Good Genes, Good Providers, and Good Fathers and Mothers:

The Withholding of Parental Investment by Married Couples

Lei Chang

Department of Psychology, University of Macau and

Department of Social Psychology, Nankai University

Hui Jing Lu

Xiao Qin Zhu

Department of Applied Social Sciences

The Hong Kong Polytechnic University

Correspondences regarding this manuscript should be addressed to Lei Chang, Department of Psychology, University of Macau, Avenida da Universidade, Taipa, Macau, China.

email: chang@umac.mo

Good Genes, Good Providers, and Good Fathers and Mothers: The Withholding of Parental Investment by Married Couples

Abstract

A conflict of interest between the sexes prevents optimal parental investment in parents in monogamous species. Most notably in biparental birds, parents invest in their young according to mate value, with the parent of higher (lower) mate value reducing (increasing) their parental investment. We tested similar hypotheses in a sample of 408 married couples with children. The results showed that, for both men and women (but more for the men than the women), parental warmth and care correlated negatively with the extent to which good-gene and good-provider mate values compared favorably with those of their peers and spouse, whereas good-father and good-mother mate values correlated positively with parental investment. These findings highlight a sexual conflict of interest in otherwise overly romanticized marital relationships and elucidate the evolution of good-father and good-mother mate preferences.

Key words: mate values; good genes; good providers; good fathers; parental investment

In movies, novels, and even real life, people romanticize marriage and love relationships, believing that a couple truly cares for each other and the fruit of their love—their children. An evolutionary perspective provides a darker but more realistic view: the fundamental conflict of interest between the sexes prohibits so-called "true love" or caring in married couples because of its constant exploitation by both partners. Instead, couples use their mate values to negotiate, trade, and withhold parental and spousal investment. The present evolutionary entry of the special issue demonstrates how couples and especially husbands use their mate values to discount parental investment.

Conflict of Interest over Biparenting

Broadly defined as "conflict between the evolutionary interests of individuals of the two sexes" (Parker, 1979, p.124), sexual conflict arises not only from polygamous mating systems (Rice, 2000), but it is also widespread in monogamous species regarding caring for offspring (Westneat & Sargent, 1996). Known as postzygotic conflict (Westneat & Sargent, 1996), the conflict of interest over raising young occurs because, in fitness terms, both parents pay a cost for offspring care and benefit from the care given by the other parent. The optimal behavior is for each parent to reduce his or her own cost and to increase the benefits derived from the other parent. As shown in parental investment theory (Trivers, 1972), this evolutionarily stable strategy leads to a seemingly unresolvable conundrum: because both parties know that investing more effort into raising their young means that the other party can invest less, both parties avoid being manipulated by investing less when they can get away with reduced investment. The question becomes when one party can get away with or allows the other party to get away with investing less than his or her prescribed share of parental investment. Evolution appears to have fashioned an apt rule of thumb for allotting parental investment acceptable to both parents.

Fitness and inclusive fitness, in terms of reproductive success, derive from both mating and parenting efforts (Trivers, 1972). Whereas the mating effort exerted in acquiring a mate of high value seemingly contributes entirely to personal fitness and the parenting or caring of the offspring as public goods partly benefits the other party, both efforts can be regarded as pre- and postzygotic investment benefitting oneself (Westneat & Sargent, 1996). Combining these two efforts, which together define fitness, provides a calculable means for determining the amount of parental investment for each party. A partner with higher mate value in good genes, for example, makes greater prezygotic contributions and is thus tolerated when making fewer or more flexible postzygotic contributions. To the extent that this evolutionary principle applies more to one sex, mainly males, because of the obligatory parental investment made primarily by the other sex, mainly females, it has been observed among many monogamous species in negotiating parental investment between the sexes (Harrison, Barta, Cuthill, & Szekely, 2009). Variations of game theory modeling of biparenting in avian behavior also suggest the same prediction. In repeated investments by parents, the earlier investment of each parent is exploited by the other parent in a downward adjustment of subsequent investment so that the overall amount of care provided by a parent is lower when the parents care together than when they provide care alone as single parents (McNamara, Gasson, & Houston, 1999; McNamara, Houston, Barta, & Osorno, 2003). Moreover, because higher parental investment by a parent signals lower mate value to the other parent, who may reduce their parental investment accordingly, parents may even deliberately invest less in the offspring initially to signal high mate value and elicit more investment from their partners (Lessells & McNamara, 2012).

Experimental and field studies have confirmed this prediction. Researchers have reduced the amount of care by one parent (e.g., burying beetles; Suzuki & Nagano, 2009) or have removed one parent entirely (e.g., zebra finches; Royle, Hartley, & Parker, 2002) to

determine whether the remaining parent compensates for the lost care. A meta-analysis summarizing these results revealed robust compensation effort by the remaining parent. This effort, however, did not fully compensate for the lost care, and, overall, females compensated for the lost parental care more than males did (Harrison et al., 2009). More crucially, parental investment differs as a function of partner mate value for both males (Diniz, Ramos, & Macedo, 2015) and females (Horváthová, Nakagawa, & Uller, 2012). Notably, male zebra finches paired with attractive females (wearing black leg bands) contribute 50% of the total nest care provided by the couple, whereas those paired with unattractive females (light blue leg bands) contribute only 30% of the care (Burley, 1986, 1988). Similarly, attractive males red leg bands) and unattractive males (green leg bands) contribute 40% and 55% of nest care, respectively (Burley, 1988). For both males and females, compared with those paired with attractive partners, blue tits sparrows paired with unattractive partners (with reduced ultraviolet reflectance on the crown feathers) exert significantly reduced parental effort in foraging trips, nest building, and catching large prey (Kingma et al., 2009; Limbourg, Mateman, Andersson, & Lessells, 2004; Mahr, Griggio, Granatiero, & Hoi, 2012). Male house finches (Badyaev & Hill, 2002) and grassquit finches (Diniz, Ramos, & Macedo, 2015) with brighter plumages invest less in parental care than do their drabber peers. A meta-analysis revealed that among monogamous birds, females paired with attractive males exert more parental investment in terms of feeding rates, incubating effort, and egg and clutch size compared with those paired with unattractive males (Horváthová et al., 2012).

The same tradeoff between parenting and mate value has been observed in men. Most male characteristics of good-gene mate values (e.g., facial muscularity) are associated with high testosterone levels (Gangestad & Simpson, 2000). Fathers have particularly lower testosterone levels compared with unmarried men of the same age, and, among married men, testosterone levels correlate negatively with spousal investment (according to questionnaire

ratings) and the amount of time they spent with their wives (Gray, Kahlenberg, Barrett, Lipson, & Ellison, 2002). Expectant fathers have lower testosterone levels compared with nonfathers (Berg & Wynne-Edwards, 2001), and fathers and nonfathers with low testosterone levels exhibit higher levels of sympathy and a stronger need to respond to infant cries than do men with high testosterone levels (Fleming, Corter, Stallings, & Steiner, 2002). Men with high testosterone levels were shown to remain unmarried or have more marital difficulties and higher divorce rates (Booth & Dabbs, 1993; Mazur & Booth, 1998), suggesting a negative correlation between good-gene mate values and long-term relationships entailing spousal and parental investment. Other studies have revealed that men with masculine faces, indicating the good-gene mate value, are perceived as untrustworthy (Kruger, 2006; Smith et al., 2009), less committed, and poorer parents (Perrett et al, 1998; Boothroyd, Jones, Burt & Perrett, 2007).

The social status of men, which represents another crucial mate value, correlates negatively with length of relationships and positively with the number of sexual partners (Perusse, 1993). Anthropological studies have revealed that strong hunting ability is a highly regarded mate value across cultures (Marlowe, 2004). In modern hunter-gatherer monogamous societies, good hunters have more surviving offspring (Gurven & von Rueden, 2006; Marlowe, 2000), engage less in parenting but more in providing (Gurven, Winking, Kaplan, von Rueden, & McAllister, 2009), and have younger, healthier wives (Gurven & von Rueden, 2006) who work harder in raising children (Hawkes, O'Connell, & Blurton Jones, 2001). Similarly, in a survey of male passengers at Heathrow Airport, self-perceived mate value (represented by status and masculinity) correlated negatively and marginally significantly with parental investment and positively and significantly with mating effort, which correlated negatively with parental investment (Apicella & Marlowe, 2004). In that study, men of high mate value reported lower parental investment in relation to lower partner

fidelity, whereas men with low self-perceived mate value reported high parental investment. Collectively, these human observations indicate the same tradeoff between mate value and parental and spousal investment, despite the discounting coming mainly from men being tolerated by women.

Thus, discrepancy in mate value between couples results in a conflict of interest over parental investment and subsequent exploitation of parental investment, with the party with higher mate value trading the surplus for their reduced parental investment, and the party with lower mate value increasing their parental investment to compensate for the loss. However, as shown both theoretically (Houston & Davies, 1985) and empirically (Harrison et al., 2009), the added parental effort from one parent does not fully compensate for the reduced investment by the other parent. Parental investment is optimal when both parents fully invest without discounting favorable mate value discrepancies. Compatibility in mate value thus maximizes parental investment from the couple. Although mate value compatibility can be achieved through assortative mating practiced by most human and nonhuman animals (Jiang, Bolnick, & Kirkpatrick, 2013), mate values are dynamic, particularly considering the long window of human biparenting, during which what appears to be comparable at one time or on one occasion may change subsequently to reawaken the conflict of interest over parental investment. The discounting of parental investment by mate values is therefore particularly relevant to human couples.

Mate Values of Men and Women

What are the mate values of men and women with which couples negotiate reducing their parental investment? Lu, Zhu, and Chang (2015) defined the mate value of men as three Gs: good genes, good providers, and good fathers. The most essential female mate choice is good genetic stock, which is to ensure the optimal outcome of her obligatory parental investment. Indicated by physiological and behavioral characteristics that are costly to their

bearers, good-gene attributes, also known as ornaments, include a symmetrical facial structure and other symmetrical features (Møller & Thornhill, 1998), physical and facial attractiveness and muscularity (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007), risk-taking proclivity (Kelly & Dunbar, 2008), and creativity and a sense of humor (Chen & Chang, 2015; Miller, 1999). Women are also more drawn to men who have access to resources than to those who do not (Li et al., 2013). Because resources are the target of male intrasexual competition, resource holders possess characteristics that enable them to outcompete other males. Good-provider characteristics are thus also known as weapons. They include competitive personalities and behaviors (Johnson, Burk, & Kirkpatrick, 2007), social dominance and formidability (Valentine, Li, Penke, & Perrett, 2014), achievement motivation, a large body size and upper-body strength (Sell et al., 2009), masculine physical features (Pound, Penton-Voak, & Surridge, 2009), and wealth and status (Chang, Wang, Shackelford, & Buss, 2011). Provisions, as well as the attributes required to acquire and provide them, are favored by women and regarded as the good-provider mate value.

In addition to good genes and good providers, a third mate value considered by women—one that evolved recently in mammalian terms, most likely coinciding with human pair bonding and monogamy—is the helpfulness of a resident father in raising young. Originating from alloparenting (Hrdy, 2009) and coevolving with concealed ovulation and mate guarding (Benshoof & Thornhill,1979), good-father characteristics are loving children, being nonaggressive, and being warm and kind (Buss & Shackelford, 2008), as well as being affiliative, caring, and gentle toward the female partner (Lovejoy, 1981; Urbaniak & Kilmann, 2003). The good-father mate value has been shown to be preferred by modern women over the good-gene and good-provider values (Lu, Zhu, & Chang, 2015) because it assists in reducing conflicts of interest in parenting.

Female physical features indicating fertility are accorded mate value by men because such features assist in resolving the male reproductive challenge of uncertain and sparse female fertility. Asymmetry in sex gametes of the two sexes, as well as mammalian pregnancy, lactation, and human menopause and concealed ovulation, renders the fertility of women the limiting factor for male reproductive success (Trivers, 1972). Physical features, such as waist-to-hip ratio (Singh, 1993), body shape (Cornelissen, Hancock, Kiviniemi, George, & Tovée, 2009), skin complexion and smoothness (Farage, Neill, & MacLean, 2009), youthful appearance (Thornhill & Gangestad, 1999), and facial symmetry and other attractive features (Møller & Thornhill, 1998), are highly regarded mate values because they indicate a window of limited female fertility that drives intrasexual competition among men. Because many of these features are also related to overall health and immunocompetence (Geary, Vigil, & Byrd−Craven, 2004), they can be called the "fertility and good genes" mate value, which is comparable to the good-gene mate value of men. Another male reproductive challenge is paternity uncertainty, which is particularly challenging for men because of the evolution of concealed ovulation, the need for prolonged mate guarding (Benshoof & Thornhill, 1979), and the eventual monogamous mating system whereby men are probably among the most devoted fathers (Geary, 2000). Physical (e.g., having a small chin), behavioral (e.g., chastity), and personality characteristics (e.g., being honest, kind, faithful, and sexually modest), all of which relieve paternity uncertainty (Chang et al., 2000), are mate values favored by men. Because of their own parental investment, men have expectations about maternal investment. Thus, also favored by men are caring, kindness, and motherliness (Geary, Vigil, & Byrd–Craven, 2004), which, together with the aforementioned paternity-soothing characteristics, can be called the "fidelity and good mother" mate value, comparable to the good-father mate value in men. Finally, because marriage is both a reproductive and productive unit (Gurven et al., 2009; Marlowe, 2003), similar to women, men also prefer

mate attributes related to provisioning, such as working hard, being generous, and being able to provide (Gurven et al., 2009), which are similar to the good-provider attributes in men. Because female economic independence and full participation in paid labor characterize modern, postindustrial economies (Newson & Richerson, 2009), which have increased the good-provider mate value in women (Low, 2005; Lu, Zhu, & Chang, 2015), this is called the "modernity and good provider" mate value to parallel the good-provider mate value in men.

The Present Study

In the aforementioned evolutionary framework, we tested the general hypothesis that parents discount their parental investment according to the extent to which their mate values are favorable compared with those of their peers and spouse. Although this hypothesis was formulated for both sexes, the effect was expected to be stronger on men because obligatory parenting among women and larger variations in parental investment among men allow men more flexibility to exploit biparenting (Trivers, 1972). We defined the mate values of men according to the three categories of good genes, good providers, and good fathers. Using the same categories and similar items, we defined the mate values of women as fertility and good genes, fidelity and good mothers, and modernity and good providers. Parental investment was measured according to paternal and maternal warmth and care. We tested the hypothesis on a sample of 408 married couples with children.

Method

Participants

The sample, obtained from a rural area of Jiang Su province in southeast China, comprised 408 married couples with children. The children's ages ranged from 3 to 11 years, with a mean age of 7.46 (standard deviation [*SD*] = 1.68) years. The parents' ages ranged from 25 to 49 years, with mean ages of 34.56 (*SD* = 3.99) and 32.51 (*SD* = 3.94) years for the husbands and wives, respectively. Most of the couples had only one child because of China's

single child policy which was only recently lifted. Most of the husbands (82.67%) and wives (77.13%) had received a middle school or high school education, while 3.46% of the husbands and 10.02% of the wives had received only primary school education. Close to 14% of husbands and 12.85% of the wives had obtained a 2- to 4-year college education. Of the 408 couples, 32 husbands and 22 wives did not complete some or all of the questions. Because of the missing items, the *n*s for the key analyses varied from 362 to 402 couples.

Measures

Men's mate value. Men's mate values were measured using the 21-item Women's Mate Preference Questionnaire (Lu, Zhu, & Chang, 2015), with seven items measuring each of the 3 G's on a 5-point scale ranging from 1 (*least true for me*) to 5 (*most true for me*). Husbands rated themselves using the items. Internal consistency reliability estimates were .75 for Good Genes (e.g., masculine), .86 for Good Providers (e.g., capable), and .87 for Good Fathers (e.g., caring).

Women's mate value. A similar set of 21 items was constructed for measuring women's mate values according to women's 3 G's: Fertility and Good Genes (attractive; sexy; good skin; good body; elegant; attractive face; good looking), Fidelity and Good Mothers (e.g., virtuous; kind; feminine; faithful; caring; loving children; good housekeeping), and Modernity and Good Providers (good income; high social status; successful career; good family background; ambitious; capable; good education). These items were pilot-tested in 241 male respondents (mean age = 23.01 years, *SD* = 3.85). The results confirmed the three-factor structure and yielded satisfactory psychometrics. In this study, wives rated themselves using the questionnaire on a 5-point scale ranging from 1 (*least true for me*) to 5 (*most true for me*). The internal consistency reliability estimates were .78 for Fertility and Good Genes, .70 for Fidelity and Good Mothers, and .80 for Modernity and Good Providers.

Parental care. We pooled 10 items from the literature (Hawkins et al., 2002; Sanderson & Thompson, 2002) to measure, on a 5-point scale ranging from 1 (*never*) to 5 (*always*), how often each parent engaged in specific child-rearing activities such as "feeding the child," "taking the child to doctor's appointments," "reading to the child," and "making sure the child is taken care of." Couples rated themselves. The internal consistency reliability estimates were .84 for fathers and 0.80 for mothers.

Parental warmth was measured using 12 items drawn from the Parental Acceptance Rejection Questionnaire (Rohner, 1986). Sample items included "I listen to my child," "I talk to my child with warmth," "I praise my child to others," and "I make it easy for my child to confide in me." The questions were rated on a 4-point scale ranging from 1 (*never*) to 4 (*always*). Couples rated themselves. The internal consistency reliability estimates for fathers and mothers were 0.62 and 0.81, respectively.

Results

Table 1 reports the means, *SD*, and correlations of the variables used in this study. We conducted multiple regression to examine the associations between mate values and parental investment and, more importantly, the moderating effect of couple's mate value difference on these associations. For the moderating effect or interaction analysis, we computed a mate value difference variable by subtracting the spouse's total mate value (i.e., the average of the three individual mate values) from each person's own total mate value so that a positive score suggests that one's total mate value was higher than that of his or her spouse. The variances of the two total mate value scores were .69 for husbands and .73 for wives which were not significantly different (p = .36) and the correlation between the two was .22. These statistics suggest minimal confounding when interpreting the results based on the computed difference score (Griffin, Murray, &Gonzalez, 1999). Following Aiken and West (1991), we first mean-centered the variables before multiplying each individual mate value variable with the total

mate value difference to form the new interaction terms. We performed the regression for husbands and wives separately.

Table 2 contains the regression results from the husbands. Good-genes and good-provider mate values were both negatively correlated with paternal warmth (good genes: β = .15, p = .013; good providers: $\beta = -.12$, p = .025), whereas the good-father mate value predicted paternal warmth (β = .21, $p < .001$) and paternal care (β = .14, p = .04) positively. Similarly, the couple's mate value difference was a negative and significant predictor of paternal warmth ($\beta = -.13$, p = .027). These findings support our predictions that, compared with both other men and their own spouse, men with greater good-genes and good-provider mate values contributed less to parental investment than did men with lower mate values. However, good genes and good-provider mate values did not show significant main effects on paternal care.

These results in part underscore the importance of our hypothesized interaction effects, which were significant with respect to good-genes and good-provider mate values but not with good-father mate value. Consistent to the main effect findings, these interaction results suggest that men used good-genes and good-provider mate values to discount parental investment, whereas good-father mate attribute only had the positive main effect on parental investment. We performed simple slope analyses on the two significant interactions and present the results in Figure 1. As illustrated by the simple slopes in Figure 1, when the husband–wife mate value difference was 1 *SD* above the mean, which was close to zero indicating that on average couples had similar self-rated mate values, paternal warmth was more negatively predicted by good-genes ($\beta = -.24$, $p < .001$) and good-provider mate values ($\beta = -.25$, $p < .001$) than it was when the husband–wife total mate value difference was 1 *SD* below the mean ($\beta = -.06$, *n.s*. for good genes and β = .03, *n.s* for good providers). Similarly, paternal care was positively predicted by good genes (β = .20, $p < .001$) and good-provider

mate value (β = .19, p < .001) when these men's overall mate value was 1 *SD* lower than their spouse, whereas these associations were negative (β = −.11, p < .05 for good genes) or nonsignificant (β = -.03, *n.s.*) when these men's total mate value was 1 *SD* higher than their spouse's.

Table 3 contains wives' results which were not as robust as the husbands'. Inconsistent with the men's findings, none of the interaction effects were significant and the modernity good provider mate value was positively correlated with maternal care (β = .13, p < .05). Other main effects were significant and were in the predicted directions. Fertility and good genes (β = −.13, p < .05) and modernity and good providers (β = −.16, p < .01) negatively predicted maternal warmth, whereas fidelity good mothers positively predicted maternal warmth (β = .22, p < .001) and maternal care (β = .18, p < .01). Overall, these results across men and women and that those involving men were stronger than those involving women are consistent with our expectations because males across species have more latitude than females in using their mate values to negotiate and discount parental investment (Trivers, 1972).

We also computed the correlation between a couple's overall mate value difference in absolute value and the couple's combined parental care and combined parental warmth. The correlation between the couple's mate value difference and the couple's combined parental care was −.14 (p = .01), and that between the couple's mate value difference and the couple's combined parental warmth was −.15 (p = .004). Although the effect size was small, these results confirm the hypothesis that mate value discrepancies between the husband and wife minimized the total parental investment when the couple's parental investment are considered together.

Discussion

The findings are mainly consistent with our expectations. For both men and women but more for men than women, good-father and good-mother mate values correlated positively and good-genes and good-provider mate values correlated negatively with parental warmth and care, suggesting that parents used their good-genes and good-provider mate values to discount parental investment. The interaction results further highlight parental discounting among husbands but not wives. Good-genes and good-provider but not good-father mate values were more negatively correlated with parental investment for husbands rated higher in overall mate value compared to their spouse.

Like most other male animals, men who do not have obligatory parental investment and thus show more variable parental investment compared to women have more leeway to scale up or down their parental investment as functions of their mate values. The good-father mate attribute which was selected later to supplement parental investment that may be realized through prezygotic good-genes and postzygotic good provisioning (Zhu et al., 2015) facilitates and reinforces but should not discount parenting and caring of young. Good genes and good provisioning, on the other hand, are evolutionarily older and species-general male mate values that formed as a result of intersexual and intrasexual selection in polygynous mating systems. In a long historical framework, these two sets of mate values (good genes and good providers versus good fathers) contradict each other and serve opposite functions. Whereas good-father traits are selected because they improve reproductive success for both sexes through parental investment, good genes and good provisioning serve mating purposes by enabling the male carriers of such traits to compete intra- and intersexually. Unsurprisingly, in the present study, these two sets of male mate values correlated in the opposite direction with paternal investment, despite both of them being preferred by women. These contradictory male mate values and female mate preferences highlight the fundamental

conflict of interest between the sexes. From the perspective of a woman, her substantial pre- and postzygotic obligatory investment in the young cannot be fully compensated for by prezygotic good genes or postzygotic good provisions alone. She also needs direct paternal investment in the form of a helper at the nest. This compensatory need evolved into the good-father mate preference in women and the good-father mate value in men. Although this additional good-father female mate preference (in addition to that for good genes and good providers) has benefitted women (as shown in the present study, the good-father mate value correlated with positive parenting attitude and effort), male parental investment remains hindered by the extent to which their mate values of good genes and good providers are positively self-perceived, suggesting a tradeoff between parenting and mating.

This potential tradeoff between parenting and mating represents the fundamental reproductive decisions of men. Because good-gene and good-provider attributes represent mating-oriented energies that enable winning intra- and intersexual competition, men endowed with or invested in the allocation of these energies ought to use them to improve their reproductive success. The ultimate tradeoff decision for men is whether it is reproductively more beneficial to be a good helper at the nest or to engage in evolutionarily older intrasexual and intersexual strategies. Competitive men in winning intra- or intersexual competition should continue to outperform their competitors, whereas those who are outcompeted in these two older mating games should be the ones to want to adopt a newer third strategy (being a helper at the nest). The "wanderers" and "outcasts" are the "pioneers" and "cutting edge of evolution" (Wilson, 2000, p. 290). Compared with good genes and good providers, good fathers are more likely to represent the cutting edge of evolution who have pioneered the evolution of good fathers as a female mate choice. Modern women seem to prefer good fathers over good providers and good genes (Lu, Zhu, & Chang, 2015). Accordingly, the evolution of the female choice of good fathers seems to have not imposed

too much additional sexual selection pressure on men, but rather created a new avenue for men, particularly those regarded as of low quality according to older sexual selection standards, to achieve reproductive success. However, for both men and women, the benefit of the good-father and good-mother mate values lies in reducing the conflict of interest between parents over parental investment.

Although the good-father mate value is similar to the good-mother mate value in that it correlates positively with parental investment, fathers use good-gene and good-provider mate values to discount their parental investment more than mothers do, who, according to the results, actually increase their maternal care as a function of the mate value of good provisioning. These findings underscore the intrinsic imbalance in biparental care. Similarly for birds, which have a much longer monogamous history than do humans, males use their mate value to discount their parental investment more than females do, and females seem to tolerate the discount more than males do (Harrison et al., 2009; Steinegger & Taborsky, 2007). Compared to female birds, women are locked further into the biparental asymmetry by the additional mammalian obligatory investment involving internal fertilization, pregnancy, and lactation, as well as a prolonged human childhood that requires additional parental investment in the form of resources and direct care. Because of the obligatory parental investment, women have less latitude in negotiating the tradeoff between mate value and parental investment, whereas men who exhibit greater parental investment variability (Trivers, 1972) have more flexibility in negotiating and exploiting parental investment. Human-specific modernity developments, in the form of imposed monogamy, paid labor participation by women, and the formation of gender egalitarian ideology, level the biparental imbalance in resource distribution and create a greater need for direct offspring care and a stronger preference for good-father mate attributes.

> Once a woman spends the same amount of time and energy on education and employment and receives (approximately) the same amount of resources as a man, her dependence on resources to ensure reproductive success is reduced by half, and her need for a helper at the nest doubles (Lu, Zhu, & Chang, 2015, p.224).

As revealed in the present study, modern women seem to resolve the conflict of interest over biparental care by leveraging the fertility and good-gene mate values but also being willing to increase their parental investment according to their increased resource-garnering ability.

Finally, the absolute mate-value difference between a couple correlates negatively with combined parental investment by the couple. This finding suggests that a parent only partially compensates for reduced care by the other parent because behavior leading to full compensation would be exploited by the other party and, thus, would not be selected (McNamara et al., 2003). Thus, compatibility in mate values between a couple reduces parental discounting by either parent and maximizes parental investment by the couple. Assortative mating according to mate values facilitates reducing the conflict of interest and increases parental investment. One implication for marriage and long-term relationships is that assortative mating should be based not only on one-on-one matches of individual phenotypes such as size, which represents one of the most typical assortments for humans and other animals (Jiang, Bolnick, & Kirkpatrick, 2013), race (Thiessen & Cregg, 1980), and specific attitudes and personalities (Luo & Klohnen, 2005), but also on the omnibus match of mate values that involve compatible as well as compensatory sorting among various congruent and incongruent traits and attributes. Each of the three Gs involves many attributes that can be matched as a group or individually with the same or different traits, because what are being matched are not the phenotypic traits but the mate values underlying each phenotype.

Another implication is that because mate values also change during the long human biparental arrangement, parents should recognize that a potential conflict of interest in parenting and marriage relationship may arise because of the shift in mate value compatibility. They can then hopefully determine how to adjust and even improve their own mate value and that of their partner. For example, because the good-gene mate value depreciates over time faster for women than for men, both members of a couple should exert effort to slow the faster more than the slower of the two depreciations to maintain compatible mate values between the couple. When one-sided mate value depreciation as well as appreciation becomes inevitable, couples should be aware of the ensuing change in parental and spousal investment and make necessary adjustments rather than merely seeking equitability and equality in parental and spousal investment, which could only worsen the marriage relationship.

The present study is not without limitations. Most notably, our findings and interpretations are limited by the evolutionary and distal approach we employed in investigating otherwise complex parenting and marriage issues that are subject to numerous proximate social and psychological influences. However, the purpose of the special issue is to contrast our evolutionary views with the socialization views to provide a deeper understanding of long-term heterosexual relationships. Related to this limitation is the moderate effect size associated with our correlational results from self-report data. However, potential method variance and social desirability effects are minimal because they would work against our hypothesis of negative relationships among otherwise uniformly positively perceived mate values and parental attitudes. Factors excluded from our evolutionary investigation that simultaneously affect the phenomenon under study would both strengthen and attenuate our findings. Future research should consider widening the research scope by including multiple factors representing diverse theories and methods into a comprehensive

study of marriage and parenting. Despite these limitations, this is one of the first studies to examine the conflict of interest between the sexes in married couples. The finding that couples use mate values to discount their parental investment provides a more realistic view of otherwise overly romanticized and seemingly disappointing marriage and love relationships.

References

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, C.A.: Sage.

Apicella, C. L., & Marlowe, F. W. (2004). Perceived mate fidelity and paternal resemblance predict men's investment in children. *Evolution and Human behavior*, *25*, 371–378.

Badyaev, A. V., & Hill, G. E. (2002). Paternal care as a conditional strategy: distinct reproductive tactics associated with elaboration of plumage ornamentation in the house finch. *Behavioral Ecology*, *13*, 591–597.

Benshoof, L., & Thornhill, R. (1979). The evolution of monogamy and concealed ovulation in humans. *Journal of Social and Biological Structures*, *2*, 95–106.

Berg, S. J., & Wynne-Edwards, K. E. (2001). Changes in testosterone, cortisol, and estradiol levels in men becoming fathers. *Mayo Clinic Proceedings*, *76*, 582–592.

Booth, A. & Dabbs, Jr., J. M. (1993). Testosterone and men's marriages. *Social Forces, 72,* 463–477.

Boothroyd, L. G., Jones, B. C., Burt, D. M., & Perrett, D. I. (2007). Partner characteristics associated with masculinity, health and maturity in male faces. *Personality and Individual Differences*, *43*, 1161–1173.

Burley, N. (1986). Sexual slection for aesthetic traits in species with biparental care. *The American Naturalist*, *127*, 4154–445.

Burley, N. (1988). The differential-allocation hypothesis: An experimental test. *American Naturalist*, *132*, 611–628.

Buss, D. M., & Shackelford, T. K. (2008). Attractive women want it all: Good genes, economic investment, parenting proclivities, and emotional commitment. *Evolutionary Psychology, 6*, 134–146.

Chang, L., Wang, Y., Shackelford, T. K., & Buss, D. M. (2011). Chinese mate preferences: Cultural evolution and continuity across a quarter of a century. *Personality and Individual Differences*, *50*, 678–683.

Chang, L., Lu, H. J., Li, H., Lee, L. Y., Li, T., & Sui, S. (2010). Patrilocal residence and father-child resemblance beliefs in relation to paternal investment. *Parenting: Science and Practice*, *10*, 274-285.

Chen, B. B., & Chang, L. (2015). Creativity and aggression as ornament and armament: Intersexual and intrasexual selection on men's mating behaviors. *Evolutionary Psychology*, *13*, 266–282.

Cornelissen, P. L., Hancock, P. J., Kiviniemi, V., George, H. R., & Tovée, M. J. (2009). Patterns of eye movements when male and female observers judge female attractiveness, body fat and waist-to-hip ratio. *Evolution and Human Behavior*, *30*, 417–428.

Diniz, P., Ramos, D. M., & Macedo, R. H. (2015). Attractive males are less than adequate dads in a multimodal signalling passerine. *Animal Behaviour*, *102*, 109-117.

Farage, M. A., Neill, S., & MacLean, A. B. (2009). Physiological changes associated with the menstrual cycle: A review. *Obstetrical & Gynecological Survey*, *64*, 58–72.

Fleming, A. S., Corter, C., Stallings, J., & Steiner, M. (2002). Testosterone and prolactin are associated with emotional responses to infant cries in new fathers. *Hormones and Behavior*, *42*, 399–413.

Gangestad, S. W., Garver-Apgar, C. E., Simpson, J. A., & Cousins, A. J. (2007). Changes in women's mate preferences across the ovulatory cycle. *Journal of Personality and Social Psychology, 92*, 151-163.

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

Geary, D. C. (2000). Evolution and proximate expression of human paternal investment. *Psychological Bulletin*, *126*, 55–77.

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

Gray, P. B., Kahlenberg, S. M., Barrett, E. S., Lipson, S. F., & Ellison, P. T. (2002). Marriage and fatherhood are associated with lower testosterone in males. *Evolution and Human Behavior*, *23*, 193–201.

Gurven, M., & Von Rueden, C. (2006). Hunting, social status and biological fitness. *Social biology*, *53*, 81–99.

Gurven, M., Winking, J., Kaplan, H., Von Rueden, C., & McAllister, L. (2009). A bioeconomic approach to marriage and the sexual division of labor. *Human Nature*, *20*, 151–183.

Harrison, F., Barta, Z., Cuthill, I., & Szekely, T. (2009). How is sexual conflict over parental care resolved? A meta-analysis. *Journal of Evolutionary Biology*, *22*, 1800–1812.

Hawkes, K., O'Connell, J. F., & Blurton Jones, N. B. (2001). Hunting and Nuclear Families: Some Lessons from the Hadza about Men's Work. *Current Anthropology*, *42*, 681–709.

Horváthová, T., Nakagawa, S., & Uller, T. (2012). Strategic female reproductive investment in response to male attractiveness in birds. *Proceedings of the Royal Society of London B: Biological Sciences*, *279*, 163–170.

Houston, A. I., & Davies, N. B. (1985). The evolution of cooperation and life-history in the dunnock. In R. M. Sibly & R. H. Smith (Eds.), *Behavioural ecology* (pp. 471–487). Oxford, UK: Blackwell.

Jiang, Y., Bolnick, D. I., & Kirkpatrick, M. (2013). Assortative mating in animals. *The American Naturalist*, *181*, E125–E138.

Johnson, R. T., Burk, J. A., & Kirkpatrick, L. A. (2007). Dominance and prestige as differential predictors of aggression and testosterone levels in men. *Evolution and Human Behavior, 28*, 345–351.

Kelly, S., &, Dunba, R.I.M. (2001). Who dares, wins: Heroism versus altruism in women's mate choice. *Human Nature*, *12*, 89–105.

Kingma, S. A., Komdeur, J., Vedder, O., von Engelhardt, N., Korsten, P., & Groothuis, T. G. (2009). Manipulation of male attractiveness induces rapid changes in avian maternal yolk androgen deposition. *Behavioral Ecology*, *20*, 172–179.

Kruger, D. J. (2006). Male facial masculinity influences attributions of personality and reproductive strategy. *Personal Relationships*, *13*, 451–463.

Lessells, C. M., & McNamara, J. M. (2012). Sexual conflict over parental investment in repeated bouts: Negotiation reduces overall care. *Proceedings of the Royal Society of London B: Biological Sciences*, *279*, 1506–1514.

Li, N. P., Yong, J. C., Tov, W., Sng, O., Fletcher, G. J., Valentine, K. A., Jiang, Y. F., & Balliet, D. (2013). Mate preferences do predict attraction and choices in the early stages of mate selection. *Journal of Personality and Social Psychology, 105,* 757–776.

Limbourg, T., Mateman, A. C., Andersson, S., & Lessells, C. K. M. (2004). Female blue tits adjust parental effort to manipulated male UV attractiveness. *Proceedings of the Royal Society of London B: Biological Sciences*, *271*, 1903–1908.

Lovejoy, C. O. (1981). The origin of man. *Science*, *211*, 3414–350.

Low, B. S. (2005). Women's lives there, here, then, now: A review of women's ecological and demographic constraints cross-culturally. *Evolution and Human Behavior*, *26*, 64–87.

Lu, H. J., Zhu, X. Q., & Chang, L. (2015). Good genes, good providers, and good fathers: Economic development involved in how women select a mate. *Evolutionary Behavioral Sciences*, *9*, 215–228.

Luo, S., & Klohnen, E. C. (2005). Assortative mating and marital quality in newlyweds: A couple-centered approach. *Journal of Personality and Social Psychology*, *88*, 304–326.

Mahr, K., Griggio, M., Granatiero, M., & Hoi, H. (2012). Female attractiveness affects paternal investment: Experimental evidence for male differential allocation in blue tits. *Frontiers Zoology*, *9*, 14–21.

Marlowe, F. (2000). Paternal investment and the human mating system. *Behavioural Processes*, *51*, 45–61.

Marlowe, F. W. (2003). A critical period for provisioning by Hadza men: Implications for pair bonding. *Evolution and Human Behavior*, *24*, 217–229.

Marlowe, F. W. (2004). Mate preferences among Hadza hunter-gatherers. *Human Nature*, *15*, 365–376.

Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *Behavioral and Brain Sciences*, *21*, 353–397.

McNamara, J. M., Gasson, C. E., & Houston, A. I. (1999). Incorporating rules for responding into evolutionary games. *Nature*, *401*, 368–371

McNamara, J. M., Houston, A. I., Barta, Z., & Osorno, J. L. (2003). Should young ever be better off with one parent than with two? *Behavioral. Ecology*, *14*, 301–310.

Miller, G. F. (1999). Sexual selection for cultural displays. In R. Dumbar, C. Knight, & C. Power (Eds.), *The evolution of culture* (pp.71–91), Edinburgh, UK: Edinburgh University Press.

Møller, A. P., & Thornhill, R. (1998). Bilateral symmetry and sexual selection: A meta-analysis. *The American Naturalist*, *151*, 174–192.

Newson, L., & Richerson, P. J. (2009). Why do people become modern? A Darwinian explanation. *Population and Development Review, 35*, 117–158.

Parker, G. A. (1979). Sexual selection and sexual conflict. In M. S. Blum & N. A. Blum (Eds.), *Sexual Selection and Reproductive Competition in Insects* (pp. 123–166). New York, N.Y.: Academic Press.

Perrett, D. I., Lee, K. J., Rowland, D., Yoshikawa, S., Burt, D. M., Henzi, S.P., … & Akamatsu, S. (1998). Effects of sexual dimorphism on facial attractiveness. *Nature*, *394*, 884–887.

Perusse, D. (1993). Cultural and reproductive success in modern societies: Testing the relationship at the proximate and ultimate levels. *Behavioral and Brain Sciences*, *16*, 267–322.

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 of London B, 276*, 153–159.

Rice, W. R. (2000). Dangerous liaisons. *Proceedings of the National Academy of Sciences*, *97*, 12953–12955.

Royle, N. J., Hartley, I. R., & Parker, G. A. (2002). Sexual conflict reduces offspring fitness in zebra finches. *Nature*, *416*, 733–736.

Sell, A., Cosmides, L., Tooby, J., Sznycer, D., von Rueden, C., & Gurven, M. (2009). Human adaptations for the visual assessment of strength and fighting ability from the body and face. *Proceedings of the Royal Society of London B, 276*, 575–584.

Singh, D. (1993). Body shape and women's attractiveness. *Human Nature*, *4*, 297–321.

Smith, F. G., Jones, B. C., Welling, L. W., Little, A. C., Vukovic, J., Main, J. C., & DeBruine, L. M. (2009). Waist-hip ratio predicts women's preferences for masculine male faces, but not perceptions of men's trustworthiness. *Personality and Individual Differences*, *47*, 476–480.

Steinegger, M., & Taborsky, B. (2007). Asymmetric sexual conflict over parental care in a biparental cichlid. *Behavioral Ecology and Sociobiology*, *61*(6), 933-941.

Suzuki, S., & Nagano, M. (2009). To compensate or not? Caring parents respond differentially to mate removal and mate handicapping in the burying beetle, Nicrophorus quadripunctatus. *Ethology*, *115*, 1–6.

Thiessen, D., & Gregg, B. (1980). Human assortative mating and genetic equilibrium: An evolutionary perspective. *Ethology and Sociobiology*, *1*, 111–140.

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

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man 1871–1971* (pp. 139–179). Chicago, IL: Aldine.

Urbaniak, G. C., & Kilmann, P. R. (2003). Physical attractiveness and the "nice guy paradox": do nice guys really finish last? *Sex Roles, 49*, 413–426.

Valentine, K.A., Li, N. P., Penke, L., & Perrett, D.I. (2014). Judging a man by the width of his face: The role of facial ratios and dominance in mate choice at speed-dating events. *Psychological Science*, *25*, 806–811.

Westneat, D. F., & Sargent, R. C. (1996). Sex and parenting: The effects of sexual conflict and parentage on parental strategies. *Trends in Ecology and Evolution*, *11*, 87–91.

Wilson, E. O. (2000). *Sociobiology*. Cambridge, M.A.: Harvard University Press.

Table

Table 1. Correlations, Means, and Standard Deviations of the Variable Used in the Study

	1	2	3	4	5	6	7	8	9	10	11
1. Good Genes	-										
2. Good Providers	.49***	-									
3. Good Fathers	-.34***	-.38***	-								
4. Fertility / Good Genes	.13*	.15**	-.06	-							
5. Modernity / Good Providers	.14**	.23***	-.06	.45***	-						
6. Fidelity / Good Mothers	.05	.04	.07	-.08	.05	-					
7. Paternal Warmth	-.34***	-.31***	.31***	.02	.02	.05	-				
8. Paternal Care	-.25***	-.14**	.19***	.08	.03	-.08	.29***	-			
9. Maternal Warmth	.14**	.18**	-.08	-.09	.10*	.24***	.07	.08	-		
10. Maternal Care	.12*	.07	-.09	.04	.11*	.18***	-.06	-.09	.19***	-	
11. Absolute Spousal Mate Value Difference	-.05	.03	.04	.01	.02	-.14**	-.13*	-.01	-.09	-.17**	-
Mean	3.42	3.41	4.02	3.50	3.57	4.04	3.18	3.16	3.19	3.82	1.72
Standard Deviation	.49	.58	.60	.60	.64	.79	.29	.56	.40	.55	1.33

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

Table 2. Regression of Paternal Parenting on Male Mate Values and Husband-Wife Mate Value Difference

	Paternal Warmth		Paternal Care	
	β	t	β	t
Good Genes	-.15	-2.41*	.04	.55
Good Providers	-.12	-2.25*	.09	1.42
Good Fathers	.22	4.23***	.14	2.55*
Husband-Wife Mate Value Difference (HWD)	-.14	-2.24*	.10	1.44
Good Genes × HWD	-.13	-2.55*	-.16	-3.88**
Good Providers × HWD	-.12	-2.71**	-.11	-2.16*
Good Fathers × HWD	-.04	-.75	.03	.59

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

Table 3. Regression of Maternal Parenting on Female Mate Values and Wife-Husband Mate Value Difference

	Maternal Warmth		Maternal Care	
	β	t	β	t
Fertility / Good Genes	-.13	-2.22*	.02	.36
Modernity / Good Providers	-.17	-2.96**	.12	2.09*
Fidelity / Good Mothers	.22	4.42***	.18	3.52**
Wife-Husband Mate Value Difference (WHD)	-.11	-2.14*	.05	-.94
Fertility / Good Genes × WHD	.01	.11	-.04	-.77
Modernity / Good Providers × WHD	-.05	-1.07	.04	.82
Fidelity / Good Mothers × WHD	.01	.28	.01	.23

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

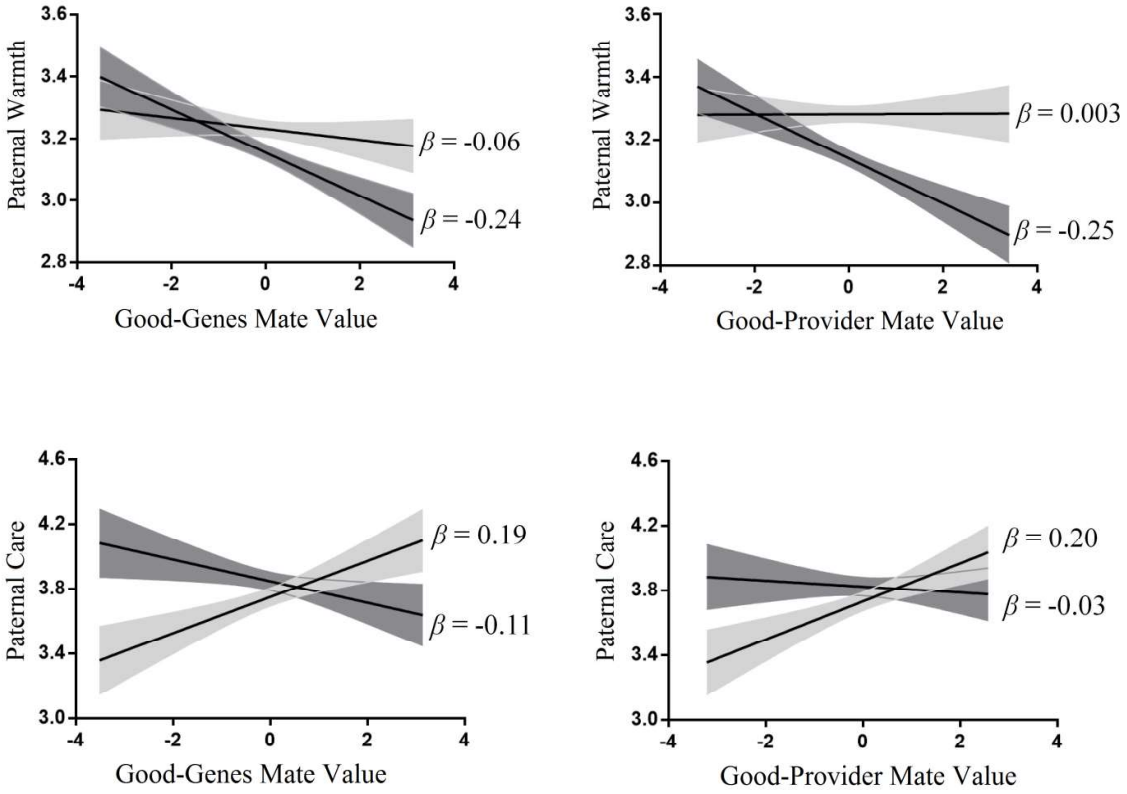

Figure 1. Simple Slopes and 95% Confidence Bands from Men's Regression at 1 *SD* above (darkened) and 1 *SD* below (light) the Mean of Husband-Wife Total Mate Value Difference (by subtracting the wife's total mate value from the husband's).