict frequency of make-up use (Mafra et al., 2020). Heavily made-up female faces are perceived to be more confident, less kind, and more vain than their non-made-up counterparts (Huguet, Croizet, & Richetin, 2004). Somewhat contrasting data, however, has shown make-up to increase subjective judgements of competence, likeability, and trustworthiness (Etcoff et al., 2011) after 250 ms. When exposure time was unlimited, an arguably more ecologically valid method, heavy make-up still increased judgements of competence, but not likeability or trustworthiness (Etcoff et al., 2011). Since make-up reliably increases attractiveness, and given the pervasive 'beautiful is good' stereotype (Dion, Berscheid, & Walster, 1972, p. 285), prior authors have tended to focus on whether or not make-up has generally positive or negative effects on interpersonal judgements. Considered from the perspective of intrasexual competition, however, more nuanced considerations are required. That make-up tends to reliably increase perceptions of confidence, competence, and vanity, but to decrease perceptions of kindness, seems commensurate with a signal of competitive intent.

Even if make-up functions as a signal of competitive intent, this is unlikely to be its sole social function. Women wear make-up (or not) in innumerate different ways in all manner of social contexts. In the first of two studies in the present paper, we asked participants to provide judgements of both interpersonal aggression and leadership potential, of either made-up or non-made-up female faces, in an attempt to separately capture different aspects of social dominance. Only the former is intended to reflect a key component of intrasexual competition, the latter reflecting a more pro-social form of social dominance. Since more attractive women are also more intrasexually competitive (Polo, Munoz-Reyes, Tapia, Wilson, & Turiégano, 2019) we expected attractiveness of the stimulus to moderate participants' judgements. We predicted that the more attractive the stimulus faces were, the more likely make-up would be to increase judgements of interpersonal aggression; while the less attractive the stimulus faces were, the more likely make-up would be to increase judgements of leadership potential. In the second study we further investigated how make-up might influence the rivals' self-perceived attractiveness.

2. Study 1

2.1. Method

2.1.1. Participants

A total of 110 women, aged 19 to 67 years, rated either the made-up ($N = 52$, aged 19-67 yrs., $M = 35.7$, $SD = 1.4$) or non-made-up ($N = 58$, aged 19-54 yrs., $M = 34.9$, $SD = 1.2$) stimuli. Participants were recruited via an undergraduate psychology course and received course credit in turn for participating. The ethical aspects of the study were approved by the Charles Sturt University Human Research Ethics Committee (protocol no. 2015/108).

2.1.2. Stimuli

Seventy smiling Caucasian female faces of apparent reproductive age (and without make-up) were drawn from the UCT HiFi face database. All images were cropped to include the face, hair, and neck above the collar line, resized to 350 × 496 pixels (for presentation at 72dpi), and their background neutrally coloured (167, 183, 170). These faces formed the non-made-up stimulus set. The made-up stimulus set was created by digitally applying make-up (lipstick, blush, eye-shadow, eye-liner and mascara) to each of the 70 non-made-up faces, using tools available at http://TAAZ.com (see Fig. 1). Different colours of eye-shadow and lipstick were applied to each face, in accordance with their natural complexion, such that the overall set of faces did not present with unrealistically consistent make-up. This variety also served to capture some of the natural variety seen in how different women apply their own make-up. Make up was applied so as to make it visually apparent, but care was taken not to camouflage flaws, or otherwise change the apparent shape or texture of the face. This was done to minimise the extent to which the digital make-up applied would increase perceived facial attractiveness.

To ascertain how the make-up we applied was perceived by naïve observers, we recruited 59 women (aged18–45 years, $M = 26.3$, $SD = 7.1$), to rate all the stimuli images, with and without make-up, for how much make-up they appeared to be wearing (from 0 = no make-up, 1 = light make-up, 2 = moderate make-up and 3 = heavy make-up). These same women also rated the made-up faces only for their suitability for various occasions (1 = casual / everyday, 2 = workplace, 3 = night time / glamourous) and their application skill (from 1 = self-applied to 3 = professionally applied). The results confirmed that our non-made-up faces were indeed perceived as not wearing make-up, and that our made-up faces were perceived as wearing self-applied, light-to-moderate make-up, suitable for casual/everyday wear and the workplace (see Supplementary Material, S1, for full methods and results of the stimuli verification procedure).

2.1.3. Procedure

The study was hosted online at surveymonkey.com. After providing informed consent via an online information statement, participants were randomly allocated to view and rate either the made-up or non-made-up faces. By manipulating make-up between-subjects, participants were not cued in to the fact that make-up was the key variable being manipulated in this study. Participants were shown each of their 70 faces once, in a randomised order, and asked to rate each face on three 10-point scales. Faces were rated for attractiveness ("How attractive is this face?", from "extremely unattractive" to "extremely attractive"), aggressiveness ("How aggressive would this woman be in an argument?", from "extremely unaggressive" to "extremely aggressive"), and leadership potential ("How good a leader would this woman be?", from "extremely

Fig. 1. Shows indicative stimuli of non-made-up (left) and made-up (right) faces. Actual stimuli cannot be made public since those individuals' permission was not sought to publish their likenesses.

poor" to "extremely good"). At the completion of the ratings participants confirmed their sex and provided their age.

2.1.4. Data analysis

Data were analysed by stimulus identity (rather than by participant), following the approach of Roberts et al. (2005). Such models afford the inclusion of attractiveness scores for each stimulus as a covariate, permitting us to examine how the attractiveness of the stimuli (as a continuous variable) moderates the effects of make-up. Mean scores for each of the three ratings were calculated for each stimulus identity for the made-up and non-made-up conditions, respectively. An overall mean attractiveness score was calculated for each stimulus identity by averaging the made-up and non-made-up means, and a score reflecting impact of make-up on the attractiveness of each face was calculated as the difference between the made-up and non-made-up attractiveness means. Normality of all scores was confirmed via visual inspection of normality plots.

The aggression and leadership scores, respectively, were then each subjected to a repeated-measures ANCOVA, with overall mean attractiveness score included as the covariate and make-up (2 levels" made-up and not made-up) as the within-stimulus factor. This permitted analysis of the main effects of both make-up and attractiveness, as well as their interaction, on each of the dependent variables. The anonymous dataset is provided in the supplementary materials.

2.2. Results

2.2.1. Attractiveness ratings

Attractiveness ratings across the made-up and non-made-up conditions were highly correlated ($r = 0.96$, $N = 70$, $p < .001$). Mean attractiveness of the made-up faces ($M = 5.22$, $SD = 1.33$) was slightly, but significantly higher ($t(69) = 2.66$, $p = .010$) than that of non-made-up faces ($M = 5.09$, $SD = 1.37$; see Fig. 2A). We observed a significant correlation between the made-up and non-made-up attractiveness difference scores and the non-made-up attractiveness scores ($r = -0.241$, $N = 70$, $p = .042$) suggesting that the impact of make-up on perceived attractiveness tended to decrease as faces became more attractive.

2.2.2. Interpersonal aggressiveness ratings

A repeated measures ANCOVA with make-up as the within-stimulus factor and overall mean attractiveness scores (centred on 0) as the covariate revealed a significant effect of make-up ($F(1,68) = 21.013$, $p < .001$, $\eta\rho^2 = 0.236$), as made-up faces were rated as more aggressive than non-made-up faces. A significant main effect of attractiveness was also observed ($F(1,68) = 9.661$, $p = .003$, $\eta\rho^2 = 0.124$) as more attractive faces were also rated as more aggressive.

Lastly, the above main effects were qualified by a significant make-up by attractiveness interaction ($F(1,68) = 9.268$, $p = .003$, $\eta\rho^2 = 0.120$). Estimating the main effect of make-up at values of attractiveness one standard deviation below the mean and one standard deviation above the mean, respectively, revealed that as women became more attractive the effect of make-up on perceived aggressiveness increased. As predicted, there was no detectable effect of make-up on perceived aggressiveness for women one standard deviation below the sample's mean attractiveness ($F(1,68) = 1.143$, $p = .289$, $\eta\rho^2 = 0.017$); but a substantial effect of make-up on perceived aggressiveness for women one standard deviation above the sample's mean attractiveness ($F(1,68) = 29.054$, $p < .001$, $\eta\rho^2 = 0.299$). These results are shown in Fig. 2B.

2.2.3. Leadership potential ratings

A repeated measures ANCOVA with make-up as the within-stimulus factor and overall mean attractiveness scores (centred on 0) as the covariate revealed a significant effect of make-up ($F(1,68) = 14.272$, $p < .001$, $\eta\rho^2 = 0.173$), as made-up faces were rated as having greater leadership potential than non-made-up faces. A significant main effect of attractiveness was also observed ($F(1,68) = 238.354$, $p < .001$, $\eta\rho^2 = 0.778$) as more attractive faces were also rated as having greater leadership potential.

The above main effects were qualified by a significant make-up by attractiveness interaction ($F(1,68) = 5.004$, $p = .029$, $\eta\rho^2 = 0.069$). Estimating the main effect of make-up at values of attractiveness one standard deviation below the mean and one standard deviation above the mean, respectively, revealed that as women became more attractive the effect of make-up on leadership potential decreased. Consistent with our predictions, there was no detectable effect of make-up on perceived leadership potential for women one standard deviation above the sample's mean attractiveness ($F(1,68) = 1.154$, $p = .287$, $\eta\rho^2 = 0.017$); but there was a significant effect of make-up on perceived leadership potential for women one standard deviation below the sample's mean attractiveness ($F(1,68) = 18.056$, $p < .001$, $\eta\rho^2 = 0.210$). These results are shown in Fig. 2C.

2.3. Discussion

In this study participants reported that attractive women depicted wearing make-up appeared more interpersonally aggressive (than when depicted not wearing make-up). Make-up did not affect the apparent interpersonal aggression of less attractive women, but it did increase judgements of leadership potential. From these findings we conclude that make-up may well act as a signal of competitive intent, but only when worn by more attractive, high mate-value women. When worn by

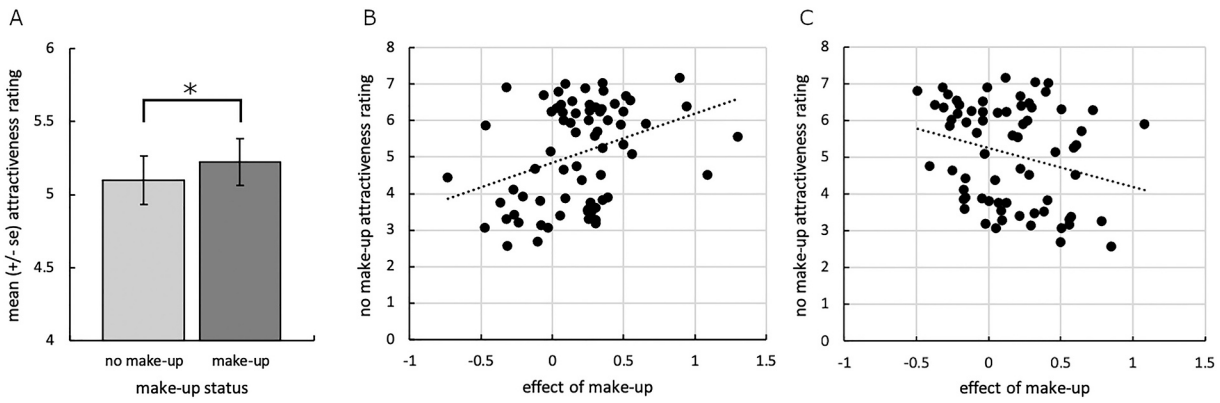

Fig. 2. Shows the effects of digital make-up application on A) ratings of attractiveness, B) interpersonal aggression, and C) leadership potential. Digital make-up application significantly increased perceived attractiveness, while attractiveness moderated the effects of digital make-up on interpersonal aggression and leadership. As women got more attractive, digital make-up increased perceived interpersonal aggression; as women got less attractive, digital make-up increased perceived leadership potential. *$p < .05$.

less attractive women, make-up may signal social, rather than intrasexual, dominance.

Since study 1 demonstrated that make-up may be perceived as a signal of competitive intent when worn by highly attractive women, we investigated in study 2 whether this signal is primarily received by other highly attractive, high mate-value women. In the second study we required participants to view either attractive or unattractive made-up or non-made-up faces and then measured their own self-reported facial and bodily attractiveness, self-esteem, and mate value. We predicted that if make-up is a signal of competitive intent that primarily functions among highly attractive women, then viewing made-up attractive faces would decrease the self-reported facial attractiveness of high mate value participants, while low mate-value participants, or participants viewing less attractive faces would be less likely to decrease their self-reported facial attractiveness. Further, if make-up functions as a general signal of competitive intent its impacts may extend beyond self-reported facial attractiveness, to bodily attractiveness and self-esteem.

3. Study 2

3.1. Method

3.1.1. Participants

A total of 511 women completed the online study. Thirty-nine participants were excluded for not reporting being sexually attracted to men ($N = 32$), being transgender ($N = 1$), withdrawing their consent after being debriefed ($N = 5$), or for providing nonsense answers ($N = 1$). The final sample contained $N = 472$ women who reported being heterosexual ($N = 435$) or bisexual ($N = 38$) aged from 17 to 71 years ($M = 29.4$, $SD = 11.0$). We retained bisexual women in the sample, because bisexuality does not preclude women from competing with other women for male mates. Further, bisexual attraction and behaviour is reported by up to as many as 30% of women who self-identify as heterosexual (Hoburg, Konik, Williams, & Crawford, 2004), and thus excluding women who identify as bisexual would compromise power and sample generalisability, without achieving a sample of purely heterosexual women (in terms of behaviour and feelings of sexual attraction). The sample resided primarily in Australia ($N = 244$), North America ($N = 104$), or the United Kingdom ($N = 106$). The majority of the sample were living with their partner (married $N = 122$, or de facto $N = 93$) or in a relationship but not living together ($N = 84$), while the remaining participants were single ($N = 173$). Participants were recruited via an undergraduate psychology course ($N = 112$, receiving course credit), via ProlificAcademic.co ($N = 143$, receiving nominal payment), or from the general public ($N = 217$, receiving no compensation). The ethical aspects of the study were approved by the Charles Sturt University Human Research Ethics Committee (protocol no. 2015/108).

3.1.2. Stimuli

From the 70 original faces used in study 1, 40 were chosen for study 2. Faces were chosen based on the attractiveness ratings awarded to the made-up and non-made-up versions in study 1. We created two sets of 20 identities each, of above and below average attractiveness, respectively. To dissociate the effects of attractiveness from those of make-up we applied the additional criterion that the difference in attractiveness ratings between the made-up and non-made-up versions of the faces be minimised. This resulted in four sets of 20 face images: 2 sets of above average attractiveness (one with make-up and one without) and 2 sets of below average attractiveness (one with make-up and one without). The attractive (above average) faces ($M = 6.58$, $SD = 0.31$) had received significantly ($t(38) = 28.89$, $p < .001$) higher attractiveness ratings than the unattractive (below average) faces ($M = 3.59$, $SD = 0.26$). The original and made-up versions of the faces had received similar attractiveness ratings within both the attractive and unattractive sets, see Table 1. A fifth set of 20 landscape images were used as control images. All images were displayed in portrait orientation (350 × 496 pixels) at a resolution of 72dpi in full RGB colour.

3.1.3. Scales

3.1.3.1. Mate Value Scale (MVS). The MVS (Edlund & Sagarin, 2014) is a 4-item, unidimensional measure of mate value. Items (such as "How would you rate your overall level of desirability as a partner?") are rated on a 7-point Likert scale (from 1 = "Extremely undesirable" to 7 = "Extremely desirable"). Responses are summed with higher scores indicating higher mate value. Reported internal reliability is good (α = 0.81 to 0.92) and was similarly good in the current study (α = 0.90 to 0.93).

3.1.3.2. Body Image States Scale (BISS) and FISS1. The BISS (Cash,

Table 1
Mean attractiveness ratings awarded during study 1 to the 4 sets of face stimuli used in study 2, showing very similar ratings awarded to original and made-up version of the faces.

Attractiveness	Version	Mean (SD)	*t*	*df*	*p*
Unattractive	Original	3.55 (0.31)	1.86	19	0.078
	Made-up	3.63 (0.25)			
Attractive	Original	6.50 (0.34)	1.89	19	0.075
	Made-up	6.65 (0.37)			

Fleming, Alindogan, Steaman, & Whitehead, 2002) is a 6-item scale that measures an individual's immediate evaluation of their body's appearance. Items ("Right now, I feel:") are scored on 9-point Likert scales (from, for example, 1 = "extremely dissatisfied with my physical appearance" to 9 = "extremely satisfied with my physical appearance"). Responses are averaged with higher scores indicating a more positive evaluation. Reported internal reliability is good (α = 0.80 to 0.90) and was similarly good in the current study (α = 0.87 to 0.88). We created a single item measure, which we informally refer to as the FISS1, which is based on the format of the BISS, but measures an individual's immediate evaluation of their face: "Right now I feel:" with responses from 1 = "extremely facially unattractive" to 9 = "extremely facially attractive". The median response option was 5 = "neither facially unattractive nor facially attractive".

3.1.3.3. Rosenberg Self Esteem Scale (RSES). The RSES (Rosenberg, 1965) is a ten-item scale that measures global self-esteem. Items (such as "On the whole I am satisfied with myself") are scored on a 9-point Likert scale (from 1 = "strongly disagree" to 4 = "strongly agree"), with higher scores signifying greater self-esteem. Reported internal consistency is good (α = 0.72 to 0.88, Gray-Little, Hancock, & Williams, 1997) and was similarly good in the current study (α = 0.91 to 0.92).

3.1.4. Design

This study's design was derived from a Solomon four-groups design. The Solomon four-groups design sees half of a study's participants complete a pre-test measure, followed by an intervention, followed by a post-test measure. The remaining participants complete only the intervention and post-test measure. Within each half of the design are a control group and (at least) on test group – hence the name, Solomon four-groups. This design reveals pre-test sensitivity (or pre-test desensitisation) if it is present, and is more powerful than using the same number of participants in a post-test only design (Braver & Braver, 1988).

In the current study we had five groups in each half of the design: four test groups wherein participants viewed images of either attractive or unattractive women, either wearing make-up or not; and a fifth control group who viewed landscape images. The dependent variables (BISS, FISS1 and RSE) and covariate (MVS) were measured either pre- and post- the image viewing task, or post- only.

We adopted the Solomon design as we were concerned about the potentially low power available in a solely post-test only design, but were also concerned that the key dependent variables (especially the single item facial attractiveness measure) might exhibit pre-test desensitisation, if participants recalled their pre-test responses during the post-test, rather than responding anew.

3.1.5. Procedure

This study was deceptively presented as a memory study to participants, to diminish the likelihood that demand characteristics would influence responses. Data were collected online using SurveyMonkey (surveymonkey.com). After providing consent, participants provided demographic information including their age, sexual orientation, relationship status, and country of residence, and confirmed their sex as female.

Participants were randomly allocated to complete the key measures either pre- and post-test, or post-test only. The former group only then completed the RSES, MVS, BISS and FISS1 measures (in randomised order).

Participants were then randomly assigned to one of 5 groups, which determined the images they viewed at test: attractive faces with or without make-up, unattractive faces with or without make-up, or control (landscape) images. To encourage participants to attend to the images (without drawing their attention to the attractiveness of the faces), the images were presented within a dummy task that required participants to rate each one for its distinctiveness on a scale from 1 to 10.

To help substantiate the memory study cover story, participants completed a dummy 10-item memory scale which included items such as "How often do you have difficulty remembering peoples' names?", with responses on a 5-point Likert scale from 1 = almost always to 5 = almost never. The post-test measures (RSES, MVS, BISS, and FISS1) were then administered (in randomised order). In between each measure participants were shown two of their test (or control) images and asked to recall the distinctiveness ratings they previously gave, functioning as a priming top-up throughout post-test.

At the completion of post-test participants were shown 10 images, 5 they had previously seen and 5 comparable novel images and asked to indicate for each image whether they had seen it before. Data confirmed sustained attention from participants as a whole throughout the study with >90% of participants answering 8 (N = 71), 9 (N = 141), or 10 (N = 219) of these answers correctly.

At the completion of the study participants were debriefed as to the study's true aims and offered the option to either re-confirm their informed consent or to withdraw their consent and their data from the study.

3.1.6. Data analysis

The anonymous dataset is provided in the supplementary materials. Data analysis followed the recommendations of Braver and Braver (1988) for Solomon multigroup designs. We first tested for pre-test (de-) sensitisation by performing a 5 (T: test condition) x 2 (P: pre-test versus no pre-test) ANCOVA (with post-test mate value scores, centred, as the covariate) on the post-test scores of each of the three dependant variables (FISS1, BISS, and RSES scores). In these analyses the absence of a significant T x P interaction indicates that no pre-test (de-)sensitisation occurred. An examination of the main effect of test condition, and the test condition x mate value interaction (both followed up by relevant contrast comparisons) are relevant to testing the hypotheses in these analyses.

Since the above analysis did not reveal significant key effects for the BISS and RSES scores, we subsequently performed two independent tests of the hypotheses by separately examining data from participants who completed both pre-test and post-test measures, and participants who completed post-test measures only. Firstly, we conducted a 5 (test condition) x 2 (pre-test versus post-test) mixed ANCOVA (with post-test mate value scores, centred, as the covariate) on the RSES and BISS scores from only those participants who completed both the pre-test and post-test measures. In these analyses the two-way (test condition x pre-test versus post-test) and three-way (test condition x pre-test versus post-test x mate value) interactions are relevant to testing the hypotheses.

Secondly, we performed a one-way (test condition: 5 levels) ANCOVA (with post-test mate value scores, centred, as the covariate) on the post-test RSES and BISS scores from only those participants who completed only the post-test measures. An examination of the main effect of test condition (followed up by relevant contrast comparisons), and the test condition x mate value interaction are relevant to testing the hypotheses in these analyses.

Lastly, we used meta-analytic techniques to combine the critical results from the two sets of independent analyses, providing the most powerful tests available of the study hypotheses (Braver & Braver, 1988). To do this we convert the critical p-values to z-scores, and combine the relevant z-scores into a single z_{meta} according to:

$$z_{meta} = \Sigma_i \, z_{pi} / \sqrt{k}$$

where z_{pi} is the z-score corresponding to the one-tailed p-value of the ith statistical test, and k is the number of such statistical tests being combined to create z_{meta}. The significance (p-value) of z_{meta} is then defined as the area under the standard normal distribution to the right of z_{meta}.

3.2. Results

3.2.1. Correlations

Pre-test (*N*=) and post-test (*N* = 472) measures of self-esteem (RSES), mate value (MVS), and body and face image (BISS and FISS1) were correlated with each other and with age. As expected, positive correlations were observed between all test variables, such that higher mate value women tended to report greater self-esteem and more positive face and body image states. Age tended not to correlate with the test variables, with the exception of self-esteem, and so was not included in subsequent analyses (see Table 2 and Table 3).

3.2.2. Mate value

To include mate value as a covariate we needed to ensure that mean mate value did not differ between the various groups. To confirm this, we ran four univariate ANOVAs comparing MVS scores across the five conditions. There was no significant main effect of condition on the pre-test MVS scores ($F(4,231) = 0.798$, $p = .527$, $\eta_\rho^2 = 0.014$), the post-test MVS scores ($F(4,467) = 0.599$, $p = .663$, $\eta_\rho^2 = 0.005$), or the post-test MVS scores when examined separately by those participants who completed post-test only ($F(4,231) = 0.199$, $p = .939$, $\eta_\rho^2 = 0.003$), and those who completed both pre- and post-test measures ($F(4,231) = 0.729$, $p = .573$, $\eta_\rho^2 = 0.012$).

3.2.3. Effects on self-perceived facial attractiveness (FISS1 scores)

Considering first the post-test scores from all participants, a 5 (condition) x 2 (pre-test completed or not) ANCOVA (with post-test MVS scores, centred, as the covariate) revealed no main effect of pre-test completion ($F(1,452) = 0.162$, $p = .687$, $\eta_\rho^2 < 0.001$) and no condition-by-pre-test completion interaction ($F(4,452) = 0.876$, $p = .478$, $\eta_\rho^2 = 0.008$), confirming that pre-test (de-)sensitisation did not occur.

After removing pre-test completion from the model, the covariate (mate value) accounted for significant variance in the model ($F(1,462) = 144.9$, $p < .001$, $\eta_\rho^2 = 0.239$). We also observed a significant main effect of condition ($F(4,462) = 2.521$, $p = .040$, $\eta_\rho^2 = 0.021$) and a significant condition-by-mate value interaction ($F(4,462) = 4.191$, $p = .002$, $\eta_\rho^2 = 0.035$). Since interactions with the covariate can compromise the reliability of a factor's main effect (via violation of the assumption of homogeneity of regression slopes), we also ran the model with the covariate excluded and confirmed that the main effect of condition was robust ($F(4,467) = 2.501$, $p = .042$, $\eta_\rho^2 = 0.021$).

With respect to the main effect of condition, planned contrasts revealed that higher FISS1 scores were observed after participants viewed unattractive compared to attractive faces ($p = .004$), although FISS1 scores in the control condition differed only from those in the unattractive condition ($p = .048$), not from those in the attractive condition ($p = .737$), suggesting that the effect of attractiveness manifested primarily as an increase in self-reported facial attractiveness following viewing of unattractive faces, rather than a decrease following attractive face viewing. No effects of make up (comparing made-up to non-made-up conditions, and both of these to the control condition) were observed (all $p > .380$).

The condition-by-mate value interaction suggests that the patterns reported above were moderated by participant mate value. To illustrate these patterns of moderation we performed a median split and designated those participants with post-test MVS scores of 18 or above as "high" and those with 17 or below as "low". Replacing the MVS covariate in the above model with a 2-level (high vs low) mate-value factor permitted planned contrasts to be calculated. As predicted the simple effect of make-up was significant for high mate value women viewing attractive faces ($p = .043$), but not when viewing unattractive faces ($p = .571$), and not for low mate value women when viewing either attractive ($p = .130$) or unattractive ($p = .571$) faces (see Fig. 3).

Table 2
Pearson product moment correlations between pre-test measures and age, for those participants ($N = 236$) who completed the pre-test measures. Cronbach's alphas are shown on the diagonal.

Measure	MVS	RSES	BISS	FISS1
MVS	0.901			
RSES	0.589**	0.909		
BISS	0.622**	0.527**	0.884	
FISS1	0.427**	0.351**	0.437**	–
Age	0.013	0.261**	−0.096	−0.051

** $p < .001$.

Table 3
Pearson product moment correlations between post-test measures and age, for those participants (N = 236) who completed the post-test measures only and for all participants ($N = 472$) combined. Cronbach's alphas are shown on the diagonals.

Group	Measure	MVS	RSES	BISS	FISS1
Completed pre- and post-test measures	MVS	0.925			
	RSES	0.588**	0.918		
	BISS	0.642**	0.501**	0.866	
	FISS1	0.442**	0.305**	0.465**	–
	Age	−0.018	0.263**	−0.083	−0.096
Completed post-test measures only	MVS	0.915			
	RSES	0.601**	0.906		
	BISS	0.659**	0.489**	0.879	
	FISS1	0.505**	0.396**	0.502**	–
	Age	−0.086	0.204**	−0.169*	−0.007
All participants combined	MVS	0.919			
	RSES	0.594**	0.913		
	BISS	0.651**	0.494**	0.872	
	FISS1	0.476**	0.349**	0.485**	–
	Age	−0.049	0.240**	−0.123*	−0.052

* $p < .01$.
** $p < .001$.

3.2.4. Effects on body image (BISS scores)

Considering first the post-test scores from all participants, a 5 (condition) x 2 (pre-test completed or not) ANCOVA (with post-test MVS scores, centred, as the covariate) revealed no main effect of pre-test completion ($F(1,452) = 0.264$, $p = .608$, $\eta_\rho^2 = 0.001$) and no condition-by-pre-test completion interaction ($F(4,452) = 0.522$, $p = .719$, $\eta_\rho^2 = 0.005$), confirming that pre-test (de-)sensitisation did not occur.

After removing pre-test completion from the model, the covariate (mate value) accounted for significant variance in the model ($F(1,462) = 335.4$, $p < .001$, $\eta_\rho^2 = 0.421$). We observed neither a significant main effect of condition ($F(4,462) = 0.981$, $p = .418$, $\eta_\rho^2 = 0.008$) nor a significant condition-by-mate value interaction ($F(4,462) = 1.919$, $p = .106$, $\eta_\rho^2 = 0.016$).

Moving then to examine data from the two halves of the design separately, we conducted a 5 (test condition) x 2 (pre-test/post-test) mixed ANCOVA (with post-test mate value scores, centred, as the covariate) on the BISS scores from only those participants who completed both the pre-test and post-test measures. Again, the covariate (mate value) accounted for significant variance in the model ($F(1,226) = 182.2$, $p < .001$, $\eta_\rho^2 = 0.446$). We did not, however observe significant pre-test/post-test-by-condition ($F(4,226) = 0.243$, $p = .914$, $\eta_\rho^2 = 0.004$) or pre-test/post-test-by-condition-by-mate value ($F(4,226) = 0.213$, $p = .931$, $\eta_\rho^2 = 0.004$) interactions.

We then performed a one-way (test condition: 5 levels) ANCOVA (with post-test mate value scores, centred, as the covariate) on the post-test BISS scores from just those participants who completed only the post-test measures. Again, the covariate (mate value) accounted for significant variance in the model ($F(1,226) = 174.0$, $p < .001$, $\eta_\rho^2 = 0.435$). There was also no significant main effect of condition ($F(4,226) = 0.667$, $p = .616$, $\eta_\rho^2 = 0.012$), and no significant condition-by-mate value interaction ($F(4,226) = 0.585$, $p = .673$, $\eta_\rho^2 = 0.010$).

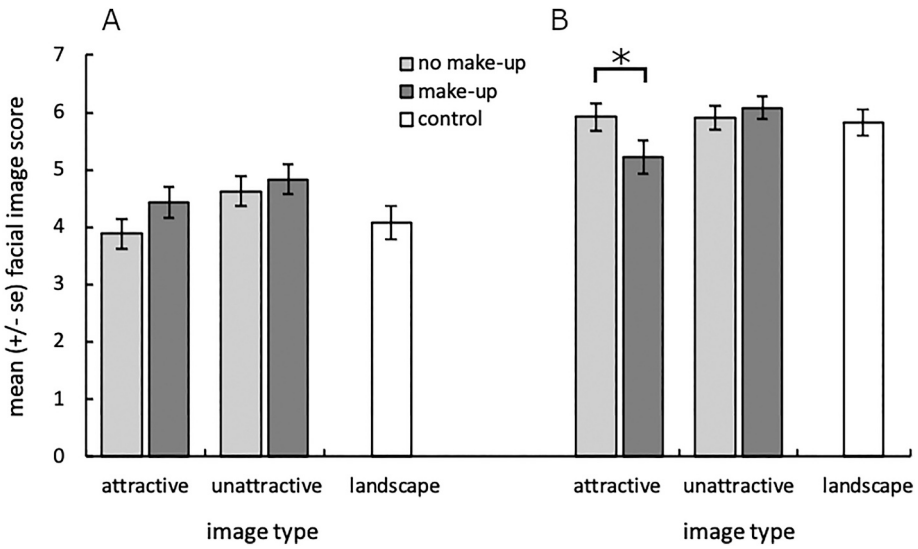

Fig. 3. Shows the effects of viewing attractive or unattractive female faces, with or without digitally applied make-up (or control landscape images) on self-reported facial attractiveness (FISS1 scores), for women of low and high self-reported mate-value separately. Only women of high self-reported mate value lowered their own reported facial attractiveness in response to digitally applied make-up, and only when it was applied to highly attractive faces. *$p < .05$.

Meta-analytically combining the outcomes from these two analyses confirmed that the data contain no evidence that condition influenced post-test BISS scores ($p_{meta} = 0.666$), or that mate-value moderated any potential impacts of condition on post-test BISS scores ($p_{meta} = 0.719$).

3.2.5. Effects on self-esteem (RSES scores)

Considering first the post-test scores from all participants, a 5 (condition) x 2 (pre-test completed or not) ANCOVA (with post-test MVS scores, centred, as the covariate) revealed no main effect of pre-test completion ($F(1,452) = 2.224$, $p = .137$, $\eta_\rho^2 = 0.005$) and no condition-by-pre-test completion interaction ($F(4,452) = 1.342$, $p = .253$, $\eta_\rho^2 = 0.012$), confirming that pre-test (de-)sensitisation did not occur.

After removing pre-test completion from the model, the covariate (mate value) accounted for significant variance in the model ($F(1,462) = 251.3$, $p < .001$, $\eta_\rho^2 = 0.352$). We observed neither a significant main effect of condition ($F(4,462) = 1.459$, $p = .214$, $\eta_\rho^2 = 0.012$) nor a significant condition-by-mate value interaction ($F(4,462) = 0.502$, $p = .734$, $\eta_\rho^2 = 0.004$).

Moving then to examine data from the two halves of the design separately, we conducted a 5 (test condition) x 2 (pre-test/post-test) mixed ANCOVA (with post-test mate value scores, centred, as the covariate) on the RSES scores from only those participants who completed both the pre-test and post-test measures. Again, the covariate (mate value) accounted for significant variance in the model ($F(1,226) = 120.3$, $p < .001$, $\eta_\rho^2 = 0.347$). We did not, however observe significant pre-test/post-test-by-condition ($F(4,226) = 0.880$, $p = .477$, $\eta_\rho^2 = 0.015$) or pre-test/post-test-by-condition-by-mate value ($F(4,226) = 0.864$, $p = .487$, $\eta_\rho^2 = 0.015$) interactions.

We then performed a one-way (test condition: 5 levels) ANCOVA (with post-test mate value scores, centred, as the covariate) on the post-test RSES scores from just those participants who completed only the post-test measures. Again, the covariate (mate value) accounted for significant variance in the model ($F(1,226) = 129.1$, $p < .001$, $\eta_\rho^2 = 0.364$). There was also no significant main effect of condition ($F(4,226) = 0.668$, $p = .615$, $\eta_\rho^2 = 0.012$), and no significant condition-by-mate value interaction ($F(4,226) = 0.371$, $p = .829$, $\eta_\rho^2 = 0.007$).

Meta-analytically combining the outcomes from these two analyses confirmed that the data contain no evidence that condition influenced post-test RSES scores ($p_{meta} = 0.391$), or that mate-value moderated any potential impacts of condition on post-test RSES scores ($p_{meta} = 0.519$).

3.3. Discussion

In study 2 we investigated how participant mate-value moderated the competitive efficacy of the make-up signal. High mate value participants reported lower self-rated facial attractiveness after viewing made-up attractive faces (compared to those who viewed non-made-up attractive faces). High mate value participants were not impacted by viewing make-up on less attractive faces, and low mate-value participants were not impacted by make-up irrespective of whether they viewed highly attractive or less attractive faces. The effects of viewing made-up female faces on self-reported facial attractiveness did not extend to self-reported bodily attractiveness or to overall self-esteem. Collectively, these data confirm make-up as a potential vector for female intrasexual competition, whose competitive functions may be restricted to interactions between high mate value women, and may specifically target rivals' self-evaluations of facial attractiveness.

4. General discussion

The present paper comprises two studies investigating the potential for make-up to act as a vector for female intrasexual competition. Collectively the data suggest that make-up may signal intrasexual competitive intent in the wearer and it may impact on rivals by specifically targeting the rivals' self-perceived facial attractiveness. Such functions may be more prevalent in, or even restricted to high mate value women, with make-up serving other social functions in lower mate value women.

In study 1 we operationalised perceived intrasexual competitiveness via ratings of interpersonal aggression. Much previous research has focused on competitor derogation as the primary manifestation of female intrasexual competition. We focused on a more direct mode of competition, since face-to-face interactions provide the most obvious means by which make-up could act as a competitive signal. Direct interpersonal aggression (typically physical violence) is more commonly associated with male, rather than female, intrasexual competition (Arnocky & Carré, 2016). Verbal interpersonal aggression (teasing, name-calling) is ubiquitous, however, among school-aged girls and plays a key-role in determining female social hierarchies (Archer & Coyne, 2005). Similarly, relational aggression (gossiping, and social and professional ostracism) is common in girls and among adult female colleagues in the workplace. We suggest that the stratified female

hierarchies, which these acts of interpersonal and relational aggression define and maintain, are a key component of female intrasexual competition. Based on the current data, make-up likely plays a role in female intrasexual competition via these interpersonal interactions.

Theories of sex differences in leadership positions suggest that (among other factors) women may disproportionately self-select out of leadership positions (Ertac & Gurdal, 2012; Reuben, Sapienza, & Zingales, 2015). Moreover, female (and male) leaders who have self-selected into their leadership roles, may out-perform leaders who have had such roles assigned to them (Chakraborty & Serra, 2017). If make-up signals a desire for social dominance, this could explain why made-up women are perceived as having greater leadership potential, than are non-made-up women. It does not, however, account for why highly attractive women would not also benefit from the same effect. It is possible that the simultaneous increase in perceived interpersonal aggression of made-up attractive faces, negatively impacted their perceived leadership potential, since aggressive, authoritarian leaders (who encourage a clear division between leaders and subordinates, and demand absolute obedience Cheng, Chou, Wu, Huang, & Farh, 2004) tend to produce dissatisfied sub-ordinates and increased deviant workplace behaviour (Jiang, Chen, Sun, & Yang, 2017).

In study 2 the effects of viewing make-up on self-perceived attractiveness were limited to facial attractiveness. As in previous studies we also observed impacts of the attractiveness of the stimuli faces, independently of their made-up status, on self-perceived facial attractiveness. Women who viewed less attractive faces rated their own facial attractiveness to be higher than women who viewed more attractive faces, and women who viewed control (landscape) stimuli. Unlike in some prior studies, however, where impacts of viewing attractive others has generalised beyond the specific attractive trait perceived, in the present study these effects too, were limited only to self-perceived facial attractiveness. There were no observed effects of either stimulus attractiveness or make-up on bodily attractiveness, or on broader self-esteem.

Make-up is primarily marketed as a tool to increase female attractiveness. In study 1, even though we did not apply the digital make-up with the goal of masking any facial flaws or otherwise increasing attractiveness, the made-up faces were nevertheless judged as more attractive by our female participants. Therefore, make-up also likely plays a less direct role in female intrasexual competition via within-sex attractiveness judgements. Mate value is a relative judgement, and women adjust their mate preferences in accord with their own self-perceived mate value (Williams & Sulikowski, 2020). Perceiving other women as more attractive than they are could therefore lead to lower self-perceived mate value and lower mate-choice standards. In study 2, however, we used stimuli whose attractiveness differed minimally, and not significantly, between the made-up and non-made-up versions. Such choice of stimuli for study 2 was crucial to be able to de-couple the effects of make-up per se, from the effects of attractiveness increase that make-up (typically) induces. The impact of make-up on perceived interpersonal aggression observed in the current data is therefore unrelated to make-up's impact on facial attractiveness. There are then (at least) two independent mechanisms through which make-up facilitates female intrasexual competition – increased perceived attractiveness and increased perceived aggression of the wearer.

In the current study, make-up's function as a signal of interpersonal aggression was restricted to highly attractive, high mate value women. Only in less attractive women did we observe that make-up increased judgements of leadership potential. Women's use of make-up as an intrasexual signal may therefore depend on their own mate quality. It may be used competitively only by high quality women. A further possibility is that make-up plays a variety of social signalling roles for women across a variety of contexts. In the present study, no social context was provided to participants to support their judgements. In the absence of such contextual cues, it may be that the more attractive stimuli women were more likely to be viewed as intra-sexually competitive (Polo et al., 2019) by a larger proportion of participants. To properly examine how physical attractiveness, mate value, and social context interact to determine the social signalling properties of make-up, future studies need to examine in detail how women of various attractiveness levels and social status wear make-up across a variety of social contexts; and how this affects others' interpersonal perceptions of the wearer.

For any social signal to function adaptively it must manipulate the behaviour of the receiver in a manner that benefits the signaller. In study 2 we observed that (high mate value) women perceiving make-up on the faces of other (high mate value) women subsequently reported lower own facial attractiveness than women who viewed non-made-up faces. The benefits of such effects to the make-up wearer presumably lie in how self-perceived attractiveness impacts the mate-attraction, mate-choice, and/or mate-retention behaviours of other women. Perceiving make-up on a potential rival may also influence such behaviours without influencing self-perceived attractiveness. Future investigations should examine whether make-up on a rival makes other women more likely to withdraw themselves from socially competitive mate-choice or mate-attraction scenarios. The context of such scenarios may also be critical. Since men rely on more on facial cues (as opposed to body cues) to make suitability judgements for potential long-term, compared to short-term, relationships (Confer, Perilloux, & Buss, 2010; Wagstaff, Sulikowski, & Burke, 2015) make-up may be employed more often as an intrasexually targeted competitive cue in short-term relationship contexts; but as an intersexually targeted self-promotional tactic in long-term relationship contexts. Future work should address this possibility.

The current study was framed to participants as an investigation into memory for faces, to minimise the possibility that demand characteristics could account for our findings. Further, we also refrained from including any specific intrasexual competitive contextual cues (such as including men as stimuli, or as priming the female stimuli (in study 2) as mating competitors. Such design decisions eliminated as many possible alternative interpretations for our findings as we could (including that any impacts the dependent variables may have been direct responses to the presence of men, rather than to women), but may also have decreased the effects sizes we observed. Studies designed to incorporate contextual cues to intrasexual competition, may reveal larger effects than reported here. They could also reveal that such effects extend to medium and lower mate value women, albeit to a lesser extent than observed for high mate value women.

In this study we observed that made-up female faces were observed as more interpersonally aggressive if they were highly attractive, but to exhibit more leadership potential if they were less attractive. When high mate value participants observed attractive female faces that were made-up (compared to observing non-made-up attractive female faces), they down-regulated their own self-reported facial attractiveness. We suggest that make-up facilitates female intrasexual competition, especially among high mate value women, by independently affecting perceived physical attractiveness and perceived social aggression. Future research needs to ascertain how mate value (of both the wearer and the perceiver) and social context interact to influence make-up's signalling functions. It should also investigate whether make-up on a rival influences other women's mate-choice relevant behaviour independently of influencing their self-perceived attractiveness.

CRediT authorship contribution statement

Danielle Sulikowski: Conceptualization, Methodology, Formal analysis, Visualization, Writing – original draft, Supervision. **Michelle Ensor:** Conceptualization, Methodology, Writing – original draft. **Danielle Wagstaff:** Conceptualization, Formal analysis, Writing – review & editing.

Acknowledgements

We wish to thank Prof. Colin Tredoux (Dept. Psychology, UCT) for providing us with the face photographs we used to create the stimuli for these experiments.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.111275.

References

Adler, P. A., & Adler, P. (1995). Dynamics of inclusion and exclusion in preadolescent cliques. *Social Psychology Quarterly*, 145–162.

Archer, J., & Coyne, S. M. (2005). An integrated review of indirect, relational, and social aggression. *Personality and Social Psychology Review, 9*(3), 212–230.

Arnocky, S., & Carré, J. M. (2016). Intrasexual rivalry among men. In *Encyclopedia of evolutionary psychological science*. New York: Springer. https://doi.org/10.1007/978-3-319-16999-6_874-1.

Besag, V. E. (2006). Bullying among girls: Friends or foes? *School Psychology International, 27*(5), 535–551.

Bjorkqvist, K., Lagerspetz, K. M. J., & Kaukiainen, A. (1992). Do girls manipulate and boys fight? Developmental trends in regard to direct and indirect aggression. *Aggressive Behavior, 18*, 117–127.

Braver, M. W., & Braver, S. L. (1988). Statistical treatment of the Solomon four-group design: A meta-analytic approach. *Psychological Bulletin, 104*(1), 150–154.

Buss, D. M. (1988). The evolution of human intrasexual competition: Tactics of mate attraction. *Journal of Personality and Social Psychology, 54*(4), 616–628.

Cash, T. F., Cash, D., & Butters, J. W. (1983). "Mirror, mirror, on the wall….?" Contrast effects and self-evaluations of physical attractiveness. *Personality and Social Psychology Bulletin, 9*(3), 351–358. https://doi.org/10.1177/0146167283093004.

Cash, T. F., Dawson, K., Davis, P., Bowen, M., & Galumbeck, C. (1989). Effects of cosmetics use on the physical attractiveness and body image of American college women. *The Journal of Social Psychology, 129*(3), 349–355.

Cash, T. F., Fleming, E. C., Alindogan, J., Steaman, L., & Whitehead, A. (2002). Beyond body image as a trait: The development and validation of the body image states scale. *Eating Disorders, 10*, 103–113. https://doi.org/10.1080/10640260290081678.

Chakraborty, P., & Serra, D. (2017). Gender differences in leadership: An experiment. 13th annual conference on economic growth and development, Indian Statistical Institute, New Delhi, December 2017.

Cheng, B. S., Chou, L. F., Wu, T. Y., Huang, M. P., & Farh, J. L. (2004). Paternalistic leadership and subordinate responses: Establishing a leadership model in Chinese organizations. *Asian Journal of Social Psychology, 7*, 89–117. https://doi.org/10.1111/j.1467-839X.2004.00137.x.

Confer, J. C., Perilloux, C., & Buss, D. M. (2010). More than just a pretty face: Men's priority shifts toward bodily attractiveness in short-term versus long-term mating contexts. *Evolution and Human Behavior, 31*(5), 348–353.

Cox, A., & Fisher, M. (2008). A framework for exploring intrasexual competition. Journal of Social, Evolutionary, and Cultural Psychology, 144–155. doi:https://doi.org/10.1037/h0099348.

Dellasega, C. A. (2009). Bullying among nurses. *The American Journal of Nursing, 109*(1), 52–58.

Dion, K. K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology, 24*, 285–290. https://doi.org/10.2307/3033549.

Edlund, J. E., & Sagarin, B. J. (2014). The mate value scale. *Personality and Individual Differences, 64*, 72–77. https://doi.org/10.1016/j.paid.2014.02.005.

Ertac, S., & Gurdal, M. Y. (2012). Deciding to decide: Gender, leadership and risk-taking in groups. *Journal of Economic Behavior & Organization, 83*, 24–30.

Etcoff, N. L., Stock, S., Haley, L. E., Vickery, S. A., & House, D. M. (2011). Cosmetics as a feature of the extended human phenotype: Modulation of the perception of biologically important facial signals. *PLoS One, 6*(10), Article e25656. https://doi.org/10.1371/journal.pone.0025656.

Fisher, M., & Cox, A. (2009). The influence of female attractiveness on competitor derogation. *Journal of Evolutionary Psychology, 7*, 141–155. https://doi.org/10.1556/JEP.7.2009.2.3.

Fisher, M., & Cox, A. (2011). Four strategies used during intrasexual competition for mates. *Personal Relationships, 18*, 20–38. https://doi.org/10.1111/j.1475-6811.2010.01307.x.

Gray-Little, B., Hancock, T. D., & Williams, V. S. L. (1997). An item response theory analysis of the Rosenberg self-esteem scale. *Personality and Social Psychology Bulletin, 23*, 443–451. https://doi.org/10.1177/0146167297235001.

Grogan, S., Williams, Z., & Conner, M. (1996). The effects of viewing same-gender photographic models on body-esteem. *Psychology of Women Quarterly, 20*(4), 569–575.

Guéguen, N. (2012). Color and women attractiveness: When red clothed women are perceived to have more intense sexual intent. *The Journal of Social Psychology, 152*(3), 261–265.

Hoburg, R., Konik, J., Williams, M., & Crawford, M. (2004). Bisexuality among self-identified heterosexual college students. *Journal of Bisexuality, 4*, 25–36. https://doi.org/10.1300/J159v04n01_03.

Hrdy, S. B. (1981). *The woman that never evolved*. Cambridge, MA: Harvard University Press.

Huguet, P., Croizet, J. C., & Richetin, J. (2004). Is "what has been cared for" necessarily good? Further evidence for the negative impact of cosmetics use on impression formation. *Journal of Applied Social Psychology, 34*(8), 1752–1771.

Jiang, H., Chen, Y., Sun, P., & Yang, J. (2017). The relationship between authoritarian leadership and employees' deviant workplace behaviors: The mediating effects of psychological contract violation and organizational cynicism. *Frontiers in Psychology, 8*. https://doi.org/10.3389/fpsyg.2017.00732.

Little, A. C., & Mannion, H. (2006). Viewing attractive or unattractive same-sex individuals changes self-rated attractiveness and face preferences in women. *Animal Behaviour, 72*, 981–987. https://doi.org/10.1016/j.anbehav.2006.01.026.

Mafra, A. L., Varella, M. A. C., Defelipe, R. P., Anchieta, N. M., de Almeida, C. A. G., & Valentova, J. V. (2020). Makeup usage in women as a tactic to attract mates and compete with rivals. *Personality and Individual Differences, 163*, Article 110042.

Miller, L., & Cox, C. (1982). For appearance's sake: Public self-consciousness and makeup use. *Personality and Social Psychology Bulletin, 8*, 748–751.

Molloy, K., & Wagstaff, D. (2021). Effects of gender, self-rated attractiveness, and mate value on perceptions tattoos. *Personality and Individual Differences, 168*, Article 110382.

Mulhern, R., Fieldman, G., Hussey, T., Leveque, J. L., & Pineau, P. (2003). Do cosmetics enhance female Caucasian facial attractiveness? *International Journal of Cosmetic Science, 25*, 199–205. https://doi.org/10.1046/j.1467-2494.2003.00188.x.

Polo, P. P., Munoz-Reyes, J. A., Tapia, A. M. F., Wilson, J. E., & Turiégano, E. (2019). Self-perceived mate value influences intrasexual competitiveness attitudes in young people of both sexes. *Evolution, Mind and Behaviour, 17*(1), 1–9.

Reuben, E., Sapienza, P., and Zingales, L. (2015). Taste for competition and the gender gap among young business professionals. Technical report, National Bureau of Economic Research.

Roberts, S. C., Little, A. C., Gosling, L. M., Perrett, D. I., Carter, V., Jones, B. C., … Petrie, M. (2005). MHC-heterozygosity and human facial attractiveness. *Evolution and Human Behavior, 26*, 213–226.

Rosenberg, M. (1965). Rosenberg self-esteem scale (RSE). *Acceptance and commitment therapy: Measures package, 61*(52), 18.

Russell, R. (2009). A sex difference in facial contrast and its exaggeration by cosmetics. *Perception, 38*(8), 1211–1219.

Schmitt, D. P., & Buss, D. (1996). Strategic self-promotion and competitor derogation: Sex and context effects on the perceived effectiveness of mate attraction tactics. *Journal of Personality and Social Psychology, 70*(6), 1185–1204. https://doi.org/10.1037//0022-3514.70.6.1185.

Schmitt, D. P., & Buss, D. M. (2001). Human mate poaching: Tactics and temptations for infiltrating existing mateships. *Journal of Personality and Social Psychology, 80*(6), 894.

Sherlock, J. M., Tegg, B., Sulikowski, D., & Dixson, B. J. (2017). Facial masculinity and beardedness determine men's explicit, but not their implicit, responses to male dominance. *Adaptive Human Behavior and Physiology, 3*(1), 14–29.

Sherlock, M., & Wagstaff, D. L. (2019). Exploring the relationship between frequency of Instagram use, exposure to idealized images, and psychological well-being in women. *Psychology of Popular Media Culture, 8*(4), 482–490.

Thomas, A. G., Jonason, P. K., Blackburn, J. D., Kennair, L. E. O., Lowe, R., Malouff, J., … Li, N. P. (2020). Mate preference priorities in the east and west: A cross-cultural test of the mate preference priority model. *Journal of Personality, 88*(3), 606–620.

Thornton, B., & Moore, S. (1993). Physical attractiveness contrast effect: Implications for self-esteem and evaluations of the social self. *Personality and Social Psychology Bulletin, 19*(4), 474–480. https://doi.org/10.1177/0146167293194012.

Wagstaff, D. L. (2018). Comparing mating motivations, social processes, and personality as predictors of women's cosmetics use. *Evolutionary Behavioral Sciences, 12*(4), 367–380.

Wagstaff, D. L., Sulikowski, D., & Burke, D. (2015). Sex-differences in preference for looking at the face or body in short-term and long-term mating contexts. *Evolution, Mind and Behaviour, 13*(1), 1–17. https://doi.org/10.1556/2050.2015.0003.

Walters, S., & Crawford, C. B. (1994). The importance of mate attraction for intrasexual competition in men and women. *Ethology and Sociobiology, 15*, 5–30. https://doi.org/10.1016/0162-3095(94)90025-6.

Williams, M., & Sulikowski, D. (2020). Implicit and explicit compromises in long-term partner choice. *Personality and Individual Differences, 166*, 110226.