

Sexual Competition among Women: A Review of the Theory and Supporting Evidence

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Abstract

Darwin (1871) observed in his theory of evolution by means of sexual selection that "it is the males who fight together and sedulously display their charms before the female" (p. 272). Researchers examining intrasexual competition have since focused disproportionately on male competition for mates, with female competition receiving far less attention. In this chapter, we review evidence that women do indeed compete with one another to secure and maintain reproductive benefits. We begin with an overview of the evolutionary theory of competition among women, with a focus on biparental care and individual differences in men's mate value. We discuss why competition among women is characteristically different from that of men and highlight evidence supporting women's use of epigamic display of physical attractiveness characteristics and indirect aggression toward same-sex peers and opposite-sex romantic partners as sexually competitive tactics. Finally, individual differences in competition among women are discussed.

Key Words: female competition, parental investment theory, sexual selection, indirect aggression, epigamic display

The sexual struggle is of two kinds; in the one it is between individuals of the same sex, generally the males, in order to drive away or kill their rivals, the females remaining passive; whilst in the other, the struggle is likewise between the individuals of the same sex, in order to excite or charm those of the opposite sex, generally the females, which no longer remain passive, but select the more agreeable partners.

(Darwin, 1871, p. 398)

Competition pervades many important aspects of human existence. Over the course of recorded history, individuals and groups have rivaled one another for status, wealth, territory, food, resources, and mating opportunities, with the victors typically gaining an advantage in terms of

survival and reproduction (Darwin, 1859, 1871). From an evolutionary perspective, such competition has been regarded to occur most frequently among males (Darwin, 1871) and only trivially among females who sometimes assume "characters which properly belong to the males" (Darwin, 1871, p. 614). Yet recent advances in evolutionary theory and supporting empirical evidence have begun to challenge this view, suggesting instead that female competition exists as an adaptive behavioral strategy in its own right: competition among females may aid in the acquisition of reproductively relevant resources (e.g., Clutton-Brock, 2009; Rosvall, 2011), as well as mating access (e.g., Campbell, 1995; Vaillancourt, 2005, 2013), and mate retention (Arnocky, Sunderani, Miller, & Vaillancourt, 2012).

In this chapter we provide an overview of the evolutionary view of competition as it applies to women. Toward this end, competition is first defined within the context of natural and sexual selection. The adaptive role of female competition is then reviewed and applied to human behavior, suggesting that female–female competition should be expected to occur among humans (Arnocky et al., 2012; Campbell, 1995, 1999; Rosvall, 2011; Vaillancourt, 2005, 2013). Two common forms of female competition are placed within this evolutionary framework: the use of physical attractiveness characteristics as a mechanism for attracting members of the opposite sex (i.e., epigamic display) and indirect aggression toward same-sex peers and opposite-sex romantic partners. Finally, individual differences in competition among women are discussed.

Why Do Humans Compete?

In the mid-nineteenth century, Charles Darwin (1859) put forth the theory of evolution by natural selection, which suggests that survival and reproduction become enhanced among organisms that are best suited to the prevailing environmental condition. The offspring of well-suited individuals will become more abundant, and the population will evolve according to their more appropriate characteristics (see also Darwin & Wallace, 1858). Darwin, however, noted many physical and behavioral characteristics that seemed to undermine his theory. One prototypical example is the brilliant plumage of the peacock, which is physically costly to produce and may detract from survival by increasing visibility to predators. This was a source of great frustration for Darwin, who wrote, “The sight of a feather in a peacock’s tail, whenever I gaze at it, makes me sick!” (Darwin, April 3, 1860, in a letter to botanist Asa Gray).

Darwin eventually came to recognize that such traits likely evolved in the context of reproductive success, even if at the expense of an individual’s survival. In his seminal work on the subject, *The Descent of Man, and Selection in Relation to Sex* (1871), Darwin proposed that sexual selection, as a special case of natural selection, is a driving force behind evolutionary change. Sexual selection refers to the success of certain individuals over others of the same sex, in relation to the propagation of offspring (Darwin, 1871). Specifically, it is the heritable traits possessed by successful reproducers that will be passed on to, and exhibited more frequently in, subsequent generations. In the case of the

peacock’s plumage, for instance, research has shown that train coloration predicts males’ mating success. Males with more brilliant plumage are more sexually desirable to peahens and may therefore have greater opportunity than males with duller coloration to pass on their genes to offspring who, in turn, will be more likely to possess similarly bright train feathers (Petrie & Halliday, 1994; Petrie, Halliday, & Sanders, 1991).

Intersexual and Intrasexual Selection

Sexual selection is the result of two important interrelated phenomena. First, *intersexual selection* refers to the degree of selectivity or choosiness of mating partners between the sexes. This choosiness is often based on epigamic display of secondary sexual characteristics, which are irrelevant to reproduction yet are attractive to members of the opposite sex because they indicate genotypic and phenotypic quality (Starratt & Shackelford, 2015). For example, peahens prefer to mate with brightly colored peacocks, perhaps because bright trains are a costly signal of a male’s genetic quality—only sufficiently healthy males will produce the brightest colorations (Zahavi, 1975). Second, *intrasexual selection* refers to competition between members of the same sex over contested mating resources and opportunities. Members of one sex rival one another by displaying their value to potential mates or through direct dominance and threat displays or other aggressive behavior (e.g., Thornhill & Alcock, 1983). For instance, among elephant seals, males engage in direct physical combat in order to acquire and control harems of females, with successful male competitors typically achieving the greatest reproductive success (Hoelzel, Le Boeuf, Reiter, & Campagna, 1999; Le Boeuf, 1974). It is important to note that intrasexual competition need not be limited to mate acquisition: after copulation, sperm competition, as a form of indirect competition, (Hoelzel et al., 1999) as well as mate-guarding behavior (Galimberti, Boitani, & Marzetti, 2000), also serve to maintain the likelihood of paternity.

Darwin observed a striking sex difference among the two aspects of sexual selection. He noted that, in the vast majority of species, adult males more often engage in intrasexual selection. Males are usually more “modified” and “fight together and sedulously display their charms before the female” (Darwin, 1871, p. 272). Conversely, females more often act as sexual gatekeepers, selecting their mates from the more competitive male population (see Andersson, 1994).

Yet Darwin was unable to this commonly reported (1991), and it took nearly a to begin to understand w considered to be more competi importantly, under what ci to this phenomenon arise.

Differential Parental Investment and Sexual Selection

Sexual selection is driven by constraints imposed on individuals. Lindenfors and Tullberg (2002) often it is females who are choosier for the reproductive success. This is due to fundamental asymmetry between the sexes in their defining characteristics (p. 10). Many researchers have argued that at the time of fertilization, males invest considerably more reproductive energy than females. This is known as anisogamy; females produce large, energy-rich eggs and males produce small, genetically cheaper sperm (Darwin, 1871; 1972). Females, being limited by the number of eggs they can produce, will invest more in each offspring, resulting in a greater investment in offspring in a given breeding season. Males, on the other hand, will produce roughly the same number of offspring in a given breeding season, but many males she mates with will have reproductive success increase. This is because the number of females that can be inseminated (Bateman, 1948) is limited. Sex differences in the energy invested in offspring production and survival are limited to anisogamous gametes. This is the central tenet of investment theory (Trivers, 1972). The expenditure of any parental investment in energy, risk, feeding, and other costs of the production and survival of offspring with it a cost that could otherwise be used for gaining mating opportunities. Males, when bearing the heavier burden of offspring (Barash, 1979; Trivers, 1972) when bearing the heavier burden of offspring, have the most to lose from making poor mating decisions and must therefore be choosier in determining which mate (Trivers, 1972). In turn, these differential constraints lead to greater variance in fitness among males. Some males will access multiple mates and produce many offspring, whereas other males will be shut out from re

re, research has shown males' mating success. Males are more sexually dimorphic therefore have greater duller coloration to females who, in turn, will be brightly bright train feathers; Petrie, Halliday, &

Sexual Selection

ult of two important factors, *intersexual selection* (mate choice) or choosiness of sexes. This choosiness plays a role in the play of secondary sex characters relevant to reproduction of the opposite sex (typical and phenotypic variation, 2015). For example, with brightly colored bright trains are a costly trait—only sufficiently brightest colorations *sexual selection* refers to the behaviors of the same sex males and opportunities. Males are attracted to another by displays of ornaments or through direct interactions or other aggressive behaviors (Alcock, 1983). For example, males engage in courtship to acquire and consolidate successful male competition: greatest reproductive success (Reiter, & Campagna, 1972). Important to note that mate choice is not limited to mate selection, sperm competition, mate-guarding behavior (Clutton-Brock, 2000), also serve to ensure paternity. Mating sex difference is a result of sexual selection. Heritability of species, adult intrasexual selection. "codified" and "fight display their charms" (Darwin, 1871, p. 272). Males often act as sexual gatekeepers from the more competitive (Andersson, 1994).

Yet Darwin was unable to determine the cause of this commonly reported sex difference (Cronin, 1991), and it took nearly a century for researchers to begin to understand why males are often considered to be more competitive than females and, importantly, under what circumstances exceptions to this phenomenon arise.

Differential Parental Investment Influences Sexual Selection

Sexual selection is driven by the reproductive constraints imposed on one sex by the other. Lindenfors and Tullberg (2011) noted that "most often it is females who are the limiting resource for the reproductive success of males due to a fundamental asymmetry between males and females in their defining characteristic, their gametes" (p. 10). Many researchers have suggested that by the time of fertilization, females have invested considerably more reproductive effort because of anisogamy; females produce a limited number of energy-rich eggs and males produce many energetically cheaper sperm (Dawkins, 1976; Trivers, 1972). Females, being limited by the number of eggs they can produce, will exhibit a corresponding limitation in reproductive outcomes. A female will produce roughly the same number of offspring in a given breeding season, regardless how many males she mates with. Conversely, male reproductive success increases significantly alongside the number of females they can access and inseminate (Bateman, 1948).

Sex differences in the energy expended toward offspring production and survival are by no means limited to anisogamous gametes. Parental investment theory (Trivers, 1972) contends that the expenditure of *any* parental effort, including time, energy, risk, feeding, and other resources toward the production and survival of offspring, carries with it a cost that could otherwise be spent on procuring mating opportunities or rearing additional offspring (Barash, 1979; Trivers, 1972). Females, when bearing the heavier parental investment, have the most to lose from making poor mating decisions and must therefore express greater choosiness in determining with whom they will mate (Trivers, 1972).

In turn, these differential reproductive constraints lead to greater variability in reproductive fitness among males. Some particularly successful males will access multiple females and produce many offspring, whereas many less successful males will be shut out from reproducing altogether

(Bateman, 1948; cf. Birkhead, 2001). Accordingly, males more than females exhibit behavioral biases toward preferring and competing for multiple mating opportunities; "there is nearly always a combination of an indiscriminating eagerness in the males and a discriminating passivity in the females" (Bateman, 1948, p. 365).

Due to increased competitive pressure among males, natural and sexual selection will, over deep evolutionary time, begin to favor the competitively adaptive morphological and behavioral male features of successful maters, leading to increased sexual dimorphism of those traits (Alcock, 2001; Lande, 1980; Moore, 1990; Selander, 1972). For instance, sexually dimorphic body size among species of snake in which males are larger than females confers a distinct competitive advantage in physical combat (Shine, 1978). As another example, the horns of male ungulates have evolved not for antipredatory defense but rather for fighting male competitors during rutting season (Lindenfors & Tullberg, 2011). Sexually dimorphic features become most pronounced among species with strong sexual selectivity (Alexander, Hoogland, Howard, Noonan, & Sherman, 1979). At the extreme end of this spectrum, male members of a highly polygynous gorilla species compete to control and mate with a harem of females. These males are typically twice as large as their female counterparts (Larsen, 2003; Plavcan, 2001; Robbins & Czekala, 1997). Conversely, biparental care in most monogamously mating species counters male reproductive variance and reduces sexual dimorphism (Archer & Coyne, 2005).

This trend has also been observed in sex-role-reversed species wherein males invest significant parental care and have a reproductive rate below that of their female counterparts. In sex-role-reversed pipefish, males are choosier in their mate selection, whereas females tend to exhibit mating effort by way of ornamentation/courtship displays toward males as well as dominance displays toward intrasexual competitors (Berglund & Rosenqvist, 2001, 2009).

A Framework for Female Competition

In more than 95% of mammalian species, females are the sole providers of parental care (Clutton-Brock, 1989, 1991; Kleiman & Malcolm, 1981; Woodroffe & Vincent, 1994). It may, therefore, be tempting to conclude that females are primarily passive mate selectors who engage in low levels of competition. However, recent evidence is beginning to challenge this assumption, suggesting

instead that evolutionary theory does not disqualify females from competing in order to benefit their survival and reproductive fitness (Rosvall, 2011; see also Hrdy, 1981). Across a wide variety of species, females have indeed been shown to compete over mating-relevant resources such as food (Baird & Sloan, 2003) and nesting sites (Rosvall, 2008), as well as for the protection of offspring (Christenson & LeBoeuf, 1978). Females have also been shown to engage in more direct forms of mating competition. Some intrasexually aggressive female birds are more likely to be monogamously (vs. polygamously) mated and may consequently receive increased benefits from males (e.g., Sandell, 1998; Searcy & Yasukawa, 1996). Among primates, dominant females have been observed to harass subordinate females. This harassment can cause enough stress that the female subordinates may fail to come into estrus or might spontaneously abort pregnancies (Campbell, 1995).

Rosvall (2011) argued that researchers' relative ignorance of female–female competition may be rooted in how researchers define sexual selection. If the definition is restricted merely to competition for the *number* of mates or copulations, as has traditionally been the case, then its applicability is biased toward males because female reproductive fitness benefits less from mating with multiple partners (Bateman, 1948). Conversely, if the definition of sexual selection is broadened to encompass all manifestations of competition for mates, including competition for mate quality and mating-relevant resources, then females' intrasexual competition should be viewed as compatible with that of males (Rosvall, 2011). For instance, in species with extensive female care and little male parental investment, female competition primarily surrounds accessing males who can provide good genetic benefits (i.e., copulating with visibly high-quality males; Fisher, 1930), as well as protecting offspring and accessing resources to bolster the capacity for maternal care (Rosvall, 2008). Among polygynous primates, females who achieve dominant status reach sexual maturity and conceive earlier, and they produce more offspring who live longer (e.g., Pusey, Williams, & Goodall, 1997). Conversely, when males engage in parental care, females often compete for exclusive mating access to the males who are most likely or able to provide parental care, resources, or territories (e.g., Andersson, 1994; Rosvall, 2011; Whiteman & Cote, 2003), as well as to prevent extra-pair mating (Roberts & Searcy, 1988). As the research literature grows in this area of inquiry, it is becoming

increasingly clear that female competition pervades a wide variety of species. These findings have led some researchers to suggest that female–female competition confers many benefits to survival and reproductive fitness and is therefore “unlikely to exist merely as non-adaptive byproducts of selection on males” (Rosvall, 2011, p. 1135). Researchers have recently begun to explore whether competition among human females might also have been sexually selected for, and, if so, how such competition might manifest within our modern social structure.

Applying Sexual Selection to Human Competition

Consistent with most mammalian species, human females have greater requisite parental investment than human males (Trivers, 1972). The internal fertilization process of human reproduction involves women bearing the greater cost of gamete production relative to men. For women, fertilization is then followed by a requisite nine months of gestation and up to four years of lactation, along with the caloric costs of carrying, protecting, and providing nutrition for the infant (Campbell, 1999). Anisogamy and differential parental care in humans suggests that women should be choosier than men when selecting their sexual partners. Research findings have largely supported this hypothesis, showing that women are less willing than men to go on a date with (and to have sex with) an attractive member of the opposite sex (Clark & Hatfield, 1989; Kurzban & Weeden, 2005; Townsend & Wasserman, 1998). Women's greater selectivity, in turn, leads men to compete with one another in order to gain and maintain mating access to choosy females (Campbell, 1995; Daly & Wilson, 1988).

Sexual selection explains many of the broad sex differences that exist in human behavior (e.g., Archer, 2009; Daly & Wilson, 1990). Men compete for dominance, resources, and social status among other intangibles that may contribute to reproductive opportunity or that serve to quell rivals (Daly & Wilson, 1988, 1994). For instance, men are more likely than women to signal their desirability by displaying high status and wealth (buying women nice dinners, getting a high-paying job, and flashing money; Buss, 1988). Men are also more likely to compete with one another using physical prowess and combat. Among men, one's proportion of fat-free muscle mass predicts his total number of past-year sex partners (Lassek & Gaulin, 2009). Some men use physical aggression in order to attain or guard sexual partners, even at the risk of incurring

injury or death (decision to utilize mental cost–benefit analysis of aggressively competing for mates; Hill & Wilson, 2007; Parker, 1978). In species with boundaries, males as more physically surrounding their compared to female (Hill & Wilson, 1983; Wilson, 1983).

Biparental Care

At first glance, the prototypical female choosiness mating opportunity of women with serially monogamous men produce more children (one purely monogamous; Tullberg, 1995; Jones & Lummaa, 2010) improve their rearing with multiple (i.e., engaging in serially monogamous) exhibit “good genes” attractiveness; Sun (2013; Weatherhead, 2013) mating strategies in preference for estrus with men who will of parental care to (2009).

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injury or death (e.g., Wilson & Daly, 1985). The decision to utilize aggression hinges on a fundamental cost–benefit analysis. Men are more likely to aggressively compete if they perceive a high likelihood of coming out victorious (Archer & Thanzami, 2007; Parker, 1974). Across cultural and contextual boundaries, males engage in more risk taking as well as more physically and sexually aggressive behavior surrounding their status and mating relationships compared to females (Archer & Coyne, 2005; Daly & Wilson, 1983; Vaillancourt, 2005).

Biparental Care

At first glance, humans seem to fit well within the prototypical mammalian model of greater female choosiness and male competition for varied mating opportunities. Men can certainly benefit their reproductive fitness by increasing the number of women with whom they copulate. For instance, serially monogamous men (but not women) produce more children than those who remain in one purely monogamous pair-bond (Forsberg & Tillberg, 1995; Jokela, Rotkirch, Rickard, Pettay, & Lummaa, 2010). Although women might also improve their reproductive fitness by copulating with multiple partners via sperm competition (i.e., engaging in short-term mating with men who exhibit “good gene” characteristics such as physical attractiveness; Sunderani, Arnocky, & Vaillancourt, 2013; Weatherhead & Robertson, 1979), their mating strategies nevertheless also include a greater preference for establishing long-term pair-bonds with men who will contribute a significant degree of parental care toward offspring (Buunk & Fisher, 2009).

Why do women exhibit a preference for monogamy and biparental care? Researchers have suggested that, over our evolutionary history, an increase in men’s parenting efforts likely would have led to greater reproductive success (Miller, 1994). Evidence suggests that biparental care can enhance the survival and well-being of offspring. For instance, in preindustrial Europe and the United States, paternal investment has been linked to infant and child survival rates (Geary, 2000). Among the Ache, a Paraguayan hunter-gatherer society, father-present children are three times more likely to survive compared to father-absent children (Hill & Hurtado, 1996). Paternal investment is also indicative of offspring “quality.” Children whose fathers provide paternal investment tend to have better social and academic skills, as well as higher income during adulthood (Geary, 2000; Pleck,

1997). From a fitness perspective, it is therefore in a woman’s best interest to secure a man who can not only provide good genes but is also able and willing to invest in their offspring (Campbell, 2004). This is reflected in the priority of women’s mate preferences. Women are attracted to both good-gene indicators, such as facial symmetry and skin quality (Jones et al., 2004), as well as to behavioral and personality cues to a potential mate’s willingness to invest in her and her offspring (Buss, 2012).

Evidence of men’s increased monogamy and parental investment can be observed in the degree of sexual dimorphism of modern humans. Males and females of biparental species tend to be morphologically similar. Although men are on average larger (approximately 15%) and stronger than women, this appears to constitute a significant reduction in sexual dimorphism compared to that of our ancestors (Geary, 2000). Hominids preceding *Homo sapiens*, such as *Australopithecus afarensis*, are believed to have displayed greater sexual dimorphism, with estimates of males being significantly larger than females, and of mating polygynously while contributing little in the way of parental investment (Geary, 2000; Gibbons, 2007; Larsen, 2003; cf. Reno, Meindl, McCollum, & Lovejoy, 2003). Conversely, the mating system of modern human society is typically described as one of serial monogamy, mild polygyny, and biparental care (see Schmitt & Rohde, 2013).

By engaging in long-term mating relationships, men might increase the quality of mate they can attract, as well as their degree of paternity certainty (Buss & Schmitt, 1993; Starratt & Shackelford, 2015). Yet biparental care also constrains male reproductive variance. Fewer men will have a large number of offspring from numerous women, and many more men will find opportunity to mate (Geary, 2000). Thus, due to the “heavy commitment that he will make in their joint progeny, it pays a male to be choosy . . . [and] women must compete with one another to secure the best men, just as men vie for the best women” (Campbell, 2004, p. 17). Indeed, when men invest in a long-term mating strategy, they tend to be more discriminating in their mate choice than if they were adopting a short-term, low-investment strategy. For instance, Buss and Schmitt (1993) found that men tend to relax their standards for a potential mate when considering short-term but not long-term mating contexts. Not all men will be equal providers of good genes, of reproductively relevant resources (e.g., food, shelter, protection,

social influence), or of parental effort (e.g., teaching, emotional support). Thus, women must also exhibit competitive attitudes (Buunk & Fisher, 2009) and behavior (Griskevicius et al., 2009; Vaillancourt, 2005, 2013) toward same-sex conspecifics for access to the highest-quality mates, who may themselves be highly selective in their mate choice (Campbell, 2004). Females who could secure the most reproductively viable mates (e.g., men who will invest in offspring, provide resources, care, etc.) would have had the greatest opportunity of producing surviving offspring. For example, it has been noted that, in some preindustrial societies, the ability of a woman to secure a high-status man was linked to more surviving offspring compared to women with lower-status partners (e.g., Voland, 1990; Voland & Engel, 1990). Because these desirable men represent only a portion of the population, it is conceivable that competition for their favor will occur (Vaillancourt, 2005).

Mate Poaching

Women, like men, do not compete merely for mating access to unattached individuals. In all human societies, some individuals will attempt to attract mates who are themselves already in an existing romantic relationship, a behavioral tactic termed "mate poaching" (Buss, 2006; Schmitt & Buss, 2001). In a large cross-cultural study, Schmitt et al. (2004) found that 35% of women admitted to attempting to poach a man from an existing romantic relationship for the purpose of a short-term liaison, and 44% reported doing so for the purpose of establishing a long-term romantic relationship. Women can benefit their reproductive fitness through short-term mating with high-quality men via sperm competition—copulating with multiple men in a short period of time creates a scenario whereby the sperm of the best genetic quality may be more likely to fertilize the women's egg (Baker & Bellis, 1995; Goetz et al., 2005; Weatherhead & Robertson, 1979). Women might also use short-term sexual encounters to "upgrade" to a better-quality romantic partner (Greiling & Buss, 2000). By poaching a man who has demonstrated his desirability and willingness to commit to other women, a female might benefit her long-term mating success (Schmitt & Buss, 2001). Arnocky, Sunderani, and Vaillancourt (2013) found that successful mate poaching by women predicted having had a greater number of lifetime sex partners, more lifetime casual sex partners, as well as more lifetime dating relationship

partners, indicating greater mating success among those women willing to compete for mates who are already "taken." Consistent with findings from studies of intrasexual competition among women, physically attractive women are more frequently the targets of a male mate poacher's desire and are more successful in their own poaching attempts compared to less physically attractive women (Sunderani et al., 2013).

Divergent Sexual Strategies and Strategic Interference

The competitive strategies of women are by no means limited to intrasexual (female–female) conflict. Women can also benefit their reproductive fitness by competing with mating partners in order to express their preferred sexual strategy. For example, it is well established that men, more than women, prefer sexual variety (Symons, 1979). For women, however, a long-term partner's infidelity is undesirable given that it can result in the division of important financial, social, and emotional resources with other women (Buss & Shackelford, 1997b), or in relationship dissolution, leading to significant loss of investment, resources, and parenting assistance (see Buss, 2003; Fisher, 1992). It may therefore benefit women to employ various mate-guarding tactics (Buss, 2002). Such behavior is common, with approximately 75% of married women (and men) reporting that they engage in some form of mate-retention behavior (Buss & Shackelford, 1997a). For women, the most common mate-retention strategies were providing love and care, physical appearance enhancement, and physical possession signals. In attempting to retain a mate, women are more likely than men to engage in appearance enhancement, verbal possession signals (e.g., discussing being off the market), and threatening punishment for a mate's infidelity (e.g., notifying her partner that she will dissolve the relationship if he cheats on her); such tactics are most likely to be employed by women who are paired with a desirable mate who is high in income and/or status striving (Buss & Shackelford, 1997a).

Why Competition among Women Differs from That among Men

The competitive strategies employed by women seem to differ fundamentally from those of men. Women, in comparison to men, less often exhibit extreme forms of overt physical and sexual aggression (Archer, 2004; Daly & Wilson, 1988; Vaillancourt, 2005). Women have more to lose in

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terms of reproductive fitness from potential physi- cally damaging confrontations (Daly & Wilson, 1989). Campbell (1999, 2004) has argued that females' greater parental investment requires greater risk aversion. Even though humans are effectively biparental species, women still provide the bulk of obligatory parental care (Hrdy, 1999). Thus, a mother's death is more debilitating to a child's survival compared to the death of a father (Sear, Mace, & McGregor, 2000). Whereas a man's inclu- sive fitness may rely on copulatory opportunity, a women's inclusive fitness relies more heavily on her successfully rearing her children through early life (Campbell, 2004). Accordingly, the costs associ- ated with direct aggression and other risky forms of competition become amplified—for a woman (and for other female nonhuman primates), it is more important to remain alive in order to rear their off- spring (see also Björkqvist, 1994; Campbell, 2004; Liesen, 2013; Smuts, 1987). It has been suggested that women instead compete using a variety of epigamic-display tactics and (relatively) less risky aggressive strategies in order to achieve dominance, attract mates, and quell rivals (Archer & Coyne, 2005; Vaillancourt, 2005, 2013). In the following section we review the evolutionary underpinnings of two commonly researched forms of competi- tion among women: epigamic display (appearance enhancement) and indirect aggression.

Epigamic Display: Competition over Physical Attractiveness Characteristics

Across diverse human cultural groups, men are remarkably consistent in their expressed preference for physically attractive women (Buss, Shackelford, Kirkpatrick, & Larsen, 2001; Cunningham, Roberts, Wu, Barbee, & Druen, 1995). Men find attractive women who best display various cues to health and fertility. These include youth, lustrous hair, clear skin, feminine and symmetrical facial features, and a low waist-to-hip ratio (WHR; rang- ing between .67 and .80), typically constituting an hourglass-like figure (Buss, 1989; Fisher & Voracek, 2006; Gangestad & Scheyd, 2005; Hinsz, Matz, & Patience, 2001; Singh & Randall, 2007; Symons, 1979). Given men's selectivity in choosing long- term mating partners, women should be expected to compete with one another in the display of these desirable characteristics (Symons, 1979). Indeed, when asked how they compete with rivals and attract mates, women often report attempt- ing to enhance their appearance (Cashdan, 1998) through the use of makeup, suntanning, nail polish,

and flattering clothing (Tooke & Camire, 1991). In their book titled *Why Women Have Sex*, Meston and Buss (2009) review evidence that women, more than men, attempt to enhance their physical appear- ance as a competitive mating strategy. Women are twice as likely as men to spend more than one hour working on their physical appearance each day. Western women are also 50% more likely than men to bronze their skin and are willing to spend almost ten times the amount of money that men spend on appearance-enhancement products (Meston & Buss, 2009). Seock and Bailey (2008) found women to enjoy shopping more, and to be more brand-conscious (aware and desiring of high-end brands) compared to men. For women, shopping seems to be more closely linked to enhancement of their self-image (Dittmar & Drury, 2000).

A woman's effort toward enhancing her appear- ance may therefore be an adaptive competition tac- tic. Hill and Durante (2011) found that women who were primed with intrasexual competition motives (by viewing photos of attractive women and rating their attractiveness, friendliness, and extraversion) were more willing to take health risks in order to enhance their physical appearance (via skin tan- ning and taking diet pills) compared to women in a control condition. Single women were also more likely to engage in risk behavior when exposed to a mating prime (viewing photos of men and rat- ing their attractiveness, friendliness, and extraver- sion). Hill, Rodeheffer, Griskevicius, Durante, and White (2012) have further shown that in an eco- nomic recession (when spending on most products decreases), women nevertheless exhibit a propen- sity toward increasing spending on appearance- enhancing products (termed "the lipstick effect"). The researchers found that such spending is driven largely by an increased desire to attract mates with resources. Indeed, physical attractiveness is posi- tively related to women's mating success. Rhodes, Simmons, and Peters (2005) found that women with highly attractive faces became sexually active earlier in life (i.e., had a longer period of repro- ductive potential) and had more long-term dating partners, compared to their less attractive peers. Physically attractive women are also more adept at stealing desirable men from already-existing roman- tic relationships (Sunderani et al., 2013). Rhodes et al. noted that "Attractive traits can certainly be altered by grooming practices and need not be entirely honest signals of mate quality" (p. 198). In other words, if a female can mimic or enhance facial attractiveness through the use of products and/or

grooming, she may, to a degree, be able to improve her long-term mating success. Women are also more likely than men to report attempting to enhance their physical appearance as a mate-guarding tactic (Buss, 2002).

Rhodes et al. (2005) also note that the association between features of attractiveness and health and fertility is clearer for bodies (Singh, 1993) than for faces (Rhodes, Chan, Zebrowitz, & Simmons, 2003). Disordered body image and eating disordered behavior have been conceptualized as being born out of competition for mate acquisition and retention (Abed, 1998). This is because a low WHR in women is viewed as an honest signal of her health, indicating a greater estrogen-to-androgen ratio and greater fecundity. For instance, in a sample of women presenting for artificial sperm donor insemination, Zaadstra et al. (1993) showed that an increase in WHR predicted a statistically significant decrease in the probability of conception. WHR was a stronger predictor of fecundity than either age or obesity. Perhaps, then, it is not surprising that males find women with a low WHR to be more physically attractive, healthier, and reproductively viable than women with a higher WHR (Singh, 1993).

This raises the question of whether women compete within the domain of body shape. The uniquely human cognitive ability to link food and exercise to body weight and shape affords individuals the capacity to purposefully alter their WHR (Abed, 1998). In extreme form, women who are unhappy with their body's appearance might engage in excessive compensatory behavior in attempting to lose weight and are at an increased risk for developing an eating disorder (Parry-Jones & Parry-Jones, 1995). Abed et al. (2012) have argued that competition over displaying youth and thinness has become intensified in recent decades due in part to declining fertility (leading to extended periods of "pseudonubility" among older women who remain thinner), increased sexual autonomy, and high concentrations of attractive same-sex competitors in our local mating environments. This may help to explain the concurrent rise in eating disorders over the same time period (Abed et al., 2012). For example, eating disorders are significantly more common among heterosexual women who are in their prime reproductive years, compared to men, older women who are outside of reproductive age, and homosexual women (e.g., Abed et al., 2012; Li, Smith, Grisevicius, Cason, & Bryan, 2010). Moreover, intrasexual competition for mates has been shown to correlate positively with body dissatisfaction,

drive for thinness, and disordered eating behavior in both cross-sectional and experimental studies (Faer, Hendriks, Abed, & Figueredo, 2005; Li et al., 2010). For example, Li et al. (2010) exposed participants to one of two photo conditions depicting either (a) high-status competitive or (b) low-status noncompetitive intrasexual rivals. Results showed that heterosexual women (but not men or homosexual women) were more likely to report body dissatisfaction and more restrictive eating attitudes following exposure to the high-status but not low-status competitor photos. Eating disorder behavior has also recently been shown to be predicted by a fast life history (i.e., greater reproductive and mating effort) among college-age women (Abed et al., 2012). Taken together, these findings suggest that competition via the epigamic display of a desirable body morphology may, in some women, lead to the use of extreme and disordered attempts at weight loss. Recent research suggests that enhancing one's own physical appearance is merely "half the battle" in the struggle for mating success. Women sometimes also seek to disparage, exclude, humiliate, and derogate their competitors along dimensions of status, fidelity, and physical attractiveness, through the use of indirect aggression.

Indirect Aggression

Evidence suggests that the degree to which women compete extends beyond mere epigamic display (i.e., attempting to attract desirable men by demonstrating the characteristics most valued by men). Women have also been shown to compete via attack on rivals' social status, attractiveness, and sexual reputation (Campbell, 1995, 1999; Vaillancourt, 2005, 2013). These attacks are often covert and surreptitious, reducing the likelihood of retaliation and of physical, social, or legal consequence (Björkqvist, 1994; Campbell, 1999; Vaillancourt, 2005, 2013). Indirect aggression involves purposefully and often covertly manipulating interpersonal relationships through acts of social exclusion, gossip, and rumor spreading in order to harm others (Crick & Grotpeter, 1995; Lagerspetz, Björkqvist, & Peltonen, 1988). The vast majority of peer aggression occurs within rather than between the sexes (Gallup, O'Brien, White, & Wilson, 2009), and a greater proportional amount of aggression among girls and women is indirect in nature (Vaillancourt et al., 2010). This is not surprising given that women's use of indirect aggression has been shown to increase the perpetrators' status within the social hierarchy (Vaillancourt

tered eating behavior experimental studies (Ceredo, 2005; Li et al., 2010) exposed participants to conditions depicting (a) high-status or (b) low-status rivals. Results showed that it was not men or homophiles who were most likely to report body image concerns or restrictive eating attitudes. High-status but not low-status individuals were more likely to be predicted by a reproductive and mate value perspective. These findings suggest that the display of a desirable physique by women, lead to the increased attempts at weight loss that enhancing one's appearance is merely "half the battle" for success. Women sometimes exclude, humiliate, and belittle dimensions of attractiveness, through the

degree to which they go beyond mere epigamic displays to attract desirable men. Characteristics most valued by men have also been shown to include men's social status, attractiveness (Campbell, 1995, 2013). These attacks are often covertly manipulative, reducing the likelihood of physical, social, or legal success (Campbell, 1999; 2013). Indirect aggression often covertly manipulates relationships through acts of rumor spreading and gossip (Rick & Grotpeter, 1995; Peltonen, 1988). The same often occurs within rather than between groups (Allan, O'Brien, White, & White, 2010). This is not surprising given that men's use of indirect aggression to increase the perpetrators' social hierarchy (Vaillancourt

& Hymel, 2006; Zimmer-Gembeck, Geiger, & Crick, 2005) and to promote depression, lower self-esteem, school dropout, and suicide among victims (e.g., Marr & Field, 2001; Owens, Slee, & Shute, 2000).

Interestingly, the content of women's indirect aggression corresponds to men's mate preferences. For example, given the degree of paternity uncertainty associated with human reproduction, men value sexual fidelity in a romantic partner. Predictably, girls and women often verbally attack female competitors' sexual reputation (e.g., by calling them promiscuous or by calling them "bitches"; Buss & Dedden, 1990) and will limit their social interactions with those deemed to be promiscuous (see Campbell, 2004, for review). Similar indirect attacks surrounding women's physical appearance are common. Vaillancourt and Sharma (2011) showed that almost all women who were randomly exposed to an attractive female confederate engaged in derogatory behavior toward her when she was dressed in sexually provocative versus conservative clothing. Indirect attack of a woman's physical appearance may have adaptive value. Derogatory statements made about a woman's physical appearance can in fact reduce men's perceptions of that target woman's attractiveness and are more likely to be perpetrated by women who are, at the time, high in estrogen and thus maximally fertile (Fisher, 2004). Women have also been found to use indirect aggression during intersexual conflict. For instance, women are more likely than men to flirt with someone in front of their romantic partner as a mate-retention strategy (Buss, 2002).

Arnocky and Vaillancourt (2012) explored whether peer aggression does in fact confer mating benefits to perpetrators. The researchers followed adolescents over the course of one year. At time 1, participants completed both self-report and peer-report measures of physical and indirect aggression, as well as self-reports of peer victimization. At time 2, participants reported on their current dating status. Controlling for age, initial dating status, popularity, and physical attractiveness, results demonstrated that for both males and females, indirect aggression at time 1 predicted having a romantic partner one year later. In addition, being victimized by one's peer group negatively predicted having a dating partner at one-year follow-up.

Individual Differences in Competition

It is important to note that the basic principles of sexually selected female competition outlined

in this chapter are contingent on various environmental factors that can either increase or decrease the propensity for competition among individuals. One condition driving the frequency and ferocity of competition among humans and other vertebrate species is the operational sex ratio, or the proportion of fertilizable females to sexually active males in a given population (Emlen & Oring, 1977). When the sex ratio is skewed, members of the scarcer sex have better mating prospects (Fisher, 1930) and can therefore express greater choosiness regarding with whom they mate (Berglund, 1994). Conversely, mating opportunities are scarcer for the abundant sex, resulting in greater intrasexual competition (Emlen & Oring, 1977). In India, for example, there are more males than females in large part because of sex-selective abortions (Jha et al., 2006). This leaves many men (typically those of low socioeconomic status) lacking mating opportunity. Research has found a strong correlation between the operational sex ratio in various states in India and homicide rates, even after controlling for urbanization and socioeconomic status (Drèze & Reetika, 2000).

Women have been found to engage in more casual sex under conditions of relative mate scarcity (perhaps conforming to a male-biased mating strategy; Schmitt, 2005; South & Trent, 1988; Stone, Shackelford, & Buss, 2007). If indirect aggression has evolved among women for the purpose of mate competition, then its use can be expected to increase under conditions of women's abundance relative to men. To test this hypothesis, Arnocky, Ribout, Mirza, and Knack (2014) exposed participants to one of two bogus magazine articles, one reporting fictitious research findings suggesting that quality mates are a scarce resource and the other suggesting that quality mates are easy to come by. The researchers found that women were more intrasexually competitive, more jealous, and more willing to use indirect aggression against a same-sex rival after being primed to believe that mates were scarce (vs. abundant). Future research would benefit from exploring whether epigamic display variables (e.g., cosmetic use, perceived skin-tanning risk, desire to diet) similarly increase in mate-scarcity versus mate-abundance conditions. Indeed, research has found that under conditions of mate scarcity, women tended to wear more revealing clothing (Barber, 1999). Cross-culturally, competition among women seems to be contextually sensitive in that it becomes intensified when suitable

men are a scarce commodity (Campbell, 1995). See chapters 14 and 15 of this book for additional review of how the operational sex ratio influences competition among women.

Mate Value

Competition may be more frequent and extreme among those who are otherwise limited in their mating opportunities. Mate value is defined as "the total value of the characteristics that an individual possesses in terms of the potential contribution to his or her mate's reproductive success" (Waynforth, 2001, p. 207). Men and women share many similarities in terms of what they consider to be a high-mate-value partner. Buss and Barnes (1986) found that both men and women desire kind, healthy, intelligent partners with exciting and easygoing personalities. However, Buss also observed sex differences in that men more than women preferred physically attractive partners, whereas women more than men preferred mates with good earning capacity.

Research has previously shown that men who do not conform well to women's mate preferences may compete more intensely for mating opportunities or for mating-relevant resources. For example, Wilson and Daly (1985) showed that poor or unmarried men were more likely to commit murder than were their wealthier or married counterparts. Men are also more likely to engage in mate-retention tactics when they are of particularly low mate value (Miner, Starratt, & Shackelford, 2009) or when they are mated with a woman of particularly high mate value (Buss & Shackelford, 1997a). Men are also more likely to engage in mate retention when they perceive an increased likelihood of a partner's infidelity (Starratt, Shackelford, Goetz, & McKibbin, 2007). This phenomenon is likely grounded in our ancestral past, whereby unnecessary or misdirected attempts at retaining partners would have detracted from other important mating and survival functions (Graham-Kevan & Archer, 2009). Thus, individuals who could best approximate the need for such efforts would probably have been more likely to survive and reproduce. Being of relatively low mate value is one particularly salient cue to an increased likelihood of cuckoldry or partner defection from the relationship, qualifying the expenditure of mate-retention effort (Arnocky et al., 2012).

If women have simultaneously evolved a propensity for the use of competitive strategies to attain and maintain desired mating opportunities, then

women should also be expected to exhibit more competition and mate-retention behavior in the face of increased reproductive threat. In support of this argument, Graham-Kevan and Archer (2009) found both men and women of low mate value to exhibit increased controlling behavior compared to their high-mate-value counterparts. Arnocky et al. (2012) found that women who perceived themselves to be of low physical attractiveness compared to their friends were more likely to perpetrate indirect aggression toward both peers (as a form of intrasexual competition) and partners (as a form of mate retention). Moreover, highly attractive women reported being indirectly victimized by their peers to a greater extent compared to less physically attractive females (Arnocky et al., 2012; Leenaars, Dane, & Marini, 2008). Arnocky et al. have suggested that low-mate-value women may be at particular risk of partner defection, given the greater proportion of more desirable competitors within the local mating market. Less attractive women (and men) have been found to worry more about a partner's potential involvement with others compared to their more attractive counterparts (e.g., White, 1980). Women who perceive themselves as being less physically attractive are also more romantically jealous (Arnocky et al., 2012). This may, in turn, warrant the perpetration of indirectly aggressive measures as a strategy for both intrasexual competition and mate retention. Future research would benefit from examining these links experimentally. Cross-sectional data are limited in that directional conclusions about the effects of low perceived mate value and jealousy on female competition cannot be made. By temporarily priming low versus high self-perceived mate value, researchers could effectively examine group differences in inducing competition, be it indirect aggression, enhanced orientation toward epigamic display, or other competition-related variables.

Conclusion

Studies of human sexual selection have disproportionately focused on the relevance of competition for men, neglecting the potential evolutionary origins of competition among women. Yet it has become increasingly clear that competition among women may be an adaptive behavioral strategy meant to augment mating and reproductive success. The amount of parental investment provided by men is unparalleled by any of our closest primate relatives (Geary,

2000). Parental investment theory predicts that individuals will invest more in offspring that are more likely to survive and reproduce. Because men have a higher potential for investment in offspring, they are expected to be more selective in choosing mates. Women, on the other hand, are expected to be less selective because they have a higher potential for investment in offspring. This theory predicts that men will compete more intensely for mates, and women will compete more intensely for mates with good earning capacity. This theory also predicts that men will be more likely to engage in mate-retention tactics, and women will be more likely to engage in mate-retention tactics. This theory also predicts that men will be more likely to engage in mate-retention tactics when they are of particularly low mate value, and women will be more likely to engage in mate-retention tactics when they are mated with a woman of particularly high mate value. This theory also predicts that men will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity, and women will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity. This theory also predicts that men will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity, and women will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity. This theory also predicts that men will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity, and women will be more likely to engage in mate-retention tactics when they perceive an increased likelihood of a partner's infidelity.

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2000). Parental investment constrains repro-
 ductive variance and increases men's choosiness
 in selecting long-term mates (Campbell, 1999).
 Because men also vary considerably in their own
 mate value, both in terms of their willingness
 and ability to invest in partner(s) and offspring
 as well as in their genotypic and phenotypic qual-
 ity, women can bolster their reproductive fit-
 ness by competing for the most desirable mates
 (Arnocky et al., 2012; Vaillancourt, 2005, 2013).
 Buss and Dedden (1990) have argued that suc-
 cessful intrasexual competition relies on enhanc-
 ing one's desirability to members of the opposite
 sex by (a) causing rivals to be less appealing and/
 or (b) enhancing one's own appeal. Each of these
 goals may be satisfied through successful compe-
 tition along dimensions of men's mate preferences
 for physically attractive, youthful, and sexually
 faithful mates (Buss, 2012). Evidence support-
 ing this hypothesis has been robustly observed
 in terms of both women's epigamic display (i.e.,
 self-promotion via physical appearance; Abed,
 1998), as well as in their use of indirect aggres-
 sion perpetrated against their peers (Arnocky
 et al., 2012). Physically attractive (Buss, 1989;
 Walker, Aronson, Abrahams, & Rottman, 1966)
 and indirectly aggressive girls and women have
 been shown to be more likely to attract mates
 (e.g., Arnocky & Vaillancourt, 2012; Gallup
 et al., 2011). Conversely, women who are victim-
 ized by their peers may be viewed as lustful or
 unfaithful, as less physically attractive, and as less
 desirable to men (Arnocky & Vaillancourt, 2012;
 Fisher, 2004; Vaillancourt, 2005, 2013). Though
 there remains much to be discovered, it seems
 to be the case that competition among women
 is intimately tied to the competition for mating
 success. The strategies employed by women do
 not merely mimic those employed by men but
 rather appear to reflect behavioral adaptations
 that are unique to the struggle for female mating
 success, suggesting that female competition exists
 not merely as a spandrel derived from sexual
 selection among males but rather as an adaptive
 behavioral strategy in its own right.

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