Attractive caregiving: women's preference for men that care for children and the role of nurturance motivation and menstrual cycle phase

Bos P. A.; Spencer H.

RESEARCH ARTICLE

Attractive Caregiving: Women's Preference for Men that Care for Children and the Role of Nurturance Motivation and Menstrual Cycle Phase

Peter A. Bos[1] · Hannah Spencer[1]

Abstract

Another person's caring abilities, in addition to physical features, may affect the observed attractiveness of that person. Using two newly developed instruments, we tested whether women ($N = 360$) judge men as more attractive when they are depicted in interactions with children (picture task) or accompanied by information on caring behavior (vignette task). Furthermore, we tested if such an effect is moderated by the following personal factors: women's nurturance motivation, having (a desire to have) a child, women's menstrual cycle phase, and use of oral contraceptives. In the picture task, women rate men as more attractive when they are depicted in interaction with a child, and this effect was enhanced by women who have high nurturance motivation and women who have (a desire to have) a child. Although the vignette task did not show a main effect of caring behavior, there was an effect of the menstrual cycle phase, demonstrating increased overall attractiveness ratings around the time of ovulation. This study confirms that perceived caring abilities in men can influence attractiveness evaluations, but that this effect varies depending on women's own caring tendencies and desire for children, and that also the menstrual cycle phase can affect evaluations of the opposite sex. These findings add to the increasing literature that attempts to provide a more nuanced understanding of the forces that shape decisions that can form some of the most important relations in human lives.

Keywords Attraction · Sexual selection · Caregiving · Parenting · Partner choice

Introduction

The media through which humans get in touch with possible future partners today, and the scale of available options (i.e., online dating), bears little similarity to the conditions under which partner selection occurred in the millennia predating ours. Nonetheless, sexual strategy theory predicts that some of the criteria used to select partners have been conserved as adaptations that maximize the chance for healthy offspring (Buss & Schmitt, 1993, 2019). It is theorized that sex-specific preferences have evolved due to an imbalance between the sexes in parental investment during and after pregnancy. Consequently, men generally place more value on physical attractiveness, whereas for women, socioeconomic status is considered more important (parental investment theory;

Buss, 1989; Geary, 2015; Townsend & Levy, 1990; Trivers, 1972). Indeed, these sex-specific differences in attractiveness evaluations of potential partners have been widely reported (e.g., Bech-Sørensen & Pollet, 2016; Buss & Schmitt, 2019; Whyte et al., 2021). In the current study, we aim to extend these findings by focusing on an aspect of attraction that has received only limited attention: the motivation to care for children.

According to the parental investment theory, the cost of offspring is higher for women compared to men, due to pregnancy and breastfeeding (Trivers, 1972). Therefore, women have to balance different interests when considering a man as a potential partner, as this partner can serve different roles, including that of provider, protector, and caregiver. For the role of provider and protector, women may prefer a male that is masculine, physically strong, and dominant. Yet this preference may conflict with the role of caregiver, for which caring and nurturing personality traits are preferable, and dominance and physical strength may turn against you and your offspring (Brown et al., 2022). Due to these considerations in partner selection, evaluations on potential

✉ Peter A. Bos
  p.a.bos@fsw.leidenuniv.nl

1 Institute of Education and Child Studies, Leiden University, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands

future partners depend strongly on societal context (e.g., Garza et al., 2021; Marcinkowska et al., 2019). Yet, overall, women prefer attractive older men with earning potential but also strongly favor marital potential (Botwin et al., 1997; Gangestad et al., 2006; Townsend & Levy, 1990). Women also show a preference for previously partnered men (Bech-Sørensen & Pollet, 2016) or men accompanied by attractive women (Waynforth, 2007). This indicates that women may prefer personality features reflective of reliability and long-term marital potential. Indeed, women find emotional connection and trust important for sexual attractiveness (Whyte et al., 2021), and men acting altruistically are rated as more attractive (Moore et al., 2013). Importantly, women rate males as more attractive when they are involved in caring behavior toward children or elderly people (Brase, 2006). In addition, a behavioral field experiment tested the effect of a male's caring interaction with a baby on actual dating behavior in a naturalistic setting (Guéguen, 2014). After a loving interaction with a baby, women were more willing to exchange phone numbers and rated the man as more attractive and suitable as a partner. Overall, these findings demonstrate that, besides attraction to physical features, caring motivation is an important facet when evaluating potential partners. Furthermore, in line with the parental investment theory, this preference for caring motivation toward children in potential partners may weigh heavier for women due to their larger investment in offspring.

It is currently unknown whether this preference for caring motivation in men reflects a more general preference for a kind partner or whether it is selective depending on the receiver of such care and kindness. For example, Lukaszewski and Roney (2010) demonstrate that women prefer kindness and trustworthiness in a potential partner, but this effect decreases when such kindness is directed at other adults. If this is indeed the case, it might be that attraction to men with care motivation toward children is influenced by a woman's desire to have children (Brase, 2006; Buss, 1989). Also woman's own nurturance motivation—the inclination to provide care and support to infants—may additionally influence attractiveness to men with childcare motivation, since both men and women with high nurturance motivation report a stronger preference for caring motivation in future partners (Buckels et al., 2015; Hofer et al., 2017). Interestingly, women who view adult and baby faces at the same time show stronger attention for the baby faces compared to male and female adult faces, and this effect seemed stronger in women with increased interest in children, whereas men showed stronger attention for faces of the opposite sex compared to infants (Cárdenas et al., 2013). Therefore, we tested the hypothesis that men in a caring context (i.e., depicted in interaction with children or accompanied by textual information that signals childcare motivation) are

rated as more attractive and to what extent is this effect stronger in women high in nurturance motivation or with a desire to have children.

Another factor that explains variability in partner preferences in women is hormonal status, such as the menstrual cycle phase and the use of oral contraceptives (OCs)—which eliminates natural hormonal fluctuations during the cycle (Montoya & Bos, 2017). Research on the effect of the menstrual cycle phase is based on the notion that evolution might have favored a selective shift in partner preferences during the fertile phase when the chance for a successful pregnancy is higher (Penton-Voak et al., 1999). An overview by Jones et al. (2008) shows that women are more attracted to masculine men during the fertile phase and to feminine men in the non-fertile phase of the cycle. Given that facial masculinity is a cue for enhanced aggressive tendencies in men, perhaps due to stronger testosterone responses in a challenging context, it may be used by women as signaling motivations antagonistic to caregiving (Carré et al., 2009; Pound et al., 2009). Although we are not aware of studies directly investigating the effect of the menstrual cycle on observed caring motivation in males, women do prefer men who are in a relationship during the non-fertile phase (Bressan, 2019; Bressan & Stranieri, 2008). This preference may suggest that men in relationships demonstrate the ability to form secure attachments and, consequently, also possess strong caregiving motivation. As a result, women's preference for partnered men during the non-fertile phase may also extend to those who show caregiving motivation toward children (Hazan & Shaver, 1994). However, it is important to point out that the literature on the effect of the cycle phase on attractiveness is inconclusive (Harris, 2013), and several recent studies addressing the shift in attractiveness failed to replicate previous findings (Garza & Byrd-Craven, 2019, 2023; Garza et al., 2017).

The effect of OCs on partner preference is even less studied, yet OC users generally have blunted reward responses toward social stimuli, including toward the opposite sex (Montoya & Bos, 2017). An overview of the available work demonstrates that women using OCs do not show the typical preference for masculine features when the chance of conception is higher (Alvergne & Lummaa, 2010). Another indication that OC use can affect attractiveness evaluations of the opposite sex is research showing reduced sexual desire in women who have started or stopped OC use during their relationship (Cobey et al., 2016; Fiurašková et al., 2022). Also, with regard to actual partner choices, women using OCs at the start of their relationship prefer partners with more feminine faces (Little et al., 2013). And women using OCs are more sensitive to cuteness variation in infant faces (Sprengelmeyer et al., 2009). These findings indicate that OC use alters sensitivity for rewarding cues, in that it might lower sensitivity for masculinity but increase sensitivity for

signals relevant to caregiving, such as signals of an infant and a preference for less dominant men.

In the current study, we therefore also investigated the moderation effects of hormonal status by testing the effect of self-reported menstrual cycle phase and use of OCs on the relation between attractiveness and childcare motivation, in addition to studying the moderation effects of nurturance motivation and a desire to have children. We expected that the menstrual cycle phase affects attractiveness ratings, showing less sensitivity (smaller differences between conditions) to indications of caregiving motivation toward children during the fertile phase compared to the non-fertile phase. Furthermore, we expected OC use to reduce overall attractiveness ratings, but based on Sprengelmeyer et al.'s (2009) study, it might induce higher attractiveness ratings in the caregiving condition or lead to greater differentiation between conditions.

Methods

Sample and Procedure

Dutch-speaking women 18 years of age or older and self-identifying as feeling attracted to men were invited to participate in the study. Participants were recruited through networks of the involved researchers and student assistants via diverse social media platforms. The questionnaire was opened by 433 participants. Of these participants, 360 (83.1%) had at least one valid score (recorded response) on one of the outcome measures (attractiveness scores) and 314 (72.5%) completed the complete questionnaire. The demographic characteristics of the sample are displayed in Table 1.

Data were collected in May 2022. Participants received detailed information on the setup of the study and were informed that they could stop participation at any time and provided informed consent. Next, participants completed a questionnaire which took about 15 min. Gift tokens of 10 euros were raffled among the participants (one gift token per group of 15 participants). The study was approved by the Ethical Review Board of Education and Child Studies, Leiden University, protocol number ECPW-2022/346. All data and syntax used in the analyses reported in this article are deposited in DataverseNL (https://doi.org/10.34894/6OSUGI) upon publication.

Measures

Attractiveness

Two tasks were designed for the present study to measure male attractiveness. The tasks provided information about

Table 1 Demographics of sample and characteristics of main study variables

	Mean (SD) or N (%)
Age	34.45 (11.10)
Education	
High school or lower vocational school	40 (12.7%)
Bachelor degree	123 (39.0%)
Master degree	152 (48.3%)
Relationship status	
Single	60 (16.8%)
In a relationship	255 (71.2%)
Attractiveness pictures	38.18 (26.12)
Attractiveness vignettes	26.85 (22.54)
Nurturance motivation	3.85 (.61)
(Desire to) Have children	
Has children	125 (34.7%)
Wants to have (more) children	124 (34.4%)
Does not want children	36 (10.0%)
Does not know	30 (8.3%)
Menstrual phase	
Menstruating	25 (13.4%)
Pre-ovulation	28 (15.1%)
Ovulation	39 (21.0%)
Pre-menstruation	43 (23.1%)
No menstruation	39 (21.0%)
Hormonal contraception	
Contraceptive pill	62 (22.0%)
Hormonal IUD	31 (11.0%)
No hormonal contraception	189 (67.0%)

the caregiving motivation for children either visually, during a picture task (first task), or in writing, during a vignette task (second task; see below). Each task contained a caregiving condition and a non-caregiving condition, both comprising half of the stimuli, and could therefore be tested within subjects. Each task consisted of 20 trials with pictures of different male models. For each male model, we created a trial with a caregiving context and a non-caregiving context. Participants were informed that all displayed men were available for a relationship. For every picture, participants were asked "How attractive do you think this man is?" Attractiveness was rated using a slider ranging from 0 (not at all attractive) to 100 (very attractive), anchored at 0. Participants did not see the exact numerical value they selected but only the lower and upper anchors.

For the picture task, pictures were collected from various online databases. To create a caregiving and non-caregiving context, we collected two pictures of each male actor—one in which the male actor is depicted in interaction with a child and one in which the same male actor is depicted alone with positive or neutral facial expressions. To avoid a strong

influence of infant cuteness on subjective ratings, children of a diverse age group accompanied the male actors. To avoid that, women rated the same men in both conditions, and two versions of the task were created randomized over participants.

The vignette task contained text and was therefore more explicit toward the aim of the study but had the advantage of using identical pictures of men in both contexts (which were rated by different women given the two versions of the task). The text vignettes contained information on whether the depicted man had been involved in a caregiving interaction (e.g., playing with a nephew, making pancakes for his daughter) or a non-caring activity (e.g., went to the cinema, made a long walk, played guitar with a band). Pictures in the vignette task were taken from the Oslo Face database, which is available upon request (Chelnokova et al., 2014). The models varied with regards to age and physical characteristics to make sure the men displayed showed a likely range of the general population of men in the Netherlands. Two versions of each task were made: in one version, a selection of 10 men were displayed within a caregiving context, and in the other version, the same men were displayed in the non-caregiving context, resulting in a total of 20 stimuli in each condition, split across two versions of the task. This allowed us to control for unwanted systematic effects of the attractiveness of the male models themselves and thus enabled us to clearly measure the effect of caregiving context on attractiveness scores. Which version of the task participants received was randomized. In contrast, the sequence of the picture task and the vignette task was kept the same for all participants; everyone received the picture task first and then the vignette task to keep the aim of the study in the first task as implicit as possible.

Nurturance Motivation

Nurturance motivation was measured using the nurturance scale of the Parental Care and Tenderness Questionnaire (PCAT-pn; Hofer et al., 2017). This scale consists of 6 items that are rated on a 5-point Likert scale. Mean scores were calculated with higher scores indicating higher nurturance motivation. Previous research has shown that this scale has good internal consistency, test-retest reliability, and validity (Hofer et al., 2017). Cronbach's alpha in the current sample was 0.76, demonstrating acceptable internal consistency.

(Desire to) Have Children

Whether participants have children or have the desire to have children in the future was measured by asking participants "Do you want to have children in the future, or do you already have children?" Participants were asked to answer using the following scale (multiple answers were allowed):

Yes, I want to have children in the future/Yes, I have children/No, I do not want to have children/I don't know.

Menstrual Phase

Despite the limited reliability of correct detection of the menstrual phases by self-reports in a between-subjects design (Blake et al., 2016; Gangestad et al., 2016), hormonal assessment or within-subject measurements were not feasible with our setup. Therefore, participants who indicated not to use any hormonal contraceptives (see below) were asked to self-report on their current menstrual phase, using the question "What menstrual phase are you in?" Participants were asked to answer on the following scale: Menstruation/Pre-ovulation (about one week after menstruation)/Ovulation (about two weeks after menstruation)/Pre-menstruation (about one week before menstruation)/I don't menstruate/I don't know.

Hormonal Contraception

The use of hormonal contraceptives was measured by asking participants "Do you use hormonal contraceptives?" Participants were asked to answer this question by selecting either "Yes, namely" (followed by a text box where they could fill out what hormonal contraceptives they used) or "No." The answers provided to the open question concerning the type of hormonal contraceptives were coded in such a way that it distinguished the contraceptive pill, hormonal IUD, and no hormonal contraception. For the moderation analyses concerning hormonal contraception, participants taking the contraceptive pill were compared with participants using no hormonal contraception. The group using hormonal IUDs was not included in the analyses, since it is currently unclear how hormonal IUDs may influence behavior. Two participants indicated that they used a copper IUD; these were placed in the group that did not use hormonal contraception.

Statistical Analyses

We conducted linear mixed-effects analyses in "R" Version 4.2.2 using the lmerTest (Kuznetsova et al., 2017) and lme4 (Bates, 2010) packages using the lmer function, with maximum-likelihood estimation and bound optimization by quadratic approximation with a set maximum of 100,000 iterations. Missing values were omitted from analyses, and continuous predictors were scaled. Prior to our main analyses, we examined whether covariates (i.e., task version and participant age) were significantly related to attractiveness scores. Covariates showing a significant relationship were included as control variables. To examine the influence of caregiving context on attractiveness ratings and identify moderating variables, we used models with maximal random

effects structures. We decomposed the variance into participant and item components and included random slopes of caregiving context over participant and item to control for type 1 error (Barr et al., 2013). We reported estimated marginal means (EMM) and EMM of linear trends, including comparisons, computed with the emmeans package (Lenth & Lenth, 2018). Degrees of freedom were calculated using the Satterthwaite method. Finally, we tested whether a model with a predictor of interest (e.g., caregiving context) fit the data better than a model without the predictor using analysis of variance, yielding chi-square statistics.

Results

Preliminary Analyses

There was no association between task version and attractiveness ratings, both for the task using pictures ($t = 1.33$, $p = .18$, $\beta = .04$; $\chi2 (1) = 1.77$, $p = .18$) and the task using vignettes ($t = -1.40$, $p = .16$, $\beta = -.05$; $\chi2 (1) = 1.95$, $p = .16$). There was a significant association between age and attractiveness ratings, both for the task using pictures ($t = 2.60$, $p = .01$, $\beta = .07$; $\chi2 (1) = 6.72$, $p = .01$) and the task using vignettes ($t = 3.36$, $p < .001$, $\beta = .11$; $\chi2 (1) = 11.10$, $p < .001$). Therefore, age was included as a covariate in all analyses.

Main Analyses

The results of the analyses concerning the main and moderation effects of caregiving context on attractiveness scores are depicted in Table 2. For the picture task, there was a significant effect of caregiving context on attractiveness ratings, $t = 4.03$, $p < .001$, $\beta = .14$; $\chi2 (5) = 498.08$, $p < .001$. Women rated men accompanied by a child as significantly more attractive ($M = 41.9$, SE = 2.30) than men not accompanied by a child ($M = 34.5$, SE = 2.74). No effect of caregiving context was found for the vignette task, $t = 1.87$, $p = .08$, $\beta = .03$; $\chi2 (5) = 35.03$, $p < .001$.

The moderation analyses for the picture task showed a significant interaction effect between nurturance motivation and caregiving context, $t = 3.55$, $p < .001$, $\beta = .05$; $\chi^2 (2) = 14.67$, $p < .001$. During the caregiving context, there was a significant association between nurturance motivation and attractiveness ratings, trend estimate = 2.43, SE = .82, $z = 2.96$, $p = .006$. During the non-caregiving context, there was no significant association between nurturance motivation and attractiveness ratings, trend estimate = 0.45, SE = .77, $z = 0.58$, $p = .81$. Consequently, the association between nurturance motivation and attractiveness ratings differed significantly between the caregiving

and non-caregiving context, estimate = 1.98, SE = .56, $z = 3.55$, $p < .001$. This interaction effect is displayed in Fig. 1A.

We also found a significant interaction effect for whether or not women (desire to) have children on the relation between caregiving context and attractiveness scores, $t = 2.30$, $p = .003$, $\beta = .08$; $\chi^2 (2) = 10.68$, $p = .005$. Women who have children or desire to have children in the future rated men depicted in a caregiving context as significantly more attractive than men in a non-caregiving context ($\Delta M = 8.05$, SE = 1.92, $z = 4.19$, $p < .001$). Women who did not have the desire to have children and/or did not know whether they want children in the future did not show a significant difference between the two caregiving contexts ($\Delta M = 3.84$, SE = 2.21, $z = 1.74$, $p = .30$). This interaction effect is displayed in Fig. 2.

Although we found no main effect of caregiving context for the vignette task, we did analyze potential moderation effects because it is possible that the absence of a main effect is due to opposite directions of effects for different groups in the sample (i.e., the presence of a moderation effect). The only significant interaction effect we found was between nurturance motivation and caregiving context, $t = 2.93$, $p = .004$, $\beta = .04$; $\chi^2 (2) = 8.53$, $p = .01$ (see Fig. 1B). During the caregiving context, there was a positive (non-significant) association between nurturance motivation and attractiveness ratings, trend estimate = 0.75, SE = .82, $z = 0.91$, $p = .59$. During the non-caregiving context, there was a negative (non-significant) association between nurturance motivation and attractiveness ratings, trend estimate = -0.49, SE = .77, $z = -0.64$, $p = .77$. The association between nurturance motivation and attractiveness ratings differed significantly between the caregiving and non-caregiving context, estimate = 1.24, SE = .42, $z = 2.93$, $p = .003$.

Finally, with regard to the question of whether the menstrual phase and oral contraceptives influence attractiveness scores, the menstrual phase showed a significant effect in the picture task ($t = 2.03$, $p = .04$, $\beta = .09$; $\chi^2 (2) = 4.24$, $p = .12$, although this was not a significant improvement of the model fit. There was a significant effect in the vignette task ($t = 2.54$, $p = .01$, $\beta = .13$; $\chi^2 (2) = 6.45$, $p = .04$), with women who reported to be in the ovulation phase rating men as more attractive regardless of caregiving context (picture task $M = 39.98$, SE = 2.93; vignette task $M = 30.40$, SE = 2.90) than women that were in another phase of their menstrual cycle (picture task $M = 35.95$, $SE = 2.51$; vignette task $M = 24.16$; SE = 2.41; see Fig. 3). No effects for oral contraceptives on overall attractiveness scores were found (picture task $t = 0.26$, $p = .80$, $\beta = 0.01$; $\chi^2 (2) = 0.41$, $p = .81$; vignette task $t = 0.53$, $p = .60$, $\beta = 0.02$; $\chi^2 (2) = 1.22$, $p = .54$).

Table 2 Main and moderation effects of caregiving context on attractiveness scores

Main effects of caregiving context		Picture task N = 360	Vignette task N = 345
Fixed effects		Estimate (SE)	Estimate (SE)
Intercept		34.46 (2.74)***	26.31 (2.17)***
Care condition		7.43 (1.84)***	1.29 (0.69)
Age		2.27 (0.74)**	2.43 (0.74)**
Variance components		Variance (SD)	Variance (SD)
Participant level	Intercept	155.66 (12.48)	162.72 (12.76)
	Condition	27.78 (5.27)	9.55 (3.09)
Stimulus level	Intercept	139.65 (11.82)	83.21 (9.12)
	Condition	62.30 (7.89)	5.55 (2.36)
Residual level		372.45 (19.29)	243.07 (15.59)
Moderation analyses		**Picture task**	**Vignette task**
Nurturance motivation		N = 315	N = 315
Fixed effects		Estimate (SE)	Estimate (SE)
Intercept		34.92 (2.83)***	26.41 (2.21)***
Care condition		7.21 (1.90)**	1.18 (0.70)
Age		2.27 (0.75)**	2.58 (0.77)***
Nurturance motivation		0.45 (0.77)	−0.49 (0.77)
Care condition × nurturance motivation		1.98 (0.56)***	1.24 (0.42)**
Variance components		Variance (SD)	Variance (SD)
Participant level	Intercept	146.19 (12.09)	158.11 (12.57)
	Condition	23.61 (4.86)	6.58 (2.57)
Stimulus level	Intercept	148.02 (12.17)	85.92 (9.27)
	Condition	65.69 (8.11)	5.81 (2.41)
Residual level		374.64 (19.36)	244.33 (15.63)
Desire to have children		N = 315	N = 315
Fixed effects		Estimate (SE)	Estimate (SE)
Intercept		38.03 (3.21)***	28.52 (2.69)***
Care condition		3.84 (2.21)	0.61 (1.11)
Age		2.52 (0.75)***	2.67 (0.77)***
Desire to have children		−3.89 (1.91)*	−2.63 (1.92)
Care condition × desire to have children		4.22 (1.41)**	0.71 (1.07)
Variance components		Variance (SD)	Variance (SD)
Participant level	Intercept	143.66 (11.99)	157.17 (12.54)
	Condition	24.71 (4.97)	8.02 (2.83)
Stimulus level	Intercept	148.27 (12.18)	85.96 (9.27)
	Condition	65.86 (8.12)	5.80 (2.41)
Residual level		374.64 (19.36)	244.34 (15.63)
Menstrual phase		N = 135	N = 135
Fixed effects		Estimate (SE)	Estimate (SE)
Intercept		32.15 (2.89)***	23.52 (2.44)***
Care condition		7.60 (1.98)***	1.15 (1.02)
Age		−0.01 (1.50)	−0.45 (1.59)
Menstrual phase		4.83 (2.38)*	6.32 (2.48)*
Care condition × menstrual phase		−1.69 (1.80)	−0.06 (1.46)

Table 2 (continued)

Variance components		Variance (SD)	Variance (SD)
Participant level	Intercept	119.91 (10.95)	145.19 (12.05)
	Condition	16.10 (4.01)	11.19 (3.34)
Stimulus level	Intercept	133.55 (11.56)	82.63 (9.09)
	Condition	60.01 (7.75)	7.77 (2.79)
Residual level		368.53 (19.20)	234.25 (15.31)
Hormonal contraception		$N = 251$	$N = 251$
Fixed effects		Estimate (SE)	Estimate (SE)
Intercept		34.53 (2.84)***	26.21 (2.28)***
Care condition		7.28 (1.82)***	1.70 (0.81)
Age		2.10 (0.86)*	2.38 (0.90)**
Hormonal contraception		0.54 (2.11)	1.14 (2.15)
Care condition × hormonal contraception		0.75 (1.46)	−1.15 (1.12)
Variance components		Variance (SD)	Variance (SD)
Participant level	Intercept	150.70 (12.28)	167.87 (12.96)
	Condition	24.15 (4.91)	8.87 (2.98)
Stimulus level	Intercept	140.51 (11.85)	81.95 (9.05)
	Condition	55.61 (7.46)	6.59 (2.57)
Residual level		375.02 (19.37)	239.94 (15.49)

*$p < .05$, **$p < .01$, ***$p < .001$

Discussion

In two different paradigms, we tested the effect of perceived caregiving motivation on the attractiveness ratings of men in a sample of heterosexual women. Furthermore, we tested the moderating effect of women's nurturance motivation, menstrual cycle phase, and use of oral contraceptives. In the first paradigm that consisted of pictures of men alone (non-caregiving condition) or interacting with a child (caregiving condition), we observed higher attractiveness ratings in the caregiving condition compared to the control condition. This effect was more pronounced for women with stronger nurturance motivation: higher scores on nurturance motivation were related to increased attraction to men in the caregiving condition, whereas this was not the case in the non-caregiving condition (see Fig. 1A). A similar pattern was observed for women with children or the desire to have a child. Women with (a desire to have) a child rated men in the caregiving condition as significantly more attractive compared to the non-caregiving condition, whereas this effect was not significant in the women with no desire to have children and/or did not know if they wanted to have children in the future (see Fig. 2). Against expectations, oral contraceptive use did not affect attractiveness ratings in the picture task.

For the vignette task, in which facial pictures of the same men were accompanied by textual information on caregiving behavior toward children (or non-caregiving related information), no main effect of information on caregiving behavior was observed. There was an interaction with nurturance motivation, showing that higher nurturance motivation was related to higher attractiveness ratings in the caregiving condition and lower ratings in the non-caregiving condition (see Fig. 1B). However, despite a significant interaction, these relations in both conditions were not significant. The vignette task also revealed an effect of the menstrual cycle phase, with higher overall attractiveness ratings in women during the self-reported phase around ovulation. The use of oral contraceptives did not affect ratings on the vignette task, similar to the picture task.

As hypothesized, the results of the picture task are in line with previous work showing that caregiving tendencies are an important aspect on which women judge potential partners (Brase, 2006; Guéguen, 2014; Moore et al., 2013). The current results extend these findings by showing that women's nurturance motivation and having (a desire to have) a child moderate this preference. We presume—given the limited information that women have to base their attractiveness judgments on—that women take the displayed interaction with the child as a proxy for caregiving motivation in these men. Women with high nurturance motivation or a (desire to have a) child are likely to place more value on such caregiving motivation in a partner. Indeed, women with strong nurturance motivation rated men who
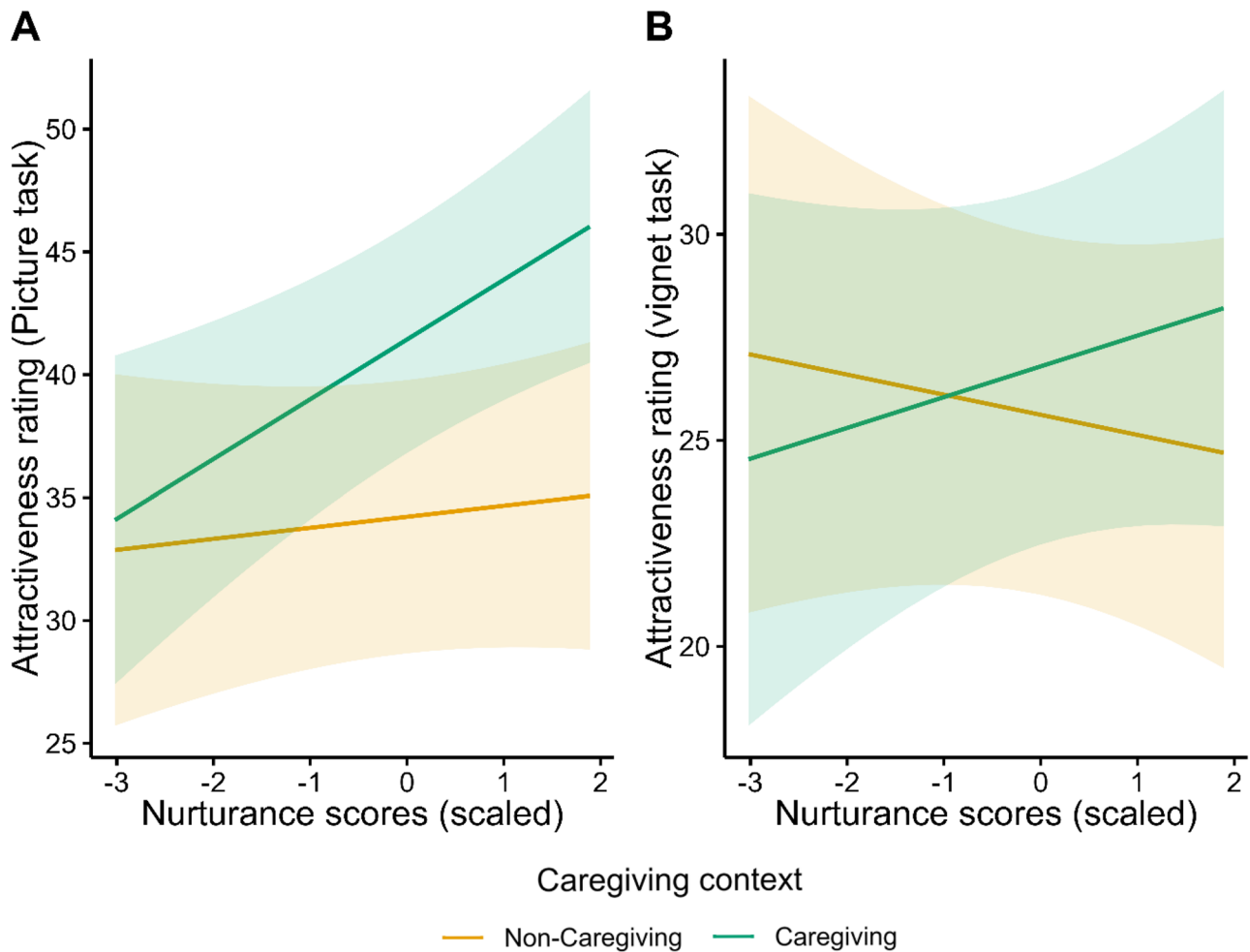
Fig. 1 Moderation effect of nurturance motivation on the relation between caregiving context and attractiveness scores in **A** the picture task and **B** the vignette task

were presented with information on caregiving motivation as more attractive. Also, women with (a desire to have) a child show increased sensitivity to information signaling potential caregiving motivation toward children. This is in line with Buckels et al. (2015) who report a stronger preference for caring motivation in future partners in both men and women scoring higher on nurturance motivation. These patterns of subjective evaluations might reflect evolutionarily conserved strategies that are shaped by the importance of male partners as providers for offspring, especially during the phase of breastfeeding, when mothers' dependency on others is most prevalent (Quinlan, 2008). As we cannot conclude from the current data, further studies on the effect of context on attractiveness ratings might give more insight into this question. For example, physically strong men are evaluated as more attractive and better capable of protecting their infants but also as less nurturant (Brown et al., 2022; Roney et al., 2006). Contextual information on the relative unsafety of the environment could shift preferences for stronger men,

at the expense of their caregiving capacities (Garza et al., 2021). Experimental work investigating these tradeoffs in relation to women's own nurturance motivation could give more insight into the factors that define attractiveness.

The vignette task furthermore revealed an effect of the menstrual cycle phase, with higher overall evaluations of attractiveness around the time of ovulation. This effect of the menstrual cycle phase was also observed for the picture task, although in that task, the inclusion of the cycle phase did not improve the model fit, which was the case for the vignette task; therefore, results in the picture task should be interpreted with caution. What explains this effect? Previous studies that report the effects of the menstrual cycle phase have observed a preference for single and more masculine men around the time of ovulation (Bressan & Stranieri, 2008; Jones et al., 2008). In the current study, women were informed that all men were available for a relationship, and we did not distinguish between characteristics in these men such as physical strength, so we cannot look at

Fig. 2 Moderation effect of (desire to) have children on the relation between caregiving context and attractiveness scores in the picture task. Note. *Significant difference at $p < .05$
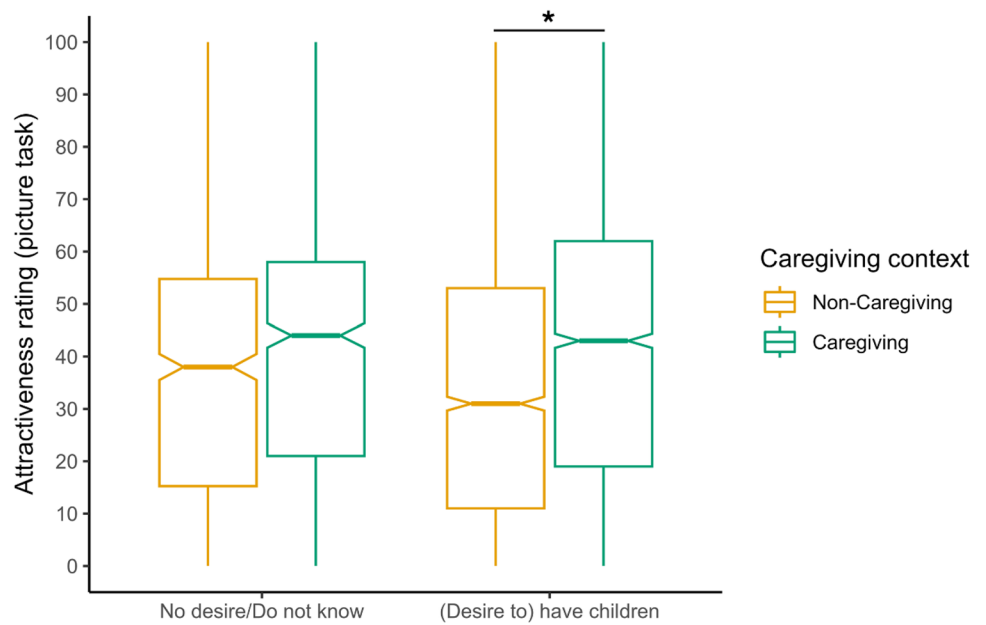
these moderating factors. Perhaps our caregiving manipulation in the picture task, in combination with overall higher ratings, obscured the possibly smaller effects of the cycle phase. Larger samples are needed to further specify such interactions. Especially if one needs to account for other variables that can affect the relationship between attraction to the opposite sex and the cycle phase, such as socioeconomic status (Kim et al., 2018). On the other hand, there still
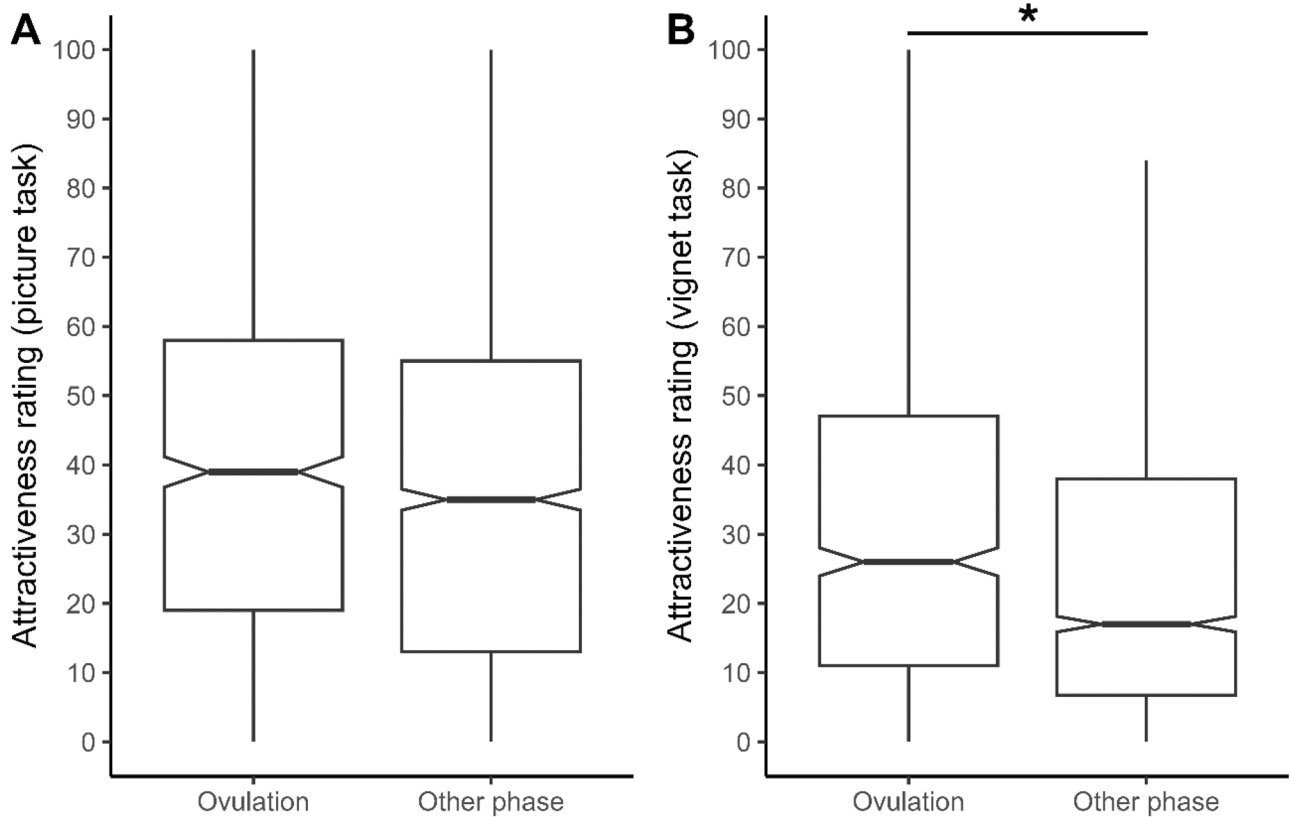
Fig. 3 Effect menstrual phase on overall attractiveness. Note. *Significant difference at $p < .05$

is discussion on the robustness of the reported effects of the cycle phase on partner preferences, as not all studies have reported selective shifts during the cycle phase in response to male stimuli (Gildersleeve et al., 2013; Gildersleeve et al., 2014; Harris, 2013). Some studies have reported an overall effect of the cycle phase, similar to the patterns observed in the current study, as in the recent work by Garza et al. (2019) which reports that women looked longer at men in general during the fertile phase. Such an overall increased attention is in line with higher attractiveness ratings toward men in general in the vignette task.

It is however important to note that the effect of the cycle phase should be interpreted with care, as our method of assessing the cycle phase by self-report is less reliable compared to hormonal assessments, or repeated daily inter-individual assessments, and we therefore cannot be sure that our index of the menstrual cycle phase reflects the biological fertile stage (Blake et al., 2016; Gangestad et al., 2016; Schmalenberger et al., 2021). As such, our inclusion of a single subjective questionnaire in a between-subject design as utilized in the current study is not recommended for future work and is thereby a limitation of this work. If hormonal assays are not feasible, a within-subject design with substantial power is recommended (e.g., Blake, 2022). Nonetheless, a potential lack of reliability in our measure does not easily explain the observed significant effect of the cycle phase. Yet oral contraceptives did not interact with the caregiving manipulation, and the effect in the picture task was marginal. It is unclear whether the absence of a significant interaction is due to seemingly contrasting effects on behavior (i.e., reduced reward sensitivity, in combination with increased detection of cuteness features; see Montoya & Bos, 2017) or due to the study being underpowered for the detection of subtle interactions.

A question that remains is why the effect of the caregiving context in the picture task was not replicated in the vignette task. Several reasons could account for this. Perhaps the explicit information related to caregiving provided during the vignette task was experienced as too artificial and thereby missed its effect. Or this information was not carefully read or not read at all. This is something that needs to be controlled for in future studies. In a previous study using a comparable paradigm with vignettes about background information on children, we did find effects on automatic emotional responses, yet in this study, retention was tested in the participants, and therefore, participants may have read the information provided more carefully (Bos et al., 2016). Another potential explanation is that the male stimuli used in the vignette task were considered generally unattractive. The neutral faces were taken from the Oslo Face database (Chelnokova et al., 2014), and average attractiveness ratings were 26.85 on a scale from 0 to 100, substantially lower compared to the male stimuli used in the picture task. Despite these average low ratings, the vignette task did yield an effect of the cycle phase. Question items controlling for these issues could be added in future studies, as they were unfortunately not included in the current study. An additional limitation is that we opted for a fixed order of tasks. This choice was motivated by the argument that we wanted to keep the participant unaware of the aim of the study in the more implicit picture task. This however limits our ability to understand why no effect of condition was found in the vignette task. In the future, it would be preferable for the two tasks to be carried out by separate participants.

A strength of this study is the relatively large sample and the inclusion of a validated instrument to measure nurturance motivation in a diverse population. Nonetheless, previous work has revealed other factors that predicted attractiveness toward men, such as own attractiveness (Buss & Shackelford, 2008), men's relation to other women (Gouda-Vossos et al., 2018), and age (Buss & Shackelford, 2008; Whyte et al., 2021), which could not all be investigated as this would require larger samples and a more complex setup of the questionnaire. An alternative approach is to focus on more homogeneous populations in which specific predictions can be tested, such as women in a certain age range, women seeking a partner, or women who desire to have children. A limitation of the current study is that only heterosexual women were included. Given the literature on sex differences in partner preferences (e.g., Bech-Sørensen & Pollet, 2016; Buss, 1989; Buss & Schmitt, 1993; Geary et al., 2004), it is interesting to know the patterns that would be revealed in a sample of men that judge women in a caregiving context and whether nurturance motivation in men has a similar effect. Of additional interest is the extension of these findings toward a non-heterosexual population. Based on the evolutionary importance of pair-bonding in the human lineage, and the role men have in the provisioning and protection of offspring, it is expected that nurturance motivation will have a similar effect in men when rating attractiveness in women (Quinlan, 2008; Stewart-Williams & Thomas, 2013). Another addition to the setup in which men and women would be included could be the distinction between short- and long-term partner choices, a distinction often addressed in research on attractiveness (e.g., Jonason & Antoon, 2019; Kim et al., 2018; Moore et al., 2013; White et al., 2021). It is a matter of discussion if this artificial distinction validly taps into evolutionary mechanisms (Stewart-Williams & Thomas, 2013). Yet sex differences have been widely reported on short- versus long-term partner choices, demonstrating that it affects men's decisions but has limited effect on those of women (Moore et al., 2013; Surbey & Conohan, 2000).

In conclusion, this study confirms that caring motivation toward children in men affects perceived attractiveness and also highlights that this effect is stronger for women who

have a stronger motivation to care for children themselves, as well as for women with children, or the desire to have a child. In addition, the data provides tentative evidence for a moderating role of the menstrual cycle phase by enhancing the observed overall attractiveness of men around ovulation. These findings add to the increasing literature that attempts to provide a more nuanced understanding of the forces that shape decisions that can form some of the most important relations in people's lives.

Declarations

References

Alvergne, A., & Lummaa, V. (2010). Does the contraceptive pill alter mate choice in humans? *Trends in Ecology & Evolution, 25*(3), 171–179.

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language, 68*(3), 255–278.

Bates, D. M. (2010). lme4: Mixed-effects modeling with R. In: Springer New York.

Bech-Sørensen, J., & Pollet, T. V. (2016). Sex differences in mate preferences: A replication study, 20 years later. *Evolutionary Psychological Science, 2*(3), 171–176.

Blake, K. R. (2022). When fertile, women seek status via prestige but not dominance. *Proceedings of the National Academy of Sciences, 119*(46), e2205451119.

Blake, K. R., Dixson, B. J., O'Dean, S. M., & Denson, T. F. (2016). Standardized protocols for characterizing women's fertility: A data-driven approach. *Hormones and Behavior, 81*, 74–83.

Bos, P. A., Jap-Tjong, N., Spencer, H., & Hofman, D. (2016). Social context modulates facial imitation of children's emotional expressions. *PLoS ONE, 11*(12), e0167991.

Botwin, M. D., Buss, D. M., & Shackelford, T. K. (1997). Personality and mate preferences: Five factors in mate selection and marital satisfaction. *Journal of Personality, 65*(1), 107–136.

Brase, G. L. (2006). Cues of parental investment as a factor in attractiveness. *Evolution and Human Behavior, 27*(2), 145–157.

Bressan, P. (2019). Confounds in "failed" replications. *Frontiers in Psychology, 10*, 1884.

Bressan, P., & Stranieri, D. (2008). The best men are (not always) already taken: Female preference for single versus attached males depends on conception risk. *Psychological Science, 19*(2), 145–151.

Brown, M., Donahoe, S., & Boykin, K. (2022). Physical strength as a cue to men's capability as protective parents. *Evolutionary Psychological Science, 8*(1), 81–88.

Buckels, E. E., Beall, A. T., Hofer, M. K., Lin, E. Y., Zhou, Z., & Schaller, M. (2015). Individual differences in activation of the parental care motivational system: Assessment, prediction, and implications. *Journal of Personality and Social Psychology, 108*(3), 497.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*(1), 1–14.

Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review, 100*, 204–232. https://doi.org/10.1037/0033-295X.100.2.204

Buss, D. M., & Schmitt, D. P. (2019). Mate preferences and their behavioral manifestations. *Annual Review of Psychology, 70*, 77–110.

Buss, D. M., & Shackelford, T. K. (2008). Attractive women want it all: Good genes, economic investment, parenting proclivities, and emotional commitment. *Evolutionary Psychology, 6*(1), 147470490800600130.

Cárdenas, R. A., Harris, L. J., & Becker, M. W. (2013). Sex differences in visual attention toward infant faces. *Evolution and Human Behavior, 34*(4), 280–287.

Carré, J. M., McCormick, C. M., & Mondloch, C. J. (2009). Facial structure is a reliable cue of aggressive behavior. *Psychological Science, 20*(10), 1194–1198.

Chelnokova, O., Laeng, B., Eikemo, M., Riegels, J., Løseth, G., Maurud, H., & Leknes, S. (2014). Rewards of beauty: The opioid system mediates social motivation in humans. *Molecular Psychiatry, 19*(7), 746–747.

Cobey, K. D., Havlíček, J., Klapilová, K., & Roberts, S. C. (2016). Hormonal contraceptive use during relationship formation and sexual desire during pregnancy. *Archives of Sexual Behavior, 45*, 2117–2122.

Fiurašková, K., Roberts, S. C., Kaňková, Š., Hlaváčová, J., Calda, P., & Havlíček, J. (2022). Oral contraceptive use during relationship formation and current relationship satisfaction: Testing the congruency hypothesis in couples attending pregnancy and fertility clinics. *Psychoneuroendocrinology, 135*, 105451.

Gangestad, S. W., Haselton, M. G., Welling, L. L., Gildersleeve, K., Pillsworth, E. G., Burriss, R. P., & Puts, D. A. (2016). How valid are assessments of conception probability in ovulatory cycle research? Evaluations, recommendations, and theoretical implications. *Evolution and Human Behavior, 37*(2), 85–96.

Gangestad, S. W., Haselton, M. G., & Buss, D. M. (2006). Evolutionary foundations of cultural variation: Evoked culture and mate preferences. *Psychological Inquiry, 17*(2), 75–95.

Garza, R., & Byrd-Craven, J. (2019). Fertility status in visual processing of men's attractiveness. *Evolutionary Psychological Science, 5*(3), 328–342.

Garza, R., & Byrd-Craven, J. (2023). The role of hormones in attraction and visual attention to facial masculinity. *Frontiers in Psychology, 14*, 1067487.

Garza, R., Heredia, R. R., & Cieślicka, A. B. (2017). An eye tracking examination of men's attractiveness by conceptive risk women. *Evolutionary Psychology, 15*(1), 1474704917690741.

Garza, R., Pazhoohi, F., & Byrd-Craven, J. (2021). Women's preferences for strong men under perceived harsh versus safe ecological conditions. *Evolutionary Psychology, 19*(3), 14747049211032352.

Geary, D. C. (2015). Evolution of paternal investment. *The Handbook of Evolutionary Psychology*, 483–505.

Geary, D. C., Vigil, J., & Byrd-Craven, J. (2004). Evolution of human mate choice. *Journal of Sex Research, 41*(1), 27–42.

Gildersleeve, K., DeBruine, L., Haselton, M. G., Frederick, D. A., Penton-Voak, I. S., Jones, B. C., & Perrett, D. I. (2013). Shifts in women's mate preferences across the ovulatory cycle: A critique of Harris (2011) and Harris (2012). *Sex Roles, 69*, 516–524.

Gildersleeve, K., Haselton, M. G., & Fales, M. R. (2014). Meta-analyses and p-curves support robust cycle shifts in women's mate preferences: Reply to Wood and Carden (2014) and Harris, Pashler, and Mickes (2014).

Gouda-Vossos, A., Nakagawa, S., Dixson, B. J., & Brooks, R. C. (2018). Mate choice copying in humans: A systematic review and meta-analysis. *Adaptive Human Behavior and Physiology, 4*, 364–386.

Guéguen, N. (2014). Cues of men's parental investment and attractiveness for women: A field experiment. *Journal of Human Behavior in the Social Environment, 24*(3), 296–300.

Harris, C. R. (2013). Shifts in masculinity preferences across the menstrual cycle: Still not there. *Sex Roles, 69*, 507–515.

Hazan, C., & Shaver, P. R. (1994). Attachment as an organizational framework for research on close relationships. *Psychological Inquiry, 5*(1), 1–22.

Hofer, M. K., Buckels, E. E., White, C. J., Beall, A. T., & Schaller, M. (2017). Individual differences in activation of the parental care motivational system: An empirical distinction between protection and nurturance. *Social Psychological and Personality Science*, 1948550617728994.

Jonason, P. K., & Antoon, C. N. (2019). Mate preferences for educated partners: Similarities and differences in the sexes depend on mating context. *Personality and Individual Differences, 148*, 57–61.

Jones, B. C., DeBruine, L. M., Perrett, D. I., Little, A. C., Feinberg, D. R., & Law Smith, M. J. (2008). Effects of menstrual cycle phase on face preferences. *Archives of Sexual Behavior, 37*(1), 78–84.

Kim, A., Bradshaw, H., Durante, K. M., & Hill, S. E. (2018). Life history, fertility, and short-term mating motivation. *Evolutionary Psychology, 16*(3), 1474704918800062.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: tests in linear mixed effects models. *Journal of Statistical Software, 82*(13), 1–26. https://doi.org/10.18637/jss.v082.i13

Lenth, R., & Lenth, M. R. (2018). Package 'lsmeans.' *The American Statistician, 34*(4), 216–221.

Little, A. C., Burriss, R. P., Petrie, M., Jones, B. C., & Roberts, S. C. (2013). Oral contraceptive use in women changes preferences for male facial masculinity and is associated with partner facial masculinity. *Psychoneuroendocrinology, 38*(9), 1777–1785.

Lukaszewski, A. W., & Roney, J. R. (2010). Kind toward whom? Mate preferences for personality traits are target specific. *Evolution and Human Behavior, 31*(1), 29–38.

Marcinkowska, U. M., Rantala, M. J., Lee, A. J., Kozlov, M. V., Aavik, T., Cai, H., & Li, N. P. (2019). Women's preferences for men's facial masculinity are strongest under favorable ecological conditions. *Scientific Reports, 9*(1), 1–10.

Montoya, E. R., & Bos, P. A. (2017). How oral contraceptives impact social-emotional behavior and brain function. *Trends in cognitive sciences, 21*(2), 125–136.

Moore, D., Wigby, S., English, S., Wong, S., Székely, T., & Harrison, F. (2013). Selflessness is sexy: Reported helping behaviour increases desirability of men and women as long-term sexual partners. *BMC Evolutionary Biology, 13*(1), 1–8.

Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., & Minamisawa, R. (1999). Menstrual cycle alters face preference. *Nature, 399*(6738), 741–742.

Pound, N., Penton-Voak, I. S., & Surridge, A. K. (2009). Testosterone responses to competition in men are related to facial masculinity. *Proceedings of the Royal Society B: Biological Sciences, 276*(1654), 153–159.

Quinlan, R. J. (2008). Human pair-bonds: Evolutionary functions, ecological variation, and adaptive development. *Evolutionary Anthropology: Issues, News, and Reviews, 17*(5), 227–238.

Roney, J. R., Hanson, K. N., Durante, K. M., & Maestripieri, D. (2006). Reading men's faces: Women's mate attractiveness judgments track men's testosterone and interest in infants. *Proceedings of the Royal Society b: Biological Sciences, 273*(1598), 2169–2175.

Schmalenberger, K. M., Tauseef, H. A., Barone, J. C., Owens, S. A., Lieberman, L., Jarczok, M. N., . . . Eisenlohr-Moul, T. A. (2021). How to study the menstrual cycle: Practical tools and recommendations. *Psychoneuroendocrinology, 123*, 104895.

Sprengelmeyer, R., Perrett, D. I., Fagan, E., Cornwell, R., Lobmaier, J., Sprengelmeyer, A., & Crow, S. (2009). The cutest little baby face: A hormonal link to sensitivity to cuteness in infant faces. *Psychological Science, 20*(2), 149–154.

Stewart-Williams, S., & Thomas, A. G. (2013). The ape that thought it was a peacock: Does evolutionary psychology exaggerate human sex differences? *Psychological Inquiry, 24*(3), 137–168.

Surbey, M. K., & Conohan, C. D. (2000). Willingness to engage in casual sex. *Human Nature, 11*(4), 367–386.

Townsend, J. M., & Levy, G. D. (1990). Effects of potential partners' physical attractiveness and socioeconomic status on sexuality and partner selection. *Archives of Sexual Behavior, 19*(2), 149–164.

Trivers, R. L. (1972). *Parental investment and sexual selection* (pp. 136–179). New York: Sexual Selection & the Descent of Man. Aldine de Gruyter.

Waynforth, D. (2007). Mate choice copying in humans. *Human Nature, 18*(3), 264–271.

White, K. P., Jonason, P. K., & Al-Shawaf, L. (2021). Mating decisions in the absence of physical attraction. *Adaptive Human Behavior and Physiology, 7*, 43–53.

Whyte, S., Brooks, R. C., Chan, H. F., & Torgler, B. (2021). Sex differences in sexual attraction for aesthetics, resources and personality across age. *PLoS ONE, 16*(5), e0250151.