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Abstract

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4 Effects of Menstrual Cycle Phase on Face Preferences

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6 David R. Feinberg · Miriam J. Law Smith

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9 **Abstract** While many studies of face preferences have
10 emphasized high agreement among individuals about the
11 types of faces they consider attractive and unattractive,
12 other studies have demonstrated systematic variation
13 in face preferences. Here, we review the evidence that
14 women's preferences for masculinity, apparent health, and
15 self-resemblance in faces change systematically during
16 the menstrual cycle. Our review focuses on the proximate
17 mechanisms that might underpin these changes (i.e., what
18 changes in hormone levels are important for effects of
19 menstrual cycle phase) and the possible functions of these
20 changes (i.e., to maximize the likelihood that offspring
21 inherit strong immune systems or to increase the likeli-
22 hood of successful pregnancy by either promoting
23 affiliation with individuals who will provide support and
24 care during pregnancy or by promoting strategies to avoid
25 contagion during social interactions). While evidence that
26 differentiates between these two accounts of the function
27 of cyclic shifts in face preferences is currently equivocal

for masculinity preferences, there is compelling evidence 28
that the function of the effects of menstrual cycle 29
phase on preferences for apparent health and self-resem- 30
blance in faces is to increase the likelihood of successful 31
pregnancy. 32
33

Keywords Facial attractiveness · Social perception · 34
Mate preferences · Hormones · Menstrual cycle 35

Introduction 36

There is increasing evidence that changes in women's hor- 37
mone levels during the menstrual cycle affect their social 38
perceptions and preferences. Studies have demonstrated 39
subtle effects of menstrual cycle phase in women with 40
natural menstrual cycles (i.e., women not using hormonal 41
contraceptives) on their preferences for sexual dimorphism 42
in 2D face shape (e.g., Johnston, Hagel, Franklin, Fink, & 43
Grammer, 2001; Penton-Voak et al., 1999), sexual dimor- 44
phism in 2D body shape (Little, Jones, & Burriss, 2007), 45
apparent health (Jones et al., 2005a; b), and resemblance to 46
self in faces (DeBruine, Jones, & Perrett, 2005) and also for 47
vocal masculinity (e.g., Feinberg et al., 2006; Puts, 2005), 48
the odor of genetic compatibility (Wedekind, Seebeck, 49
Bettens, & Paepke, 1995), masculine behaviors (Gangestad, 50
Simpson, Cousins, Garver-Apgar, & Christensen, 2004) and 51
pheromones (Grammer, 1993). 52

Two theories predict that women might alter their pref- 53
erences during the menstrual cycle. On the one hand, women 54
may increase attraction to men displaying putative cues to 55
heritable immunity to infectious disease (i.e., possible 56
indirect benefits) during ovulation, when fertility is high. 57
On the other hand, at times when women's hormonal profile is 58
similar to that during pregnancy or when the body is 59

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60 preparing for pregnancy (e.g., the luteal phase of the men-
61 strual cycle), women may show stronger preferences for
62 characteristics in a partner or an associate that might be
63 beneficial at this time, such as social and material support or
64 reduced risk of disease (i.e., direct benefits).

65 Theories of attraction emphasizing good genes for
66 immunocompetence suggest that women should make an
67 effort to obtain a paternal genetic contribution to their off-
68 spring that maximizes offspring health (Miller & Todd,
69 1998; Thornhill & Gangestad, 1999). However, it may be
70 more important for women to secure a mate with good genes
71 for immunocompetence when they are likely to be able to
72 use these genes (i.e., when they are likely to conceive) than
73 at other times (Penton-Voak et al., 1999). If men with good
74 genes for immunocompetence require a considerable
75 amount of mating effort to obtain or if there are tradeoffs
76 between good genes for immunocompetence and other
77 desirable qualities (such as willingness to invest in their
78 offspring or partner), it would benefit women to modulate
79 their mate preferences depending on their probability of
80 conception (Fink & Penton-Voak, 2002; Gangestad &
81 Simpson, 2000). This account of the effects of menstrual
82 cycle on preferences emphasizes the possible indirect ben-
83 efits associated with mate choices (e.g., offspring inherit
84 good genes for immunocompetence).

85 A different, although not mutually exclusive, theory is
86 that the effects of menstrual cycle phase on preferences are
87 by-products of changes in hormone levels that are associated
88 with pregnancy or that are implicated in preparing the body
89 for pregnancy (DeBruine et al., 2005; Jones et al., 2005a).
90 For example, progesterone level is raised during pregnancy
91 and raised progesterone during the luteal phase of the
92 menstrual cycle prepares the body for pregnancy (Gilbert,
93 2000). Thus, effects of menstrual cycle phase on preferences
94 and perceptions may reflect mechanisms that increase the
95 success of pregnancy, such as strategies designed to protect
96 the health of mother and fetus (Jones et al., 2005a, b) or
97 strategies designed to gather social support for the mother
98 and child (DeBruine et al., 2005; Jones et al., 2005b). Under
99 this view, changes in preferences during the menstrual cycle
100 would then be explainable as by-products of pregnancy-
101 related functions. This account of the effects of menstrual
102 cycle on preferences emphasizes the possible direct benefits
103 associated with mate choices (e.g., increased contagion
104 avoidance compensates for maternal immunosuppression and
105 increased preferences for kin promote support for the
106 mother and child).

107 Next, we will review evidence that women's prefer-
108 ences for facial characteristics such as masculinity,
109 apparent health, and self-resemblance change during the
110 menstrual cycle. Finally, we will discuss the possible
111 functions of these shifting preferences in light of the
112 theories discussed above.

Masculinity

114 Masculine traits in men are thought to signal greater heri-
115 table immunity to infectious disease and lesser willingness
116 to invest in partners and offspring compared to men with
117 more feminine traits (for reviews see Fink & Penton-Voak,
118 2002; Gangestad & Simpson, 2000). Men's facial mascu-
119 linity is positively related to their long-term health
120 (estimated from medical records, Rhodes, Chan, Zebrowitz,
121 & Simmons, 2003; estimated from incidence of colds,
122 Thornhill & Gangestad, 2006) and circulating testosterone
123 level (Penton-Voak & Chen, 2004; Roney, Hanson, Durante
124 & Maestriperi, 2006). In addition to possessing masculine
125 faces, partnered men with high testosterone levels score
126 lower on a spousal investment measure than partnered men
127 with low levels of testosterone (Gray, Kahlenberg, Barrett,
128 Lipson, & Ellison, 2002). Furthermore, men with masculine
129 faces are ascribed more negative personality characteristics
130 (e.g., untrustworthy, cold personality) and are more domi-
131 nant than men with relatively feminine faces (Mazur &
132 Booth, 1998; Perrett et al., 1998).

133 Female attraction to masculine characteristics in male
134 faces (Johnston et al., 2001; Penton-Voak et al., 1999;
135 Penton-Voak & Perrett, 2000 see Fig. 1 for examples of
136 male faces with exaggerated masculine and feminine shape
137 characteristics), bodies (Little et al., 2007), voices (Fein-
138 berg et al., 2006; Puts, 2005), behavioral displays in video
139 clips (Gangestad et al., 2004), and odors (Grammer, 1993)
140 is strongest during the late follicular phase of the menstrual
141 cycle, when women are most fertile. These effects of men-
142 strual cycle phase on perceptions do not appear to occur in
143 women who are using oral contraceptives (e.g., Penton-
144 Voak et al., 1999), are most pronounced in women with
145 partners (Penton-Voak et al., 1999), and have been observed
146 in North American (Johnston et al., 2001), European (Pen-
147 ton-Voak et al., 1999), and Japanese (Penton-Voak et al.,
148 1999) samples. Table 1 summarizes the main parameters of
149 these studies of cyclic variation in women's preferences for
150 facial masculinity.

151 It would appear that female attraction to male cues
152 associated with possible indirect benefits (e.g., heritable
153 immunity to infectious disease) is enhanced when fertility is
154 high, while attraction to cues to possible direct benefits (e.g.,
155 investment) is strongest at other times. This shift in prefer-
156 ences may increase women's reproductive success by
157 increasing offspring viability (Fink & Penton-Voak, 2002;
158 Gangestad & Simpson, 2000). Women may maximize the
159 possible benefits of their mate choices by being more open
160 to short-term relationships with masculine men around
161 ovulation, when fertility is highest. Consistent with this
162 view, women generally report being more interested in
163 socializing with men around ovulation than at other times
164 (Haselton & Gangestad, 2006) and partnered women report

Fig. 1 Example of a composite male face that has been manipulated to increase (right) and decrease (left) masculinity of 2D face shape (e.g., Jones et al., 2005b; Penton-Voak et al., 1999; Perrett et al., 1998). Computer graphic methods are used to systematically and objectively alter sexual dimorphism of 2D shape in digital face images by transforming images along a continuum defined by male and female prototypes

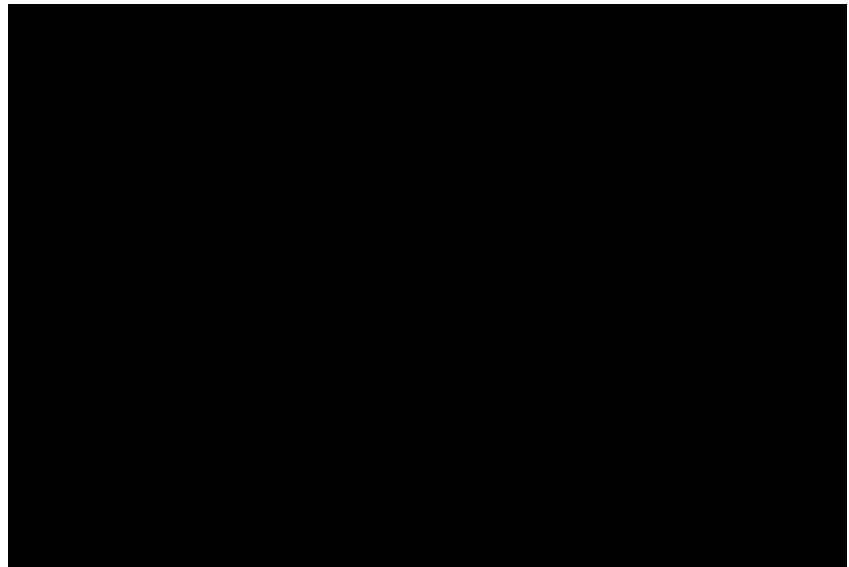


Table 1 Summary of the main parameters of studies of cyclic variation in women's preferences for masculine faces. Number of participants refers to the number of women with natural menstrual cycles in each study (i.e. women reporting no use of hormonal contraceptives)

All of these studies showed stronger attraction to masculinity around ovulation than at other times

Study	Number of participants	Design	Measurement used to assess cycle
Johnston et al. (2001)	42	Within-subjects	Diary
Jones et al. (2005b, Study 1)	93	Between-subjects	Diary
Jones et al. (2005b, Study 2)	656	Between-subjects	Diary
Penton-Voak et al. (1999, Study 1)	39	Within-subjects	Diary
Penton-Voak et al. (1999, Study 2)	43	Within-subjects	Diary
Penton-Voak and Perrett (2000)	139	Between-subjects	Diary
Welling et al. (2007)	70	Within-subjects	Diary and salivary testosterone

165 more extra-pair flirtation around ovulation than at other
 166 times (Haselton & Gangestad, 2006). Furthermore, women
 167 report greater frequency of sexual fantasy about men other
 168 than their primary partner around ovulation than during the
 169 luteal phase of the cycle (Gangestad, Thornhill, & Garver,
 170 2002). Indeed, change in preferences for masculine men
 171 during the menstrual cycle is more pronounced when
 172 women are asked to judge male faces in terms of their
 173 attractiveness for a short-term relationship (e.g., an affair)
 174 than when women are asked to judge male faces in terms of
 175 their attractiveness for a long-term relationship (e.g., mar-
 176 riage) (Johnston et al., 2001; Penton-Voak et al., 1999).
 177 Welling et al. (2007) recently found that women's prefer-
 178 ences for masculine faces were strongest on days of the
 179 menstrual cycle when levels of salivary testosterone were
 180 high, suggesting change in testosterone level may be an
 181 important hormonal mechanism for cyclic changes in
 182 women's masculinity preferences. Since raised testosterone
 183 is associated with both increased sex drive (Riley & Riley,
 184 2000) and ovulation (Alexander, Sherwin, Bancroft, &

Davidson, 1990; Bloch, Schmidt, Su, Tobin, & Rubinow, 185
 1998), Welling et al's findings are consistent with the view 186
 that increased attraction to masculine men around ovulation 187
 may function to increase offspring health. 188

While most studies of the effects of menstrual cycle 189
 phase on masculinity preferences have emphasized the 190
 possible indirect (i.e., genetic) benefits of increased attrac- 191
 tion to masculine men around ovulation (e.g., Johnston 192
 et al., 2001), recent findings have also suggested that the 193
 effect of menstrual cycle phase on preferences for masculine 194
 men may, at least partly, reflect increased attraction to 195
 possible sources of care and support when raised progester- 196
 one prepares the body for pregnancy (i.e., direct benefits). 197

Jones et al. (2005b) found that women's preferences for 198
 femininity in both male and female faces changed during the 199
 menstrual cycle. Preferences for femininity in female and 200
 male faces were stronger during the luteal phase of the 201
 menstrual cycle than at other times, and the change in 202
 preference for femininity was positively related to the esti- 203
 mated change in progesterone level. Because feminine 204

205 female and male faces are perceived as more trustworthy
 206 and “better parents” than their masculine counterparts are
 207 (e.g., Perrett et al., 1998), Jones et al. (2005b) suggested
 208 that increased attraction to feminine individuals at times
 209 when the body is preparing for pregnancy may increase the
 210 amount of support women receive during pregnancy. Puts
 211 (2006) found that increased attraction to relatively feminine
 212 voices during the luteal phase was also positively related to
 213 the estimated change in progesterone level. Jones et al’s
 214 findings demonstrating increased preferences for feminine
 215 men *and* women during the luteal phase of the menstrual
 216 cycle that is positively related to the estimated change in
 217 progesterone level point to a different (but not mutually
 218 exclusive) possible explanation of changes in women’s
 219 preferences for masculine individuals during the menstrual
 220 cycle whereby attraction to femininity increases the care and
 221 support that is available during pregnancy.

222 Many studies have demonstrated systematic variation in
 223 the magnitude of cyclic shifts in women’s masculinity
 224 preferences. For example, cyclic shifts in women’s masculin-
 225 ity preferences appear to be most pronounced in women
 226 with romantic partners (Penton-Voak et al., 1999). Addi-
 227 tionally, feminine women, as indexed by responses on a test
 228 of sex-typical attitudes (Johnston et al., 2001) or by late-
 229 follicular phase estrogen level (Welling et al., 2007) showed
 230 larger cyclic shifts in attraction to masculinity in men’s
 231 faces than did relatively masculine women. However,
 232 Feinberg et al. (2005) found that women with high average
 233 levels of estrogen showed smaller cyclic shifts in attraction
 234 to masculine voices than did women with relatively low
 235 average levels of estrogen. This finding was interpreted as
 236 potentially indicating that feminine, high-quality women are
 237 better able to obtain investment from masculine, high-
 238 quality men. Individual differences in the magnitude of
 239 cyclic shifts in women’s mate preferences remains an
 240 important topic for future research. In particular, it is
 241 intriguing that feminine women appear to show bigger
 242 cyclic shifts in attraction to masculine faces, but show
 243 smaller cyclic shifts in attraction to masculine voices. This
 244 could indicate that the functions of cyclic shifts in prefer-
 245 ences for facial and vocal masculinity are not identical.

246 Apparent Health

247 Jones et al. (2005a, b) investigated the effect of menstrual
 248 cycle phase on women’s preferences for faces varying in
 249 health of appearance (e.g., color and texture cues associated
 250 with high and low apparent health). Table 2 summarizes the
 251 main parameters of these studies. Aversion to faces with
 252 cues associated with illness (e.g., pallor) was stronger during
 253 the luteal phase of the menstrual cycle (when progesterone
 254 level is raised and fertility is low) than during the late

follicular phase (when progesterone level is low and fertility
 is high). This effect was observed for judgements of the
 attractiveness of both male and female faces, and was more
 pronounced when male faces were judged in terms of their
 attractiveness as a partner for a short-term relationship than
 when male faces were judged in terms of their attractiveness
 as a partner for a long-term relationship (Jones et al.,
 2005a). Furthermore, change in attraction to faces with high
 apparent health appeared to reflect estimated change in
 progesterone level during the menstrual cycle: estimated
 progesterone level was positively related to the strength of
 preferences for faces with high apparent health, but estrogen
 level was not related to the strength of preferences for faces
 with high apparent health (Jones et al., 2005b). While pre-
 vious studies relied exclusively on self-reported cycle data
 to assign test days to different cycle phases, these studies
 used a combination of self-reported diary data and measured
 progesterone levels from urine samples.

Importantly, the effect of menstrual cycle phase on health
 preferences was observed in a sample of women who
 showed a general preference for masculine faces and
 increased attraction to masculine faces around ovulation
 (Jones et al., 2005b), establishing that increased attraction
 to health during the luteal phase of the menstrual cycle is not
 an artefact of women demonstrating stronger face prefer-
 ences in general during the luteal phase of the menstrual
 cycle than at other times. Change in preferences for male
 faces manipulated in apparent health were independent of
 change in preferences for masculine faces, indicating that
 the effect of cycle phase on health preferences was not a
 by-product of change in preferences for masculinity (Jones
 et al., 2005b).

Because change in women’s preferences for faces vary-
 ing in health of appearance was associated with change in
 progesterone level during the menstrual cycle, and because
 progesterone level is also raised during pregnancy and fol-
 lowing use of most oral contraceptives (Gilbert, 2000),
 Jones et al. (2005a) also investigated the effects of preg-
 nancy and oral contraceptive use on health preferences.
 Women who were pregnant reported stronger preferences
 for faces with high apparent health than women with natural
 cycles who were matched in terms of age, partnership status,
 and country of residency. Furthermore, women using oral
 contraceptives demonstrated stronger preferences for
 apparent health in faces than did women with natural cycles
 when possible effects of partnership status, age and country
 of residency were controlled for in analyses.

Collectively, these findings indicate that preferences for
 apparent health in faces are strongest during conditions
 associated with raised progesterone level (e.g., pregnancy,
 luteal phase of the menstrual cycle, and following oral con-
 traceptive use). Increased aversion to facial cues associated
 with illness at these times may reflect a mechanism that

Table 2 Summary of the main parameters of studies of variation in women's preferences for apparent health in faces

Study	Number of participants	Design	Measurement used to assess cycle
Jones et al. (2005a, Study 1)	639	Between-subjects	Diary
Jones et al. (2005a, Study 2)	19	Within-subjects	Diary and urinary progesterone
Jones et al. (2005a, Study 3)	22	Within-subjects	Diary and urinary progesterone
Jones et al. (2005a, Study 4)	115 (pregnant), 857 (natural cycles)	Between-subjects	N/A
Jones et al. (2005a, Study 5)	1570 (oral contraceptive users), 1325 (natural cycles)	Between-subjects	N/A
Jones et al. (2005b, Study 2)	656	Between-subjects	Diary

Number of participants refers to the number of women with natural menstrual cycles in each study (i.e. women reporting no use of hormonal contraceptives) unless stated otherwise. All of these studies showed stronger attraction to apparent health during the luteal phase than during the late follicular phase of the menstrual cycle, except for Jones et al. (2005a). Studies 4 and 5 which showed stronger attraction to apparent health in pregnant women and women using oral contraceptives than in women with natural menstrual cycles

308 compensates for maternal immunosuppression by reducing
309 the likelihood of women contracting illnesses during social
310 interactions and that protects the developing fetus. Indeed,
311 increased aversion to possible sources of illness during
312 pregnancy has also been observed in food preferences during
313 pregnancy (Fessler, 2002; Flaxman & Sherman, 2000).
314 Moreover, raised salivary progesterone during the menstrual
315 cycle is also associated with increased salience of facial cues
316 to nearby danger and contagion (Conway et al., 2007). It is
317 unlikely that increased aversion to male faces with cues
318 associated with illness at times when progesterone level is
319 raised reflects increased attraction to healthy men who may
320 provide durable care and investment as long-term partners
321 during pregnancy or when the body is preparing for pregnancy
322 because change in health preference during the menstrual
323 cycle was more pronounced when male faces were judged as a
324 possible short-term partner than a long-term partner.

325 Self-Resemblance

326 Cues of kinship can signal both increased direct benefits, in
327 the form of altruism from family members, and decreased
328 indirect benefits, in the form of inbreeding depression.
329 Women may show cyclic changes in their preferences for
330 cues of kinship for one or both of these reasons. That is,
331 women may show aversions to potential mates displaying
332 kinship cues near ovulation, when the cost of an incestuous
333 mating is highest, or they may increase their preference for
334 kinship cues when raised progesterone prepares the body for
335 pregnancy.

336 One potential cue of kinship is similarity of the major
337 histocompatibility complex (MHC). Since genetic relatives
338 tend to share many of the same alleles in the MHC,
339 inbreeding causes the number of distinct alleles in the MHC
340 to decrease, weakening immune function (Penn & Potts,
341 1999). Preferences for MHC similarity have been shown to
342 vary with pregnancy status in mice and hormonal state in
343 humans. Although female mice tend to prefer mates with

dissimilar MHC odor signatures (Penn & Potts, 1998), 344
pregnant mice prefer to nest with others who share their 345
MHC odor (Manning, Wakeland, & Potts, 1992). Human 346
women using oral contraceptives that mimic the effects of 347
raised progesterone during pregnancy demonstrate stronger 348
preference for self-similar MHC odors than do women with 349
natural cycles (Wedekind et al., 1995). Other cues of kin- 350
ship may also be preferred when women's hormonal profile 351
is similar to that of pregnancy. 352

Facial resemblance to self is a cue that humans respond to 353
in a manner consistent with it being a cue of kinship (see 354
DeBruine, Little, Perrett, & Jones, 2007). While kin tend to 355
be favored in most social contexts, some cues of kinship 356
(e.g., early close association, Westermarck, 1921) are 357
unattractive in a mating context. Consistent with this, both 358
men and women judge self-resembling other-sex faces to be 359
particularly trustworthy but unattractive, especially when 360
judging the attractiveness of other-sex faces for a short-term 361
relationship (DeBruine, 2005), where the costs of inbreed- 362
ing cannot be offset by benefits such as greater duration of 363
marriage and extended family support for a large family size 364
(Bittles, Grant, Sullivan, & Hussain, 2002). 365

To test if preferences for self-resembling faces vary 366
across the menstrual cycle and whether this functions to 367
decrease the genetic costs of inbreeding when women are 368
most fertile or to motivate kin-seeking behaviors during 369
pregnancy, DeBruine et al. (2005) tested women's ($N = 74$) 370
preferences for self-resembling male and female faces at 371
different points in the menstrual cycle. Preferences for self- 372
resemblance were greater during the non-fertile luteal phase 373
than during the fertile late follicular phase. Correlational 374
analyses determined that preferences for self-resemblance 375
were positively associated with progesterone levels (as 376
estimated from reported cycle day), but not with estrogen 377
levels or conception risk. In addition, these effects were 378
stronger for female faces than for male faces, leading to the 379
conclusion that cyclic shifts in preference for self-resem- 380
blance function to motivate seeking support from kin rather 381
than preventing inbreeding. 382

383 Discussion

384 In terms of whether the effect of menstrual cycle phase on
 385 women's preferences for facial masculinity reflects
 386 increased attraction to facial cues which, in men, are asso-
 387 ciated with possible indirect benefits (e.g., offspring inherit
 388 strong immune systems) or facial cues associated with
 389 possible direct benefits which will increase the success of
 390 pregnancy (e.g., greater amounts of care and support),
 391 evidence is equivocal. On the one hand, increased attraction
 392 to masculine men during the late follicular phase of the
 393 menstrual cycle is more pronounced when men are judged
 394 for a possible short-term relationship than when men are
 395 judged as possible long-term partners. This latter finding
 396 supports the proposal that the function of the effect of
 397 menstrual cycle phase on preferences for masculinity is to
 398 increase offspring health by increasing women's willing-
 399 ness to mate with masculine partners when fertile (e.g.,
 400 Johnston et al., 2001; Penton-Voak et al., 1999). On the
 401 other hand, increased preferences for femininity during the
 402 luteal phase of the menstrual cycle, when raised progesterone
 403 prepares the body for pregnancy, has been observed
 404 for judgements of both male and female faces and was
 405 related to change in progesterone level. This supports the
 406 view that the function of the effect of menstrual cycle phase
 407 on preferences for masculinity is to promote affiliation with
 408 individuals who will provide support and care during
 409 pregnancy (Jones et al., 2005b). Of course, these two
 410 accounts of the effect of menstrual cycle phase on masculin-
 411 ity preferences are not necessarily mutually exclusive:
 412 the function of cyclic changes in attraction to masculinity
 413 may be both to increase offspring health *and* to promote
 414 affiliation with individuals who are likely to be valuable
 415 sources of care and support during pregnancy.

416 While evidence that differentiates these two accounts of
 417 the function of the effects of menstrual cycle phase on
 418 preferences for masculine faces is equivocal, there is com-
 419 pelling evidence that the function of the effects of menstrual
 420 cycle phase on preferences for apparent health and self-
 421 resemblance in faces is to promote the success of pregnancy.
 422 Attraction to apparent health in male and female faces is
 423 stronger during the luteal phase of the menstrual cycle than
 424 during the late follicular phase and appears to reflect change
 425 in progesterone level (Jones et al., 2005b). Furthermore,
 426 attraction to apparent health in faces is stronger in pregnant
 427 women than in women with natural menstrual cycles (Jones
 428 et al., 2005a). These findings support the proposal that
 429 increased attraction to apparent health when women are in
 430 conditions that are characterized by raised progesterone
 431 levels reflect a mechanism that reduces the likelihood of
 432 pregnant women contracting illnesses during social inter-
 433 actions (Jones et al., 2005a, b). That preferences for self-
 434 resemblance are stronger during the luteal phase of the

menstrual cycle than during the late follicular phase, par- 435
 ticularly when judging female faces for which attraction 436
 carries no possible cost of inbreeding, and are correlated 437
 with change in progesterone level rather than conception 438
 risk, suggest that the function of the effect of menstrual 439
 cycle phase on preferences for self-resemblance in faces is 440
 to promote affiliation with individuals who are likely to 441
 provide care and support during pregnancy, rather than to 442
 avoid inbreeding at times when the costs of inbreeding are 443
 particularly pronounced (DeBruine et al., 2005). 444

445 Although it is well established that face preferences influ-
 446 ence many different social outcomes (e.g., partner and
 447 associate choices, hiring decisions, and voting behavior, see
 448 Langlois et al., 2000), most studies of face preferences have
 449 focused on identifying facial characteristics that are generally
 450 attractive (i.e., characteristics that are, on average, preferred
 451 by people). The findings for effects of menstrual cycle phase
 452 on women's preferences for masculinity, apparent health, and
 453 self-resemblance in faces that were reviewed here contribute
 454 to a growing literature demonstrating that variation in face
 455 preferences is systematic. Although the precise nature of the
 456 functions of hormone-mediated face preferences remains
 457 somewhat unclear, they do appear to evince adaptive design in
 458 female mate preferences.

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