Play and Mate Preference
Testing the Signal Theory of Adult Playfulness

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The overwhelming majority of play research concerns juveniles. However, a full understanding of the phenomenon requires knowledge of play and playfulness across the life spans of those animals, including humans, who play in adulthood. The authors investigate a theory of play based on Darwin's concept of sexual selection that may account for the existence of play among adult humans. The authors hypothesize that playfulness becomes a highly desired characteristic in potential long-term mates but also that the reasons for desiring playful mates differ for males and females. The authors suggest that for males, playfulness in females signals youth and, hence, fecundity; for females, playfulness in males signals nonaggressiveness. They test these hypotheses using mate-preference data. **Key words**: adult play and playfulness; play and mate preference; play evolution; sexual selection

> If a wild animal habitually performs some useless activity, natural selection will favour rival individuals who devote the time and energy, instead, to surviving and reproducing. Nature cannot afford frivolous *jeux d'esprit.* Ruthless utilitarianism trumps, even if it doesn't always seem that way.
>
> —Richard Dawkins, *The God Delusion*

Play is quintessential *jeux d'esprit,* but because nearly all, if not all, mammals, many birds, and members of numerous other species play (Burghardt 2005), it also presents one of evolution's most vexing problems. Play appears to be not only nonutilitarian but is often downright dangerous. It seemingly wastes time and energy, opens players to injury and occasionally even to death, and leads, at times, to a lack of vigilance that may expose them to predation (Bekoff and Byers 1998; Bjorklund and Pellegrini 2002; Fagen 1981; Pellegrini and Bjorklund 2004; Symons 1978; for an alternate view see Martin and Caro 1985; Power 2000). So, why does play exist?

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In 1998 at a combined meeting of The Association for the Study of Play and the Society for Cross-Cultural Research, one of us—Garry Chick—delivered a keynote address titled "What is Play For?" (Chick 1998, 2001). In it, he expressed his worry about traditional theories of play (as described in, e.g., Ellis 1973) and their failure to explain adequately the existence of play. Most of these theories are outdated and all but useless because they do not lead to testable predictions. Additionally, and as important, they fail to address play and playfulness among adults. (We regard play as the behavioral manifestation of playfulness that, in turn, is the propensity to engage in play.) In contrast, Chick proposed a theory, based on Darwin's concept of sexual selection, that is not only relevant to adult play and playfulness but also permits the generation of testable hypotheses. Specifically, Chick postulated that play and the personal characteristic of playfulness, among adult humans, send signals, or messages, to the opposite sex of important information regarding the signaler's suitability as a long-term mate. Moreover, the content of the signals sent by males and by females differs. Through play and playfulness, males signal their nonaggressiveness while females signal their youth and fecundity. This article presents and tests hypotheses based on Chick's signal theory of adult playfulness.

Proximate and Ultimate Cause

Chick's proposal rested on an explicitly evolutionary perspective. Therefore, we distinguish two types of explanation we believe apply to play and playfulness to understand them from an evolutionary perspective. In biology, *proximate cause* refers to something immediately responsible for some other action or event. This contrasts with *ultimate cause*, generally a reference to an evolutionary explanation. In an influential 1961 paper, biologist Ernst Mayr wrote that proximate and ultimate causes deal with how and why questions respectively. For example, how do birds determine when to migrate? They migrate because they have internal biological clocks that alert them to fly north (in the Northern Hemisphere) for reproduction and south for the winter. But, why did they evolve such biological clocks and navigation skills in the first place? They did so because otherwise they might freeze or starve in the northern winter. In the cases of insectivores (insect eaters) or frugivors (fruit eaters), their food supplies disappear. Many raptors (meat eaters) and seedeaters do not migrate because their food supplies remain relatively stable during winters. Therefore, seasonal

migration depends on the availability of food, on protection from predators, and on mates and breeding locations (Mayr 1961). Disciplines such as physiology, developmental biology, and molecular biology generally address how physical or behavioral traits function and thereby provide explanations in terms of proximate cause. Evolutionary biology, behavioral biology, and some subfields of ecology deal with the evolutionary history and adaptive functions of physical or behavioral traits and, therefore, provide explanations in terms of ultimate cause. Mayr argued that these two types of causes are distinct and that both are necessary for a complete understanding of a phenomenon (but see Laland et al. 2011 for a revised view of the distinction in biology).

Proximate and Ultimate Cause in the Social Sciences

The notions of proximate and ultimate cause have had relatively little impact in mainstream social science (where ultimate cause is sometimes referred to as "distal cause"). For both humans and other animals, many behaviors appear to derive from various motivations. Some of these motivations are biological, such as hunger, thirst, and sex. Each of these has both proximate and ultimate explanations.

Humans and other animals also perform tasks to receive external rewards, such as money or food, or to avoid punishment. Under these conditions, people or animals are often said to be "extrinsically motivated." In addition, psychologists and social psychologists ascribe some actions to "intrinsic motivations," things that spark pleasure, feelings of achievement and self-worth, or personal development, all presumably without external reward. The problem with attributing human behavior to extrinsic or intrinsic motivations is that both are proximate explanations and provide little information about why the motivations exist in the first place, which renders them incomplete. For example, in a brief comment on Chick's sexual selection–based theory of play, DeKoven (2002) wrote "One more reaction I [had] to that article about 'What is Play For?' [was that] the author covers everything in depth except the possibility that play might be for fun." DeKoven's suggestion that play may exist because it is fun is a proximate explanation. Yes, play is for fun. But, why is it fun?

Play is fun for children and remains so for most adults. But, developmentally, we know that participation in physical play follows a curvilinear relationship with age, peaking in early adulthood. We also know that adult play in most other playful animals declines even earlier—soon after adolescence—and even more dramatically. Although mothers, and occasionally fathers, play with their offspring, the overwhelming majority of play involving nonhuman animals

occurs among juveniles (e.g., van Lawick-Goodall 1968; Bekoff and Byers 1981). There are, however, a few significant exceptions such as some domesticated species—especially dogs—and, of course, humans.

We have bred dogs for guarding, retrieving, pointing, herding, and other specializations. Some breeds, such as Labrador retrievers, tend to be more playful in adulthood than herding and guard dogs, for example. Moreover, many of the most playful breeds also exhibit pronounced neoteny, that is, they retain juvenile characteristics such as droopy ears, short muzzles, heavy bodies, and relatively short legs, especially compared to their wolf ancestors. In an illustration of how this may have happened, Russian biologists led by Dmitri Belyaev began an experiment in selectively breeding the silver fox (*Vulpes vulpes*) in 1959. They chose animals for breeding based on their "flight distance" which refers to how close a human can approach an animal before it flees. (Basically, this is a measure of the animal's tameness.) Belyaev and his colleagues chose for breeding foxes with the shortest flight distances. After only the tenth generation, 18 percent of the foxes showed extremely tame behavior, much like that of domestic dogs, and "by one month postnatal they become eager to establish human contact, whimpering to attract attention and sniffing and licking at humans, just like puppy dogs" ("Study of the Molecular Basis of Tame and Aggressive Behavior in the Silver Fox Model," n.d.). Domesticated foxes, then, are tame, want to interact with humans, show neonatal characters (e.g., droopy ears), and remain playful into adulthood (Trut 1999). It is possible, therefore, that when humans first selected wolves to tame, which led to the first dogs, a suite of neonatal characteristics, including playfulness, were byproducts of that process. We may also have selected dogs for playfulness, specifically. Chick's questions asked whether playfulness in adulthood emerged through a process of self-domestication similar to the human domestication of dogs and to the experiment with silver foxes. Other animals may practice such self-domestication, as well. Hare, Wobber, and Wrangham (2011) hypothesize that bonobo (*Pan paniscus*) behavior, compared to that of the chimpanzee, is the result of self-domestication through the selection for nonaggressiveness. Another hint is that, like Labrador retrievers, humans retain many neonatal characteristics compared to our closest evolutionary relatives—apes like chimpanzees and gorillas. These features include a rounded, vaulted cranium, a juvenile face (flat, with small jaws and teeth, no brow ridges), forward positioning of the foramen magnum, delayed closure of the cranial sutures, an unrotated and unopposable big toe, and an extended period of playfulness

(Bolk 1926). Apparently playfulness may be part of a suite of juvenile traits retained into, and through, adulthood by some species. To better understand the mechanism by which this could have happened, we must first briefly examine Charles Darwin's theory of evolution by natural selection.

The Engines of Evolution

To explain both similarities and differences among animals and plants, Darwin proposed three forces that drive evolutionary change. These are *artificial selection, natural selection,* and *sexual selection.* Artificial and sexual selection are really subtypes of natural selection.

In chapter I of *On the Origin of Species by Means of Natural Selection*, "Variation under Domestication," Darwin (1859) introduced selective breeding or *artificial selection.* Artificial selection is the deliberate or, sometimes, accidental (Darwin called these "methodical" and "unconscious") choice of humans to breed plants or animals with particular, presumably desirable, characteristics while those with undesirable characteristics are prevented from breeding—or, at least, not encouraged to breed. Darwin detailed the breeding of racing pigeons, popular for sport in Victorian England and a species with which he was particularly familiar. He noted that "One of the most remarkable features in our domesticated races is that we see in them adaptation, not indeed to the animal's or plant's own good, but to man's use or fancy" (21). The breeding of modern maize from teosinte (a wild grass), cauliflower, broccoli, kale, Brussel sprouts, kohlrabi, and collard greens, as well as modern cabbage from ancient wild cabbage, or the great variety of modern dogs from their wolf ancestors illustrate the power of artificial selection.

Darwin then introduced *natural selection*. He asked, "Can the principle of selection, which we have seen is so potent in the hands of man, apply under nature? I think we shall see that it can act most efficiently" (59). The theory of evolution by natural selection assumes that individual members of any given species vary among themselves. Stated simply, the principle of natural selection says that if some aspect of this variation gives one member of a species an advantage, be it ever so slight, over another that helps it to survive and reproduce, it will be naturally selected and passed on to descendants if the trait is heritable. The descendants will resemble their parents, leading to the accumulation of the variation and evolutionary change.

Darwin also proposed sexual selection in *The Origin of Species* but gave it book-length treatment in *The Descent of Man, and Selection in Relation to Sex* (1871). Sexual selection comes in two varieties, competition and choice. Competition occurs between members of the same sex, most often males, who engage in contests that may include physical combat to collect and guard harems of females, protecting nearly or totally exclusive sexual access to them. Size, strength, aggressiveness, and weaponry (such as antlers, enlarged teeth, pincers, or claws) are important in competition, and lesser males may never reproduce at all. Male competition may also involve possession of critical resources required by females, such as food or breeding sites.

Choice, the second variety of sexual selection, occurs between the sexes and is most often exercised by females. Through female choice, Darwin explained the garish adornments characteristic of males of many species, especially birds. The male peafowl's (i.e., peacock) display is an exemplar of showy male decoration. But bright coloration or other exaggerated characteristics may be cumbersome and likely maladaptive from the point of view of exposure to predation. So, they should not exist. Darwin described sexual selection through female choice: "I can see no good reason to doubt that female birds, by selecting during thousands of generations, the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect" (1859, 66).

Experimental evidence supports the idea of female choice. Malte Andersson and colleagues (1982; Andersson et al. 2002; Pryke and Andersson 2001, 2002) studied female choice in the widowbird, a polygynous bird that nests in open grasslands in Kenya. Widowbird males have bodies about the size of the North American robin but also extremely long (approximately 50 cm.) tail feathers. Females, on the other hand, have 7 cm. tails. Males attract females by flying low over their territories with tail feathers fanned. After mating, females nest in tall grass, and the males are not involved in rearing the young. Andersson (1982) hypothesized that the elongated tail plays a role in mate attraction. He then led an experiment wherein all of the males in an area were captured and treated in one of four ways. Some were simply released as a control group to demonstrate that capture itself did not influence mating success. Birds in the second control group had their tails cut but then replaced (glued back on). Andersson and colleagues shortened the tails of birds in a third experimental group to about 14 cm. The researchers then used the leftover feathers to extend the tails of the fourth group to about 75 cm. They found that females preferred the new longer-tailed males by a ratio of 4 to 1 over their short-tailed colleagues and about 3

to 1 over the control birds. However, the longer tail feathers interfered with the flight characteristics of the second experimental group and probably placed it at greater risk of predation. Hence, there are natural limits on the lengths (literally) to which males can go to attract females. Many other studies, both in the laboratory and the wild, have also shown the power of sexual selection by female choice (e.g., Endler 1983, 1986; Haines and Gould 1994).

Human males and females engage in both competition and displays to attract mates, and both exercise choice. Competition comes in many forms, including physical conflict, but also in displays with behavioral and material components. Men may provide women with expensive gifts or equip themselves with expensive cars or clothing to demonstrate their skill at acquiring goods and necessities. Women may wear garments or use makeup designed to enhance their looks and make themselves appear younger, healthier, and more desirable (see Puts [2010] for an excellent summary and analysis of research on sexual selection in humans).

Children's Play

From an ultimate causal perspective, juvenile play must have future benefits for playful animals at least as great as its immediate costs. Otherwise, it would never have remained a behavioral trait of so many animals. The benefits of play common to all animals may include enhancing motor skills, learning social skills, and developing cognitive abilities (Bekoff and Byers 1998; Burghardt 2005; Pellegrini and Smith 1998; Smith 1982). Young humans may learn how to take on roles, manipulate language, solve problems, and become more creative through play (Lancy 1996; Rubin, Fein, and Vandenberg 1983).

Bock (2005) and his colleague (Bock and Johnson 2004) have developed a perspective on children's play based in evolutionary behavioral ecology. They hypothesize that the forms and frequency of play mirror adult productive tasks in particular ecological circumstances (Bock 2002, 2005). For example, in traditional foraging societies, adult males do most of the hunting. Therefore, play relevant to the development of hunting skills—such as learning to track, snare, and spear prey—should not only occur but should be more common among boys than girls (Bock 2005; Bock and Johnson 2004). Similarly, because many researchers think rough-and-tumble play serves as practice for fighting (Fry 1990; Groos 1898; Pellegrini 2002; Smith 1982) and find it more common among boys than among girls, it should appear more frequently and take up more time in more belligerent socio-

ecological cultures (Fry 2005) and in traditional hunting cultures (Bock 2005). Bock hypothesized that pretend play, often viewed as preparatory for adult competence through practice and role playing, may be prevalent where direct practice would be costly or dangerous (e.g., where real food might be spoiled by unskilled preparation or where hunting could involve confrontation with dangerous predators). As such, it should be gender specific in order to complement adult roles in given social and ecological contexts (Bock 2002, 2005; Bock and Johnson 2004).

Based on this theorizing, Bock made several predictions about children's work and play in traditional settings. For example, the amount of time devoted to play and to work should vary inversely with age: older children work more and play less. This means, first, that time allocated to the development of productive adult skills through play should decline in proportion to the degree of adult competence achieved. Second, children will play more at activities that bear a relationship to the subsistence strategy (e.g., foraging, agriculture) in which the child will participate as an adult. Third, children will spend more time in play forms that are related to gender-specific productive skills in the subsistence ecology in which they will participate as adults. Bock and Johnson (2004; Bock 2005) found strong support for these hypotheses in extensive time allocation, economic, demographic, and experimental data gathered in a community in the Okavango Delta of Botswana in the early to mid-1990s. In addition to the evidence for his hypotheses, Bock (2002) found that trade-offs between immediate and future productivity significantly determined children's play. Where children's work was economically viable, they worked. Where it was not, they played, but their play generally reflected activities relevant to their household subsistence economy. Time allocation research by Gurven and Kaplan (2006) among the Machiguenga and the Piro of the Western Amazon basin in Brazil and Peru and by Kramer (2005) in a Mayan village in the Yucatan produced similar results. So, a perspective based in evolutionary human ecology seems to explain much about children's play in terms of its ultimate causation: it is economically useful and usually so in the long term. However, the work by Bock and his colleagues applies only to children's play. What of play among adults?

Adult Play

Adult play and playfulness present problems from an ultimate causal perspective because they do not appear to fit the same reasoning we apply to chil-

dren's play. Presumably, most of the skills that children need to be competent adults have been learned by the time they reach adulthood or, at least, learning them in the context of play has given way to learning them in the context of adult activities. The research by Bock and others (Bock 2002, 2005; Bock and Johnson 2004; Kramer 2005; Gurven and Kaplan 2006) indicates that as soon as children are productive at work, play with models of productive tasks declines and disappears. With respect to adults, it is difficult to see how any possible future benefits of play could outweigh its immediate costs (but see Palagi [2006] for evidence of immediate benefits in the bonobo). Nevertheless, adult humans do play, commonly into old age (e.g., Yarnal et al. 2008, 2009; Yarnal and Qian 2011).

Adult play often simply extends children's play. For instance, children begin to play games with rules around the age of five or six (Piaget 1962; Elkind 2007) and may continue these activities into late adulthood. Examples include ball games—such as baseball, softball, soccer, and basketball—card games, and board games. These may become more complex as cognitive skills increase with age (e.g., Go Fish or Old Maid gives way to poker or bridge; Candy Land or Uncle Wiggily is replaced by Monopoly or chess). Adults engage in other, more cognitively sophisticated, activities compared to children such as word play, including puns and jokes that involve linguistic and rhetorical manipulations. "Horseplay" is a form of rough-and-tumble play often undertaken by adolescents and adults. Similarly, children's play like cowboys and Indians or cops and robbers translates into adult play forms such as paintball. Adults engage in presumably more sophisticated forms of sex play than children do, including the aptly named "foreplay."

According to The Entertainment Software Association (2012), the average video game player is thirty-seven years old. Forty-two percent of video game players are female, and a higher percentage of video game players are women (37 percent) than boys under eighteen (13 percent). Twenty-nine percent of Americans over the age of fifty play video games. Similarly, adults, including older adults, commonly play with model machines, such as model airplanes, cars, boats, and trains (Chick 2004), as well as real machines including bicycles, snowmobiles, motorcycles, personal watercraft (e.g., the Jet Ski), and all-terrain vehicles (Chick and Hood 1996). Older adult women also engage in a variety of play activities. For example, the Red Hat Society is a social play group for women ages fifty and over with more than thirty-eight thousand members in chapters ranging in size from twenty to two hundred. Red Hatters don outrageous red

hats, vivid purple outfits, "spiky heels and all manner of gee-gaws" to "strut their stuff," "hoot and holler" and publically demonstrate that "we ain't dead yet" (Yarnal 2006). Some women play at bowling (Heuser, 2005), line dancing (Brown 2007), cruising (Yarnal 2004), and masking (Yarnal, et al. 2009). Adults, like many other mammals, not only play with each other but also play with their children—that we continue to do so when our offspring reach adulthood separates us from other species.

Chick (1998, 2001) suggested both male and female adult humans prefer mates who are playful because playfulness signals desirable attributes in possible mates. Earlier, Sigmund (1993) thought we may have bred "ourselves into playmates" (207). He proposed we did so by preferring playful children and, therefore, providing more care for them than for their less playful siblings. Progeny choice refers to the way we select core over marginal offspring either by neglecting weaker or otherwise low-quality young or by permitting sibling rivalry to kill off siblings (Forbes and Mock 1998). Siblicide is phylogenetically widespread. It occurs among plants, insects, and mammals, though researchers have probably studied it most among birds with respect to what they call "optimal clutch size" (Lack 1947; Mock, Drummond, and Stinson 1990). Because selection through progeny choice is not random, it can increase the average quality of offspring (Forbes and Mock 1998). Although parental preference for, and enhanced care of, more playful children may occur, Sigmund (1993) provided no evidence for it. Moreover, even if parents favor playful progeny, selection for a trait in children does not mean it will be retained in adulthood. On the contrary, juvenile playfulness declines precipitously with sexual maturity in nearly all playful species.

Michael Ghiselin (1974, 1982) proposed that play, as well as art, science, religion, and morals, are the products of artificial selection. He observed that people who are playful are less likely to do harm to each other: "We seek their company and cherish them, and this may reasonably be expected to increase their Darwinian fitness" (1982, 165). We agree with Ghiselin's proposal and regard it as a corollary to our own position. However, we believe the messages encoded in male and female playfulness differ while Ghiselin implies they should be the same; therefore, we predict that selection pressures on males and females also differ (cf. Trivers 1972) while he does not.

Finally, as we noted earlier, theories without testable hypotheses are of little value. Fortunately, sexual selection in humans has attracted considerable attention in mate-preference research.

Mate-Preference Research

Studies of mate preferences have been around for a more than half a century (Hill 1945; McGinnis 1958; Hudson and Henze 1969) and have been conducted primarily with college-aged adults. Early work was largely atheoretical, but recent research has usually been based on Robert L. Trivers's (1972) parental-investment theory. Trivers theorized that, since the female investment in offspring, including ovulation, pregnancy, lactation, and child care, is almost always far greater than that of males, females should choose mates who are willing and able to provide the most resources for raising a family. This may include securing food, protecting territories, or defending both the female and the young against aggressors. Females would look for external indicators of this willingness and ability in potential mates. Trivers also hypothesized that the sex with the greater parental investment would also be the choosier in selecting mates and that, again, this should be more characteristic of females.

Chick (1998, 2001) proposed that both females and males favor playfulness in potential mates because it offers a relatively unambiguous signal of reproductively important information. For females, Chick (1998, 2001) hypothesized, playfulness in males signals they are less likely to harm their mates and their offspring. That is, playful males are less dangerous than serious males (cf. Ghiselin 1974, 1982). For males, female playfulness signals something entirely different: it indicates youth and health, each a sign of fecundity.

Male Preferences in Mates

Because women's ability to bear children declines over the course their lives, men should seek youthful women as age and appearance strongly predict fertility in females (Buss 1989). Standards of beauty differ across cultures, but humans rarely if ever regard asymmetric features or features that indicate advanced age or disease signs of beauty. According to Buss: "Features of physical appearance associated with youth—such as smooth skin, good muscle tone, lustrous hair, and full lips—and behavioral indicators of youth—such as high energy and a sprightly gait—have been hypothesized to provide the strongest cues to female reproductive capacity (Symons 1979; Williams 1975). Sexual attraction and standards of beauty are hypothesized to have evolved to correspond to these features. On this account males *failing* to prefer females possessing attributes that signal high reproductive capacity would, on average, leave fewer offspring than would males who do prefer to mate with females displaying these attributes" (2).

Hence, as Buss (1985, 1989; Buss and Barnes 1986) hypothesized, males would be more interested than females in the physical attractiveness of potential mates while females would consider earning capacity in possible mates to be more important than would males. Buss found support for these hypotheses, and several other studies (Buunk et al. 2002; Hatfield and Sprecher 1995; Khallad 2005; Lippa 2007; Shackelford, Schmitt, and Buss 2005) provide similar results across a variety of populations using a variety of methods.

Female Preferences in Mates

Male fertility depends less clearly on age and thus may be generally more difficult to assess on the basis of physical appearance. Therefore, again, the physical appearance of males should be less important to females than female appearance is for males (Buss 1989). While this may be so, research suggests that male appearance nevertheless has some importance for human females. Women find men with athletic bodies, especially a V-shaped torso, more attractive than those with average physiques (Dixon et al. 2003, Li et al. 2006, Jonason 2007). Men may bias exercise regimens to enlarge the upper body to obtain a V-shaped torso favored by women (Jonason 2007).

Sexual-selection theory indicates that males compete for mating opportunities and females choose those who demonstrate superior resources in terms of material well-being but also that females consider genetic quality in making such choices. Physical competition through play, games, and sport is an obvious way in which human males demonstrate physical (and often strategic) qualities such as speed, endurance, and strength (Manning and Taylor 2001). Males seem to believe that acumen in sports is important for mate choice and that athletic ability is attractive to females (Walters and Crawford 1993). Schulte-Hostedde and his colleagues (2008) suggest, if game and sports participation offers honest signals regarding male quality, a number of hypotheses can be proposed. For example, "participants in sport should have more sexual partners than nonparticipants, and the *level* of sport performance should also predict the number of sexual partners" (114). Faurie, Pontier, and Raymond (2004) found that male French students who competed in sports reported having more sexual partners than did nonparticipants and, among athletes, performance levels correlated positively with reported numbers of sexual partners. Caution is advised here because Faurie and her colleagues provide only self-reported data, not behavioral data. It could be that better athletes are bigger liars than lesser men. The number and extent of extramarital dalliances by a few well-known professional

athletes supports the hypothesis, but data of high reliability and validity are rare.

The type of sports also may affect male displays of quality. Team sports may permit the display of some positive qualities, such as cooperation and sociability, better than individual sports. In addition, team sports permit comparison with a greater number of others than does individual sports participation (Schulte-Hostedde, Eys, and Johnson 2008). But female choice may also include other criteria.

Females face serious problems when choosing a mate based on criteria other than male appearance, resources, and genetic quality—both infanticide and the physical abuse of females are common in many mammals. Male lions, for example, typically kill all of the suckling cubs in a pride after deposing a previously dominant male. This serves to eliminate the progeny of another male but also insures that females come into estrus quickly so that the newly dominant male or males can sire offspring. Male lions do not typically retain their dominant position for long, so the only way to ensure that their genes pass to the next generation is to reproduce quickly. Packer and Pusey (1983) estimated that about one-fourth of all lion cubs are victims of infanticide. Infanticide has also been observed among various species of monkeys as well as among gorillas and chimpanzees. While infanticide has not been observed in orangutans, Wrangham and Peterson (1996) indicate "Most female orangutans are raped regularly." Battering females is relatively common among chimpanzees, although not among gorillas: "Every female chimpanzee gets battered, some are raped, and a few have their infants killed. Many or even most gorilla mothers experience infanticide—but they aren't battered" (151).

Infanticide among humans is rare. Nevertheless, biological fathers are much less likely than stepfathers to kill their children (e.g., Buss 1989; Harris et al. 2007). Daly and Wilson (1998) argued that an American child with one biological parent and one stepparent is approximately one hundred times more likely to suffer infanticide than a child who lives with both biological parents. Temrin, Buchmayer, and Enquist's study (2000) based on data from Sweden contradicts this view. However, a reanalysis, corrected for age differences in children living with a stepparent, shows that the Swedish data agrees with those from North America, albeit more weakly (Daly and Wilson 2001). Evidence from modern industrial societies, including Australia (Tooley et al. 2006) indicate that unintentional fatal accidents are higher for children living with a stepparent than with biological parents and, in the United States, that more financial resources are spent on genetic offspring than on stepchildren (Anderson, Kaplan, and Lan-

caster 1999). Marlowe (1999) found lower levels of male care for stepchildren than biological children among the Hadza, a foraging society in Tanzania, as well.

According to Kyriacou et al. (1999), "Domestic violence is the most common cause of nonfatal injury to women in the United States." Further, "the lifetime risk of severe injury as a result of domestic violence has been estimated to be 9 percent for women, with a lifetime risk of up to 22 percent for any type of injury from domestic violence. The risk of death from domestic violence is also substantial; one third of the homicides of women in the United States are committed by a spouse or partner" (1892). The situation in other countries is a little better in some places but much worse in others. Results from a World Health Organization study of domestic violence covered more than twenty-four thousand women, aged fifteen to forty-nine, from fifteen sites in ten countries around the world (Bangladesh, Brazil, Ethiopia, Japan, Peru, Namibia, Samoa, Serbia and Montenegro, Thailand, and Tanzania). In thirteen of the fifteen sites, 35 percent to 76 percent of the women had been either physically or sexually assaulted since the age of fifteen. In every setting but one, a current or previous partner, rather than a stranger or other individual, had perpetrated the assault (Garcia-Moreno et al. 2005).

Females of many species, including humans, have good reason to fear for both the safety of their children and for themselves from males with whom they have intimate relationships. But, how are they to judge if males are dangerous? If Ghiselin (1974, 1982) and Chick (1998, 2001) are correct, playfulness in males may signal nonaggressiveness. Playfulness may be part of a suite of both physical and behavioral changes resulting from self-domestication for nonaggressiveness (cf. Hare,Wobber, and Wrangham 2012).

Forms of Sexual Signaling

Humans and other animals exhibit a variety of signals regarding their value as mates. These include visual, olfactory, auditory, taste, and behavioral cues. We have already mentioned birds—the males of many species, common cardinals being one, exhibit elaborate coloration; others, like widowbirds, feature elongated tails. Some mammals, such as deer, moose, and elk, sport antlers, which are generally sexual weaponry, used in combat with other males. The extinct Irish elk (it was not exclusively Irish and was actually a deer, not an elk), had antlers that could span twelve feet, weigh ninety pounds, and grew anew each year (Coyne 2009). All these characteristics provide visual signals of potency to both other males and to females. Aurelio Malo and colleagues (2005), for

example, indicate that antler size is an honest signal of sperm quality and quantity in red deer. Sexual signals such as elaborate calls, songs, scents, and mating displays are common among animals and almost always appear maladaptive in that they might draw predator attention and consume copious amounts of energy (Coyne 2009).

Among humans, visual and behavioral signals play a critical role in sexual displays although olfaction (sometimes stimulated by perfumes, colognes, deodorants, and other fragrances) also helps. Women in many societies commonly attempt to enhance their secondary sexual characteristics and youthful appearance through structure enhancing undergarments or added coloration (from lipstick, nail polish, and rouge, for example). Men may wear jackets with shoulder pads to emphasize a V-shaped torso, but much of their sexual signaling is behavioral, particularly displays of wealth, prestige, and power. As Puts (2010) indicates, "Beauty, fashion, and physical fitness are so important in the United States that they have become multi-billion dollar industries" (157). And indeed, physical appearances are important worldwide in male selection. They are not, however, the only forms of sexual signaling. Sundie et al. (2011) illustrated in three experiments that conspicuous consumption is a strategy used by men with short-term mating in mind and that women accurately interpret it as the men intend it. The study concludes that conspicuous consumption by males is not just a display of economic prowess but part of a signaling system devoted to short-term mating.

While the physical appearance of a female can clearly signal her reproductive potential, a man's ability to invest economically in offspring is less obvious, though potent when recognized. In a comparative study of five widely dispersed foraging groups (the Ache of the upper Amazon basin, the Hadza of East Africa, the !Kung of southern Africa, the Lamalera of Indonesia, and the Meriam of Melanesia), Smith (2004) found that success as a hunter correlates with demographics such as overall "fertility, number of mates, offspring survivorship, and lifetime reproductive success" (343). Indeed, he reported gains in reproductive success (the number of surviving offspring) between 50 percent and 100 percent for successful hunters. Marlowe (2003) reported that Hadza women cite "good hunter" as the single most valued trait in a potential mate while Wiessner (2002) found that better hunters among the !Kung had 50 percent higher fertility than poor hunters. The better hunters also had nearly double the number of surviving offspring although their wives were neither more numerous nor younger. Smith (2004) reported that skilled hunters in all groups enjoy prestige and high social status.

Playfulness as a Preferred Trait in Potential Mates

While many studies have addressed the importance of different characteristics to men and women in their mating preferences, studies that include playfulness are conspicuously absent (Chick 2001). Buss (1989) examined characteristics linked to physical attractiveness, age, earning ability, ambition and industriousness, chastity, and health. Greiling and Buss (2000) explored factors that may lead to infidelity in women including what characteristics they might look for in other men, but playfulness was not included among the traits they questioned participants about. Koyama, McGain, and Hill (2004) reexamined the difference in rankings of the traits from Buss (1998) and found that the rankings did not significantly differ in cultures with more gender equality. Schmitt (2005) studied the socio-sexuality of 14,059 people in forty-eight nations but did not address the topic of playfulness. McGraw (2002) examined the degree to which members of the opposite sex in several geographical locations across the United States found varying personal characteristics to be attractive. He intended to determine if the desirability of such traits as physical attractiveness and resource-accruing ability differed based on the conditions in one's local environment, such as living in a more expensive city. Unfortunately, none of these studies included characteristics indicative of playfulness among the traits examined.

Clearly not much research exists on playfulness as a desirable characteristic of potential mates in humans. To have some standard against which to compare the desirability of playfulness as a trait in mates, we decided to replicate, in part, the study by Buss and Barnes (1986) using their list of thirteen possible characteristics of prospective mates that individuals might seek. We added *playful, sense of humor,* and *fun loving* to include the concept of playfulness in the list. (We began with a list of thirty-five traits as part of a larger study. A factor analysis of this larger data set provides several factors, one of which consists of playful, sense of humor, and fun loving. We termed this factor "playfulness." Our goal in this article is to see how these traits compare in desirability to the thirteen used by Buss and Barnes.)

Males and females both value a sense of humor in potential mates (e.g., Daniel et al. 1985; Feingold 1992). However, experimentally manipulating humor has resulted in the paradox that, while women prefer men who produce humor, men show no corresponding interest in humorous women (Bressler and Balshine 2004; Lundy, Tan, and Cunningham 1998). Miller (2000, 2001) has hypothesized that both the ability to produce and to appreciate humor evolved by sexual

selection: the production of humor signals genetic quality, and its appreciation signals sexual interest. If this is the case, women may prefer men who can produce humor while men may favor women who enjoy their humor (Bressler, Martin, and Balshine 2006). Hence, a sense of humor appears to be an important feature in mate preference. However, we are unaware of any mate- preference research considering playfulness in detail or examining fun loving at all. We added fun loving because it seemed to capture some of the proximate qualities of play and playfulness.

Hypotheses

Our general hypothesis was simply that playfulness, a sense of humor, and fun loving would be ranked high, specifically, in the top half, of the list of sixteen traits. Because we wanted to make our study consistent with Buss and Barnes's, we did not include negative traits, such as aggressive, dominant, or physically abusive that might have permitted us to determine whether there is a difference between males and females on these traits. We would have expected females to rate them more negatively than males based on our conjecture that females choose playful males because they are less likely to harm females and their children. However, two of the sixteen traits, *kind and understanding* and *easygoing*, if rated higher by females than by males, are at least consistent with the idea that females prefer mates who would not be aggressive toward them. Hence, we hypothesize that females will rate these traits in a potential mate as more desirable than males will rate them in females. We also anticipated that males would rate physical attraction higher than females because it fits our conjecture that males are interested in playful, youthful, fecund females and is consistent with Buss and Barnes's results. In addition, we hypothesize that *healthy* and *good heredity* also suggest fecundity and, therefore, that males will rate them as more desirable in females than females will in males.

The Research

Sample

Our study included 254 undergraduate students as informants. All were enrolled in a large introductory course on recreation and leisure. About half of

the sample (n=132) completed an in-class paper survey during a fall semester while the remainder (n=122) completed the same survey online in a subsequent semester. We first examined the results for the effects different administration methods might have on the students and the study, but we found no differences between the two groups. None of the students was younger than eighteen or older than twenty-six (mean=20.32). Unfortunately, the gender distribution was far from equal: 164 males and 89 females (one case missing). Three students indicated they were married, but the remainder identified themselves as single (seven cases missing). Eighty-three students were in their fifth semester at the university, the median and modal response, with the range between the first and the ninth semester. The survey was distributed as a class participation assignment, worth five points on the participants' final grades if they returned completed surveys. The portion of students returning questionnaires reached 85.7 percent.

In general, researchers must view data from university undergraduates with extreme caution, and this study is no exception. Henrich, Heine, and Norenzayan (2010) have called such samples "Western, Educated, Industrialized, Rich, and Democratic" (WEIRD). Henrich and his associates claim that WEIRD subjects, rather than being typical, are "particularly unusual compared with the rest of the species—frequent outliers" and that "members of WEIRD societies, including young children, are among the least representative populations one could find for generalizing about humans" (61). However, for this research, a sample of undergraduates was attractive because the great majority of students (92 percent) were between the ages of eighteen and twenty-two, near their peak level of interest in sexual partners.

Procedure

We used a modified version of a survey employed by Buss and Barnes to determine mate preferences. They based their report (1986) on two studies they conducted. In their first study, they asked ninety-two married couples to complete the Marital Preferences Questionnaire (Gough 1973) and a battery of additional questions designed to measure personality. The Marital Preferences Questionnaire asks about a broad range of traits the subject might find desirable in a mate. It consists of seventy-six alphabetically ordered items, such as *adaptable, affectionate in nature, dominant, intelligent, physically attractive*, and *witty*. Buss ands Barnes instructed respondents to rate the desirability of the traits on a 5-point Likert-type scale.

Buss and Barnes's factor analysis of the data identified nine interpretable factors. For their second study, Buss and Barnes then used these factor-analysis results to develop a short list of traits and asked a second sample of fifty male and fifty female undergraduates to rank them. For the most part, Buss and Barnes chose the items from their analysis with the highest factor loading from each of the nine factors. However, they kept both *intelligent* and *creative*—although these traits fell in the same factor—"because of their conceptual distinctiveness" (567). They also included *good earning capacity* and *physically attractive* because these revealed large gender differences in their first sampling. Finally, they included *good heredity* on the basis of literature that suggested its importance in mate preference.

These procedures resulted in thirteen items: *kind and understanding*, *exciting personality*, *intelligent*, *physically attractive*, *healthy*, *easygoing*, *creative*, *wants children*, *college graduate*, *good earning capacity*, *good heredity*, *good housekeeper*, and *religious*. As we indicated, we added *fun loving*, *sense of humor*, and *playful* to this list. Buss and Barnes asked those in their second sample to rank order the thirteen characteristics. However, we asked students to rate each of the sixteen characteristics using a scale from 1 to 10—with 1 as "not at all desirable," 6 as "moderately desirable," and 10 as "extremely desirable." We did not provide anchoring descriptions for the other numbers. We chose not to use rank ordering for two reasons. First, we felt that we would get higher quality data by not doing so. That is, although our Likert-type rating scales produced ordinal data, they offered informants the opportunity to provide more interval-like responses than rank ordering, including tied responses. Second, we felt that rank ordering sixteen items would be pressing the cognitive limits of our informants. Rank ordering eight or even ten items is fairly easy. Rank ordering sixteen is not.

Each questionnaire concluded with several demographic questions. We asked the students to provide their gender so that we could analyze the responses of males and females. We also asked each to note his or her major, semester standing, desired ages at marriage, and desired ages of partner (how many years younger, how many years older, or same age) and to rank his or her family income and grades on a scale of below average, average, and above average. Finally, the survey ended with an open-ended question asking how many children the informant would like to have. Buss and Barnes asked this question, so we added it as a further basis of comparison with their study.

Results

Figure 1 below shows the rank order of traits determined by Buss and Barnes and the same traits, with the addition of playful, sense of humor, and fun loving, from our data. (We refer to our study in all figures as CYP—Chick, Yarnal, and Purrington.) Because we used a 10-point rating scale, we transformed our results to rank orders to permit comparison.

Figure 1 shows that playfulness ranks fifth overall but fourth as a trait females desire in males. A sense of humor ranks first overall while fun loving ranks third overall and third for males and females respectively. Our hypothesis that these three traits should rank in the upper half of the full list of sixteen finds ample support. To show that our sample and that used by Buss and Barnes were similar, we correlated the rank ordering of the thirteen traits common to both Buss and Barnes's and our sample using Spearman's *rho*. The correlation between Buss and Barnes's total sample and our total sample is .83 (n=13). The high correlations between the rankings by males and females in Buss and Barnes's sample and in our sample (figure 2) indicate that the two groups ranked

	Buss and Barnes			CYP		
	Both	F	M	Both	F	M
Playful				*5*	*4*	*5*
Sense of humor				*1*	*2*	*1*
Fun loving				*3*	*3*	*3*
Kind and understanding	1	1	1	2	1	2
Exciting personality	2	2	2	7	5	7
Intelligent	3	3	3	6	6	6
Attractive	4	6	4	10	11	9
Healthy	5	5	5	4	8	4
Easygoing	6	4	6	8	7	8
Creative	7	7	8	15	15	15
Wants children	8	10	7	9	9	10
College graduate	9	8	9	11	10	11
Good earning capacity	10	9	11	14	13	14
Good heredity	11	11	10	12	14	12
Good housekeeper	12	12	12	13	12	13
Religious	13	13	13	16	16	16

Figure 1. Rank orders of traits in Buss and Barnes and present study (CYP)

	Buss and Barnes		CYP
	Females	Males	Females
Buss and Barnes	0.934		
Males	13		
	0.000		
CYP	0.866	0.857	
Females	13	13	
	0.004	0.003	
CYP	0.835	0.890	0.947
Males	13	13	16
	0.006	0.001	0.000

Figure 2. Correlations (Spearman's *rho*) between common items in CYP study and Buss and Barnes (Sidak adjusted p values below number of cases)

the traits very similarly although the correlations within each sample are higher than the correlations between the two samples. This may be because the data collections took place more than twenty years apart and in different parts of the United States (ours in an Eastern university, theirs in a West Coast university).

Figure 3 provides the number of cases, minimum and maximum values, means, and the standard deviations for characteristics that females, males, and the total sample find desirable in mates.

We found kind and understanding to be the highest ranked trait that females sought in males, a result which duplicates Buss and Barnes. However, a sense of humor, fun loving, and playful rank second, third, and fourth among traits females sought in males. Males rate sense of humor first among the traits they sought in females, with fun loving third, and playful, fifth. They also rate kind and understanding very high, second among the sixteen characteristics.

Figure 3 shows that the three items we added to the Buss and Barnes list, sense of humor, fun loving, and playful, rank first, third, and fifth, respectively, among the sixteen items for the total sample. None was rated lower than 4 on the 10-point scale while, among the other characteristics, only intelligent received no scores below 4. The results clearly support our main hypothesis that sense of humor, fun loving, and playful would rank in the upper half of the attractive traits.

	Female ratings[1] of male				Male ratings[1] of female				Combined ratings[1]			
	n	Min[2]	Mean	Std. Dev.	n	Min[2]	Mean	Std. Dev.	n	Min[2]	Mean	Std. Dev.
Playful	*88*	*4*	*8.39*	*1.32*	*163*	*4*	*8.48*	*1.19*	*252*	*4*	*8.44*	*1.24*
Sense of humor	*89*	*6*	*9.00*	*1.11*	*164*	*4*	*9.01*	*1.12*	*254*	*4*	*9.00*	*1.11*
Fun loving	*89*	*5*	*8.78*	*1.10*	*164*	*5*	*8.70*	*1.17*	*254*	*5*	*8.72*	*1.15*
Kind and understanding	89	6	9.11	1.07	164	2	8.74	1.28	254	2	8.87*	1.22
Exciting personality	89	3	8.34	1.51	164	5	8.30	1.37	254	3	8.31	1.41
Intelligent	89	5	8.21	1.37	164	5	8.37	1.35	254	5	8.32	1.36
Physically attractive	89	3	7.63	1.65	164	4	8.15	1.39	254	3	7.96*	1.50
Healthy	89	3	8.10	1.65	163	4	8.65	1.29	253	3	8.46*	1.45
Easygoing	89	2	8.12	1.71	164	5	8.28	1.40	254	2	8.22	1.51
Creative	89	1	6.51	2.23	163	1	6.17	2.13	253	1	6.28	2.17
Wants children	89	1	8.00	2.49	163	1	8.04	2.08	253	1	8.02	2.23
College graduate	88	1	7.85	2.38	164	1	7.24	2.56	253	1	7.44	2.51
Good earning capacity	89	1	6.91	2.19	163	1	6.71	2.22	253	1	6.78	2.20
Good heredity	89	1	6.60	2.33	164	1	7.23	2.02	254	1	7.01*	2.15
Good housekeeper	89	1	7.19	1.99	164	1	6.83	2.08	254	1	6.96	2.05
Religious	89	1	5.74	2.72	164	1	5.57	2.76	254	1	5.61	2.76

1 Scale: 1 = Not at all desirable to 10 = Extremely desirable
2 All characteristics received a maximum rating of 10.
* Significant difference between males and females at the .05 level.

Figure 3. Descriptive statistics for female ratings of preferred male characteristics, male ratings of preferred female characteristics, and combined ratings for both genders

We also examined the hypothesis that males would prefer in females those traits suggesting youthfulness and health more than females would prefer the same traits in males. We compared male with female ratings, using a two-sample t-test (with unequal variances), for the degree to which they preferred physically attractive mates (males = 8.15, females=7.63), healthy mates (males=8.65, females=8.10), and those with good heredity (males=7.23, females=6.60). The difference between males and females was significant for physically attractive (t=2.51, df =155.92, p=.013, Cohen's d=.402), healthy (t =2.723, df =148.28, p =.007, Cohen's d =.447), and good heredity (t=2.149, df =159.57, p =.033, Cohen's d = .340). (We used Cohen's d to measure effect size for the t-tests. Cohen's d is calculated by dividing the difference between the two sample means by the standard deviation. Using the pooled standard deviation is most common with independent samples. Cohen's d ranges from 0 to infinity with values between 0 and .2 indicating a small effect; those near .5, a moderate effect; and those of .8 and above, a larger effect.) Similarly, we compared values for female preferences in males to test the hypothesis that females prefer playful males because such males are less dangerous than non-playful males. These traits include kind and understanding and easygoing. As expected, females rated kind and understanding as more desirable than males did (females=9.11, males=8.738; t =2.479, df =209.029, p =.014, Cohen's d =.313). Female and male preferences did not differ with respect to *easygoing* as a preferred trait in a mate (females = 8.124, males = 8.28, t = 0.742, df = 152.221, p = .460).

Finally, we examined the two traits that interested Buss and Barnes, that is, good earning capacity, in addition to physically attractive, as indicated above. Buss and Barnes hypothesized that females would rank good earning capacity in males higher than males would in females. Males, on the other hand, should rank physical attractiveness in females higher than females would rank the desirability of this trait in males. As indicted above, males rated good earning capacity at 6.71 (sd = 1.22) while females rated the trait at 6.91 (sd = 2.19). While the rating for females appears to be slightly higher, the difference is not statistically significant (t = 0.684, df = 182.82, p = .495). As noted above, males preferred physical attractiveness in females significantly higher than females preferred it in males. Kind and understanding, healthy, physically attractive, and good heredity were the only traits rated significantly differently by males and females.

Discussion

A complete understanding of why humans—juveniles and adults—play requires both proximate and ultimate explanations. These do not conflict but complement each other (Mayr 1961; Laland et al. 2011). The results we report here support Chick's (1998, 2001) hypothesis that adult playfulness results from sexual selection and signals positive qualities to potential long-term mates. We did not design our set of personal traits explicitly to test the hypotheses that females prefer playful males because such males are less dangerous to them and their children or that males prefer playful females because playfulness connotes fecundity. Nevertheless, males rated three traits characteristic of female fecundity as significantly more desirable in females than females rated them in males, and females rated one of two traits characteristic of male nonaggressiveness as more desirable than males rated them in females. Hence, we conclude that these first tests of the signal theory of adult playfulness support or are, at least, consistent with our hypotheses. However, there are several caveats to consider with respect to the research and our conclusions.

"You Can't Always Get What You Want"

The 1969 Rolling Stones' song title expresses succinctly a major problem with mate-preference research that asks subjects to rate the desirability of certain traits in potential mates. That is, there is no guarantee that individuals who claim to seek these traits actually find them. The fact that those sampled tended to rank sense of humor, fun loving, and playful at or near the top of the list of sixteen characteristics does not mean that the mates they have selected or will select actually exhibit these traits (cf. Perussé 1994). As Perussé recognized, "Most research on mate choice in modern societies is based on data that may or may not reflect actual mating behavior" (255). Mate-preference data, such as ours, deal in ideals, not actual behavior.

Different methods also frequently seem to provide different results. For example, Pillsworth (2008) first examined stated preferences for traits among the Shuar, a group with a hunting and horticulture economy. She found that both males and females rated physical attractiveness at the bottom of a list of nineteen personal traits. In a second study, informants were asked to rate twenty-eight photographs of opposite-sex peers in terms of how desirable each would be as a long-term romantic partner as well as in terms of eight characteristics, such as physically attractive, intelligent, and hardworking. In this study, for both males and

females, Pillsworth found a significant correlation between the ratings of a target individual's physical attractiveness and his or her desirability as a sexual partner. Her results showed, therefore, that Shuar men and women exhibit similar preferences for physical attractiveness in a long-term partner but also whether physical attractiveness rates high or low depends on the method of data collection.

Other methods used in mate-choice and mate-preference research include speed dating, where individuals meet several potential partners in succession and decide which they would like to see again. Under these conditions, both men and women appear to base their decisions about possible partners almost entirely on traits they observe. Kurzban and Weeden (2005), for example, found that women do not use indicators of status or resources in their choices. Peter Todd and his colleagues (2007) found that speed-dating choices differed substantially from participants' stated preferences in partners. The authors suggest that the cognitive processes that underlie mate preferences may be quite different than those for mate choices.

On the other hand, Burriss, Welling, and Puts (2011) have shown, in a laboratory study, "that women's preference for masculinity in unfamiliar men's faces is predicted by their partner's self-rated masculinity" (1026). In turn, the way men rated their own masculinity correlates strongly with the way their partners rated it. The authors conclude, "This study shows that women's preference for masculinity is reflected in the masculinity of the men with whom they partner" (1026). They did not find a correlation between preferences and independent ratings of facial masculinity, however, and infer that other variables, such as body type, voice, height, or behavior may influence choice.

Finally, as noted above, the great majority of mate-preference studies are based on WEIRD samples, often college students (Henrich, Heine, and Norenzyan 2010), with only a few from non-Western groups such as the Hadza of Tanzania (Marlowe and Wetsman 2001), the Zulu of South Africa (Tovée et al. 2006), and the Shuar of Ecuador (Pillsworth 2008). Future research must involve methods to address both stated mate preferences and actual mate choices and use representative samples of individuals from cultural and ecological settings around the world to avoid biases. Moreover, playfulness and related traits must be examined in conjunction with a much larger set of possible individual characteristics, both positive and negative, in order to further test our hypotheses.

Other Motives for Adult Play

In his 1973 cross-cultural study, Richard G. Sipes tested two competing theories

of sports participation and warfare. He sought to explore what he termed "combative sport." Combative sports may involve either individual contests, such as wrestling, or group contests, such as American football, but must involve real or potential body contact that is direct or that involves real or simulated weapons or, if actual body contact is absent, the use of real or simulated weapons against real or simulated humans.

One position, the Drive Discharge Model, posits that individuals build up aggressive feelings over time that they can discharge through participation in either warfare or combative sports. Sipes hypothesized that, if the Drive Discharge Model proved correct, there should be an inverse relationship between the presence of combative sports and warfare because the aggressive tendencies could be discharged through either.

The other position, termed the Culture Pattern Model, indicates that there should be a direct correlation between the presence of combative sports and warfare because such sports provide good training for war. Using a small cross-cultural sample (n=20), Sipes found strong support for the Culture Pattern Model.

Chick, Loy, and Miracle (1997) reexamined warfare-combative sports relationship with a substantially larger cross-cultural sample (n=110) and found general agreement with Sipes's results. The strongest results they found, however, involved the presence of warfare and what they termed "sham combats," that is, mock combats and training activities, rather than between warfare and either individual or team combative sports. Chick and Loy (2001), again using a cross-cultural sample, found that childhood training in aggressiveness, fortitude, and competiveness among males serves a preparatory role for some sports and warfare. So, participation in sports may prepare men for war, keep them prepared, and provide more opportunities for learning aggression than are available to women (Archer 2009).

Males participation in sports may also reliably signal physical and, perhaps, mental qualities to females in addition to competition for status (De Block and Dewitte 2009; Faurie, Pontier, and Raymond 2004). In a cross-cultural study, Deaner and Smith (2012) show these possibilities are sex specific to males. They found that there are more sports for males, in general, and that hunting-related and combative sports are almost exclusively male pursuits. Hence, adult male participation in forms of competitive play such as sports—and especially combative sports—may provide training for other activities, including war, but may also be seen by females as a marker of genetic quality and status. However, it

seems unlikely that either training for war or the signaling of genetic quality by participating in sports occurs among females because of the large gender difference in sports, particularly in hunting and combative sports (Deaner and Smith 2012).

Summary

While there are problems with mate-preference research based on ratings of desirable traits in long-term mates, we find our results encouraging. It seems to us that signaling one's virtues as a potential long-term mate through playfulness is not farfetched—nearly all our results support or are consistent with the idea, and none contradict it. Otherwise, like elaborate tail feathers, enormous antlers, or displays that attract the attention of predators, adult playfulness is extremely difficult to explain. We believe that we bred playfulness into ourselves, intentionally or otherwise, but not by preferring playful children, as claimed by Sigmund (1993), nor primarily through artificial selection, as suggested by Ghiselin (1974, 1982). The work of Belyaev and his colleagues with foxes illustrates how easy it was to breed playful adults even when the trait under selection—flight distance or tameness—does not overtly include the propensity to play as adults. Selection for tameness results in neoteny and, in turn, neoteny appears to carry a suite of ancillary traits, including playfulness, with it. We do not feel that it is a major step to suggest that adult play is therefore a signal that conveys nonaggressiveness (tameness?) to females when exhibited by males. And, because it is so characteristic of juveniles, female play and playfulness communicate youthfulness, health, and, hence, fecundity to males.

There are signals that indicate playfulness and the desire to play. These include the play face, the play bow, and so on, but, if we are right, play itself is also a signal among adults. Since we are proposing sexual selection as the explanation for why both males and females prefer playfulness in possible mates, we do not believe that our hypothesis is directly relevant to juveniles. While juveniles are sure to prefer other playful juveniles, parents may prefer playful juveniles, and so on, we think the reasons for doing so, described above, are not the same as among adults. In an ultimate sense, play has helped make us who we are, as adults; and in a proximate sense, it has made being an adult much more fun than it might have been otherwise.

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