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Do Women Feel Worse to Look Their Best? Testing the Relationship Between Self-Esteem and Fertility Status Across the Menstrual Cycle

Sarah E. Hill
Texas Christian University

Kristina M. Durante
University of Texas, Austin

Two studies measured self-esteem across the menstrual cycle to test the prediction that self-esteem will vary interindividually as a positive function of mate value and intraindividually as a negative function of fertility status. Study 1 (n = 52) found that self-esteem was positively related to mate value between women but that women experienced a self-esteem decrease nearest to ovulation, when women tend to be more attractive to men. Study 2 (n = 59) replicated these results and demonstrated that the self-esteem decrease at high fertility was positively related to women's reported long-term mating motivation. Additionally, the magnitude of the self-esteem decrease at high fertility was found to be related to increased willingness to spend money on items to enhance attractiveness at high fertility. A self-esteem decrease at high fertility may motivate mate value enhancement efforts when such efforts are most critical.

Keywords: self-esteem; ovulation; mate value; fertility; evolution

What is the link between self-esteem and mating behavior? Researchers have long noted that self-esteem plays an important role in motivating various kinds of social behavior (Crocker & Park, 2004; Crocker & Wolfe, 2001; Leary & Baumeister, 2000; Leary & Downs, 1995; Wolfe & Crocker, 2003). People seek to achieve boosts and avoid drops in self-esteem in the domains most central to their feelings of self-worth (Crocker & Park, 2004; Crocker, Karpinski, Quinn, &

Chase, 2003). For instance, researchers have found that individuals whose self-worth is contingent on scholastic success experience a greater self-esteem decrease in response to perceived academic failures than do those whose self-worth is not contingent on such successes (Crocker et al., 2003; Park & Crocker, 2008). Likewise, relationships between contingencies of self-worth and self-esteem have been found in domains ranging from receiving family support and God's love to gaining social approval and self-perceptions of competitive ability (see Crocker & Wolfe, 2001, for a review). Low self-esteem—and the pursuit of avoiding it—may thus play an important role in motivating social behavior in domains that are most relevant to one's self-worth.

From an evolutionary perspective, contingencies of self-worth are predicted to reflect, in part, traits influencing one's ability to meet proximate-level goals that have been reliably correlated with survival and reproductive success over evolutionary time (Hill & Buss, 2006; Kirkpatrick & Ellis, 2001, 2006). On this view, pursuing increases and avoiding drops in self-esteem

may motivate individuals to invest sufficient effort in meeting ancillary goals that correspond to recurrent adaptive problems facing humans. Indeed, a growing body of research has demonstrated that the activation of fitness-related goals has a powerful influence on perception, cognitions, and behaviors (see, e.g., Griskevicius et al., 2007; Maner, DeWall, & Gailliot, 2008; Maner, Gailliot, Rouby, & Miller, 2007). Among the hypotheses derived from this perspective is that men's and women's self-esteem should be positively related to self-perceived mate value—how attractive an individual is to romantic partners (Barkow, 1980, 1989; Kenrick, Groth, Trost, & Sadalla, 1993; Tooby & Cosmides, 1990; Wright, 1994). Consistent with this hypothesis, researchers have demonstrated that global self-esteem is positively correlated with self-perceptions of mate value (Brase & Guy, 2004; Wade & Cooper, 1999; Wade, Thompson, Tashakkori, & Valente, 1989). Others have found self-esteem to be positively related to physical attractiveness (Brase & Guy, 2004; Dion, Berscheid, & Walster, 1972; Thornton & Moore, 1993; Wade et al., 1989), a trait that plays an important role in overall mate value (Buss, 1989, 1994/2003; Gangestad & Simpson, 2000; Hill & Reeve, 2004).

Further support for the hypothesized relationship between self-esteem and mate value can be found in the correlation between self-esteem and mate-value-enhancement motivations. Research has demonstrated that self-esteem is negatively related to the amount of effort individuals report spending on activities aimed at augmenting their desirability to mates, especially among those without romantic partners (Brase & Guy, 2004). Others have found that among low-self-esteem individuals whose self-worth is appearance contingent, self-esteem threats directed at appearance increased motivation to spend time engaged in attractiveness enhancement activities such as working out or shopping for clothes (Park & Maner, 2009). Taken together, these findings are consistent with the view that, at least for some people, self-esteem is positively related to self-perceived mate value, and downward self-esteem shifts may play a role in motivating mate-value-enhancement efforts.

Although the momentary importance of motivating effort to meet proximate goals historically related to fitness—such as mate value enhancement—is predicted to vary with personal achievements and failures in that domain, an evolutionary perspective also implies that they should be influenced by other factors influencing the reproductive benefits available from such effort. Factors such as current relationship status and satisfaction, availability of potential romantic or sexual partners, and the mate value of romantic rivals all play a role in determining the expected payoff associated with attempts to enhance one's desirability (satisfaction, Bui,

Peplau, & Hill, 1996; alternative mates, Kenrick, Neuberg, Zierk, & Krones, 1994; rivals, Gutierres, Kenrick, & Partch, 1999). Although these and similar situational effects operate outside the purview of what is typically conceptualized as the self, they may also be able to influence self-esteem. For instance, self-esteem has been found to be sensitive to changes in the attractiveness of peers to whom one is exposed (Morse & Gergen, 1970; Thornton & Maurice, 1997). Others have found that self-esteem is related to relationship status, with people in relationships having higher self-esteem than those without romantic partners (Brase & Guy, 2004). These data suggest that self-esteem may be calibrated to multiple contextual factors—including, but not limited to, social feedback about the self—that modulate the current necessity of desirability enhancement. If you are low in mate value, you may reap tremendous benefits from investing effort in desirability enhancement. On the other hand, if you are already in a committed long-term relationship, the cost of investing effort in mate value enhancement may outweigh any potential benefits associated with doing so. On this view, an individual's self-esteem at a given moment may reflect input from multiple proximate-level contextual cues that have reliably influenced the fitness benefits available from mate value enhancement.

Here, we develop this logic, proposing that self-esteem is calibrated to multiple contexts that have reliably influenced the potential benefits available from mate value enhancement over evolutionary time. Specifically, we hypothesize that there is a relationship between self-esteem and one internal factor that plays a critical role in modulating the potential reproductive benefits historically related to meeting proximate mating goals—fertility. Some preliminary support for this hypothesis can be found in the somewhat paradoxical relationship that exists between self-esteem and fertility across the life span. Across the life span, self-esteem is inversely related to ages in which individuals—especially women—are at their most attractive and are most desirable to members of the opposite sex (Kenrick & Keefe, 1992; Kenrick, Keefe, Gabrielidis, & Cornelius, 1996; Mathes, Brennan, Haugen, & Rice, 1985). Self-esteem is high during childhood and declines at adolescence, when individuals become sexually mature (Eccles et al., 1989; Marsh, 1989; Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). Self-esteem reaches its lifetime low between ages 18 and 22 and then remains low until individuals are in their 50s when it begins to increase again (Robins et al., 2002). This U-shaped function of self-esteem across the life span may reflect self-esteem varying inversely with fertility such that it motivates self-enhancement behaviors—including mate value augmentation—at times when such efforts would have the greatest likelihood of

translating into reproductive success. Over evolutionary history, individuals who were most motivated to intensify mate-value-enhancement efforts when fertility was high would have had the greatest likelihood of having their efforts translate into successful mate acquisition and reproductive success. The current research seeks to test this hypothesis by isolating a key factor that has been found to influence women's fertility and mating motivations across short time spans—the ovulatory cycle. Our hypothesis predicts that although self-esteem will vary positively with personal attributes and achievements that influence mate value (e.g., physical attractiveness), it will simultaneously vary negatively with the present importance of investing effort in mate value enhancement based on cyclical changes in fertility.

For women, changes in fertility occur both across the life span and within a woman's monthly menstrual cycle. Women's cyclical fertility peaks near ovulation—the 48-hr period within each cycle when conception is most likely to occur (Wilcox, Dunson, Weinberg, Trussell, & Day Baird, 2001). This insight led researchers to predict that women's sexual motivations and mate preferences should be sensitive to cycling fertility. Research has found that women experience an increase in sexual desire near ovulation (Bullivant et al., 2004) and report heightened desire for men possessing characteristics thought to be indicative of high genetic quality (e.g., symmetry, Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004; Gangestad & Thornhill, 1998; facial masculinity, Penton-Voak et al., 1999; major histocompatibility complex gene compatibility, Garver-Apgar, Gangestad, Thornhill, Miller, & Olp, 2006). This preference is especially strong for women with primary partners who lack these quality markers (Gangestad, Thornhill, & Garver-Apgar, 2005; Garver-Apgar et al., 2006; Pillsworth & Haselton, 2006).

Emerging evidence also indicates that cycling fertility may influence women's mate-value-enhancement motivations. Researchers have demonstrated that women dress more provocatively when ovulating, a behavior found to be especially pronounced in those actively seeking romantic partners (Durante, Li, & Haselton, 2008). Women are also consistently rated as "trying to look more attractive" at high fertility compared to low fertility (Haselton, Mortezaie, Pillsworth, Bleske-Rechek, & Frederick, 2007). Others have found converging evidence for cyclic effects on desirability enhancement motivations in the form of changes in women's derogation of rivals' attractiveness. One study found that women rated other women significantly lower in attractiveness at times when their own conception risk was the highest (Fisher, 2004), suggesting that women are attempting to manipulate others' views of their own attractiveness by trying to downplay the attractiveness of others. These findings provide convergent evidence suggesting that women experience increased motivation to enhance their own desirability relative to that of rivals when conception is most likely to occur. Additionally, because the ovulatory phase of the menstrual cycle is the period during which men find women most attractive (Havlicek, Roberts, & Flegr, 2005; Miller, Tybur, & Jordan, 2007; Singh & Bronstad, 2001; Thornhill et al., 2003), this is also the time in a woman's cycle when her efforts are most likely to translate into successful mate attraction.

Here, we test the hypothesis that self-esteem is negatively related to fertility across the menstrual cycle. We predict that although self-esteem will vary positively with a woman's self-perceived mate value, it will simultaneously vary negatively with the present importance of investing effort in mate value enhancement based on cyclical changes in fertility. Specifically, we predict that although self-esteem will vary *inter*individually as a positive function of mate value, it will vary *intra*individually as a negative function of fertility status across the ovulatory cycle.

STUDY 1

To test our hypothesis, we measured the self-esteem of normally cycling women at two different points within the menstrual cycle—once near ovulation and again at a low fertility. In doing this, we isolated the window of peak fertility within the ovulatory cycle—the short span of time when conception is most probable and women's mating decisions are most consequential. We predicted that (a) self-esteem would be positively correlated with self-perceived mate value between women and (b) women would experience an intraindividual self-esteem decrease at high fertility. It is reasoned that this downward shift may increase women's mate-value-enhancement motivations at the point in their cycles when mating effort is most critical. Additionally, the functional perspective on social cognition from which our hypothesis was derived implies that individual differences in mating effort should influence the magnitude of the self-esteem shift expected at high fertility. That is, self-esteem shifts at high fertility should be most pronounced among those for whom mating goals are most salient. Accordingly, we predicted that relationship status may influence the relationship between self-esteem and fertility such that the self-esteem decrease would be greater for single than mated women.

Method

Participants. Fifty-two female undergraduates at the University of Texas, Austin aged 17 to 22 years

(*M* = 18.94) participated. All were normally ovulating and not on hormonal contraceptives.

Procedure. A telephone recruitment procedure was used and only women reporting regular menstrual cycles (25 to 35 days) were eligible to participate. Participants came into the lab twice—once during an expected high-fertility day and once again during an expected low-fertility day. To confirm expected fertility, women completed an ovulation predictor test in the lab—the Clearblue® Easy Ovulation Test Kit—that measures luteinizing hormone (LH) in urine. A positive test indicates ovulation will occur within 24-36 hr. On average, high-fertility testing sessions took place .71 days after a positive test indicated a surge in LH (*SD* = 1.18). Low-fertility sessions were scheduled 6 or more days post-LH surge or at least 3 days before menstrual onset. On average, low-fertility testing sessions took place 4.46 days before menses (*SD* = 3.22). Twenty-nine participants completed high-fertility testing first and 23 completed low-fertility testing first. At each session, participants completed a biographical survey that contained three questions designed to assess self-perceived mate value. Participants were asked to rate their body, face, and overall sexiness compared to other women using a 9-point scale (after Durante & Li, 2009) and reported on their relationship status (i.e., whether they were currently involved in a committed, long-term romantic relationship). Self-esteem was measured using the 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965). This measure was chosen because multiple studies have demonstrated it to be highly reliable (e.g., O'Brien, 1985; Robins, Hendin, & Trzesniewski, 2001). Furthermore, Rosenberg is one of the most frequently used self-esteem measures, granting the current study maximum relevance to prior research.

Results

As in prior studies, the Rosenberg scale yielded high test–retest reliability, $r(52) = .87$; $\alpha = .93$. Differences in self-esteem across high- and low-fertility sessions were examined using a repeated measures ANOVA (generalized linear model [GLM]; SPSS 15.0) with session (high vs. low fertility) as the repeated factor and relationship status (in a relationship, $n = 21$ vs. single, $n = 31$) as a between-subjects factor. The results of this analysis revealed that, consistent with our prediction, self-esteem was significantly higher at low fertility (*M* = 24.02, *SD* = 4.75) than at high fertility (*M* = 22.35, *SD* = 4.44), $F(1, 50) = 24.04$, $p < .001$, $\eta^2 = .33$. Contrary to our prediction, however, there was no interaction between relationship status and self-esteem across the cycle.

Self-perceived mate value did not differ significantly across high- and low-fertility sessions. Thus, to test the prediction that self-esteem would be positively related to self-perceived mate value, self-perceived mate value was collapsed across sessions (high-low composite, $\alpha = .95$) and entered into the base model ANOVA as a continuous, independent variable. The results revealed no interaction between self-perceived mate value and session; however, there was a main effect of self-perceived mate value on self-esteem, $F(1, 49) = 12.05$, $p = .001$, $\eta^2 = .20$. As predicted, overall self-esteem (high-fertility/low-fertility composite, $\alpha = .93$) was highly positively correlated with self-perceived mate value, $r(52) = .45$, $p = .001$, $d = 1.01$.

Secondary analyses were also conducted to examine the effects of order of session (high- vs. low-fertility session first), days to menstrual onset (number of days until onset of menstruation following low-fertility testing), and days to ovulation (number of days to ovulation in the high-fertility session was completed) on the dependent measure. There were no main effects of any of these measures on the dependent measure nor did any of them interact with the independent variables of interest (i.e., session or relationship status).

Discussion

As predicted, although self-esteem was positively related to self-perceived mate value between women, women experienced an intraindividual self-esteem decrease at peak fertility. These results lend support for our hypothesis, showing that fertility status within women is negatively related to self-esteem across the menstrual cycle.

Although relationship status was predicted to influence the magnitude of the self-esteem decrease at high fertility, no such result emerged. The size of the self-esteem shift did not differ between mated and unmated women. There are multiple reasons why this might have occurred. One possibility is that women in relationships may also reap mating-related benefits from increased desirability enhancement motivation at high fertility. For instance, increased attractiveness enhancement on the part of a mated woman may increase the likelihood that she will be able to entice her current mate to have sex at a time when conception is most likely to occur. It is also possible that this result may owe itself to relationship status being a poor measure of a woman's mating motivations. Research has demonstrated that women whose primary partners lack markers believed to be indicative of genetic quality experience increased interest in extra-pair mates at high fertility compared to low fertility (Gangestad et al., 2005; Garver-Apgar et al., 2006; Pillsworth & Haselton, 2006). Others have found that physically attractive women with high levels of estradiol tend to be less committed to existing partners and more likely to move on to a new relationship if a

higher quality mate becomes available (Durante & Li, 2009). Findings such as these underscore the possibility that relationship status may not be indicative of a woman's mating motivations. A better measure of mating goal salience would be the degree to which participants are actively seeking long- or short-term mates, regardless of their current relationship status. We designed Study 2 to address this weakness and replicate our main effect in a separate sample of women. Additionally, we sought to test whether the self-esteem shift at high fertility is associated with an increased desire to engage in mate-value-enhancement behaviors.

STUDY 2

In Study 2, participants rated the degree to which they were actively seeking long- and short-term relationships in addition to reporting their current relationship status. We predicted that the self-esteem decrease expected at high fertility would be greatest among individuals for whom mating goals are most salient, that is, among women actively seeking mates. In Study 2 we also added six questions to test whether the self-esteem decrease at high fertility corresponds to increased willingness to spend money on items promising attractiveness-enhancement benefits. We predicted that (a) self-esteem would decrease nearest to ovulation, (b) the magnitude of the self-esteem decrease at high fertility would be positively related to the strength of women's self-reported mating motivations, and (c) the magnitude of the decrease at high fertility would correspond to increased willingness to spend money on expensive appearance-enhancement measures at high fertility compared to low fertility.

Method

Participants. Fifty-nine female undergraduates at the University of Texas, Austin aged 17 to 27 years (M = 18.71) participated. All were normally ovulating and not on hormonal contraceptives.

Procedure. The procedure followed was similar to that described in Study 1. In Study 2, high-fertility testing sessions took place, on average, .78 days after a positive test indicated a surge in LH (SD = .81). On average, low-fertility testing sessions took place 4.76 days before menses (SD = 3.56). Thirty-four participants completed high-fertility testing first and 25 completed low-fertility testing first. As in Study 1, participants in each session completed a survey to assess self-perceived mate value, relationship status, and self-esteem. Additionally, we measured long- and short-term mating motivations by having participants use 7-point scales to rate the

degree to which they were actively seeking each type of relationship.

To test whether the magnitude of the predicted self-esteem decrease at high fertility would correspond to increased willingness to spend money on items to enhance appearance, we gave participants a hypothetical shopping task. During this task, participants were asked to imagine that they were preparing for a big social event in which there would be a lot of single, attractive people in attendance. They were told that they did not have very much money at the present time but that they had a credit card available to use. They were told that they were considering purchasing six items to help them prepare for the event: (a) an outfit; (b) makeup and facial products; (c) a tanning package; (d) shoes; (e) hair styling, manicure, and pedicure; and (f) undergarments. For each of the six item types, participants were offered two options: One option was very expensive and, in turn, promised great attractiveness-enhancement benefits; the other option was inexpensive but offered no promise of enhancing attractiveness. For example, participants were given the following options for shoes: (a) You spot and purchase shoes to go with your outfit at a local shoe warehouse. Sale price is $45. (b) You spot and purchase the latest designer shoes from a sample sale that complement your outfit and make your legs look longer and leaner than they actually are. Sample sale price is $150.

Results

As in Study 1, differences in self-esteem across high- and low-fertility sessions were examined using a repeated measures ANOVA (GLM; SPSS 15.0) with session (high vs. low fertility) as the repeated factor and relationship status (in a relationship, n = 11 vs. single, n = 48) as a between-subjects factor. As in Study 1, women experienced a self-esteem decrease at high fertility (M = 22.20, SD = 5.22) compared to low fertility (M = 22.90, SD = 4.98), $F(1, 57)$ = 9.85, p = .003, η^2 = .15. A secondary analysis was conducted in which order of session, days to menstrual onset, and days to ovulation were added to the model to test whether any of these variables influenced self-esteem or interacted with the independent variables of interest. No such effects emerged; thus, all three variables were dropped from subsequent analyses.

The self-perceived mate value, long-term mating effort, and short-term mating effort variables did not differ significantly between high- and low-fertility sessions. Thus, each of these three variables was collapsed across sessions (all composites α > .85) and entered into the base model ANOVA as continuous, independent variables. The results of this analysis revealed a significant Session × Long-Term Mating Motivation interaction, $F(1, 55)$ = 5.32, p = .025, η^2 = .09. To probe this interaction, we calculated the partial correlation coefficient between

women's long-term mating motivation and the magnitude of the self-esteem decrease at high fertility (self-esteem at high fertility minus self-esteem at low fertility). The results revealed a positive relationship between women's self-reported long-term mating motivations and the magnitude of the self-esteem decrease at high fertility, corresponding partial $r(55) = -.30$, $d = .63$. There were no interactions found between short-term mating motivation, relationship status, or self-perceived mate value and fertility session. However, as in Study 1, a main effect of self-perceived mate value on self-esteem emerged, $F(1, 53) = 18.91$, $p < .001$, $\eta^2 = .26$. As predicted, overall self-esteem (high-fertility/low-fertility composite, $\alpha = .93$) was highly positively correlated with self-perceived mate value, $r(59) = .38$, $p = .003$, $d = .82$. No main effects were found for either long- or short-term mating motivation on overall self-esteem.

To test whether the magnitude of the self-esteem shift predicted a greater willingness to purchase expensive attractiveness-augmentation products at high fertility, we first calculated the total number of expensive products purchased at each session by summing the number of times participants chose the expensive, more enhancing product over the less expensive option across all six item types (anchors: 0 and 6; $\alpha = .53$). Differences in items purchased across session (high vs. low fertility) were examined using a repeated measures ANOVA in which session was the within-subjects factor, and self-esteem difference score (self-esteem at high fertility minus self-esteem at low fertility) and long-term mating motivation were included as continuous, between-subjects factors. The results of the analysis revealed a significant Session × Self-Esteem Difference interaction, $F(1, 53) = 5.75$, $p = .02$, $\eta^2 = .10$. Probing this interaction revealed that a greater decrease in self-esteem at high fertility corresponded to an increased willingness to purchase expensive items to enhance attractiveness at high fertility, corresponding partial correlation, $r(53) = -.31$, $d = .65$ (see Figure 1). There were no main effects of fertility, self-esteem difference, or long-term mating motivation on items purchased to enhance attractiveness, nor was there an interaction between long-term mating motivation and the number of items purchased to enhance attractiveness across the cycle.

Discussion

The results of Study 2 replicated the finding that although self-esteem is positively related to self-perceived mate value between women, self-esteem decreases when fertility is at its highest point within the ovulatory cycle. Convergent support for our hypothesis was found in the relationship between women's self-reported long-term mating motivations and the magnitude of the self-esteem shift at high fertility. The more motivated women were
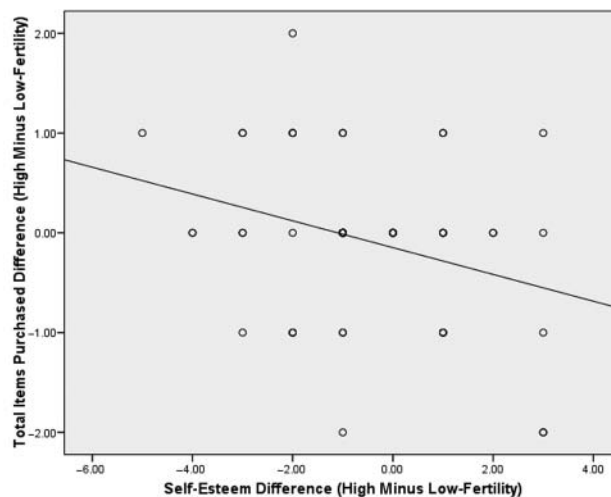

Figure 1 Total items purchased at high minus low fertility versus self-esteem at high minus low fertility.

to secure long-term romantic partners, the greater the self-esteem decrease at high fertility. Additionally, although there was no difference in the number of attractiveness-enhancement items purchased between high and low fertility, the magnitude of the self-esteem dip at high fertility was positively related to an increased willingness to purchase expensive attractiveness-enhancement products to prepare for a hypothetical social event. This result suggests that the observed self-esteem decrease at high fertility may play a role in motivating the mate-value-enhancement behaviors other researchers have observed at high fertility (Durante et al., 2008; Haselton et al., 2007). Additionally, as in Study 1, current relationship status did not influence the magnitude of the self-esteem decrease at high fertility. That this effect failed to emerge in both studies suggests that the self-esteem shift at high fertility may facilitate mating goals that are common to women who are both mated and unmated (see the General Discussion).

No support was found for women's short-term mating motives influencing the decrease in self-esteem at high fertility. This result may reflect men's relatively lower standards in the short-term compared to long-term mating context (Kenrick et al., 1990; Kenrick et al., 1993). That is, because men are generally less choosy about short-term compared to long-term mates, a woman's mate-value-enhancement efforts may be less likely to correspond to quality differences in the short-term partners available to her. On this view, the magnitude of the self-esteem shift at high fertility may be sensitive to proximate-level features that influence the degree to which mate-value-enhancement efforts are likely to correspond to ability to secure increasingly desirable mates. Another possibility is that this result owes itself to the small number of women in this sample who had

romantic partners (*n* = 11). Although there are clear benefits available to women from securing short-term sexual partners whose genetic quality surpasses that of their primary mate's (see, e.g., Gangestad et al., 2005), single women's mating efforts may be best used attracting long-term partners who can provide them with both resource investment (direct benefits) and high genetic quality (indirect benefits). Future research on a larger sample of mated women is needed to test whether there is an interaction between the quality of a woman's romantic partner, her short-term mating motivations, and the observed self-esteem dip at high fertility.

GENERAL DISCUSSION

Although intuition suggests that women should feel best at the point in their ovulatory cycle when they appear most attractive to others, the results of the current studies demonstrated the opposite. Study 1 found that although self-esteem is positively related to self-perceptions of mate value between individuals, women experienced an intraindividual self-esteem decrease near ovulation. Study 2 replicated this effect and demonstrated that women's long-term mating motivations are positively related to the magnitude of the self-esteem decrease at peak fertility. For women who are most actively seeking a long-term mate, the benefits associated with increased motivation to enhance mate value at high fertility would be even greater than for those women whose mating goals are less salient. These findings are consistent with the hypothesis that self-esteem may be sensitive to specific contextual cues—including fertility and mating motivation—that influence the potential payoffs associated with mate value enhancement. Study 2 also demonstrated a positive relationship between the magnitude of the self-esteem decrease at high fertility and increased willingness to spend money to augment attractiveness in a hypothetical shopping task. Other researchers have found that women are more motivated to enhance their appearance at high fertility compared to low fertility (Durante et al., 2008; Haselton et al., 2007). Although the results of the current studies did not replicate this main effect, the interaction between the self-esteem shift across the cycle and willingness to spend on attractiveness-enhancement products suggests that the self-esteem shift at high fertility may play a role in motivating these behaviors. Women may feel a little worse at times in their cycle when motivation to look their best would have been most likely to translate to increased reproductive success over evolutionary time.

In addition to lending initial support for the hypothesis that self-esteem may be negatively related to fertility across the menstrual cycle, the current results highlight that the relationship between how individuals feel about themselves, how they appear to others, and the cognitive processes that guide behavior may not always be related to one another in a completely straightforward way. Researchers have demonstrated that women undergo a number of positive changes during the ovulatory phase of the menstrual cycle. Women report feeling sexier and more attractive at high fertility (Haselton & Gangestad, 2006) and are perceived as more attractive to others at this time (Havlicek et al., 2005; Miller et al., 2007; Singh & Bronstad, 2001; Thornhill et al., 2003). Thus, the negative relationship between fertility and self-esteem found in two samples of women is not what intuition would dictate. However, as we have suggested in this article, this result may owe itself to self-esteem decreasing in response to the heightened importance of self-enhancing goals at high fertility. Taken together with the findings that self-esteem is U-shaped across the life span (e.g., Robins et al., 2002), these findings raise the intriguing possibility that intrapersonal self-esteem may be at its lowest when individuals are at the points in their lives when they have much to feel good about (i.e., they are at the peak of their ability to achieve their objectives, mating and otherwise). That is, although self-esteem varies positively with an individual's daily failures and successes, it may simultaneously vary negatively with the evolutionary importance of succeeding in these domains based on current fertility. Although this interpretation is consistent with the current findings and the documented changes in self-esteem across the life span, further research is clearly needed before any such conclusions can be drawn.

It is important to emphasize that although we found evidence for a negative relationship between self-esteem and fertility across the menstrual cycle, this relationship is not necessarily a causal one. Research has demonstrated that women experience a number of important changes at high fertility, any of which could be responsible for the relationship between self-esteem and fertility presented in this article. For instance, women experience increased sexual desire at high fertility (Bullivant et al., 2004) and exhibit a heightened preference for short-term mating opportunities (Gangestad et al., 2004; Gangestad & Thornhill, 1998; Penton-Voak et al., 1999). It is possible that changes such as these may influence how a woman feels about herself via changes in her behavior. For instance, if women's heightened mating desires at high fertility translate into increased willingness to approach mating prospects, this change in behavior may correspond to an increased probability that a woman has been recently rejected. If true, it is likely that this change and not fertility per se would be responsible for the observed self-esteem decrease near ovulation. This alternative would also account for the demonstrated interaction between mating motivation and the magnitude of the self-esteem shift at high fertility. That is, for women

who are most motivated to attract long-term mates, mating-market failures would likely have an asymmetrically negative impact on their self-esteem at high fertility compared to low fertility. Future research would need to ask women about their recent mating-related activities to test this potential alternative. Another alternative is that the self-esteem decrease near ovulation may result from changes in the way men treat women at this time. Researchers have found that ovulating women are touched more frequently in singles bars (Grammer, 1996) and are mate guarded more intensely by their romantic partners (Haselton & Gangestad, 2006). These and other behavioral changes in men may make women feel more objectified than they do normally, which could lead to a decrease in self-esteem. Future research is needed to draw more definitive conclusions about the specific mediating variables involved in the documented relationship between self-esteem and fertility.

A second note of caution must be made regarding a weakness in the methodology used to test whether the self-esteem dip at high fertility corresponds to an increased willingness to purchase expensive items designed to enhance attractiveness. The method with which we tested this prediction asked participants to choose which of two items they would most prefer to purchase across six classes of items. Each of the six item types was a product that is related to physical appearance (e.g., clothes, shoes); thus, we cannot conclude with certainty that the self-esteem shift at high fertility leads to increased willingness to spend on attractiveness augmentation per se. That is, the demonstrated effect of increased willingness to spend on attractiveness-enhancement items may actually result from a more general desire to spend money on anything when self-esteem is low. Researchers have found that when self-esteem is threatened, people often engage in immediate impulses and urges designed to make them feel better, due to a lack of self-regulation (Crocker & Park, 2004). Therefore, women's increased spending on the hypothetical shopping task may simply be an example of self-regulation failure during a self-esteem threat. Future research is needed to demonstrate that women purchase products related to attractiveness (e.g., new clothes) during periods of high fertility but do not purchase other pleasant products not related to attractiveness (e.g., electronics) to rule out this alternative hypothesis.

We have posited that the ovulatory decrease in self-esteem may increase women's mate-value-enhancement motivations at high fertility; however, this strategy is not without costs. For instance, one cost associated with a decrease in self-esteem at high fertility is that a woman could accept a mate of lower quality than she would if her self-esteem was higher. This could result in a woman making suboptimal mating choices at times when the consequences of her mate choice are paramount. Research is needed to determine whether women's mating psychology contains mechanisms that may help avert such a cost. One potential safeguard may be a woman's self-perceived mate value. Despite women experiencing a dip in self-esteem at high fertility, in the current study, women's self-perceived mate value remained constant between low and high fertility. Self-perceived mate value remaining stable at high fertility (or, as some studies have found, increasing at high fertility; Haselton & Gangestad, 2006) may be the mechanism that protects women from accepting lower quality mates. Existing research demonstrates that men and women positively assort for overall mate quality (Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Hill & Reeve, 2004). Thus, although women experience a slight decrease in self-esteem and invest more effort in mate value enhancement, their self perceptions of mate value may protect them from settling for a less desirable partner than they otherwise would. Future research is needed to test this hypothesis and explore whether a slight decrease in self-esteem, such as the one presented in the current studies, is associated with lowered standards in mate selection.

Finally, additional research is needed to verify whether a similar self-esteem decrease is found in response to other factors that influence the importance of mate competition at a given moment (e.g., changes in marital status, sex ratio of current social network). Such research is necessary before we can draw any general conclusions about the degree to which self-esteem is sensitive to other changes in the internal and external environment that may similarly modulate the salience of mate value enhancement. Nonetheless, the current study sheds new light on intraindividual variation in self-esteem across short time spans and, coupled with previous research, suggests that mechanisms that regulate fertility may play an important role in guiding behavior. At a minimum, future research exploring self-esteem can benefit from identifying where female participants are in their menstrual cycles, as this variable appears to have a significant influence on a woman's general feeling of self-worth.

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