



# Does physical attractiveness buy happiness? Women's mating motivation and happiness

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## Abstract

Given the centrality of physical attractiveness in women's mate value, we predicted that mating motive salience would increase the weight of physical attractiveness in women's happiness. At an individual difference level, women with chronically high levels of mating motivation weighed physical attractiveness more heavily in their happiness than others (Study 1). When mating motivation were experimentally primed, happiness hinged more on physical attractiveness in the mating than in the control condition (Study 2). Finally, when compared across the ovulatory cycle, the importance of physical attractiveness in women's happiness was accentuated during the high-fertility phase (Study 3). Results provide converging evidence that mating motivation increases the importance attached to and sensitivity towards physical attractiveness in appraising happiness among women. The current work suggests a novel evolutionary function of happiness, namely, to signal progress toward adaptively important goals.

**Keywords** Physical attractiveness · Mating motivation · Happiness · Evolutionary psychology · Mate value

## Introduction

Physical appearance is one of the most salient and noticeable characteristics of a person. It not only serves as an important cue for social evaluation, but also generates a “halo effect,” leading people to believe that an attractive person possesses a more desirable personality, a more rewarding social life, and, overall, a happier life than others (Langlois et al. 2000).

Are good-looking people indeed happier than less attractive people? Significant relationships have been found between physical attractiveness and psychological well-being measures (Gupta et al. 2016; Hamermesh and Abrevaya 2013). For instance, physical attractiveness is positively correlated with self-esteem (Shackelford 2001), whereas negative body image is associated with low emotional well-being and depressive mood (Mond et al. 2011).

Yet, despite long-standing consensus, the debate on the robustness of the physical attractiveness and happiness link

continues because evidence from large-scale studies suggest otherwise. For instance, a meta-analysis (Feingold 1992), as well as a study of 1100 female twins (McGovern et al. 1996), failed to find a strong link between physical attractiveness and affective measures. The general conclusion from subjective well-being research is that objective personal resources, such as one's physical appearance, predict happiness less strongly than intuition might suggest (Lyubomirsky 2001).

One key factor that may moderate the seemingly inconsistent link between physical attractiveness and happiness is the person's goals. In one well-known study on physical attractiveness and happiness, Diener et al. (1995) found that the impact of physical attractiveness on happiness depended on the content of personal goals. Specifically, although physical attractiveness was generally a weak predictor of life satisfaction, it became a markedly stronger predictor among those for whom attractiveness was an important idiographic goal. This pattern is consistent with the idea that happiness hinges on a personal sense of having resources in areas that are relevant to one's central goals (Hofer et al. 2006; Oishi et al. 1999). That is, people's sense of happiness may depend on how successful they are in satisfying values that align with their key motives (Brunstein 2010). If so, for whom and under what conditions does physical attractiveness become a particularly salient personal goal?

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## Mating motivation and physical attractiveness

A growing body of evolutionary psychology research suggests that adaptively significant goals influence a wide range of perceptual and cognitive processes, often outside of awareness (Ainsworth and Maner 2012). Many of these goals are closely intertwined with fundamental social motives, which are linked to a set of distinct, recurrent threats and opportunities that human face, such as protecting oneself from physical harms from others, avoiding contagious disease, finding friends, gaining status, acquiring mates, retaining a mate, and caring for children and family (Bugental 2000; Neel et al. 2016). Each of those motivational states tend to produce a specific cognitive mindset that directs the individual's attention to fitness-relevant stimuli in the social environment (Kenrick et al. 2010).

For example, the mate-seeking motivation, which can be primed by imagining a potential mate (Sundie et al. 2011) or activated by hormonal fluctuations (Bullivant et al. 2004), directs people's attention to information about their own as well other's mate value (Griskevicius and Kenrick 2013). Because men place a premium on physical attractiveness in their choice of a romantic partner, women's self-appraised mate value is determined in great part by physical attractiveness (Li et al. 2002). As such, the importance of physical attractiveness as a personal resource for women is accentuated when mating goals are salient. For instance, when females are primed to draw the attention of potential mates, they become more willing to take health risks (e.g., take dangerous pills), as long as they enhance their attractiveness (Hill and Durante 2011). In a similar vein, women in the ovulatory phase of the fertility cycle prefer more attractive and revealing clothing (Durante et al. 2008; Haselton et al. 2007) and place more emphasis on physical attractiveness in defining themselves (Beaulieu 2007), compared to women outside of the fertile window. These effects reflect shifts in mating motivation that track fertility (Gildersleeve et al. 2014).

Although evidence for the relation between physical attractiveness and happiness is mixed, at least among women, it appears that the importance of physical attractiveness would vary according to the strength of her mate-seeking motive. Is it the case that the women's mating desire strengthens the association between physical attractiveness and happiness? We explored this possibility across three studies, measuring or manipulating mating motives in different ways. In Study 1, we measured chronic individual differences in mate-seeking motivation through a questionnaire; women who score higher on this dispositional measure were expected to base their happiness

more on physical attractiveness than others. In Study 2, we experimentally primed mating motivation, hypothesizing that physical attractiveness would predict happiness more strongly when mating motives were made salient. Finally, to increase the ecological validity of our finding, in Study 3, we examined how the link between physical attractiveness and happiness fluctuates across the women's ovulatory cycle. Across the diverse measures and study methods, we expected to find a consistent pattern—women's happiness judgments will be based more on physical attractiveness when their desire for mating is high.

### Study 1

Women vary in the strength of their mate-seeking motive, and presumably, on the importance they attach to physical attractiveness. We examined whether those with chronically high level of mate-seeking motivation place more premium on their physical attractiveness in their self-judgments of happiness. The key prediction was that the relation between physical attractiveness and happiness would be tighter among women with chronically high (compared to low) levels of mate-seeking motivation.

### Method

#### Participants

The sample size of this study was determined on the basis of a power analysis using G\*power (Version 3.1; Faul et al. 2007). The test indicated a desired sample of 115, anticipating a small to medium effect size ( $f^2 = 0.07$ ), power of 80, and  $\alpha = 0.05$ . One hundred and 56 female participants were recruited through Amazon's Mechanical Turk (MTurk). Based on predetermined exclusion criteria, we eliminated data from participants who failed one of two simple attentional checks (i.e., I do not understand a word of English;  $n = 20$ ) and those who identified as nonheterosexual ( $n = 18$ ). Thus, our final sample included 118 women ( $M = 32.16$  years,  $SD = 6.72$ ). Participants' reported ethnicities were primarily Caucasian (68.6%), with the remainder listing a range of ethnicities.

### Materials and procedure

#### Mate-seeking motivation

To obtain individual differences in motivational inclinations of seeking and attracting a mate, we used the mate seeking scale from the Fundamental Social Motives Inventory (Neel et al. 2016). A sample item reads, "I spend a lot of time thinking about ways to meet possible dating partners" ( $\alpha =$

0.85). According to previous research, an individual who scores higher on this scale is more likely to report a number of behaviors indicative of mating effort and more likely to have been in social situation that could facilitate mate seeking, such as going out dancing (Neel et al. 2016).

### Happiness

The satisfaction with life scale (SWLS; Diener et al. 1985) assessed participants' cognitive assessment of their life satisfaction ( $\alpha = 0.94$ ). Positive and negative affect were measured by the scale of positive and negative experience (SPANE; Diener et al. 2009;  $\alpha$  for positive affect = 0.94,  $\alpha$  for negative affect = 0.91). We computed a composite subjective well-being variable by summing life satisfaction and positive affect, from which negative affect was subtracted (Diener et al. 1999).

### Importance of life domains

On the page immediately following the happiness measure, participants were asked to indicate how much importance they placed on various life domains when they were answering the previous happiness questions. Participants indicated the importance of six life domains on a 7-point scale (1 = *not at all important*; 7 = *very important*): physical attractiveness, self, intelligence, social relationship, financial status, and leisure.

### Self-perceived physical attractiveness

Participants were asked to rate their physical appearance (1 = *extremely unattractive*, 7 = *extremely attractive*), as well as how pleased (1 = *very unhappy*, 7 = *very happy*) and satisfied (1 = *not at all satisfied*, 7 = *very satisfied*) they are with their physical attractiveness. These ratings were summed to create a composite score for the self-perceived physical attractiveness (Cronbach  $\alpha = 0.91$ ).

### Personality

The ten item personality inventory (TIPI; Gosling et al. 2003) was included to control for two traits that are strongly related with subjective well-being—extraversion and neuroticism (Steel et al. 2008).

## Results and discussion

We first tested whether mate-seeking motives predict how much weight one places on physical attractiveness (compared to other life domains) for happiness. The correlations between the mate seeking scale and each of the six life domain importance ratings are displayed in Table 1. As

**Table 1** Perceived importance of domains for happiness and correlations with mate-seeking motivation

Life domains	<i>M</i> ( <i>SD</i> )	<i>r</i>	<i>p</i> value
Physical attractiveness	4.99 (1.32)	0.25	0.007
Self	6.08 (1.02)	− 0.02	0.74
Intelligence	5.35 (1.40)	0.11	0.20
Social relationship	5.26 (1.36)	0.06	0.47
Financial status	5.40 (1.35)	0.11	0.21
Leisure	5.40 (1.26)	− 0.00	0.98

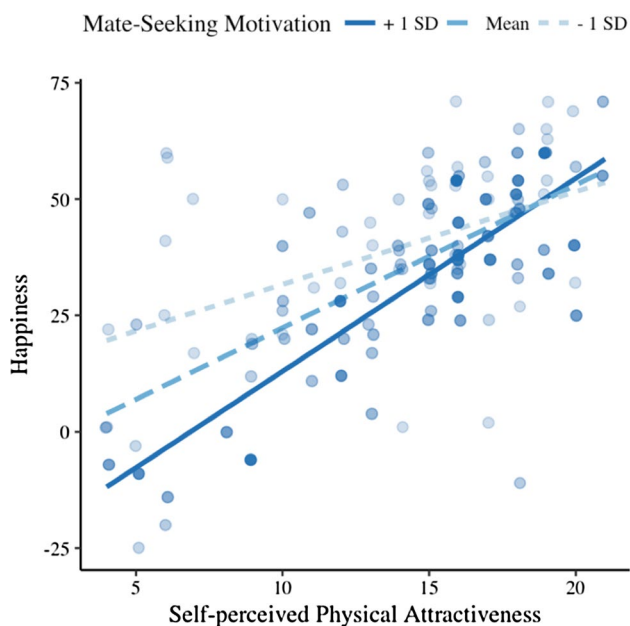
predicted, participants with higher mate-seeking motivation assigned more importance to physical attractiveness as a source of their happiness ( $r = 0.25$ ,  $p = 0.007$ ), but this motive was irrelevant for predicting the importance of other life domains.

Second, to examine the key hypothesis—that the relation between physical attractiveness and happiness should be stronger among women with chronically high than low levels of mate-seeking motivation—we performed a multiple regression analysis on the subjective well-being predicted by self-perceived physical attractiveness, mate-seeking motivation, and their interaction. All measures were centered for regression.

There were significant main effects of self-perceived physical attractiveness,  $t(114) = 9.25$ ,  $p < 0.001$ ,  $b = 3.07$ ,  $SE = 0.33$ , 95% CI [2.41, 3.72], and mate-seeking motivation,  $t(114) = -3.43$ ,  $p = 0.001$ ,  $b = -0.50$ ,  $SE = 0.15$ , 95% CI [− 0.78, − 0.21]. Overall, women who self-perceive to have high physical attractiveness reported higher happiness and women who have high mate-seeking motivation reported lower happiness. As summarized in Fig. 1, the self-perceived physical attractiveness  $\times$  mate-seeking motivation interaction was significant,  $t(114) = 3.09$ ,  $p = 0.003$ ,  $b = 0.10$ ,  $SE = 0.03$ , 95% CI [0.04, 0.17]<sup>1</sup>.

Following Aiken and West (1991), we probed the effect of mate-seeking motivation at 1 *SD* above and below the mean and tested the simple effect of self-perceived physical attractiveness. Among participants with low mate-seeking

<sup>1</sup> The focus of this paper was on the role of mating motivation on female's happiness, rather than gender difference. However, our Study 1 data also included males ( $n = 150$ ;  $M = 31.53$ ,  $SD = 6.54$ ), allowing us to examine this issue. Regression analysis revealed a significant three-way interaction between sex (dummy coded), self-perceived physical attractiveness (centered), and mating motivation (centered) on subjective well-being,  $t(261) = -2.09$ ,  $p = 0.038$ ,  $b = -0.09$ ,  $SE = 0.04$ , 95% CI [− 0.17, − 0.01]. Specifically, the two-way Physical Attractiveness  $\times$  Mating Motivation interaction was significantly different for men than for women. Although this interaction was significant for female participants (as reported in the main text), this was not the case among male participants,  $t(149) = 0.43$ ,  $p = 0.665$ ,  $b = 0.01$ ,  $SE = 0.03$ , 95% CI [− 0.04, 0.07].



**Fig. 1** Self-perceived physical attractiveness and happiness as a function of mate-seeking motivation in Study 1. The line shows estimated happiness at low (1 *SD* below the mean), medium (mean), and high (1 *SD* above the mean) level of mate-seeking motivation

motivation, self-perceived physical attractiveness positively predicted happiness,  $t(114) = 4.47$ ,  $p < 0.001$ ,  $b = 2.00$ ,  $SE = 0.45$ , 95% CI [1.11, 2.88]. Importantly, however, this pattern was significantly more pronounced among participants with high mate-seeking motivation,  $t(114) = 8.08$ ,  $p < 0.001$ ,  $b = 4.14$ ,  $SE = 0.51$ , 95% CI [3.13, 5.16]. This interaction remained significant after controlling for two personality traits that are closely related to happiness—extraversion and neuroticism,  $t(111) = 2.99$ ,  $p = 0.003$ ,  $b = 0.09$ ,  $SE = 0.03$ , 95% CI [0.03, 0.15]. The current results suggest that physical attractiveness have a stronger impact on the happiness of women who have high than low mate-seeking motivation.

Additionally, we tested whether the interaction between self-perceived physical attractiveness and mate-seeking motivation independently predicted each component of subjective well-being. The interactions were significant for life satisfaction (SWLS),  $t(114) = 2.73$ ,  $p = 0.007$ ,  $b = 0.04$ ,  $SE = 0.01$ , 95% CI [0.01, 0.06], for positive affect,  $t(114) = 2.81$ ,  $p = 0.006$ ,  $b = 0.04$ ,  $SE = 0.01$ , 95% CI [0.01, 0.06], and for negative affect,  $t(114) = -2.05$ ,  $p = 0.043$ ,  $b = -0.03$ ,  $SE = 0.02$ , 95% CI [-0.07, -0.001]. This analysis suggests that the self-perceived physical attractiveness becomes an especially stronger predictor of both cognitive and emotional appraisals of happiness to women when they have high compared to low mate-seeking motivation.

Consistent with our prediction, the higher a woman's motivation to find a romantic partner was, the more she

believed that physical attractiveness was central for her happiness. Moreover, self-perceived physical attractiveness corresponded more closely with happiness among women with high than low mate-seeking motive. These results offer preliminary support for the hypothesis that physical attractiveness plays a more pronounced role in women's happiness when they have a strong desire to attract a mate. In Study 2, we sought to replicate this finding in a more controlled experimental setting.

## Study 2

To examine the causal link between mating motive and happiness more directly, we experimentally manipulated mating motive in Study 2. After priming mating motivation using a video clip and a guided visualization exercise, female participants received either a positive or negative feedback about their physical attractiveness. Conceptually parallel to the chronic individual difference finding from Study 1, it was expected that happiness judgment would be more affected by the physical attractiveness feedback only when mating motivation was activated. Thus, we anticipated a significant priming condition  $\times$  physical attractiveness feedback interaction, such that the effect of physical attractiveness on happiness would be greater when mating motivation is made salient.

## Method

### Participants

Based on the effect size from the study 1 ( $\eta_p^2 = 0.07$ ), a priori power analysis required a sample size of 107, anticipating a power of 0.80 and  $\alpha = 0.05$ . We were able to exceed that target, as our final sample included 124 female undergraduate students ( $M = 21.94$  years,  $SD = 1.51$ ) who participated in exchange for partial course credit.

### Design and procedure

The study used a 2 (Priming: mating, control)  $\times$  2 (physical attractiveness feedback: positive, negative) between-subjects design. Participants arrived for a study ostensibly concerned with facial symmetry. Face photographs were taken upon arrival, with the understanding that their facial symmetry would be precisely analyzed by a newly developed computer software. After completing a brief demographic questionnaire and the ten-item personality inventory (Gosling et al. 2003), participants were randomly assigned to either the mating ( $n = 61$ ) or control ( $n = 63$ ) priming condition.

## Mating motivation primes

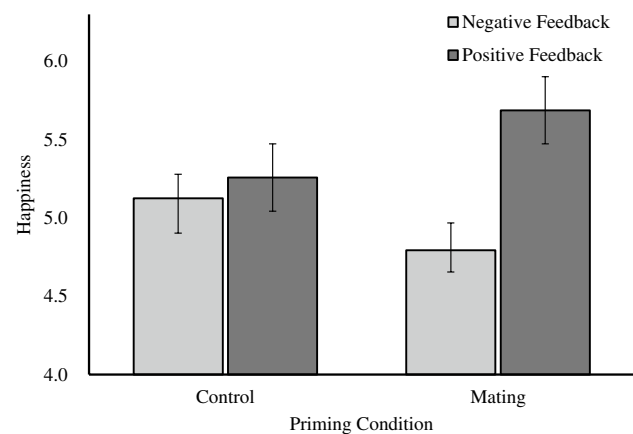
Mating motive was primed using a video clip and a guided visualization exercise. In the mating condition, participants viewed a clip from the *Tom Ford* lipstick advertisement, in which couples exchange passionate kisses. Following the clip, they read a scenario about meeting a highly desirable man and spending a romantic day with him. In the control condition, participants viewed a clip from a *Nike* advertisement that showed exercising scenes. After the clip, they read a scenario about having fun with a close same-sex friend, without any romantic or sexual content. As a manipulation check, participants were asked to indicate their (1) level of romantic arousal, (2) level of sexual arousal, and (3) desire to attract others on a 7-point scale, ranging from 1 (*not at all*) to 7 (*very much*). These three items were combined to form a measure of mating motivation ( $\alpha = 0.92$ ). These manipulations have elicited mating motives successfully in past studies (e.g., Griskevics and Kenrick 2013; Sundie et al. 2011); in the present sample, participants in the mating condition ( $M = 4.75$ ,  $SD = 1.20$ ) reported significantly higher level of mating motivation than those in the control condition ( $M = 2.16$ ,  $SD = 1.35$ ),  $t(122) = 11.23$ ,  $p < 0.001$ . Thus, the mating motivation priming was effective.

## Physical attractiveness feedback

After the priming procedure, participants were randomly assigned to either the positive (mating:  $n = 32$ ; control:  $n = 31$ ) or the negative (mating:  $n = 29$ ; control:  $n = 31$ ) physical attractiveness feedback condition. They received bogus feedback about their facial symmetry, purportedly analyzed by a new computer program. In the positive feedback condition, participants were told that their facial attractiveness, based on the degree of symmetry, ranked in the top 8% of the population; in the negative condition, participants were told that they ranked in the bottom 21%. After receiving the feedback, participants rated their self-perceived physical attractiveness on a 7-point scale ranging from 1 (*not at all attractive*) to 7 (*extremely attractive*). Participants in the positive feedback condition ( $M = 4.46$ ,  $SD = 1.03$ ) reported significantly higher self-perceived physical attractiveness than those in the negative condition ( $M = 3.92$ ,  $SD = 1.24$ ),  $t(122) = 2.65$ ,  $p = 0.009$ . Thus, the physical attractiveness feedback manipulation was effective.

## Happiness

As a baseline happiness measure (before priming), participants completed the Cantril Ladder scale (Cantril 1965) in which they report where they currently stand in life on a ladder with 11 steps (from 0 = *worst possible life* to 10 = *best possible life*). After receiving the physical attractiveness

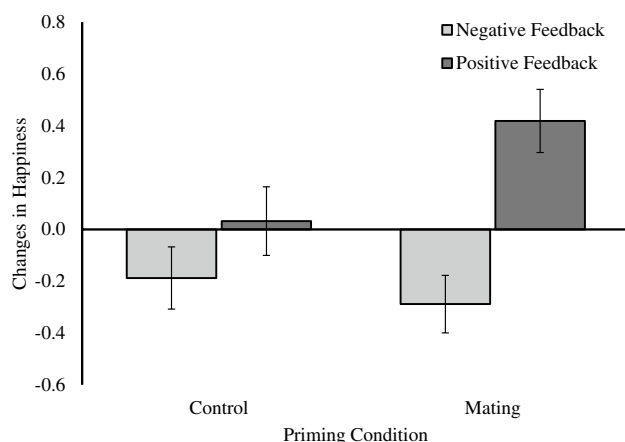


**Fig. 2** Effect of bogus physical attractiveness feedback on happiness in mating and control conditions. Error bars represent standard errors of means

feedback, participants rated their happiness again, using a different measurement. As a post-priming happiness measure, participants were asked to rate how satisfied they are with their life, using a scale that ranged from 1 (*very dissatisfied*) to 7 (*very satisfied*). For the degree of changes in happiness, baseline happiness score was subtracted from post-priming happiness score after both happiness ratings were standardized (transformed into z-scores).

## Results and discussion

A planned contrast demonstrated that there were no significant differences on baseline happiness, all  $t(120) < 0.06$ ,  $ps > 0.60$ . A 2 (Priming: mating, control)  $\times$  2 (physical attractiveness feedback: positive, negative) analysis of variance (ANOVA) found a marginally significant main effect of priming condition,  $F(1, 120) = 3.89$ ,  $p = 0.051$ ,  $\eta_p^2 = 0.03$ , and a significant main effect of physical attractiveness feedback  $F(1, 120) = 8.91$ ,  $p = 0.003$ ,  $\eta_p^2 = 0.07$ , qualified by a significant interaction,  $F(1, 120) = 4.76$ ,  $p = 0.031$ ,  $\eta_p^2 = 0.04$  (Fig. 2). As expected, the physical attractiveness feedback had a more pronounced effect on the women's happiness in the mating condition than the control condition. In the mating condition, participants who received positive feedback on their physical attractiveness reported significantly higher happiness ( $M = 5.69$ ,  $SD = 0.78$ ), compared to those who received negative feedback ( $M = 4.79$ ,  $SD = 0.94$ ),  $t(120) = 3.59$ ,  $p < 0.001$ . In the control condition, physical attractiveness feedback did not significantly alter the happiness judgment (positive feedback  $M = 5.26$ ,  $SD = 1.24$ ; negative feedback  $M = 5.13$ ,  $SD = 0.87$ ),  $t(120) = 0.54$ ,  $p = 0.587$ . The moderating role of physical attractiveness was significant over and above extraversion and neuroticism,  $F(1, 118) = 4.62$ ,  $p = 0.034$ ,  $\eta_p^2 = 0.04$ .



**Fig. 3** Effect of bogus physical attractiveness feedback on changes in happiness in mating and control conditions. The degree of changes in happiness was computed by subtracting the standardized baseline happiness from the standardized post-priming happiness. Error bars represent standard errors of means

The priming  $\times$  physical attractiveness feedback interaction was also significant on happiness change,  $F(1, 120) = 3.97$ ,  $p = 0.049$ ,  $\eta_p^2 = 0.03$  (Fig. 3). In the mating condition, participants who received positive feedback reported a significant increase in happiness ( $M = 0.42$ ,  $SD = 0.69$ ), compared to those who received negative feedback ( $M = -0.29$ ,  $SD = 0.60$ ),  $t(120) = 4.06$ ,  $p = 0.001$ . In the control condition, feedback on physical attractiveness did not significantly alter happiness judgments (positive feedback  $M = 0.03$ ,  $SD = 0.74$ ; negative feedback  $M = -0.19$ ,  $SD = 0.68$ ),  $t(120) = 1.28$ ,  $p = 0.202$ .

The present findings suggest that women’s happiness judgments are sensitive to their motives; when mate acquisition became salient, their happiness depends more on a self-feature that can help them attain that goal: physical attractiveness. Whether activated experimentally (Study 2) or dispositional (Study 1), it appears that physical attractiveness becomes a more significant yardstick of happiness when mating motivation is salient. In Study 3, we sought to verify this pattern in a more naturalistic setting, by examining whether the women’s ovulatory cycle predicts the extent to which physical attractiveness is taken into account in happiness judgments.

### Study 3

Hormonal fluctuations also affect women’s mating motivation. Evolutionary models have proposed that women’s mating psychology is sensitive to fertility and their mating motivation is strongest during the ovulatory phase. For example, during the period surrounding ovulation, women pay more attention to men (Anderson et al. 2010), report

greater interest in attracting new romantic partners (Haselton and Gangestad 2006), display more flirting behaviors (Cantú et al. 2014), and becomes more receptiveness to others’ attempts to initiate romantic involvements with them (Guéguen 2009a, b). Given that the ovulatory cycle may constitute a “natural” manipulation of mating motivation, Study 3 examined the possibility that happiness becomes more contingent on women’s relative physical attractiveness during the high- than low-fertility period.

One of the main channels women use to assess their physical attractiveness is social comparison (Myers and Crowther 2009). Because the typical direction of this physical attractiveness comparison is upward (e.g., against attractive media images), frequent comparison is associated with decreased level of satisfaction and negative mood (e.g., Strahan et al. 2006). In fact, frequency of social comparison, in general, is predictive of lower subjective well-being (Fujita 2008; White et al. 2006). In sum, frequent comparison of physical attractiveness is likely to lower one’s confidence in that particularly self-domain, which may spill over and lower overall happiness.

We hypothesized that this potential negative association between frequency of physical attractiveness comparison and happiness will be amplified among women in the high-fertility period of their ovulation cycle. That is, the increased mating motivation during this period could make physical attractiveness a more central component of happiness. To test this idea, we asked female participants to rate how often they made physical attractiveness comparisons during two different periods—the high- and low-fertility phases of the ovulatory cycle. To boost the probability of engaging in an upward (than downward) social comparison, participants were asked to compare their faces with sets of highly attractive models. We predicted that the detrimental effect of this upward physical attractiveness comparison would be more pronounced when the happiness judgment was made during the high- than low-fertility phase.

## Method

### Participants

Sample size was determined in reference to past ovulatory cycle studies that suggest 44–64 participants are necessary to achieve 80% power to detect a Cohen’s  $d$  of 0.8, including effects of 8% anovulatory cycles and reporting error (Gangestad et al. 2016). Gangestad et al. (2016) demonstrated that within-subject studies with 50–80 sample sizes can be as powerful as between-subject studies of 700. We recruited 83 unmarried women, who were normally ovulating (25–35 days of cycle length) and not on any hormonal contraceptives. Thirty participants were dropped from the final analyses, due to incomplete data ( $n = 10$ ) or because

**Table 2** Correlation between frequency of social comparison and happiness across ovulatory cycle

Life domains	High fertility				Low fertility			
	<i>M</i>	<i>r</i>	<i>p</i>	<i>BF</i> <sub>01</sub>	<i>M</i>	<i>r</i>	<i>p</i>	<i>BF</i> <sub>01</sub>
Physical attractiveness	4.55	− 0.37	0.007	0.25	4.75	− 0.10	0.50	7.41
Intelligence	4.57	− 0.19	0.17	3.71	4.13	− 0.06	0.69	8.58
Social relationship	3.00	− 0.01	0.95	9.27	2.85	0.12	0.40	1.47
Financial status	3.37	− 0.22	0.11	2.65	3.34	− 0.27	0.05	6.56

their high- or low-fertility sessions did not occur during the predetermined high- or low-fertility windows ( $n = 20$ ), leaving a final sample of 53 participants ( $M = 21.34$  years,  $SD = 1.34$ ).

## Materials and procedure

### Assessing fertility

All participants were asked to participate in the experiment twice and to report (1) the date of previous menstrual onset, (2) anticipated date of next menstrual onset, and (3) their typical cycle length. Based on this information, the participants' fertility phase (high or low) was calculated during their first session. The follow up session was scheduled so that their second visit would take place during an ovulation period that was opposite to the initial session. That is, person A who was in the high-fertility phase at Session 1 would be scheduled for a follow up session on a date anticipated to be her next low-fertility phase, and vice-versa. Thus, all participants answered the identical questions twice (during low- and high-fertility period). To reconfirm the participants' ovulatory cycle, when necessary, mobile contact was made.

Adopting the reverse-cycle-day method, the high-fertility days were identified as reverse-cycle-day 14–20, which correspond to days 9–15 in a 28-day cycle (Gangestad et al. 2016). The low-fertility days were identified as periods of lower conception probability within the cycle (cycle 1–6, and 18–28).

### Induced upward social comparison

Before answering the social comparison items, participants were asked to compare their faces with 15 highly attractive female models. This task was repeated using different set of models, during the high and low fertility sessions, prior to making the comparison ratings. Specifically, participants were asked to select one picture among the attractive model images that they thought most resembled them and compare with her on various beauty dimensions. The order of the two sets for physical attractiveness comparison was counter-balanced. The overall means of models' average attractiveness for Set 1 ( $M = 5.22$ ,  $SD = 0.76$ ) and Set 2 ( $M = 5.22$ ,  $SD = 0.88$ ) did not significantly differ,  $t(104) = 0.00$ ,  $p = 1.00$ .

### Frequency of social comparison

By adopting items from the frequency of social comparison scale (FSCS; Fujita 2008), participants were asked to rate how often they made social comparisons over the past 3 days—to capture the fertility phase—on four life domains that were positively correlated with mating motivation on Study 1, on a scale ranging from 1 (*never*) to 7 (*always*); physical attractiveness, intelligence, social relationship, financial status.

### Happiness

At the end of each session, participants completed two items that were summed to create an index of happiness ( $\alpha = 0.68$ ). First, participants indicated how satisfied they are with their life, using a scale that ranged from 1 (*very dissatisfied*) to 7 (*very satisfied*). Next, participants completed the Cantril Ladder scale (Cantril 1965; from 0 = *worst possible life* to 10 = *best possible life*).

### Personality

The Ten Item Personality Inventory (TIPI; Gosling et al. 2003) was used to measure extraversion and neuroticism.

## Results and discussion

We predicted that unfavorable social comparisons of physical attractiveness may have a greater negative effect on women's happiness judgements during the high-relative to the low-fertility phase. Table 2 display the full results from the standard and Bayesian analyses of correlation. As expected, a significant negative correlation was found between frequency of physical attractiveness comparison and happiness during the high-fertility phase,  $r_{high}(53) = -0.37$ ,  $p = 0.007$ . It indicates that the more often women compare their physical attractiveness during the high-fertility phase, the less likely they were to be happy. Importantly, however, such pattern did not occur during the low-fertility phase,  $r_{low}(53) = -0.10$ ,  $p = 0.500$ .

Because null hypothesis significance testing does not assess the strength of the null hypothesis, we also analyzed these correlations using a Bayesian approach. This allowed

us to assess the strength of evidence for  $H_0$  (i.e., no relationship between frequency of comparison and happiness) versus  $H_1$  (i.e., significant relationship), in the high- and low-fertility periods, respectively. We used the default priors implemented by SPSS version 25. Consistent with the above analyses, a Bayesian factor suggests that there is substantial evidence for  $H_1$  during the high-fertility period,  $BF_{01} = 0.25$ . Specifically, the observed high-fertility data are 4 times more likely to have occurred relative to  $H_0$ , given the data (Jeffreys 1961). In contrast, during low-fertility, a Bayesian factor suggests substantial evidence for  $H_0$ ,  $BF_{01} = 7.41$ . This suggests that the low-fertility data are 7.41 times more likely to have occurred relative to  $H_1$ , given the data.

To measure a difference between two non-overlapping correlations from a same sample without a common third variable, we used a non-overlapping dependent correlation comparison (Zou 2007). The difference between the two correlations was marginally significant,  $r_{high} - r_{low} = -0.27$ , 95% CI [-0.56, 0.03], which suggests that there is a stronger relationship between frequency of physical attractiveness social comparison and happiness during the high- than low-fertility phase. Also, after controlling for extraversion and neuroticism, social comparison frequency of physical attractiveness still significantly predicted happiness during the high-fertility phase, partial  $r = -0.30$ ,  $p = 0.030$ , but not during the low-fertility phase, partial  $r = -0.07$ ,  $p = 0.610$ .

The current finding suggests that the relation between physical attractiveness and happiness varies across the menstrual cycle. During the high-fertility phase—when women tend to have higher mating motivation—upward comparisons of physical attractiveness were detrimental to happiness. This was not the case during the low-fertility phase. These results converge nicely with the earlier pattern of correlational (Study 1) and experimental (Study 2) findings as well as the outcomes of a recent meta-analysis (Gildersleeve et al. 2014). Even though, there are ongoing debates on the robustness of the ovulatory cycle shifts in women mating-related cognition (e.g., Koehler et al. 2006), current findings support the overarching idea that subtle changes in the women's mating motivation, cognition, and behavior occur across the ovulatory cycle (Gildersleeve et al. 2014). Collectively, we found that the strength of the link between physical attractiveness and happiness among women fluctuates according to the salience of their mating motivation.

## General discussion

Does physical attractiveness buy happiness? It depends on one's salient goals and motivations. Adopting an evolutionary framework, we examined the link between physical attractiveness and happiness. Given that physical

attractiveness is a critical component of women's mate value, we predicted and found that physical attractiveness plays an especially important role in happiness among women with high mating motivation. Specifically, two findings were obtained: when mating motivation was high, (a) physical attractiveness (but not other life domains) was believed to be a more important component of happiness, and (b) the actual relevance of physical attractiveness and happiness increased. This pattern was robust across different operationalizations of mating motivation. Whether obtained by self-report, induced experimentally, or a result of hormonal shifts, women with higher mating motivation seemed to be happier when they felt physically attractive.

Where does happiness come from? Recent research posits that happiness judgements are sensitive to one's relevant goals. Thus, the very same resource or ability might facilitate happiness when pursuing a relevant motive, but have marginal influence on happiness when coupled with an irrelevant motive. Viewing happiness in this way may provide a possible explanation for the previous mixed results across meta-analyses and college-sample studies. Because different goals are salient across the lifespan, as well as across sex and relationship status (Hill and DelPriore 2013; Neel et al. 2016), fine-grained predictors of happiness may uniquely exist across specific groups. Along this line, not all individuals consider physical attractiveness as an important goal (Diener et al. 1995), perhaps leading to its marginal impact on happiness in general (Feingold 1992; Lyubomirsky 2001). However, the current research suggests that physical attractiveness has a notable impact on happiness for, at least, women who are in their reproductive life stage, especially when they are pursuing a potential romantic partner.

Extending this reasoning, these findings suggest a novel future direction for sex differences in happiness research. Although past research has most often focused on mean-level differences (e.g., Fujita et al. 1991), the present study suggests that judgments of happiness may reflect a cascade of cognitive processes attuned to sex-specific mating needs and strategies. In the case of women, a prime indicator of mate value—physical attractiveness—figured prominently in happiness appraisal, particularly when the mating motive was elevated. There are reasons to believe that this relation might be different among men. Given that women prefer men with high financial and social status (Li et al. 2002), men with high mating motivation might instead base their happiness more heavily on indicators of status. In fact, men (compared to women) report that status-seeking is more strongly linked to their anticipated happiness (Kenrick and Krebs 2018) and place more weight on their economic standing during life satisfaction judgment if mating motivation is primed (Shin and Suh 2018). One implication of this is that men and women might have different beliefs about which domain of resources or ability will maximize their



happiness, even under the same fundamental social motive, and these different pursuits might be systematically linked to their sense of happiness.

By recasting the functional aspect of happiness, the current research highlights a number of interesting and potentially illuminating avenues for future research and theory in the science of well-being. From an evolutionary perspective, one function of happiness is to signal progress toward fitness-relevant goals (Suh 2014). Although cultural values and scripts offer various guidelines and standards for appraising happiness, it seems unlikely that basic biological needs and urges are insulated from this comprehensive evaluation of one's happiness. One of the central agendas of a biological being is reproductive success, which is viewed by many as an ultimate human goal (Kenrick et al. 2010; Neel et al. 2016). Successful mating starts from an accurate assessment of mate value in the competitive market (e.g., Kavanagh et al. 2010), as people seek partners of high mate value (i.e., those who possess characteristics likely to facilitate one's own reproductive success). If happiness signals progress toward fitness-relevant goals, and people seek partners of high mate value, one's own happiness should be sensitive to beliefs about one's own mate value. For instance, happiness of people seeking long-term relationships are calibrated to beliefs about their long-term mate value, whereas the happiness of people seeking short-term relationships are calibrated to beliefs about their short-term mate value (Ko et al. 2018). Similarly, the present findings provide additional support for a functional approach to happiness. Even though women may not constantly monitor their mate value, cues reflective of mate value—physical attractiveness—gain more importance in happiness when the desire to attract a mate increases, as it would ultimately signal progress toward reproductive success.

This research builds on a growing body of literature examining the evolutionary significance of fundamental social motives (Neel et al. 2016). These social motives influence social cognition, emotion, and behavior (e.g., Beall and Tracy 2017; Sacco et al. 2016; Schaller et al. 2017). However, this present study is the first that we are aware of that applies this framework to happiness. One worthy future question is whether prioritizing or feeling more succeed in certain social motives is systematically linked to individual differences in various type of well-beings. For example, while people emphasize the fundamental social motive of status-seeking for their anticipated self-actualization, they emphasize affiliation motive for their anticipated subjective well-being, and mate attraction motive for their anticipated hedonic well-being (Krems et al. 2017). Directing attention to the contribution of fundamental social motives will provide a new way of thinking about the individual variation in well-beings. The current study provides a first step in this

direction to illustrate how fundamental social motives can shape happiness.

This set of studies presented an interdisciplinary bridge between research on happiness and evolutionary psychology by exploring the ultimate function of happiness and demonstrating the utility of evolutionary theory. The continued marriage between evolutionarily inspired approaches and happiness research sets a potentially fruitful stage to uncover the secrets of happiness, as well as to build a fertile ground for empirical work.

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