Research Report

Women's Preferences for Male Behavioral Displays Change Across the Menstrual Cycle

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ABSTRACT—*Women prefer both the scent of symmetrical men and masculine male faces more during the fertile (late follicular and ovulatory) phases of their menstrual cycles than during their infertile (e.g., luteal) phases. Men's behavioral displays in social settings may convey signals that affect women's attraction to men even more strongly. This study examined shifts in women's preferences for these behavioral displays. A sample of 237 normally ovulating women viewed 36 or 40 videotaped men who were competing for a potential lunch date and then rated each man's attractiveness as a short-term and a long-term mate. As predicted, women's preference for men who displayed social presence and direct intrasexual competitiveness increased on high-fertility days relative to low-fertility days, but only in a short-term, not a long-term, mating context. These findings add to the growing literature indicating that women's mate preferences systematically vary across the reproductive cycle.*

Two recent lines of research have shown that the criteria women use to evaluate men's attractiveness shift across the menstrual cycle. First, women prefer the scent of men who evince high developmental stability (as measured by fluctuating asymmetry) particularly during fertile days of their cycles (Gangestad & Thornhill, 1998; Rikowski & Grammer, 1999; Thornhill & Gangestad, 1999b; Thornhill et al., 2003). Second, women prefer masculine faces more on fertile days than on nonfertile days (Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999). These findings are believed to reflect evolved adaptations for women to choose sires who can provide genetic benefits to offspring. Heightened attraction to men who possess putative indicators of genetic benefits (e.g., symmetry and facial masculinity, which covary positively; Gangestad & Thornhill, in press) may increase the probability that women have sex with them when fertile, even if such men are not their primary partners. This interpretation is supported by the finding that women's attraction to masculine facial features is heightened midcycle when they evaluate men as short-term partners (i.e., as sex partners), but not when they evaluate men as long-term, stable partners (Penton-Voak et al., 1999). These preference shifts may explain why women report increased sexual attraction to men other than primary partners when fertile (Gangestad, Thornhill, & Garver, 2002).

Although scent and facial attractiveness may importantly affect women's attraction to men (Buss & Schmitt, 1993; Herz & Cahill, 1997; Regan & Berscheid, 1995), men's behavior—how they interact with women and other men—may be even more important determinants of attraction. Women prefer men who display self-assurance and stand up for themselves with other men, but who exhibit warmth and agreeableness (e.g., Cunningham, Druen, & Barbee, 1997; Graziano, Jensen-Campbell, Todd, & Finch, 1997; Jensen-Campbell, Graziano, & West, 1995). The former attributes, which reflect intrasexual competitiveness, may partly function as signals of genetic benefits (i.e., broadly defined heritable condition) that are also conveyed by facial masculinity and developmental stability. The latter attributes may be especially valued in long-term, stable mates. In a previous study (Simpson, Gangestad, Christensen, & Leck, 1999), we found that men who are more symmetrical tend to use more direct intrasexual competitive tactics (e.g., directly comparing themselves favorably with competitors) when interacting with attractive women than do asymmetrical men. Johnston et al. (2001) found that men who have more masculine faces are perceived as more socially dominant yet less investing as fathers compared with men who have less masculine faces (see also Berry & Wero, 1993; Mueller & Mazur, 1996, 1997).

The present study tested whether women's preferences for men's behavioral displays shift according to women's fertility status. Women viewed videotaped segments of men being interviewed for a potential lunch date. These men answered questions posed by an attractive woman who they presumed would be choosing a date. After the interview, they were asked to tell a competitor why the interviewer should choose them. The women evaluated each man's attractiveness as both a short-term mate (i.e., a sex or "affair" partner) and a long-term mate. We examined whether these ratings were associated with variation in the men's behavioral displays on two principal components reflecting the men's observer-rated behavior with the

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interviewer: Social Presence and Direct Intrasexual Competitiveness. On the basis of the theory that these behavioral displays partly reflect (and signal) broadly defined condition (see Thornhill & Gangestad, 1999a), we predicted that during fertile days, women would prefer the displays in short-term mates more than in long-term mates, but during nonfertile days, this difference between mating contexts would not occur.[1]

METHOD

Seventy-six men were recruited from introductory psychology classes at Texas A&M University to participate in a study on "relationship formation" (mean age = 18.8). Each was interviewed over a video-camera system by one of two attractive female undergraduates and was told she was considering him for a potential lunch date. Unbeknownst to the men, the woman's portion of the interview had been scripted and videotaped; an experimenter in a separate room synchronized the interaction. After each man answered six questions posed by the female interviewer, another man appeared on his monitor and was introduced as the other male being considered for the date. The participant was told that the interviewer wanted to hear him tell the "competitor" why she should choose him over the competitor. All interviews were videotaped. Each participant was fully debriefed and gave permission for his videotaped interview to be used for future research. (See Simpson et al., 1999, for details.)

Following data collection, sets of trained raters coded two categories of behavior, the men's behavioral tactics and their nonverbal displays. Behavioral tactics included the following measures: use a direct approach, focus on the conversation, use humor, just be oneself, assert superiority over the competitor, assert niceness/promise to treat the woman well, claim communality with the woman, claim to be likeable, claim to be a good conversationalist, and ensure a good time with the woman (mean $\alpha = .90$; see Simpson et al., 1999, for details). The following nonverbal displays were coded: time spent gazing downward ($\alpha = .88$), time spent having direct eye contact (.96), number of smiles (.81), and number of laughs (.86). In addition, using 9-point scales, each rater gave specific impressions of the men's interview performance (e.g., "appeared laid back," "appeared composed/together," "seemed 'nerdish'"), providing 18 ratings for each of two segments (the first minute of the interview and the response to the competitor; mean $\alpha = .83$).

Factor analysis of the behavioral tactics (reported by Simpson et al., 1999) yielded three factors: (a) Direct Intrasexual Competitive Tactics, including assert superiority, just be self (reverse scored), and use direct approach; (b) Nice-Guy Self-Presentation, including assert niceness, claim communality with interviewer (reverse scored), and ensure a good time (reverse scored); and (c) Interest in Getting Personal, including claim to be a good conversationalist, focus on conversation, just be self, and claim to be likable. The 18 impression ratings were also factor-analyzed (using principal-axis factoring and oblimin rotation). A scree test revealed six factors: (a) Composure, including appeared laid back, maintained eye contact, and appeared unflappable; (b) Nice Personality, including emphasized having a good personality and being a nice guy; treating women well; and being romantic; (c) Nerdishness, including appeared nerdish, had a high-pitched voice, and appeared "cool" (reverse scored); (d) Self-Deprecation, including displayed self-deprecation and made self-contradictions; (e) Presentation as Athletic, including mentioned athleticism; and (f) Derogation of Competitor, including talked about self and put down the competitor. Factor scores were estimated using regression-based factor coefficients.

To identify broad dimensions of men's displays tapped by these observer-rated measures, we subjected all of the factors and nonverbal behaviors to a principal-components analysis. Two components explaining similar variance (18% and 17%) and about 1.5 times more variance than any other component were extracted and rotated using oblimin criteria. The first, labeled Social Presence, was defined by composure, presentation as athletic, eye contact, lack of self-deprecation, lack of downward gaze, and lack of nice-guy self-presentation (all loadings $\geq \pm.50$). The second, labeled Direct Intrasexual Competitiveness, was defined by derogation of the competitor, direct intrasexual competitive tactics, lack of laughing, and lack of mentioning a nice personality (all loadings $\geq .50$). Component scores were computed.

Women ($N = 277$) were then recruited from psychology classes at the University of New Mexico to participate in a study of attraction. All were normally ovulating (not using a contraceptive pill or injection). Women who had not had a menstrual period in the preceding 50 days ($n = 4$), did not provide information sufficient to determine their cycle day ($n = 8$), or filled out the rating form incorrectly ($n = 1$) were excluded. Age ranged from 18 to 49. Because some older women reported difficulty rating the attractiveness of much younger men (the oldest male was 23), and given that adult U.S. women tend to be most interested in men their own age or older (Kenrick & Keefe, 1992), the 27 women older than 25 were excluded from the analysis (though their inclusion did not change the results). The final sample size was 237 (mean age = 19.3).

The women were shown 1-min segments of the videotaped interviews. They saw either the first minute (when the men answered the question, "Please tell me about yourself, including who you are, what you like to do, and what you don't like to do"; $n = 133$) or the segment in which the men responded to the competitor ($n = 104$). Each woman saw approximately half the interviews; one set saw the first 40 men ($n = 108$), and the other set saw the last 36 men ($n = 129$). Participants were instructed to rate each man on a series of dimensions, the first two of which were central to the current study:

> Attractive as a short-term mate: High scores are males who are very attractive for short-term sexual affairs. Low scores tend to be unattractive as short-term sexual partners.
>
> Attractive as a long-term mate: High scores are males with whom you would want a long-term relationship. Males scoring low would be unattractive as a long-term partner.

[1] "Condition" is a theoretical term referring to efficiency of converting biological resources into fitness-promoting features. According to biological signaling theory, individuals of better condition are able to produce bigger signals than individuals of poorer condition because their marginal fitness gains as a function of signal intensity are greater. Though possessing greater fitness potential, individuals of better condition need not be more disease resistant or live longer (because the negative effects of their signaling on viability may be greater than the negative effects of the signaling of individuals in poorer condition; Getty, 2002; Kokko, 2001). In a variety of mammalian species, intrasexual competitive displays appear to function as signals of condition (e.g., Andersson, 1994), and here we theorize that men's intrasexual competitive displays function similarly.

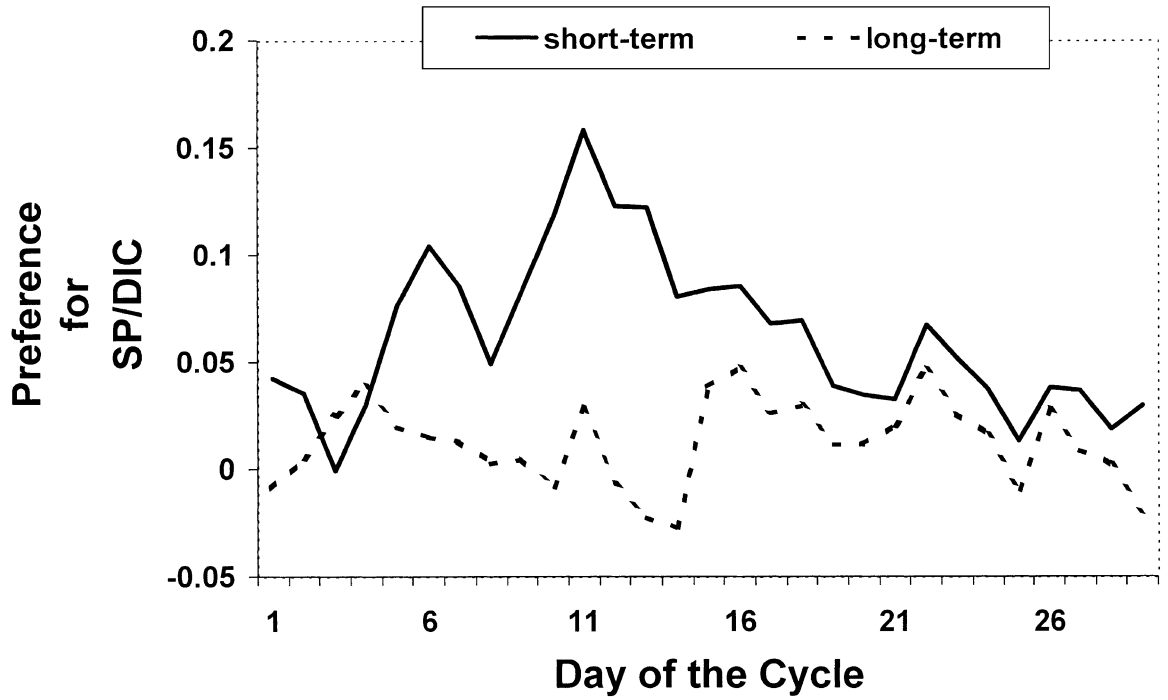

Fig. 1. Preference for Social Presence (SP) and Direct Intrasexual Competitiveness (DIC) as a function of day of the cycle (adjusted for cycle length as explained in the text); points are 3-day moving averages. Preference is the mean regression slope of individual women's ratings regressed on men's Social Presence and Direct Intrasexual Competitiveness, with men's physical attractiveness controlled. High-fertility days run from about Day 6 to Day 14, with fertility peaking at Day 12.

All ratings were made on 5-point scales, where 1 = *lowest 5%*, 2 = *lower 30%*, 3 = *middle 30%*, 4 = *higher 30%*, 5 = *highest 5%*, and percentages referred to the general population of men. A different sample of women ($N = 55$) rated the men's physical attractiveness (mean n rating each man = 13.75). Average ratings ($\alpha = .90$) were used to control for men's physical attractiveness.

Each woman reported the first day of her last menstrual cycle as well as her typical cycle length. Using actuarial medical data (Jöchle, 1973), we estimated the women's conception risk in two ways (see Baker & Bellis, 1995). First, we used actuarial tables to estimate the probability of conception for each woman on the cycle day her ratings were made. Second, we took into account each woman's cycle length (sample $M = 28.7$ days, $SD = 3.4$) to put her on a 29-day cycle before estimating her day in the cycle and conception risk based on actuarial data (see Gangestad & Thornhill, 1998; Thornhill & Gangestad, 1999b). On average, women with longer cycles ovulate later in the cycle than women with shorter cycles. We assumed that ovulation typically occurs about 15 days prior to the end of the cycle (e.g., Day 14 in a 29-day cycle). The two estimates were highly correlated ($r = .72$, $p < .00001$) and, as in previous studies (Gangestad & Thornhill, 1998; Thornhill & Gangestad, 1999b), averaged to estimate conception risk.

RESULTS AND DISCUSSION

Attractiveness ratings were analyzed through multilevel regression using SAS (8.0 PROC MIXED). Two characteristics of men were treated as Level 1 predictors: a unit-weighted composite of Social Presence and Direct Intrasexual Competitiveness (SP-DIC composite; aggregated so as to maximize power to detect a predicted effect) and physical attractiveness. Women's conception risk was treated as a Level 2 predictor, which could moderate the slope of individual women's ratings of men on male characteristics. Two additional factors of no theoretical interest were entered as Level 2 predictors to control for extraneous variance due to the specific stimulus tapes that women saw: segment (first minute vs. segment with competitor) and set (first 40 men vs. second 36 men; see Method).[2] Two dependent variables were run: A combined sum of the short-term and long-term mating-attractiveness ratings and the difference between the short-term and long-term attractiveness ratings. Analysis of the combined measure examined changes in women's overall attraction to men as a function of men's behavioral displays and physical attractiveness. Analysis of the difference scores examined how women's attraction differentially related to men's characteristics as a function of mating context (short-term vs. long-term). Effects in the latter analysis are effectively the interactions of all effects with mating context. The predicted effect analogous to the finding of Penton-Voak et al. (1999) was the interaction of conception risk, SP-DIC composite, and mating context. All Level 1 variables were zero-centered so that Level 2 main effects are effects on mean attractiveness ratings.

The predicted effect emerged: Conception Risk × SP-DIC Composite × Mating Context, $t(7677) = 3.06$, $p = .002$. Figure 1, based on calculation of individual regression slopes of individual women's

[2]Because these effects are of no interest, we do not report them here. Also, controlling for women's age did not change the results. Full results are available from the authors.

TABLE 1
Results of Multilevel Regression Analyses

Effect	*t*	*p*
Female conception risk	2.25	.025
Male physical attractiveness	6.28	$<.0001$
Male Social Presence	−1.02	.306
Male Direct Intrasexual Competitiveness	−0.33	.744
Conception Risk × Physical Attractiveness	0.52	.605
Conception Risk × Social Presence	1.77	.076
Conception Risk × Direct Intrasexual Competitiveness	−0.15	.880
Conception Risk × Mating Context	−1.71	.088
Physical Attractiveness × Mating Context	0.24	.810
Social Presence × Mating Context	2.98	.003
Direct Intrasexual Competitiveness × Mating Context	2.11	.035
Conception Risk × Physical Attractiveness × Mating Context	1.02	.306
Conception Risk × Social Presence × Mating Context	*2.10*	*.036*
Conception Risk × Direct Intrasexual Competitiveness × Mating Context	*2.21*	*.027*

Note. For conception risk and Conception Risk × Mating Context, $df = 232$; for all other effects, $df = 7672$. The predicted effects are presented in italicized type.

ratings as a function of the composite behavior-display measure (with men's physical attractiveness controlled), shows how these slopes change as a function of women's day in the cycle. In general, women's attraction to these displays in a short-term mating context, but not a long-term context, increased on high-fertility days.

Follow-up analyses on short-term and long-term mating-attractiveness ratings verified this pattern. With short-term mating attractiveness as the dependent variable, a predicted Conception Risk × SP-DIC Composite interaction emerged, $t(7677) = 2.58$, $p = .010$; as expected, this interaction was not significant when long-term mating attractiveness was the dependent variable, $t(7677) = -0.36$, n.s.

Additional follow-up analyses revealed that, entered independently, both Social Presence and Direct Intrasexual Competitiveness interacted with conception risk and mating context to predict attractiveness ratings, $t(7672) = 2.10$ and 2.21, respectively, $p = .036$ and .027 (Table 1).

Table 1 reports additional effects yielded by this analysis. Physical attractiveness affected overall ratings, $t(7672) = 6.28$, $p < .0001$. Social Presence and Direct Intrasexual Competitiveness were more preferred for short-term than long-term mating, $t(7672) = 2.98$ and 2.11, respectively, $p = .003$ and .035; these effects make sense if, as we suggest, these behavioral displays advertise traits that trade off against perceived investment in a committed relationship (e.g., Gangestad & Simpson, 2000). Women also rated men as more attractive when at higher conception risk, $t(7672) = 2.25$, $p = .025$.

These results contribute to the growing literature showing systematic shifts in mate preferences over the cycle (see also Macrae, Alnwick, Milne, & Schloerscheidt, 2002). Because women's attraction to men may depend on men's behavioral traits even more than on their scent or facial masculinity, the preference shifts documented in the present study may be the most consequential ones demonstrated to date. The fact that these shifts in preference, like those for facial masculinity, are specific to women's evaluations of short-term mates further supports the premise that they may reflect an evolved female adaptation to garner genetic benefits through extrapair mating. Future research should further evaluate this interpretation.

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REFERENCES

Andersson, M.B. (1994). *Sexual selection*. Princeton, NJ: Princeton University Press.

Baker, R.R., & Bellis, M.A. (1995). *Human sperm competition: Copulation, masturbation, and infidelity*. London: Chapman & Hall.

Berry, D.S., & Wero, J.L.F. (1993). Accuracy in face perception: A view from ecological psychology. *Journal of Personality, 61*, 497–503.

Buss, D.M., & Schmitt, D.P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review, 100*, 204–232.

Cunningham, M.R., Druen, P.B., & Barbee, A.P. (1997). Angels, mentors, and friends: Trade-offs among evolutionary, social, and individual variables in physical appearance. In J.A. Simpson & D.T. Kenrick (Eds.), *Evolutionary social psychology* (pp. 109–140). Mahwah, NJ: Erlbaum.

Gangestad, S.W., & Simpson, J.A. (2000). The evolution of human mating: The role of trade-offs and strategic pluralism. *Behavioral and Brain Sciences, 23*, 573–587.

Gangestad, S.W., & Thornhill, R. (1998). Menstrual cycle variation in women's preference for the scent of symmetrical men. *Proceedings of the Royal Society of London B, 262*, 727–733.

Gangestad, S.W., & Thornhill, R. (in press). Male facial masculinity and bodily fluctuating asymmetry. *Evolution and Human Behavior*.

Gangestad, S.W., Thornhill, R., & Garver, C.E. (2002). Changes in women's sexual interests and their partners' mate retention tactics across the menstrual cycle: Evidence for shifting conflicts of interest. *Proceedings of the Royal Society of London B, 269*, 975–982.

Getty, T. (2002). Signaling health versus parasites. *American Naturalist, 159*, 363–371.

Graziano, W.G., Jensen-Campbell, L.A., Todd, M., & Finch, J. (1997). Interpersonal attraction from an evolutionary perspective: Women's reactions to dominant and prosocial men. In J.A. Simpson & D.T. Kenrick (Eds.), *Evolutionary social psychology* (pp. 141–167). Mahwah, NJ: Erlbaum.

Herz, R.S., & Cahill, E.D. (1997). Differential use of sensory information in sexual behavior as a function of gender. *Human Nature, 8*, 275–286.

Jensen-Campbell, L.A., Graziano, W.G., & West, S.G. (1995). Dominance, prosocial orientation, and female preferences: Do nice guys really finish last? *Journal of Personality and Social Psychology, 68*, 427–440.

Jöchle, W. (1973). Coitus-induced ovulation. *Contraception*, *7*, 523–564.

Johnston, V.S., Hagel, R., Franklin, M., Fink, B., & Grammer, K. (2001). Male facial attractiveness: Evidence for hormone medicated adaptive design. *Evolution and Human Behavior*, *21*, 251–267.

Kenrick, D.T., & Keefe, R.C. (1992). Age preferences in mates reflect sex differences in reproductive strategies. *Behavioral and Brain Sciences*, *15*, 75–91.

Kokko, H. (2001). Fisherian and "good genes" benefits of mate choice: How (not) to distinguish between them. *Ecology Letters*, *4*, 322–326.

Macrae, C.N., Alnwick, K.A., Milne, A.B., & Schloerscheidt, A.M. (2002). Person perception across the menstrual cycle: Hormonal influences on social-cognitive functioning. *Psychological Science*, *13*, 532–536.

Mueller, U., & Mazur, A. (1996). Facial dominance of West Point cadets as a predictor of later military rank. *Social Forces*, *74*, 823–850.

Mueller, U., & Mazur, A. (1997). Facial dominance in *Homo sapiens* as honest signaling of male quality. *Behavioral Ecology*, *8*, 569–579.

Penton-Voak, I.S., & Perrett, D.I. (2000). Female preference for male faces changes cyclically—further evidence. *Evolution and Human Behavior*, *21*, 39–48.

Penton-Voak, I.S., Perrett, D.I., Castles, D., Burt, M., Koyabashi, T., & Murray, L.K. (1999). Female preference for male faces changes cyclically. *Nature*, *399*, 741–742.

Regan, P.C., & Berscheid, E. (1995). Gender differences in beliefs about the causes of male and female sexual desire. *Personal Relationships*, *2*, 345–358.

Rikowski, A., & Grammer, K. (1999). Human body odour, symmetry and attractiveness. *Proceedings of the Royal Society of London B*, *266*, 869–874.

Simpson, J.A., Gangestad, S.W., Christensen, P.N., & Leck, K. (1999). Fluctuating asymmetry, sociosexuality, and intrasexual competitive tactics. *Journal of Personality and Social Psychology*, *76*, 159–172.

Thornhill, R., & Gangestad, S.W. (1999a). Facial attractiveness. *Trends in Cognitive Sciences*, *3*, 452–460.

Thornhill, R., & Gangestad, S.W. (1999b). The scent of symmetry: A human pheromone that signals fitness? *Evolution and Human Behavior*, *20*, 175–201.

Thornhill, R., Gangestad, S.W., Miller, R., Scheyd, G., McCollough, J.K., & Franklin, M. (2003). Major histocompatibility complex genes, symmetry, and body scent attractiveness in men and women. *Behavioral Ecology*, *14*, 668–678.

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