Environment of Evolutionary Adaptedness, Rough-and-Tumble Play, and the Selection of Restraint in Human Aggression
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The observation that aggressive behavior is widespread in the animal kingdom suggests that it has evolved to fulfill survival and reproductive functions. Intraspecific aggression, in comparison with predation, tends to be much less bloody. There are exceptions to this generalization, such as when a langur male, taking over a harem, practices infanticide against his predecessor's offspring, or when a female praying mantis begins to devour her mate during copulation—but for the most part, conspecifics do not attempt to kill each other (Hrdy, 1977; Huntingford and Turner, 1987).

The thesis of this chapter is that natural selection has favored the restrained use of aggression in humans. Intraspecific killing has been selected against. Although obviously homicides occur, they can be viewed as the exception, not the rule. In support of this thesis, the first observation is that aggression within numerous other species reflects restraint and nonlethal patterns, thus showing that curtailed or limited aggression has been favored by natural selection in many different contexts (Maynard Smith, 1974; Maynard Smith and Price, 1973). Consequently, there is a precedent for the evolutionary argument that restrained aggression has been positively selected in humans. Second, a careful examination of aggression within nomadic forager societies—the social context that most closely approximates the conditions under which humans evolved—supports the thesis about the restrained nature of most human aggression.

Using extant nomadic forager data to glean insights about the evolutionary past and human nature, we will see that homicides are very rare in some nomadic band societies and occur from time to time in others. Importantly, when killings do occur, the motives are very personal, not collective. Nomadic forager societies are not warlike (Fry, 2006, 2007; Fry and Söderberg, 2013; Kelly, 1995; Lee and Daly, 1999; Reyna, 1994). In fact, there are numerous features of nomadic forager social organization that militate strongly against warfare. The types of aggression that tend to occur at the band level of social organization probably have
been typical in the human evolutionary past. A central focus of this chapter is to consider the reasons that the killing of other humans may well have been selected against as humankind evolved. The chapter also considers the possible role of rough-and-tumble play (R&T) in learning restrained patterns of aggression during the course of development. Research on animals and human children suggests that R&T may be important in the learning of social skills, such as how to assess an opponent's strength, how to signal submission, and how to keep from sustaining serious injuries during a fight (Einon and Potegal, 1991; Pellegrini, 1993, 1995; Pellis and Pellis, 2007, 2009).

Reconstructing the Environment of Evolutionary Adaptedness

One way to gain inferences about the environment of evolutionary adaptedness (EEA) is to use a process called nomadic hunter-gatherer analogy. For most of their evolutionary past, humans lived as nomadic foragers. Therefore, the best societies to examine with the goal of gaining insights about the EEA are extant nomadic foragers (Bicchieri, 1972; Marlowe, 2005, 2010). The goal is to look for recurring patterns across such societies, with the explicit assumption that features which characterize mobile hunter-gatherers in current times across a variety of habitats are likely to have been regular features in the EEA as well (Fry, 2006).

Nomadic hunter-gatherers live in bands whose composition varies as people transfer regularly among groups. Nomadic foragers have few material possessions, are politically egalitarian, and tend to be widely dispersed. Lacking authoritative leadership, nomadic band societies nonetheless manage to deal with much conflict through avoidance, discussion, group meetings, contests, ostracism, and other nonviolent or aggression-limiting ways (Boehm, 1999; Fry, 2000, 2006, 2007, 2011; Fry and Söderberg, 2013).

Disputes tend to be personal, such as between two men over a woman (Fry, 2006, 2007; Fry and Söderberg, 2013; Reyna, 1994; Service, 1966). The most common reasons for homicide are avenging the death of a close family member and competition over a woman (Fry, 2011; Fry and Söderberg, 2013). Another reason for homicide in some nomadic band societies is that band members do not tolerate overly aggressive persons; recidivist killers and otherwise dangerous persons may be executed for the public good (Balikci, 1970; Boehm, 1999; Fry, 2011; Lee, 1979, 1993). Most disputes in nomadic forager societies, however, are nonlethal, and many conflicts involve no physical aggression at all. A typical response to conflict within a band is for one party to simply leave the group and join another band. Nomadic foragers are famous for voting with their feet (Fry and Söderberg, 2013).

Nomadic hunter-gatherer bands tend not to engage in war or have militaristic value orientations (Fry, 2006, 2007, 2011; Steward, 1968; Kelly, 1995, Table 8.1). After spending much of his career studying nomadic foragers, Steward (1968, p. 334)
explains that warfare is almost nonexistent among nomadic hunter-gatherers for a variety of reasons:

"First, the primary groups [small bands] that comprise the larger maximum bands intermarry, amalgamate if they are too small or split off it too large. Second,... there is no more than a tendency for primary groups to utilize special areas. Third, most so-called 'warfare' among such societies is no more than revenge for alleged witchcraft or continued interfamily feuds. Fourth, collecting is the main resource in most areas. Primary bands did not fight one another, and it is difficult to see how a maximum band could assemble its manpower to defend its territory against another band or why it should do so."

Wolf (2001, p. 196) notes that the Ju/'hoansi [or San], Shoshone, and Walbiri live in some of the least abundant environments on earth, but in times of environmental stress these groups do not go to war. Instead, they share:

"Among some human groups organized conflict between groups is absent or rare, and we can perhaps specify the conditions that account for the absence of war among them. All three populations—San, Shoshoneans, Walbiri—live in environments where strategic resources are widely scattered and seasonally variable. To survive, a person periodically needs to gain access to resources in other locations, and he gains such access through ties of kinship, marriage, friendship, and exchange."

The amount of interpersonal physical aggression in forager band societies varies from one group to the next. Ethnographers describe killings in some nomadic band societies. On the other hand, other mobile foragers, such as the Paliyan of India (Gardner, 2004, 2013) and the Batek Semang of Malaysia (Endicott, 1979, 2013), have nonviolent value systems, and physical aggression, including homicide, is extremely rare. For one sample of 21 nomadic band societies, ethnographers assessed homicides to be uncommon in one-third of the sample (seven societies), describing killings as rare, very rare, never mentioned to occur, none known, and unknown (Fry, 2011; Fry and Söderberg, 2013).

Next three types of natural selection pressures that may have favored restraint against intraspecific killing will be considered. Two of these also apply within animal species more generally, but the third hypothesized selection pressure against killing may be uniquely human (Fry and Szala, 2013).

Natural Selection Favors Restrained Intraspecific Aggression

Aggression has both evolutionary costs and benefits. Costs include physical injuries; mortality; harming one's own kin if they are opponents; losing friends and supporters through damaged relationships; draining time and energy away from
other necessary pursuits such as obtaining food, finding mates, or being vigilant for predators; and being ostracized from the social group as a troublemaker (Archer and Huntingford, 1994, p. 10; Bernstein, 2007, 2008; Boehm, 1999; Hamilton, 1971; Riechert, 1998, p. 82; Service, 1966). On the other hand, evolutionary benefits of aggression include obtaining resources such as food, territory, and mates; safeguarding one's offspring and oneself from attack; and achieving or maintaining dominance in a social hierarchy, which in turn correlates with access to resources or mates (Alcock, 2005; Archer, 1988; Wilson, 1975, pp. 242–243). In short, aggression serves a variety of evolutionary functions that vary from species to species (Alcock, 2005; de Waal, 1989; Wilson, 1975). The overall conclusion is that aggression can be risky, but it also can be beneficial to individual fitness in certain circumstances (Fry, Schober, and Björkqvist, 2010). Natural selection can be seen as shaping the aggressive behavior of a species over many generations to maximize fitness benefits and minimize costs. This principle applies not only to other species but also to humans.

Most intraspecific aggression in the animal world is nonlethal (Alcock, 2005; Hinde, 1974, p. 268; Kokko, 2008; Maynard Smith and Price, 1973). Nonetheless, on occasion injuries sustained during a fight can result in death, as reported, for example, among chimpanzees, hyenas, and lions (Alcock, 2005; Schaller, 1972; Wilson, 1975, p. 246; Wilson and Wrangham, 2003). Blanchard and Blanchard (1989, p. 104) explain that “In evolutionary terms... successful individuals will be those with techniques which enable them to avoid agonistic situations involving serious possibilities of defeat or injury.” And Bernstein agrees (2008, p. 60): “The potential costs of fighting are such that natural selection has favored individuals that avoid taking risks when the cost to themselves is likely to exceed the benefits of anything obtained by engaging in that interaction.” Consideration of intraspecific competitive and aggressive behavior across species reveals a variety of ways that individuals minimize risks (Fry et al., 2010). First, noncontact displays are used in place of actual fighting. For example, among elephant seals, threats outnumber fights by about 60:1 (Le Boeuf, 1971). Second, when fighting does occur, it often consists of ritualized aggression, wherein serious injuries and death are unlikely, such as in the head-buttng contests for which ungulates are renowned. Third, animals practice avoidance and hence eliminate the possibility of confrontations. For instance, lions simply avoid members of other prides (Schaller, 1972).

As Darwin (1880) observed, most of the intraspecific aggression in the animal kingdom occurs between males. Intraspecific male–male aggression usually does not entail all-out fighting, but rather reflects various types of restraint (Archer and Huntingford, 1994; Bernstein, 2007; Eibl-Eibesfeldt, 1961; Kokko, 2008; Le Boeuf, 1971; Riechert, 1998, p. 65). That is, animal aggression rarely involves “total war” as Maynard Smith and Price call it (1973, p. 15), “but instead intraspecific conflicts are usually of a limited war type, involving inefficient weapons or ritualized tactics that seldom cause serious injury to either contestant.” Natural selection seems to have favored individuals who “follow the rules” of ritualized fighting so as not to expend unnecessary energy or to increase unnecessarily the risk for injury. The
point is illustrated by the data showing that out of 1,314 agonistic interactions between pairs of male caribou, 1,308 were ritualized sparring matches between animals who followed the rules of restrained engagement, compared with a mere six bouts of escalated fighting (Alcock, 2005). This is a ratio of 1 escalated fight to every 218 ritualized contests.

Triumph of Restraint: Display and Tournament Contests in Nonhuman Animals

In a classic article, Maynard Smith (1974) distinguishes between two kinds of ritualized contests, which he calls displays and tournaments. Displays reduce the risk for injury to nil because they involve no physical contact between adversaries. Side-blotched lizards, for example, perform push-up displays toward their opponents; male tarantula hawk wasps engage in aerial displays, flying upward side-by-side for many meters before diving back to earth, repeating the process many times over (Alcock, 2005). Red deer stags engage in reciprocal roaring displays as they compete for mating privileges (Archer, 1988; Archer and Huntingford, 1994). The roaring displays may escalate to parallel walking displays wherein the deer visually assess each other’s size and strength, still without making any physical contact.

Red deer also illustrate tournament contests; if neither animal yields after roaring and parallel walking displays, the final element of competition entails an antler-wrestling tournament (Archer and Huntingford, 1994). Tournaments are energetically expensive compared with roaring and walking displays, and the possibility of injury, although unlikely, does exist (Riechert, 1998).

As Kokko (2008, p. 55) points out, “There is an optimal level of aggression, rather than more being always better.” With rare exceptions, animals follow the rules of restraint rather than escalating to more risky types of fighting. Competing giraffes batter each other with their necks and heads until one gives up (Alcock, 2005). Maynard Smith and Price (1973, p. 15) describe how mule deer “fight furiously but harmlessly by crashing or pushing antlers against antlers, while they refrain from attacking when an opponent turns away, exposing the unprotected side of its body.” Generally speaking, once an opponent submits or tries to flee, prolonging a struggle serves no useful purpose; to the contrary, failing to respect a loser’s submission signals may lead to escalation, a greater chance of injury, and wasted energy ( Bernstein, 2007; Bernstein and Gordon, 1974; Roseoe, 2007).

In summary, research shows that restrained, nonlethal aggression, in contrast to more risky escalated combat, has evolved as the predominant pattern of intraspecific competition in many species (Alcock, 2005; Archer and Huntingford, 1994; Bernstein, 2007; Bernstein and Gordon, 1974; Fry et al., 2010; Fry and Szala, 2013; Hinde, 1974, p. 269; Kokko, 2008, p. 49; Riechert, 1998, p. 65). Natural selection favors nonlethality among conspecifics. “If aggression is elicited, then it must be
limited, controlled, and regulated in such a way that it terminates with minimal risk of injuries,” explains Bernstein (2008, p. 59). The prevalence in the animal kingdom of displays instead of contact aggression and ritualized tournaments instead of “total war” suggests that restraint is a more successful evolutionary strategy than engaging in unbridled intraspecific aggression. Alcock (2005, p. 309) sums up the evolutionary reasoning: “The ‘fight no matter what’ types would eventually encounter a superior opponent who would administer a serious thrashing. The ‘fight only when the odds are good’ types would be far less likely to suffer an injurious defeat at the hands of an overwhelmingly superior opponent.” We would expect the same evolutionary logic to apply to humans.

**Display and Tournaments in Nomadic Forager Societies**

Examples of noncontact displays can be found in the literature on nomadic foragers (Fry et al., 2010). For example, Tonkinson (1978, p. 124) explains that fights among the Australian Mardu take place “in an atmosphere of great public drama and menace, so that honor is satisfied, but with a minimum of physical violence.” Individuals may deliver harangues to express grievances, for instance, as they sit by their campfires at night (Silberbauer, 1972; Tonkinson, 1978, p. 123). Some Inuit societies engage in noncontact contests wherein rivals deride each other verbally in song (Balikci, 1970).

The typical pattern of tournament contests in nomadic forager societies involves wrestling. Contests vary in intensity from one nomadic forager society to the next, and not all foragers engage in contests. The first generalization is that disputes whether dealt with through contests or by other means, tend to be interpersonal in nature (Fry, 2005, 2011; Fry and Söderberg, 2013). The next is that the winner of a contest gains status and sometimes a concrete reward such as a wife. Hence tournament contests, like displays, are serious business. Third, the curtailed aggression evident in tournament contests in nomadic forager societies parallels the ritualized fighting of animal species. As among animals, the restrained aggression that typifies such contests allows for the establishment of dominance or for access to resources with substantially less risk than would result from all-out fighting. Thus contests in forager band societies may be over serious matters, but nonetheless, as a limited form of competition, they are less risky to the participants than uninhibited fighting (Fry, 2005; Fry et al., 2010; Fry and Szala, 2013).

In addition to song contests, the Netsilik Inuit settle disagreements as two competitors take turns striking each other on the forehead or shoulders. Eventually, one man gives up. “After the fight, it is all over,” explained an Inuit man, “it was as if they had never fought before” (Balikci, 1970, p. 186). To take another example, disputes between Siriono men may be settled through wrestling (Holmberg, 1969). Rules limit the engagement, and participants usually employ self-restraint and adhere to the rules. Holmberg (1969, p. 156) explains that, “any other type of fighting is
frowned upon and is usually stopped by non-participant men and women. On one occasion Eantándu when drunk, struck an opponent with his fists. Everyone began to clamor that he was fighting unfairly, 'like a white man.' He stopped immediately." Homicide is "almost unknown" among the Sirionó, indicating that aggressive rivalries rarely escalate beyond the culturally acceptable wrestling matches (Holmberg, 1969, p. 152).

The Ona foragers of South America also wrestled to resolve disputes (Gusinde, 1931). The nomadic Slave and Dogrib bands of North America had the custom of allowing a man to usurp another man’s wife by out-wrestling the husband (Helm, 1956). The Ingalik practiced a similar custom (Osgood, 1958, p. 204). If a married Ingalik woman took off with another man, typically she would hide in the forest while her lover and her husband wrestled over her.

Examples of contests are easy to find in the nomadic forager literature, no doubt due in part to the absence in these egalitarian societies of judicial authorities who could handle disputes. Contests in nomadic hunter-gatherer societies can be viewed as conflict resolution mechanisms that have rules which limit aggression. Hoebel (1967, p. 92) concludes that contests in Inuit societies serve to handle conflict without the loss of life; this conclusion can be generalized on the basis of the ethnographic evidence to other nomadic band societies. As we have seen, the ritualization of aggression in many species prevents injuries among contestants (Archer and Huntingford, 1994; Fry et al., 2010; Maynard Smith and Price, 1973). Among humans also, contests with rules that limit aggression allow for the resolution of differences with less risk for injury than might occur during less restrained forms of fighting (Fry, 2005, 2006). Spectators take a role in enforcing contest rules if necessary (Geodale, 1974; Holmberg, 1969). The metacommunicative context of contests reflects the meaning that they are simultaneously serious yet not dangerous, or at least not as dangerous as unbridled, escalated aggression. Winning a contest by the rules enhances status, but winning through cheating—by fighting unfairly—may have the opposite effect within the small-scale social world of nomadic foragers (Fry, 2005).

Nomadic forager analogy suggests that aggression in the EEA probably carried certain social costs aside from the more obvious risks to life and limb. Values and behaviors that are uniformly appreciated in nomadic band societies include generosity, cooperation, egalitarianism, and sharing, whereas those that are not appreciated include bullying, aggressiveness, rule breaking, and stinginess (Boehm, 1999; Fry, 2006; Lee, 1979; Lips, 1947; Tonkinson, 1978). For example, the Paliyan place a special emphasis on respecting other people and behaving nonviolently (Gardner, 2004, 2013). Among the Ju/’hoansi, the ideal son-in-law should lack a reputation for fighting (Lee, 1993). Lips (1947) reports how a Montagnais-Naskapi hunter and his family starved to death in the winter after being ostracized from the band for antisocial behavior. The point is that engaging in too much or too severe aggression, or other types of antisocial behavior, probably had fitness-reducing social costs in the EEA.
Inclusive Fitness

A second selection pressure against killing and unbridled aggression involves the concept of inclusive fitness (Fry et al., 2010). Hamilton (1964, 1971) posited that the genetic relatedness among individuals affects how they treat each other. He proposed that “the social behaviour of a species evolves in such a way that in each behaviour-evoking situation the individual will seem to value his neighbours’ fitness against his own according to the coefficients of relationship appropriate to that situation” (Hamilton, 1964, p. 19). Assisting relatives enhances an individual’s own fitness in this inclusive sense because relatives share alleles. At the opposite extreme, natural selection would be expected to minimize aggression among genetic relatives for the same reason. The killing of relatives would be strongly selected against.

Based on demographic data on nomadic hunter-gatherer societies, it seems probable that many, social interactions in the EEA took place among related individuals (Lee, 1993; Marlowe, 2005, 2010, p. 49). Marlowe (2010) explains that most persons within a Hadza camp are related, with a group of sisters often forming the core network of relationships within a band. Marlowe (2010, p. 49) also points out that “Any Hadza can usually decipher some kin connection to any other, given that there are only about 1,000 Hadza and kin ties are so overlapping.” This relative-intensive social world of nomadic foragers differs markedly from that of present day nation-states, for example, in which people regularly interact not only with nonrelatives but also with complete strangers.

When a person cooperates, shares, protects, or cares for relatives, the person is likely to enhance inclusive fitness. Killing or injuring a relative has the opposite effect on inclusive fitness and therefore should have been selected against in the EEA. As the Gilyak say, brothers should not fight brothers (Shternberg, 1999, p. 63). When Lee (1979, p. 383) examined Ju/hoansi homicides, he found that close relatives, although interacting frequently, tended not to kill each other.

Revenge Killing Within the EEA

Based on studies of extant nomadic foragers, it can be hypothesized that another powerful selection force favoring restrained, nonlethal forms of aggression in the EEA has resulted from the tendency for the family members of a murder victim to avenge the death of their relative by killing the killer (Fry, 2006; Fry and Söderberg, 2013). Cases of revenge homicide among other animal species seem not to exist. The important implication is that by perpetrating a homicide within the nomadic forager social environment, a killer may be signing his own death warrant to be executed at the hands of his victim’s kin. Given that nomadic band social organization is the social type of the EEA, this additional selective force favoring restrained aggression instead of killing may have been very significant. Thus the tendency for family members to avenge a murder of a relative may constitute a third significant evolutionary selective force against intraspecific killing in humans.
Recall that nomadic band societies are not warlike, and some such societies have extremely low rates of homicide. This obviously reflects community-wide restraint against engaging in serious aggression. However, in social situations in which homicides do periodically occur, revenge was found to be the most consistent motive for killing among a sample of 21 nomadic forager societies in the Standard Cross-Cultural Sample (Fry, 2011). Westermarck (1924) concluded that humans possess a psychological predilection to repay a good deed with a corresponding act of kindness and also to repay an abuse with a punishment. Revenge homicide can be considered a manifestation of this reciprocity principle. In nomadic band society, a recurring motif is for a homicide victim’s family to try to kill the murderer. If the victim’s family kills the killer, this typically ends the matter because the second killing balances the scales of justice and restores the peace (Fry, 2006, p. 230).

This reciprocity principle, as played out in the nomadic band context, is illustrated by the Micmac of North America who believed that “If thou killest, thou shalt be killed” (Le Clercq, 1910, p. 286), as well as in the observation for the Chukchee of Siberia that “a murder rarely remains unavenged” (Bogoras, 1975, p. 663). The words of a Ju/hoansi man also reflect his awareness of the reciprocity principle of revenge: “I want to hunt eland, kudu, and gemsbok, but hunting men is what gets you killed” (Lee, 1979, p. 391). The Montagnais-Naskapi of Canada traditionally believed that the appropriate response to a homicide was the execution of the killer by a family member of the victim (Lips, 1947, p. 470), which was also the case for the Yukaghir of Siberia, whose custom validated the execution of revenge by a brother or another close relative of a homicide victim (Jochelson, 1926). Ingaliq custom held that revenge for a killing could be enacted only by the victim’s father, son, brother, grandfather, grandson, or uncle, but not by more distant relatives. In violation of this rule, the friend of a recently killed man became enraged at the disrespectful behavior that his friend’s killer was exhibiting and, on impulse, stabbed him to death. A couple of days later, the new victim’s father, uncle, and brother came to confront the avenger, saying: “You had no business to kill that boy” (Osgood, 1958, p. 54).

“I know that,” he answered, “but he talked to me without politeness and having already killed my friend, it made me mad and I killed him. You would do the same in the circumstances.”

The man’s assessment rang true even to these family members: “After considering the character of the one who had just been killed, they concluded that perhaps it was better he was dead” (Osgood, 1958, p. 54). This case illustrates again the generalization that overly aggressive persons and troublemakers are not socially appreciated. Perhaps also the nomadic forager sense of justice that “If thou killest, thou shalt be killed” (Le Clercq, 1910, p. 286) came into play as the relatives contemplated the situation. In any case, no further retribution was sought.

If killing once is risky, then becoming a recidivist killer seals one’s fate (Boehm, 1999; Fry, 2006). The execution of bullies, violent troublemakers, and especially serial killers is a theme in the ethnographic literature on nomadic band societies.
Based on his studies of the Copper Inuit, Damas (1991, p. 78) concludes that "Certain men were feared for their aggressiveness or violent tendencies, but they almost invariably met with violent ends themselves." Hoebel (1967, p. 88) observes that the recidivist killer in band society becomes a public enemy. "The single murder is a private wrong redressed by the kinsmen of the victim. Repeated murder becomes a public crime punishable by death at the hands of an agent of the community." Lee's (1979, p. 394) account of the demise of a Ju/'hoansi recidivist killer illustrates Hoebel's point: "He had killed two people already, and on the day he died he stabbed a woman and killed a man.... No one came to his aid because all those people had decided he had to die.... They all fired on him with poison arrows till he looked like a porcupine." Based on his reading of numerous nomadic forager ethnographies from Africa, Australia, North America, and the Arctic, Boehm (1999, p. 82, italics added) concludes that aggressive men are likely to be executed: "My suspicion is that the pattern may be generalized to nomadic foragers in general."

The recurring resort to payback killings and executions in forager society reflects Westermarck's (1924) reciprocity principle regarding tit-for-tat paybacks. Bullies, overly aggressive persons, serious troublemakers, and especially recidivist killers usually receive their just desserts in accordance with this reciprocity principle, and this tendency would seem to constitute an additional, uniquely human selection pressure favoring the restrained use of intraspecific aggression in humans. Thus it is no surprise that restraint in the use of intraspecific aggression, which as we have considered represents a widespread pattern in the animal kingdom, also constitutes a theme among nomadic hunter-gatherers. Exercising restraint during competitive interactions may well be the outcome of strong selective forces operating in the EEA (Fry, 2006, 2007).

**Rough-and-Tumble Play and the Development of Restraint**

Features that typify mammalian R&T (Fry, 1990, 2005) are as follows: Threats are absent or infrequent, movements are free and easy, muscle tone is relaxed, biting is inhibited, play signals such as the play face and play vocalizations are evident, roles frequently reverse, dominance relations are relaxed, individuals of different sizes are partners, and sequences of behavior vary (Aldis, 1975; Bekoff and Byers, 1981, 1985; Fagen, 1978, 1981; Pellis, 1984; Scott and Panksepp, 2003; Smith, 1982; Symons, 1978). Human R&T consists of restrained wrestling, grappling, hitting, and chasing and fleeing, usually with clear indicators of playful intent such as laughter or smiles (Blurton Jones, 1972; Fry, 1990, 2005; Smith and Lewis, 1985).

Rough-and-tumble play (R&T) almost certainly was a regular developmental feature of childhood in the EEA. This assertion is based on the observations that R&T is common in the animal kingdom, is ubiquitous among primate species, and has been reported in societies around the world (Fry, 2005). The observations that R&T is widely, probably universally, distributed across human societies and that
boys tend to engage in more frequent and more vigorous R&T than do girls, along with research results on age differences in R&T, all combine to suggest that, as in other species, R&T in humans has evolved to fulfill certain adaptive functions (Boulton, 1996; Boulton and Smith, 1992; Fry, 1990, 2005; Pellegrini, 1994, 2002, 2003; Smith, 1997; Smith and Boulton, 1990).

This section of the chapter explores two ideas regarding R&T and restraint. First, it considers the proposition that R&T plays a role in the developmental learning of restrained aggression. Second and relatedly, this section focuses on how the R&T of adolescents has many interesting parallels to the contests of adults, thus suggesting a link between the learning in adolescence of aggression-limiting social skills and the contests engaged in by adults. As we have considered, the recurring pattern across many species is for intraspecific competition to be expressed short of serious fighting. How might R&T play a role in the learning of such restraint?

There are indications that the process of becoming socially competent in the use of restrained aggression depends on having opportunities to engage in R&T as juveniles. Animals and humans that lack R&T experience tend to be less competent at dealing with their peers, for example, as they misinterpret an act of play as a real attack. Pellis and Pellis (2009) thoroughly review the literature on R&T among rats and reach the conclusion that the animals that lack R&T experience when young are deficient in their social interaction ability as adults. For example, the rats that have been deprived of R&T overreacted to benign social contact in such a way as to bring on attacks by other animals.

Similar deficiencies in managing agonistic situations have been reported for male mice raised only among females (Korpela and Sandnabba, 1994). These male-deprived male mice engaged in significantly more aggressive attacks than did mice that had been raised with other males (Korpela and Sandnabba, 1994). Bernstein (2008, p. 60) notes that monkeys who have lacked the opportunity to interact with other members of their species while growing up, rather than showing the restraint that is typical under natural conditions, “launch suicidal attacks against opponents who are clearly physically superior to them or, alternatively, may mount murderous attacks on opponents who are signaling submission and attempting to withdraw from the site of a contest.” In human children, engaging in R&T correlates positively with social competency (Pellegrini, 1993, 1995). Play researchers Pellis and Pellis (2009, p. 144) observe, “Whether it is employed by rats, hyenas, monkeys, or humans, play fighting offers a level of nuance in social interactions that permits differences to be sorted out without the use of extreme violence.”

We now turn to a consideration of the similarity between adolescent R&T and adult contests as described among nomadic forager societies. At the same time, a cross-cultural examination of R&T reveals that stylistic variations are clearly learned during development (Fry, 1987, 2005). Human R&T provides an interesting example of how evolutionary factors and elements of the social environment interact over the course of development. For example, the Semai of Malaysia are an extremely peaceful people who shun war and feuding, and rarely experience
homicide (Dentan, 1968). Semai parents discourage R&T. Correspondingly, Semai children engage in R&T, but compared with such behaviors in most other cultures, Semai R&T is mild, involving only minimal or no physical contact (Fry, 2005).

The preliminary evidence suggests that the practice of fighting skills and the establishment of dominance are probable evolutionary functions of R&T that shift in importance depending on age (Boulton, 1996; Boulton and Smith, 1992; Fry, 1990, 2005; Neill, 1976, 1985; Pellegrini, 1994, 2002, 2003; Smith, 1982, 1997; Smith and Boulton, 1990). Specifically, the importance of an R&T practice function in young children may be replaced by a dominance function in older children and teens (Fry, 2005; Pellegrini, 1994, 2002, 2003; Pellis and Pellis, 2009; Smith and Boulton, 1990). That is, these fighting practice and dominance hypotheses may be applicable to different degrees at different stages of development. Even at the same age, these two functional explanations need not be viewed as mutually exclusive (see Neill, 1985). For example, assessing a partner's strength during R&T could relate both to gaining practice in a generalizable skill useful in later life (Boulton, 1996; Fry, 1990) and also to establishing dominance over a particular opponent in the short or long term (Pellegrini, 2002).

Several events observed among Zapotec teenagers (who are not from a nomadic forager society) indicate that the clear distinction between R&T and fighting, apparent in the 3- to 8-year-old Zapotec children, may blur somewhat by the teenage years (Fry, 1987, 2005). Sometimes horseplay among Zapotec teenagers appears, judging from facial expressions, to become somewhat serious, but then shifts back to play again (Fry, 1987). This observation supports Neill's (1976, pp. 218, 219) proposal that the intermingling of R&T and aggression sometimes occurs among 12- to 13-year-old boys: "Once the weaker boy has registered distress the bond can be maintained by the fight taking a more playful form, but if he does not do so at the start of the fight, the stronger boy may increase the intensity of the fight until he does." Thus, by adolescence, R&T may have a dominance function, an interpretation that gains credence from observational and interview data on older children (Pellegrini, 1994, 2002, 2003; Smith, Hunter, Carvalho, and Costabile, 1992).

By adolescence, R&T participants seem to be well aware that play and aggression are not as distinct phenomena as they were at younger ages (e.g., Pellis and Pellis, 2009; Smith et al., 1992; Smith, Smees, Pellegrini, and Menesini, 2002). To evoke Bateson's (1972) concept of metacommunication, instead of the shared understanding between older partners being "this is not real aggression"—as would seem to aptly apply to the R&T of young children—the shared understanding becomes something like "we both know this has a serious component, but we implicitly agree to pretend that it does not," or, perhaps, "we both know that our status is involved, but it is not as serious a situation as it would be if we were to stop pretending that it is not serious" (Fry, 2005). Perhaps some additional insights about the likely functions of R&T might arise from comparing it with both contests and adult aggression (Fry, 1990, 2005).
The intermingling of play and aggression among adolescents has parallels to the contests in nomadic forager contexts. Contests, as in adolescent R&T, can involve dominance struggles while allowing for the resolution of differences with less injury than might occur during real aggression. Contests, like adolescent R&T, have features that straddle play and aggression. Contests have rules that promote restraint, and spectators can take a role in enforcing the rules if necessary. Thus contests are simultaneously serious yet not serious, or serious yet not as dangerous as escalated aggression. Contests directly parallel the R&T of adolescents because both types of interaction may grade back and forth between play and aggression in the gray area of exercising restraint and simultaneously seeking to dominate an opponent. Pertaining to postpubescent children, especially boys, Pellis and Pellis (2009, p. 144) observe that “dominance can be negotiated through play fighting: this means that these animals do not have to resort to full-blown fighting to settle any problems of their relationships.” We could equally well use the same sentence in reference to adult contests: “Dominance can be negotiated through contests” in some foraging societies, which also means the avoidance of full-blown fighting. The similarities between adolescent R&T and adult contests—as contrasted both with the R&T of younger, preadolescent children and serious aggression as sometimes seen in adults—are presented in Table 7.1. As reflected in this table, the clear link between winning a contest and increasing one’s status (or, contrariwise, losing and suffering a loss in status) is reflected in the nomadic forager examples we have considered and hints at the importance of dominance striving in male humans. In contests, as in the R&T among adolescents, curtailed aggression parallels the ritualized aggression of some animal species. Restrained aggression,

| TABLE 7.1 A Theoretical Formulation: R&T Play, Contests, and Adult Aggression Compared |
|----------------------------------------|---------------------------------|---------------------------------|
| **Preadolescent R&T** | **Adolescent R&T and Contests** | **Adult Aggression** |
| Winning is *not* important | Winning is important (There may be sporting or juridical elements to contests) | Winning is important |
| Friendly mood | Friendly-to-hostile mood | Hostile mood |
| No attempt to dominate | May include domination attempts | Attempts to dominate |
| No intent to injure | No intent to seriously injure | Intent to injure |
| Serious injury extremely rare | Serious injury possible, but rare | Serious injury possible |
| Much restraint | Some restraint | Minimal restraint |
| Resources irrelevant | Resources possibly relevant | Resources usually relevant |
| Others not interested | Others interested as referees and spectators | Others very interested as peacekeepers or allies |

The elements suggested in this table are derived from the literature on R&T and from surveying numerous ethnographic accounts of conflict management and aggression among nomadic hunter-gatherers and in other societies (see Fry, 1987: Table 3, 2005, 2006, in 2011; Smith, 1997: Table 1; and Smith et al., 2002: Table 14.1). The table is adapted and updated from Fry (2005).
whether in adult contests or in the R&T of adolescents, allows dominance to be established with substantially less risk to the participants than would result from all-out fighting. The metacommunicative parallel between adolescent R&T and adult contests as serious but not serious is intriguing.

Could adolescent R&T provide practice at participating in restrained, rule-based competitive struggles, such as contests, later in life? It can be hypothesized that R&T not only contributes to the learning and practice of fighting skills but more broadly to gaining experience at handling agonistic interactions with restraint, such as developing an understanding about when not to fight at all, how to “fight by the rules” within a particular social context, when and how to signal submission, and how to respond with deescalation to an opponent who wants to give up (Bernstein, 2007, 2008; Eimon and Potegal, 1991; Fry, 2005; Korpela and Sandnabba, 1994; Pennisi, 2000).

**Summary and Conclusion**

Killing is not the norm in nomadic band societies; most male–male competition takes restrained paths. Ethnographic descriptions of nomadic foragers portray men as following the rules of limited engagement as they wrestle, grapple, punch, or hit. Some nomadic forager societies have extremely low levels of physical aggression. When conflicts do occur, they involve interpersonal motives, not intergroup hostility; in other words, warfare is atypical at the nomadic band level of social organization (Fry, 2006; Fry and Söderberg, 2013).

We have considered three reasons that natural selection would seem to favor restrained use of intraspecific aggression and specifically the avoidance of lethal aggression. First, a comparison of physical aggression across species, including humans, suggests that the risks for escalated fighting that can lead to intraspecific killing are high (Fry and Szala, 2013; Maynard Smith and Price, 1973; Maynard Smith, 1974). Second, in band societies, some social interaction is among relatives on a daily basis, and thus selection pressures against killing conspecifics may have been reinforced through inclusive fitness considerations (Hamilton, 1964, 1971). The data on nomadic forager societies suggest a third selective force may have operated to favor of nonlethal aggression in humans: Killers tend to be targeted for execution by the families of their victims, and recidivist killers tend to be targeted by the whole group.

Certain common elements of human R&T are apparent in widely distributed cultures. When information exists, wrestling and grappling, restrained hitting and punching, and chasing and fleeing recur in descriptions of children’s R&T. Engaging in R&T during childhood and adolescence may facilitate the developmental learning and practice of restraint. Research on R&T in children suggests that both practice and dominance functions are likely. For humans, the practice of fighting skills may be more complex than in some other species. Humans may have
to practice not only fighting maneuvers but also restraint within a social world that includes rules for fighting and dispute resolution. It is interesting to contemplate how much aggression among humans is restrained, curtailed, or limited through social conventions, enforced by the participants themselves and by other members of the group. Contests are one obvious example of restrained aggression and may be similar to the R&T in adolescent boys by providing a way to resolve dominance struggles with minimal risk to the participants.

Among animals, it seems that one lesson learned during play fighting is the use of restraint (Bernstein, 2007, 2008; Einnon and Poteagal, 1991; Fry, 2005; Korpela and Sandnabba, 1994; Pennisi, 2000). Bernstein (2008, p. 60, see also Pellis and Pellis, 2007) points out that “monkeys reared in social isolation seem to lack the social skills required to assess the willingness of a rival to engage in escalated aggression, the ability of the rival to inflict aggressive costs, and even the meaning of signals that a rival uses when conceding access to a contested resource.” In the human EEA, it seems likely that lessons learned during R&T in youth about assessing opponents, fighting with restraint, and reading signals about escalation or capitulation had survival value, especially for males, in dealing with intraspecific conflict over the course of their lives so as to minimize risks and maximize benefits (Fry, 1987, 1990, 2005).

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