

Own attractiveness and dissatisfaction with physical appearance independently predict the salience of facial cues to size when women judge other women's attractiveness

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1 **Own attractiveness and dissatisfaction with physical appearance independently**
2 **predict the salience of facial cues to size when women judge other women's**
3 **attractiveness**

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19 **predict the salience of facial cues to size when women judge other women's**
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21

22 **Abstract**

23 While facial cues to body size are a valid guide to health and attractiveness, it is
24 unclear whether the observer's own condition predicts the salience of (low) size as a
25 cue to female attractiveness. The current study examines whether measures related
26 to women's own attractiveness/appearance predict the extent to which they use facial
27 cues to size to differentiate other women on the attractiveness dimension. Women
28 completed a BMI preference task, where they indicated their preference for high-
29 versus low-BMI versions of the same woman, provided data to calculate their BMI and
30 completed various psychometric measures (self-rated attractiveness/health,
31 dissatisfaction with physical appearance). Here, attractive women and women who
32 were dissatisfied with their own appearance were more likely to associate facial cues
33 to *low* body size with *high* attractiveness. These data suggest that psychological
34 factors related to women's appearance shape their evaluations of other women based
35 on cues to size. Such variation in attractiveness judgements may function to reduce
36 the costs of female competition for resources, for example, by identifying 'quality' rivals
37 and/or excluding others based on cues to size.

38

39 **Key Words:** BMI, face perception, attractiveness, female competition, indirect
40 aggression

41 **Introduction**

42 Women compete with other women based on their desirability to potential mates via
43 methods of indirect aggression such as self-promotion and denigration (Vaillancourt,
44 2013) and, on average, are more sensitive to social exclusion than men (Benenson et
45 al., 2013). Moreover, behaviours related to women's body image, such as eating
46 behaviours, appear to be related to their competitiveness around other women
47 (reviewed in Vaillancourt, 2013). Body-mass index (BMI) predicts health (Finucane et
48 al., 2011) and is negatively correlated with women's attractiveness, explaining a large
49 proportion of the variance in female physical attractiveness (Tovée et al., 1998). Facial
50 cues provide a valid guide to body size (Coetzee et al., 2009) and measures of health
51 (Rantala et al., 2013; reviewed in Re & Rule, 2016) and facial cues to low BMI are
52 perceived as attractive (e.g., Han et al., 2016). As individuals can accurately gauge
53 BMI from facial adiposity alone (Coetzee et al., 2009), women may use *facial* cues to
54 body size during day-to-day interaction to assess competitors for mates on the
55 attractiveness dimension, particularly as women's sartorial appearance may be used
56 to conceal or accentuate certain bodily features (Grogan et al., 2013). Indeed, features
57 of clothing such as patterning may alter the apparent size of the wearer (Thompson &
58 Mikellidou, 2011) and laboratory studies on social judgements of bodies typically
59 enhance *internal* validity by examining ratings of individuals in tight-fitting clothing
60 (e.g., Stephen & Perera, 2014). Given the importance of facial cues for social
61 interaction (Currie & Little, 2009; Furnham et al., 2001), tests of variation in
62 attractiveness judgements of rivals for mates based on (more subtle) facial cues to
63 body size arguably enhance *external* validity, given that facial cues are easier to
64 access during social interaction.

65 Attractive women are thought to be effective competitors for mates due to their
66 'market demand' (e.g., Wincenciak et al., 2015) and thus may be more likely to
67 promote themselves over rivals or denigrate other rivals (see Vaillancourt, 2013).
68 However, it is unclear if psychological or objective measures of women's own
69 attractiveness predict the extent to which they use facial cues to body size to
70 differentiate female rivals on the attractiveness dimension. The current study
71 examines this, in light of a prior framework where social judgements of the
72 attractiveness of same-sex rivals varies in light of the functional benefits of identifying
73 those rivals (e.g. when competition for mates might be particularly intense; Watkins et
74 al., 2012).

75 If *attractive* women have a stronger preference for facial cues to low size, this
76 would suggest that they are more sensitive to effective competitors for mates and/or
77 weaken social effort toward less attractive rivals based on cues to size. Alternately, if
78 *less attractive* women have a stronger preference for facial cues to low size, this would
79 suggest that low 'market value' women are more sensitive to effective competitors for
80 mates. To test whether this prediction merely reflects preferences for size similarity or
81 similar apparent health in other women, or if psychological factors make unique
82 contributions to women's evaluations of other women, other variables related to own
83 appearance and 'quality' are examined. Here, self-ratings of attractiveness relative to
84 a *typical* individual may have effects on women's perceptions of other women that are
85 independent of their (dis)satisfaction with their appearance, if visual exposure to
86 women who differ *systematically* from average shape/size (i.e. via media; Sarwer et
87 al., 2004; Voracek & Fisher, 2002, 2006) is related to appearance concerns (see
88 Grabe et al., 2008; Stephen and Perera 2014), and is motivated by female competition
89 as opposed to female mate choice (Vaillancourt, 2013; see also Mealey, 2000).

90

91 **Methods**92 ***Face stimuli***

93 Women were photographed in a standardized setup with neutral expression and direct
94 gaze. High-BMI and low-BMI versions of the same woman were manufactured using
95 established techniques (e.g., Perrett et al., 1998), with 50% of the linear differences in
96 2D shape between symmetrized versions of a high-BMI female prototype ($M_{\text{age}}=25$
97 years, $SD=3.57$ years; $M_{\text{BMI}}=24.81\text{kg/m}^2$, $SD=0.45\text{kg/m}^2$) and low-BMI female
98 prototype ($M_{\text{age}}=22$ years, $SD=2.15$ years; $M_{\text{BMI}}=17.24\text{kg/m}^2$, $SD=5.95\text{kg/m}^2$) added
99 to or subtracted from digital face images of 7 young White adult women ($M_{\text{age}}=21.86$
100 years, $SD=1.78$ years). The constituents of each face prototype (10 faces,
101 downloaded separately from 3d.sk; see, e.g., Fruhen et al., 2015) had accompanying
102 height/weight data (the top/bottom 20% of full face set ordered by BMI). The mean
103 BMI of the 'high' prototype was greater than that of the 'low' prototype ($t(9.11)=4.01$;
104 $p<.01$, $d=2.66$).

105 The resultant high-BMI and low-BMI versions of the individual face images differ
106 in size aspects of 2D shape but are identical in other regards (see Figure 1). This
107 process created 7 pairs of female faces, with each pair consisting of a high- and low-
108 BMI version of the same individual. Images were standardized on pupil position,
109 resized (300x400 pixels) and presented adjacently (labels 'Image A' and 'Image B'
110 above the left/right image respectively).

111 In a manipulation check, 17 raters (5 males, $M_{\text{age}}=26.06$ years, $SD=8.11$ years)
112 judged the larger of the two faces within each pair (response options: 'slightly larger',
113 'somewhat larger', 'larger', 'much larger'). High scores on the task (4-7) reflected a
114 stronger tendency to associate the high-BMI face with larger size and, conversely,

115 lower scores (0-3) reflected a stronger tendency to associate the low BMI face with
116 larger size. The shape manipulation altered perceived size in the expected direction
117 ($M_{\text{Perceived Size}}=4.80$, $SEM=.04$, $t(6)=36.08$; $p<.001$, $d=13.64$).



118
119 **Figure 1.** Example high- (left) and low- (right) BMI versions of the same woman.

120

121 ***Participants and procedure***

122 Seventy-nine women ($M_{\text{age}}=27.26$ years, $SD=10.87$ years, one woman later excluded
123 for not completing all trials), recruited via adverts and our research participation
124 scheme (awarded either £5 or course credit), took part in a BMI preference task, with
125 each trial consisting of a high-BMI and low-BMI version of the same woman.
126 Participants indicated which face in the pair they rated as more attractive and how
127 much more attractive they rated their chosen face. Trial order was fully randomized
128 and the side of the screen on which the high-BMI face was presented was

129 counterbalanced. Bi-items analyses where the stimulus served as the unit of analysis
130 confirmed that low BMI versions of women's faces were perceived as more attractive
131 than high BMI versions of women's faces ($t(6)=4.86$; $p<.01$, $d=1.84$).

132 Participants also took part in a separate randomized face judgement task
133 unrelated to the current study and, following these tasks, a battery of questionnaires
134 run on surveymonkey.com (estimated height to nearest centimetre; self-rated
135 attractiveness/health on a 1 (much less than average) to 7 (much more than average)
136 scale). Self-rated attractiveness is correlated with objective measures of
137 attractiveness and attractiveness ratings of face photographs (Weeden & Sabini,
138 2007) and prosocial biases toward attractive individuals in naturalistic contexts (e.g.,
139 tipping; Lynn, 2009). Participants completed single-item measures of i) general body
140 dissatisfaction and ii) overall appearance dissatisfaction using a paper-based 10cm
141 visual analogue scale (i.e. 0 to 100 scale) with the anchor points 'None' and 'Very
142 much' (Heinberg & Thompson, 1995; $M_{\text{Body dissatisfaction}}=50.76$, $SD=24.80$, Range=8-
143 100; $M_{\text{Overall appearance dissatisfaction}}=47.22$, $SD=23.73$, range=5-100). This instrument is
144 validated against the body satisfaction subscale of the Eating Disorder Inventory
145 (Garner et al., 1983). Weight was also measured (Weight Watchers 8991BU precision
146 body analyser electronic scale; $M_{\text{BMI}}=24.41$ kg/m², $SD=5.03$ kg/m², range=16.88-
147 43.12 kg/m²). Participants were then thanked, debriefed and reimbursed or awarded
148 credit. All procedures were granted full Ethical approval.

149

150 ***Coding of responses to faces***

151 Low-BMI face rated 'much more' (=0), 'more' (=1), 'somewhat more' (=2), or 'slightly
152 more' (=3) attractive than the high-BMI face.

153 High-BMI face rated 'slightly more' (=4), 'somewhat more' (=5), 'more' (=6), or 'much
154 more' (=7) attractive than the low-BMI face.

155 This data was used to calculate participant's average score on the BMI
156 preference task. High scores indicate a stronger preference for facial cues to *high* BMI.

157

158 Results

159 When compared against chance (i.e. 3.5) women generally preferred low-BMI version
160 of women's faces ($M=2.63$, $SEM=.08$; $t(77)=10.92$; $p<.001$, $d=1.24$). Simple
161 correlations are reported in Table 1. As the two dissatisfaction measures were highly
162 correlated, a new variable was created (dissatisfaction with physical appearance) by
163 averaging scores on the two scales.

164

165 **Table 1.** Correlations (ρ) between predictor variables and outcome variable (Ns
166 between 65 and 79).

	Preference for high BMI	Self-rated attractiveness	BMI (kg/m ²)	Body dissatisfaction	Overall appearance dissatisfaction
Preference for high BMI					
Self-rated attractiveness	-.365*				
BMI (kg/m ²)	.410*	-.428*			
Body dissatisfaction	.107	-.486*	.267*		
Overall appearance dissatisfaction	.051	-.539*	.271*	.793*	
Self-rated health	-.176	.331*	-.297*	-.512*	-.435*

167

168 Multiple regression analyses were conducted on preference for high BMI in women's
169 faces, with self-rated attractiveness entered in the first block, and own BMI,
170 dissatisfaction with physical appearance and self-rated health entered simultaneously
171 in the second block. Multicollinearity was not a cause for concern (Average VIF= 1.51,

172 all VIF<1.65, all tolerance scores >.60; see Field, 2009). The first ($F(1,64)=9.68$;
173 $p<.01$) and second model ($F(4,64)=5.36$; $p=.001$) were significant and accounted for
174 13% (adjusted r square = .12) and 26% (adjusted r square = .21) of the variance in
175 the outcome variable respectively. The additional three predictors improved the
176 original model (F Change = 3.53; $p=.02$).

177 Self-rated attractiveness was negatively correlated with women's preference for
178 facial cues to high BMI in other women ($t= -3.11$, standardized beta = $-.37$; $p<.01$) and
179 remained significant in the second model ($t= -3.29$, standardized beta = $-.47$; $p<.01$).
180 BMI and self-rated health did not predict women's preference for facial cues to high
181 BMI (both absolute $t <1.77$, both absolute standardized beta $<.23$, both $p>.083$).
182 Dissatisfaction with physical appearance was a negative predictor of preference for
183 high BMI in other women ($t= -2.75$; standardized beta = $-.39$, $p<.01$). Rerunning
184 analyses with heterosexual women only revealed the same pattern of results.

185

186 Discussion

187 The current study replicates the association between attractiveness and facial cues to
188 low BMI (Han et al., 2016) and presents new evidence that self-rated attractiveness
189 and dissatisfaction with physical appearance make unique contributions to women's
190 judgements of other women. Relatively attractive women use facial cues to size to a
191 greater extent to differentiate other women on the attractiveness dimension. These
192 women were more likely to associate facial cues to *low* size with *high* attractiveness,
193 when distinguishing between altered versions of the same woman. This may function
194 to reduce the intensity of competition among female rivals by identifying attractive
195 rivals for mates and/or reducing social effort toward other women based on cues to
196 size (i.e. a potential cognitive mechanism for female exclusion or denigration;

197 Benenson et al., 2013; Vaillancourt, 2013). Critically, this relationship is not a mere by-
198 product of preferences for size similarity as the positive relationship between women's
199 own BMI and their preferences for facial cues to size was not significant when
200 controlling for other moderating factors, consistent with earlier discussion on the
201 equivocal nature of this relationship (Stephen & Perera, 2014). Indeed, women who
202 were *less satisfied* with their own appearance also used facial cues to other women's
203 size to a greater extent when judging their attractiveness. The findings reported here
204 may motivate further work on distinctions between psychological and objective
205 measures of appearance and corresponding judgements or behaviours related to
206 competitiveness within female groups.

207 It may seem counter-intuitive that women who consider themselves more
208 attractive than average and women who are dissatisfied with their appearance both
209 judge other women's attractiveness in a similar manner based on facial cues to their
210 BMI. However, there are reasons why this pattern of results might not be contradictory.
211 The measure of own attractiveness used here captures women's self-evaluation
212 against an average-looking person. By contrast, dissatisfaction with appearance is
213 correlated, at least in part, with sociocultural pressures from the media (Grabe et al.,
214 2008; see also Boothroyd et al., 2016), where the physical traits of some women in
215 the media (e.g. models) deviate *systematically* from an average female (e.g., Sarwer
216 et al., 2004; Voracek & Fisher, 2002, 2006). Indeed, female intrasexual competition,
217 rather than female attractiveness to potential mates, may be related to women's desire
218 to alter or enhance their appearance in light of the environment, as is suggested in
219 studies examining female-specific motives for thinness (Li et al., 2010). The data here
220 is consistent with this proposal, as the relationship between appearance
221 dissatisfaction and women's attractiveness judgements of other women was observed

222 after controlling for women's own BMI, suggesting a *psychological* component that
223 makes a unique contribution to women's attractiveness judgements after controlling
224 for a strong *physical* correlate of their attractiveness to other men (Tovée et al., 1998).
225 As recent work suggests a potential perceptual basis to appearance dissatisfaction in
226 the form of biased subjective perceptions of normality following exposure to body
227 images of specific size (Sturman et al., 2017), further work could examine the role that
228 visual experience plays in female attractiveness judgements of friends and same-sex
229 rivals. Collectively, these data suggest that both self-evaluations related to women's
230 effectiveness as a competitor for a mate and self-evaluations related to motives to
231 improve appearance and/or a general aversion toward cues to large size predict
232 women's attractiveness judgements of other women.

233 In sum, these findings extend work by demonstrating that the characteristics of
234 the perceiver contribute to women's judgements of facial cues to size in other women.
235 This is of utility for examining physical and psychological predictors of attractiveness
236 and their relationship to behaviours and mental processes that underpin sociality and
237 exclusion within female groups.

238

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244

245 **Author contributions**

246 Sole-authored manuscript.

247

248 **Conflict of interest**

249 The author declares no conflict of interest.

250

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