Natural Born Nonkillers

A Critique of the Killers-Have-More-Kids Idea

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There is an oft-voiced proposition within evolutionary psychology that over the course of evolutionary time, natural selection favored human males who have killed over those men who have not. The implication is that killing has been favorably selected as a fitness enhancing strategy. Interestingly, the impetus for this proposition in large part stems from one particular article on the tribal Yanomamö people of Brazil and Venezuela published in 1988. In this article, Chagnon (1988) reports that Yanomamö men who have participated in a killing out-reproduced their same-aged peers. If a Yanomamö man participates in a killing, he must undergo a purification ritual and henceforth wears the cultural label *unokai*. In a series of publications, Chagnon (1990: 95, 1992a: 205, 1992b: 239-240; see also Chagnon, 2010) reiterated that *unokais* average more than two-and-half times the number of wives and more than three times the number of offspring as non-*unokais of the same age*. Pinker (2002: 116) concludes that "if that payoff was typical of the pre-state societies in which humans evolved, the strategic use of violence would have been selected over evolutionary time."

A careful re-examination of the Yanomamö *unokai* findings and the inferences that have been drawn from them are important because they have been broadcast far-and-wide and have been uncritically accepted within evolutionary psychology and other fields. For example, Buss discusses the *unokai* reproductive success findings in *Evolutionary Psychology* (1999) and again in *The Murderer Next Door* (2005: 35): "Humans have evolved powerful psychological adaptations that impel us to murder as a means for solving specific problems we encounter during the evolutionary battles for survival and reproduction." Harris relates the killers-have-more-offspring finding in *The Nurture Assumption*. In *U.S. News and World Report*, a journalist proposed that Chagnon's study "lends new credence" to the idea that "war arises from individuals struggling for reproductive success" (Allman, 1988: 57). Pinker reiterates the findings in *How the Mind Works* (1997) and again in *The Blank Slate* (2002).

Since Chagnon (1983), Buss (1999), and others view the Yanomamö as a living diorama of humanity's ancestral past, then it follows by this reasoning that humans are descendents of natural born killers. The basic evolutionary logic runs as follows. There is variability in a population: Some men are killers and some are not. Certain individuals out-reproduce their neighbors, and, based on the Yanomamö study, killers appear to have more offspring. Traits, such as killing, are to some degree heritable and thus can be passed to succeeding generations. Therefore, humans have evolved to be natural born killers.

In this chapter, we will argue that this dramatic interpretation of human nature is probably 180 degrees off course and that the killers-have-more-kids proposal is unfounded for a variety of reasons. First, computer simulations of evolutionary processes suggest that killing as an aggressive strategy would have been selected against, not favored, by natural selection. Second, the idea that lethal aggression has been evolutionarily favored in humans runs counter to a substantial body of contextualizing data on animal behavior that shows intraspecific killing to be the exception, not the rule, in the animal kingdom. Third, military science and anthropology suggest that humans have an evolved psychological aversion to killing, not a psychological adaptation that impels them to kill. Fourth, psycho-social models regarding the socialization and social learning of values related to killing and nonkilling reflect the observed cultural variation in these behaviors, whereas the idea of an evolved propensity for killing is hard-put to account for such variation. Fifth, the original study (Chagnon, 1988) has multiple analytical flaws that call into serious doubt the conclusion that Yanomamö killers have over three times the number of children as nonkillers. Sixth, two other studies, on the Waorani and Cheyenne (Beckerman, Erickson, Yost, Regalado, Jaramillo, Sparks, Iromenga and Long, 2009; Moore, 1990), report findings opposite to those published for the Yanomamö by Chagnon (1988).

Computer Simulations of Evolutionary Processes

Game theory simulations of the evolutionary process provide us with a *hawk-dove* model, which, although simple, offers some tantalizing insights. Maynard Smith and Price (1973; Maynard Smith, 1974) use computer simulations to model the evolution of aggression by comparing the relative success of different fighting strategies. They use the term *evolutionary stable strategy* for a particular behavioral pattern, that "if most of the members of a population adopt it, there is no 'mutant' strategy that would give higher

reproductive fitness" (Maynard Smith and Price, 1973: 15). An evolutionary stable strategy is roughly comparable to a behavioral adaptation.

The researchers discovered that neither belligerent (hawk) nor timid (dove) strategies are as evolutionarily successful as a strategy they call the *retaliator* strategy. This approach to social interaction entails being nonaggressive unless attacked, at which point a retaliator fights back. In the computer simulations, timid individuals that retreated did not fare very well compared to more aggressive individuals; however, fighting entails risks of injury and therefore overly-aggressive individuals also accumulated evolutionary costs. The conclusion from such simulations is that the agonistic strategies that fare the best are those that are limited and restrained, not lethal ones. Restrained aggression is more advantageous to fitness than either pure dove or pure hawk strategies (Archer, 1988; Archer and Huntingford, 1994; Riechert, 1998).

Restrained Patterns of Competition: The Animal Data

In making a cross-species generalization, ethologist Hinde (1974: 268) concludes that among animals, "death and injury are less common than might be expected." In fact, most intraspecific aggression in the animal kingdom is nonlethal (Alcock, 2005; Kokko, 2008; Maynard Smith and Price 1973). Nonetheless, escalated fighting can lead to fatal injuries, for example, as has been reported among chimpanzees, hyenas, and lions (Alcock, 2005; Schaller, 1972; Wilson, 1975: 246). Also, there are some special cases where the cost-to-benefit ratio of killing tips the balance in favor of killing. For instance, the mating system among langur monkeys consists of social groups with a single male and a harem of females with whom the male mates until he is deposed and replaced by a new male (Hrdy, 1977). After a series of fights to gain mating rights over a harem, a new male often attempts to kill young infants that were sired by the previous male (Hrdy, 1977). On the cost side, an adult male langur does not place himself in much risk of injury by attempting to kill an infant, although the infant's mother or other female relatives may attempt to protect an infant from an infanticidal male. On the benefit side, an infanticidal male langur may be able to reproduce sooner than if a male allows his predecessor's infants to live, because the mothers of killed infants will come into estrus and be able to conceive during matings with the new male sooner than if they had continued lactating and nursing the infants fathered by the prior male (Hrdy, 1977).

So in some special cases, like langur infanticide, killing does occur in the animal kingdom and conveys evolutionary benefits. However, such cases are exceptional and represent situations where the fitness pay-offs to the killer

outweigh the risks to the killer. For the most part, however, animal studies show a recurring pattern wherein aggression against conspecific rivals is limited, restrained, and rarely lethal (Archer and Huntingford, 1994; Eibl-Eibesfeldt, 1961, 1979: 37-40; Fry, 1980; Fry, Schober and Björkqvist, 2010; Hinde, 1974: 269; Maynard Smith and Price, 1973; Riechert, 1998; Schaller, 1972: 55).

Most of this restrained intraspecific aggression in the animal kingdom occurs between males who are competing directly or indirectly for mates (Fry et al, 2010). For example, male 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" (Maynard Smith and Price, 1973: 15). It is in the survival interests of both contestants to follow the rules of restrained, ritualized fighting so that they minimize the risk of injury and reduce energy expenditure. This point is illustrated by the fact that out of 1,314 sparring matches between pairs of male caribou only six escalated fights were observed (Alcock 2005). This is a ratio of one serious fight to every 218 ritualized contests.

Blanchard and Blanchard (1989: 104) explain: "In evolutionary terms...successful individuals will be those with techniques which enable them to avoid agonistic situations involving serious possibilities of defeat or injury, while leaving them to continue in more promising situations." The aggressive behavior of a given species can then be seen as the outcome of natural selection operating over many generations, refining behavioral patterns so as to maximize fitness benefits and minimize fitness costs. This idea is summarized by Bernstein (2008: 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."

Noncontact agonistic displays, ritualized competitions (as opposed to serious fighting), and submission signals used to end a fight prior to serious injury are widespread among animals because over evolutionary time, such behaviors have conveyed fitness benefits on those individuals who have practiced them over those who did not (Archer and Huntingford, 1994: 3-4; Aureli and de Waal, 2000; Fry, 1980; Fry et al., 2010; Hinde, 1974: 270, 272; Maynard Smith and Price, 1973). Generally speaking, the evolutionary "logic of animal conflict," as Maynard Smith and Price (1973) title their classic paper, means that natural selection as a recurring pattern rewards the limited use of force over "no holds barred" fighting. The widespread appearance in species after species of restrained aggression between conspecific rivals instead of lethal tactics provides an important contextualizing precedent against which to formulate hypotheses about human aggression. Based on numerous studies of animal aggression, the logical hypothesis would be that humans also have evolved restraint against killing, not a predilection for it.

Aversion to Killing: Military Science and Nomadic Forager Studies

A wealth of knowledge has been accumulated in military science and thoroughly reviewed by Grossman (1995) and Grossman and Siddle (2008) that supports the conclusion that humans have an aversion to killing. The resistance of soldiers to kill other human beings has been documented across diverse wars and societies from U.S. troops in World War II, French officers in the 1860s, Argentine soldiers during the Falkland Islands War, the battle of Gettysburg during the American Civil War, and more generally throughout history (Grossman and Siddle, 2008: 1802).

One of the most intriguing examples of the unwillingness on the part of soldiers in combat to actually fire at their fellow human beings comes from an analysis of 27,574 muskets recovered from the Civil War battlefield at Gettysburg, Pennsylvania. Nearly 90 percent of the muskets were loaded. Additionally, about 12,000 (44 percent) of the weapons were loaded more than once with some 6,000 having between three-to-ten rounds packed into the unfired gun barrel. Grossman (1995) points out that if soldiers were desperately firing their weapons as soon as they had loaded them, only some five percent of the guns, not nearly 90 percent, would have been loaded, and certainly not loaded two or more times. Clearly, a huge number of soldiers under close range combat at Gettysburg were spending their time loading and reloading their guns rather than firing them to kill enemy soldiers.

A classic study of weapon firing rates was conducted during World War II by U.S. Army historian Brigadier General S. L. A. Marshall. After conducting extensive post-combat interviews with soldiers, Marshall concluded that only 15-to-20 percent of the men fired their weapons at a human target (Grossman and Siddle, 2008: 1802). Others fired without aiming, or into the air, or did not fire at all. The phenomenon is also reflected in statistics on aerial "dog fights" of World War II: Less than one percent of U.S. fighter pilots accounted for 30-to-40 percent of the enemy aircraft shot-down in the air whereas the majority of combat pilots did not shoot down a single enemy plane, and many never even tried to do so (Grossman, 1995). General Marshall wrote that "the average and healthy individual...has such an inner and usually unrealized resistance towards killing a fellow man that he will not of his own volition take a life if it is possible to turn away from that responsibility" (Marshall quoted in Grossman, 1995: 29).

This resistance towards killing is reflected in the greater amount of psychiatric symptoms in the soldiers who were involved in killing in comparison with military personal who were not expected to kill but who still faced high risks of being killed, such as medical personnel or soldiers on reconnaissance missions behind enemy lines (Grossman and Siddle, 2008). In light of the "problem" of getting men to kill, it is not surprising that combat training has been redesigned since World War II to overcome the inhibitions towards killing on the part of typical soldiers that cause them "to posture, submit, or flee, rather than fight" (Grossman, 1995: 28). Another argument in favor of the human resistance towards killing are high rates of depression, PTSD, suicide, domestic violence, and a host of other problems faced by war veterans which show that participation in killing is psychologically very costly and traumatic. Only one-to-two percent of the men in combat lack the typical inhibitions toward killing, and they exhibit sociopathic tendencies (Grossman and Siddle, 2008).

Turning to data from nomadic forager societies, Fry et al. (2010) have suggested that at least three kinds of natural selection pressures have favored nonkilling over killing in humans. First, in the previous section, nonlethal, aggression is the rule, not the exception, in the animal kingdom. This observation is important because it reflects numerous naturalistic experiments during evolutionary history that have resulted in the same outcome time and again: Attempting to kill conspecifics is rarely favored by natural selection. This corpus of evidence provides an important precedent for proposing that evolutionary selection pressures have favored restrained forms of aggression over lethal patterns in humans also. Given the amount of violence in today's world, this argument may seem to be counterintuitive. However, today's world is dramatically different from the conditions under which the human species has evolved and if we are discussing proclivities for killing as part of an evolved human nature, we must focus attention on environment of evolutionary adaptedness and the selection pressures that have operated on humankind.

A second selection force favoring nonlethality in humans as well as in other animals involves inclusive fitness. The concept of inclusive fitness holds that since relatives have alleles in common, then selection should favor the good treatment of one's relatives (Fry et al., 2010; Fry, 1980, 2006). In extant foraging band societies, a huge amount of daily social interaction takes place among genetic relatives and this was almost certainly the case in the ancestral past as well. Killing and injuring relatives has a negative effect on inclusive fitness and therefore should have been selected against.

The third possible selection pressure against killing involves the observed tendency for the close family members of a homicide victim in nomadic forager societies to avenge the death of their relative by killing the killer (Fry et al., 2010). Thus, by committing a homicide, a killer often signs his own death warrant and consequently lowers his own fitness. Revenge was found to be the most common motive for committing homicide among the sample of 21 nomadic forager societies in an ethnographic database called the Standard Cross-Cultural Sample (Fry, in press a, in press b). The typical pattern is that, motivated by feelings of revenge, a homicide victim's family may attempt to kill the killer. If they succeed, this payback killing typically ends the matter because the two killings cancel each other (Fry, 2006: 230). This tendency is illustrated by the Micmac belief that "If thou killest, thou shalt be killed" (Le Clercq, 1910: 286), as well as in the observation for the Chukchee of Siberia that "a murder rarely remains unavenged" (Bogoras, 1975: 663). This revenge pattern also is apparent among the Montagnais-Naskapi of Canada's Labrador Peninsula (Lips, 1947: 470), the Ingalik of western Canada (Osgood, 1958, p. 54), and the Yukaghir of Siberia. (Jochelson, 1926), the Ju/'hoansi of the African Kalahari Desert (Lee, 1979: 391), and other nomadic forager societies. Given that the nomadic band social organization is the social type under which humans evolved, the fitness ramifications favoring nonkilling may have been significant (Fry, 2006, in press a, in press b).

To sum-up, computer simulations, data on animal behavior, evidence for an aversion for killing from military sciences, and the insights we can glean by analogy from an examination of extant nomadic forager societies converge to suggest that natural selection has not favored killing over the course of human evolution. In fact, these diverse bodies of knowledge converge to suggest an alternative hypothesis: Killers probably have been selected against in the ancestral evolutionary environment due to the same types of cost-benefit selection forces that have acted against escalated aggression in other species, due to humans having evolved in small groups consisting largely of relatives, and due to the tendency in nomadic band society for the family of a homicide victim to attempt to kill the killer in revenge for the loss of their loved-one.

A Psycho-Social Model Explains More than an Evolutionary Psychology "We-Are-Evolved-Killers" Proposition

If the goal is to understand killing and nonkilling, then we must begin by noting the variation in these behaviors across time and space. First, not all societies engage in war (Fry, 2006). The existence of countries that have successfully avoided wars for long periods of time such as Costa Rica, Sweden, Switzerland, and Iceland offer a challenge to the idea that humans have an evolved predilec-

tion for killing. Second, although homicide rates vary tremendously from one society to the next and also change over time within the same society, the vast majority of people never kill or attempt to kill anyone. It is difficult to see how the proposition that natural selection has favored males that kill over those who do not explains this inter-societal and intra-societal variation in killing and the fact that most humans do not ever kill. On the other hand, a number of proximate psychological, social, and economic factors offer more promising explanations of these phenomena (Nisbett and Cohen, 1996). We will illustrate this point by focusing on the importance of values in affecting behavior.

Values are conscious, trans-situational expressions of basic human needs which serve as guiding principles in a person or a social entity (Schwartz, 1992, 1994). Schwartz proposes an integrated system that is structured by ten value types (*Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Tradition, Conformity, Security, Power*, and *Achievement*), each characterized by its own motivational goal. According to Schwartz (1992) the value system is organized by two dimensions: a Self-Transcendence vs. Self-Enhancement dimension and an openness to change vs. conservatism dimension. These two dimensions underlie motivations: The value types Universalism and Benevolence both involve concern for others whereas Achievement and Power both emphasize concern for the self; Self-Direction and Stimulation involve openness to change whereas Tradition, Conformity, and Security emphasize resistance to change (Schwartz, 1992, 1994).

Conceptualization of values as goals to aspire to implies that values can motivate individuals to behave in certain ways by guiding their judgment regarding which actions are considered as more justified or more desirable than alternatives (Ajzen, 2001; Ball-Rokeach and Loges, 1996; Feather, 1992, 1995; Schwartz, 1994; Verplanken and Holland, 2002). Values are connected to selfhood (Smith, 1991; Feather, 1992), constitute a core of one's personal identity (Bilsky and Schwartz, 1994; Hitlin, 2003), and hence can be viewed as distal determinants of attitudes and decisions (Hitlin, 2003; Hitlin and Piliavin, 2004; Lönnqvist, Leikas, Paunonen, Nissinen and Verkasalo, 2006; Rohan, 2000; Verplanken and Holland, 2002).

A consideration of cultural beliefs, attitudes, norms, and values is crucial for understanding why certain social groups favor nonviolent methods of resolving conflicts whereas other societies are more open to the use of violence (Bonta and Fry, 2006; Fry, 2009; Miklikowska and Fry, 2010). Research shows that value priorities constitute a motivational context within which violence and warfare are perceived as either legitimate or illegitimate. According to Basabe and Valencia (2007) and UNESCO (1995), the

structural bases for a culture of peace are related to values of egalitarianism, harmony, and tolerance within a society all of which correspond with the Self-Transcendence dimension of basic human values (Schwartz, 1994). Consequently, the values constituting the Self-Transcendence dimension have been found to be antithetical to violence, whereas the values from the Self-Enhancement dimension correlate with aggressive ways of behaving. Specifically, values representing the Self-Transcendence dimension have been found to be positively linked with cooperative behaviors (Sagiv, Sverdlik and Schwartz, 2010), altruistic behaviors (Bardi and Schwartz, 2003; Lönnqvist et al., 2006; Omoto and Snyder, 1995), internal and external peacefulness of groups (Miklikowska and Fry, 2010) as well as with prosocial views such as positive perceptions towards immigration, support for an inclusive moral universe (Schwartz, 2007), "macro worry" (a concern about the state of the world and society) (Schwartz, Sagiv and Boehnke, 2000), and readiness for contact with members of an out-group (Sagiv and Schwartz, 1995; Biernat, Vescio, Theno and Crandall, 1996). Consequently, Self-Transcendence values correlate negatively with violent behavior and bullying (Knafo, 2003; Knafo, Daniel and Khoury-Kassabri, 2008), authoritarianism (Altemeyer, 1998; Cohrs, Moschner, Maes and Kielmann, 2005a), attitudes favoring war (Cohrs, Moschner, Maes and Kielmann, 2005b), noninclusive moral universe (Schwartz, 2007), and social dominance orientation (Cohrs at al., 2005b). On the other hand, values congruent with the Self-Enhancement value dimension are negatively related to the expression of empathy for others, altruism, and cooperation (Bardi and Schwartz, 2003; Myyry and Helkama, 2001; Sagiv et al., 2010), and positively related to violent behavior and bullying (Knafo, 2003; Knafo et al., 2008), authoritarianism (Cohrs et al., 2005a), and "micro worry" (concern for one's self) (Schwartz et al., 2000).

Clearly human beings have a potential for competition, aggression, and killing (Fry, 2004, 2006). Yet, whether this potential becomes an enacted reality depends on the specific cultural setting (Howell and Willis, 1989). Close observation of peaceful and nonwarring societies draws attention to the role of values in maintaining social tranquility (Bonta and Fry, 2006; Dentan, 1978; Fry, 2009; Huesmann, 1988; Miklikowska and Fry, 2010). Cultural settings wherein Self-Transcendence values dominate seem to pattern social behavior in a peaceful way (Staub, 1996). To illustrate this, we will consider briefly the Semai of Malaysia, the Paliyan of India, and the Ifaluk of the Pacific.

Semai daily life is characterized by nonviolence. The Semai neither war nor feud. They rarely use any form of aggression to deal with conflict and, in fact, "usually tolerate annoyances and sacrifice personal interests rather than precipi-

tate an open confrontation" (Robarchek, 1997: 54). Spousal quarrels rarely occur, children are not corporally punished, neighbors seldom argue, even fighting among children is a rarity, and homicides are virtually nonexistent (Robarchek, 1977; Robarchek and Dentan, 1987; Robarchek and Robarchek, 1992). Even when faced with slave-raiding, "the Semai response was always a disorganized and headlong flight into the forest" (Gregor and Robarchek, 1996; 161).

Two paramount Semai values are affiliation (harmonious interpersonal relationships within the band, agreeing, not fighting, not getting angry, not causing trouble) and nurturance (giving both emotional and material support to others, helping, cherishing, feeding) (Robarchek, 1979, 1980). The importance of affiliation and nurturance leads naturally to consideration for the needs of other people--to Self-Transcendence values. The Semai hold an ideal image of their social group as benevolent and nurturing, "we are all siblings here, we take care of one another," and "when I couldn't hunt, you took care of me; when you were sick, I took care of you" (Robarchek, 1989b: 911). The importance of affiliation is also a direct reason for the Semai tremendous fear of conflict (Robarchek, 1980).

Adopting a social learning perspective, it can readily be seen that raising children in an environment that emphasizes the cultural values of nurturance and affiliation means that the youngest members of Semai society have few opportunities to learn physical aggression (Moss, 1997). In the Semai nonviolent social setting, the learning though observation and imitation of aggression is nearly impossible. As Dentan (1978: 132) remarks, "even if a child wanted to become violent, it would have no very clear idea of how to proceed."

In summary, the values of affiliation, nurturance, tolerance, egalitarianism, peace, and conflict avoidance (representing the Self-Transcendence value dimension) provide a foundation for nonviolent Semai behavior. Physical aggression is incompatible with Semai values and the image they hold of themselves (Robarchek, 1979).

The Paliyan place great value on equality, respect, and nonviolence. They believe that "everyone merits equal respect by virtue of being a human being" (Gardner, 2000b: 85). To Paliyan thinking, if a person interferes with the freedom of another, then he or she is acting disrespectfully. This set of values is incompatible with using aggression as a means of dealing with conflicts. For the most part, the Paliyan use effective nonviolent techniques such as third party conciliation, avoidance of conflict situations, and self-restraint, as reflected in the nonviolent ethos, "If one strikes, the struck man keeps still. It is our main motto" (Gardner, 1999: 263),

Gardner (2000a: 225) recorded a mere 20 examples of *disrespect* over a four-and-a-half month period in one Paliyan band. Most instances of disrespect were very mild, for instance, when adults lightly slapped youngsters, or when a person with bruised feelings got up and left in complete silence. Even the most serious instances of disrespect, generally those involving marital jealousy, were very mild if viewed from a culturally comparative perspective. The vast majority involved no physical contact at all, and sometimes no words were exchanged, as when a person simply left the band (Gardner, 1972: 439). Gardner (1999) failed to uncover any cases of homicide. The Paliyan do not engage in feuds or war and respond to threats of violence from outsiders by moving away (2004, 2010).

The nonviolent, nonwarring Semai and Paliyan provide a poignant illustration of the human capacity for living in peace and at the same time raise questions against the notion that killing has been selected over evolutionary time to become a natural attribute of humanity. The Ifaluk of Micronesia is another society that contradicts the idea that human nature includes an evolutionary predilection to kill other people. The Ifaluk have been studied by Burrows (1952) and Spiro (1952) following WWII and by Lutz (1988) some 30 years later. The lack of physical aggression on Ifaluk caught the attention of all three anthropologists. Burrows (1952: 25) writes:

> What is striking about Ifaluk...is the fact that there is no discrepancy between its cultural values (the ideal culture) and its actual behavioral patterns (the real culture). Not one individual could remember a single case of murder, rape, robbery, or fighting; nor did the ethnographer witness such behavior in his seven-month study. It was almost impossible to convey to the people the concept of murder, the thought of wantonly killing another person is so completely alien to their thinking.

In a cross-cultural study of rape, Minturn and her colleagues (1969) rated Ifaluk as a society where rape does not take place. Lutz (1988: 199) explains that in the view of the people of Ifaluk, violence was almost inconceivable: "The horror that the idea of violence evokes for the Ifaluk was evident in their discussions of the rumored aggressive tendencies of Americans and some other groups. Several people checked with me to see if the stories they had heard about the existence of murder in the United States were in fact true." This represents an interesting turn-around to some theorists who have trouble imagining that war and violence are not manifested in every human society (e.g., Wrangham and Peterson, 1996). Lutz (1988) also recounts that when the people of Ifaluk watched American movies that the U.S. Navy

brought to the atoll and saw the characters in the films being shot and beaten they were terrified and sickened for days. The case of Ifaluk runs counter to assumptions that humans have evolved predilections towards killing,

The Ifaluk—like the Semai, Paliyans, and many other peaceful peoples around the world—have a Self-Transcendence value orientation that inhibits physical aggression. Anthropological research shows that Self-Transcendence values may contribute to peace in three ways: by directly discouraging violent behavior; by favoring nonviolent responses to conflicts such as discussion, avoidance, and tolerance; and by encouraging self-control and restraint (Baszarkiewicz and Fry, 2008; Gardner, 2010; Miklikowska and Fry, 2010). Although it is possible that the simple forms of social organization provide more certain conditions for the translation of values into practice the comparisons of communities that differ in terms of values but are close geographically illustrate the power of values in contributing to differences in violence (Bonta, 1996; Fry, 1994, 2004, 2006, 2007; Fry and Fry 1997; O'Nell, 1989; Robarchek and Robarchek, 1992; Staub, 1996).

Methodological Problems with the Yanomamö *Unokai* Study

Ferguson (1989) wrote a commentary on Chagnon's (1988) findings and raised the question whether *unokais* and non-*unokais* were really of comparable ages, suggesting instead that some of the difference in reproductive success between the two groups actually was related to age differences between the groups. Chagnon (1989) simply ignored Ferguson's age question and in subsequent publications continued to state that *unokais* had over three times the number of offspring as non-*unokais* of the same age (Chagnon 1990: 95; Chagnon 1992a: 205; Chagnon 1992b: 239-240; Chagnon, 2010). Years later, Chagnon continues to sidestep the age issue as evidenced by his unwillingness to provide the actual means and standard deviations for the ages of the *unokais* and the non-*unokais* (see the Appendix). However, some simple mathematics applied to the Chagnon's published data shows unequivocally that the majority of the *unokais* are over 41-years of age, whereas the majority of non-*unokais* are 30-years of age or younger. Fry (2006) estimates the age difference between the two groups of men to be at least 10.4 years. Obviously, the age distributions are very different for these two groups of men and therefore, before any claim can be made that one group averages more than three times as many offspring as the other group, this substantial age difference must be taken into consideration.

A second complication that makes the interpretation of Chagnon's (1988) *unokai* finding problematic is that headmen generally tend to have more wives and children than other men (Ferguson, 1989; see also Chagnon, Flinn and Melancon, 1979: 318). Using data published by Chagnon, Fry (2006) presents calculations that correct simultaneously for the effects of headmanship and age. The results show that if any *unokai* reproductive advantage exists at all, then such an advantage is nowhere near the three-fold figure that has proliferated in the literature.

There are two more issues worth mentioning. First, Chagnon (1988) included in his study only Yanomamö men that were alive at the time of his research. Ferguson (1989) points out that this procedure could bias the results because the ethnographic data on the Yanomamö suggest that *unokais* are at greater risk of being targeted in revenge-killings than are non-*unokais* (see also Lizot, 1994: 855). Chagnon's inclusion of solely men that were alive at the time of his study is questionable because it implicitly presumes that *unokais* and non-*unokais* have an equal chance of being killed, whereas ethnographic data suggest that killers have a higher chance of meeting a violent end than do nonkillers. Chagnon (1988: 986, emphasis added) explains that "Raiders may inflict deaths on their enemies, but by so doing *make themselves and kin prime targets for retaliation.*" Second, Chagnon (1988) conflates the Yanomamö cultural concept of *unokai* with actual, physical killers (Albert, 1989). Chagnon (1988) takes an entire population of living men and classifies them dichotomously as either *unokais* or non-*unokais*. A person can undergo the purification ceremony, however, for various reasons: A man may directly, physically kill another man; A man may go along on a raid and, take part in shooting a volley of arrows blindly into a village, perhaps killing someone in the process; A man may shoot an arrow into a corpse; A man may kill someone through sorcery, shamanism, or by destroying the victim's animal alter ego (Albert, 1989). Thus the Yanomamö undergo the purification ceremony for multiple reasons and there are multiple paths to attaining the label of *unokai*. Chagnon (1988), however, explains that all the so-called *unokais* in his sample directly, physically participated in killing. If that is the case, what happened to the other types of *unokais* in Chagnon's dichotomous classification? Since no men are left out of the comparison, then either some men who are *unokais* in the eyes of the Yanomamö (for killing via supernatural means, for example) are included in Chagnon's non-*unokai* group, or else Chagnon's *unokai* group in fact includes some men who have undergone the purification ritual for "killing" corpses, practicing sorcery, and so on, but have not actually, physically killed anyone. Finally, it is problematic to gloss *unokai* as warrior, as many writers have done,

because some men have undergone the purification ceremony after committing homicide within their own village (Chagnon, 1988).

In conclusion, there are multiple reasons for doubting that *unokais* have any real reproductive advantage over non-*unokais* at all. If any such advantage does exist, it clearly is only a fraction of the amount reported by Chagnon. The *unokais* as a group are substantially older than the non-*unokais*. "Even the most conservative calculation (age alone) cuts the originally reported *unokai* advantage by 56 percent, whereas the most liberal (yet plausible) calculation combining corrections for age and headman effects totally eliminates any *unokai* advantage" (Fry, 2006: 198). But correcting for age and headman effects does not fix all the problems. Comparing samples of living men is problematic because it obscures an almost certain higher mortality rate for *unokais* than for non-*unokais*. Finally, although the term *unokai* is an indigenous concept that results from multiple types of killing, Chagnon (1988) conflates its meaning with a Western focus on physical killing. These various methodological and analytical issues are cumulative and obviously far from trivial. In light of these multiple concerns, any assertion that *unokais* have more offspring and wives than non-*unokais* is problematic.

Two Other Studies Show the Opposite of the Yanomamö Study

Using the findings from one study to generalize to "all social groups on Earth" (Ghiglieri, 1999: 194) is scientifically unsupportable. And making such a generalization is even more problematic when other studies show the opposite. Moore (1990) examined ethnohistorical and census data for the warlike Cheyenne and discovered that Cheyenne war chiefs had *lower* reproductive success and shorter lives than did Cheyenne peace chiefs.

The Waorani of Ecuador had a very high rate of killing before foreign missionaries assisted the Waorani in making peace with each other (Beckerman et al., 2009; Robarchek and Robarchek, 1998). Beckerman and colleagues (2009) interviewed and gathered genealogical data for over 100 Waorani elders of both sexes to investigate possible relationships between participation in lethal raiding and reproductive success. Beckerman et al. (2009) explain: "To avoid some of the methodological objections raised to Chagnon's work, we included in our sample of warriors both living and dead men; we ranked their aggression by the number of raids they participated in and not by a local term of contested meaning with which they are labeled. Our analysis is free of the problem caused by the inherent correlation of the warrior's age with both participation in raids and reproductive success." The research team analyzed

whether the amount of raiding was associated with the survivorship of the raiders, survivorship of their wives, number of wives, number of children born, and survivorship of offspring to the age of 15 years, in other words, "life history features presumably linked to individual fitness" (Beckerman et al., 2009). They operationally defined *zealous warriors* in three ways: As those Waorani men whose lifetime rate of raiding exceeded the average for all men, exceeded the average for all men plus 0.5 standard deviations, and exceeded the average for all men plus 1.0 standard deviation.

The key finding was that the zealous warriors had lower, not higher, lifetime reproductive success. Beckerman et al. (2009) conclude that: "More aggressive men (i.e., zealous warriors) no matter how defined, do not acquire more wives than milder men, nor do they have more children, nor do their wives and children survive longer. In fact, the most statistically significant difference revealed by our analysis is in the other direction: Bellicose men have fewer children who survive to reproductive age, a finding that strongly suggests that they have lower individual fitness than less aggressive males."

Finally, Beckerman and his colleagues point out that since their reproductive success findings for the Waorani are the opposite of the findings reported by Chagnon (1988), clearly the Yanomamö findings do not apply to tribal societies in general. In our opinion, because the Waorani study in contrast to the Yanomamö study controlled for the spurious effects of age, considered the reproductive life histories of both living and dead men, and did not attempt to use cultural labels (i.e., *unokai*) but instead counted actual numbers of raids undertaken, the Waorani results carry much more weight than do the Yanomamö findings.

An evolutionary model of human killing/nonkilling should be consistent with an accumulated knowledge base, not merely the results of one particular study. Especially because findings on two other societies, the Cheyenne and Waorani, show the opposite, any claims that Chagnon's (1988) findings are pivotal to understanding the evolution or human aggression overstep the bounds of reasonable scientific inference.

Conclusions

History has its quirks. Sometimes a single event has enormous consequences, setting in place a cascade of subsequent developments. As the young discipline of evolutionary psychology has evolved over the last two-to-three decades, Chagnon's (1988) report that killers-have-more-kids has taken a central place in the evolutionary psychology hall of fame having had

a tremendous impact on publications within evolutionary psychology that deal with homicide, violence, and warfare.

Evidence for the substantial impact of this one article is twofold. First, the finding that killers have more wives and children has been widely broadcast across academic disciplines including psychology, economics, anthropology, primatology, political science, biology, and medicine, as well as in the popular press (e.g., Allman, 1988; Barash, 2001: 165-174; Burnham and Phelan, 2000: 88; Buss, 1999: 304-305, 2005: 210; Campbell, 1999: 212; Cronk, 1999: 80; Daly and Wilson, 1994: 274; Gat, 2000b: 75, 76, 87 note 4, 2006: 58; Geary, 1998: 317-318; Ghiglieri, 1999: 144, 193-194; Konner, 2006: 5; Low, 1993: 21, 26, 31; Manson and Wrangham, 1991: 369, 374; McCarthy, 1994: 107; Pinker 1997: 510, 2002: 116; Potts and Hayden, 2008: 162; Symons, 1990: 436-437; Thayer, 2004: 131; Wrangham and Peterson, 1996: 64-74). Second, many discussions of warfare from an evolutionary perspective uncritically recount the finding and then advance variations of the interpretation that killing probably paid fitness dividends over the evolutionary history of the human species (e.g., Buss 2005; Gat, 2006; Konner, 2006; Pinker, 1997, 2002; Thayer, 2004; Wrangham and Peterson, 1996). For example, Potts and Hayden (2008: 162, 164, emphasis in original) follow-up a retelling of the *unokai* findings with the statement: "The Yanomamö...are not only like us—they *are* us."

It is pretty unusual in science for findings from a problematic study to be reiterated uncritically across many fields. Playing up one sole finding as revealing larger evolutionary truths about human nature and a propensity for killing is not exactly good science. To be taken seriously, evolutionary explanations of killing and human nature should be grounded in evolutionary theory, construct realistic models that can generate testable hypotheses, and rest on solid bodies of data. A series of methodological and analytical issues render Chagnon's (1988) killers-have-more-kids finding difficult to interpret. We have noted how age, headmanship, exclusion of deceased men from the sample, and ambiguous group membership issues combine to call the veracity of the findings into question. Additional methodological concerns about Chagnon's (1988) findings also have been voiced by others (e.g., Albert, 1989; Lizot, 1994; Ferguson, 1989, 1995; Sponsel, 2010) but tend to be ignored in favor of touting the original finding. The fact that the findings have not been replicated by studies on the Waorani and Cheyenne (Beckerman et al., 2009; Moore, 1990) at the very least should discourage the type of over-zealous generalizing that has been done on the basis of this one study.

We suggest that the idea that humans have evolved an inclination for killing is actually 180 degrees off course and encounters various stumbling

blocks. For example, how are nonwarring, nonfeuding, and nonviolent societies such as the Semai, Paliyan, and Ifaluk to be explained? Why is the supposed inclination toward killing not manifested in such cases? Buss's (2005) answer is that the inclination toward killing is triggered in particular social situations and thus is not always and everywhere active. In the absence of convincing evidence that any such inclination to kill exists at all, we suggest that a more parsimonious explanation is that the amount of killing in a given society reflects proximate psycho-social influences, which result in variable rates of killing within and across societies.

We presented multiple reasons why an interpretation exactly opposite to the now famous killers-have-more-kids idea actually makes more evolutionary sense. First, at the theoretical level, the evolutionary models and game theory simulations of animal conflict indicate that limited aggression is a better fitness enhancing strategy than escalated aggression. Second, data on animal competition across a great number of species suggest the natural selection tends to disfavor lethal aggression against conspecifics under most circumstances. And in correspondence with the corpus of animal studies, the findings on the Waorani and the Cheyenne show that the men who killed the most had *lower* fitness that their compatriots (Beckerman et al., 2009; Moore, 1990). Third, evidence from military science suggests that humans may well have a strong inhibition against killing other humans. Interestingly, Chagnon (1988: 987) explains that "many raiding parties turn back", that individual Yanomamö raiders "drop out for reasons such as being 'sick' or 'stepping on a thorn," and that a majority of the *unokais* have participated in a killing only once in a lifetime. Do these facts suggest, ironically, a reluctance to kill on the part of the very Yanomamö men whose bellicosity so many authors have touted? Fourth, an examination of extant nomadic forager societies suggests that killing may well have been selected against, not favored, in this type of social organization. Three types of possible selection pressures against killing were discussed.

As an overall conclusion, bountiful theoretical and empirical reasons exist for making the prediction that killers will be found to average *less* offspring than nonkillers across a variety of social circumstances. This prediction stems from an application of evolutionary theory and observations of animal and human behavior. We suggest that this alternative prediction to the killers-have-more-kids idea merits further examination.

Acknowledgment

Some of the data reported in this chapter were collected during research funded by the National Science Foundation (Grant number 03-13670), whose financial support is gratefully acknowledged. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

Appendix

This Appendix contains excerpts from an online discussion between Napoleon Chagnon and Douglas P. Fry regarding the *unokai* and non-*unokai* age issue. This series of posts appeared on the Evolutionary Psychology list at yahoogroups.com between March 30, 2008 and April 5, 2008. Additional parts of this discussion are online.[1] The mathematical calculations and discussion referred to in this Appendix can be found in Fry (2006: 184-199, 288-305).

On March 30, 2008, Napoleon Chagnon posted:

...Ultimately, what is really at issue behind much of the criticism of my work are two nearly 'sacred' Anthropological Truths, given down from above to the anthropological laity by self-appointed Ayatollahs like Sahlins. The first one is that warfare is rare to nonexistent in the pristine primitive world of hunters and gatherers because Original Man is basically a nice critter, a Noble Savage. Many of my anthropological critics seem to be upset to the point of suggesting that my data on Yanomamö warfare and violence is 'suspect,' 'exaggerated,' 'cooked,' 'controversial,' etc. and might my data might possibly cause people to question this Noble Savage view because my empirical findings are plausible, meticulously documented and have become widely known. ...The second issue is the question of whether or not anthropology is a "science" and whether or not it can be "scientific" if the humans in human behavior can be "factored out."

On April 1, 2008, Douglas P. Fry posted:

...Most striking is the fact that Chagnon's own data show that *unokais* as a group are substantially older than non-*unokais*. Despite his claims that *unokais* and non-*unokais* are of comparable ages, mathematics show that they are not. From carefully examining Chagnon's own published data, it can be determined that 55% of the *unokais* are over 41 years of age, whereas 56% of the non-

[1] <http://naturalbornnonkillers.blogspot.com>.

unokais are younger than age 31. I calculate, again using Chagnon's own published data, that the age differences between these two groups of men is at least 10.4 years. Older Yanomamö men have more offspring than younger Yanomamö men, whether or not they are *unokais*. Chagnon's published data show this clearly. What this means is that huge age differences between *unokais* and non-*unokais* throw the whole finding that 'killers have more kids' into serious doubt, because older men have more kids than younger men.

On April 1, 2008, Napoleon Chagnon posted:

...I carefully read the lengthy endnote in Fry's 2006 publication at about the time it appeared and concluded that with some shaky but creative assumptions about my age estimates for the Yanomamö males in my study—both *unokai* and non-*unokai*—one could try to make the case Fry just posted today on the Ev-Psych list.

...I have never published data that would enable someone to determine who specifically was a 'killer,' his name, his village, his age, how many wives he had, and how many offspring. In short, the data needed to make the criticisms that Fry makes can not be gleaned from my published data.

On April 2, 2008, Douglas P. Fry posted:

...Either the math is correct or not. I have explained in detail what I am doing at every step, cite the sources of Chagnon's data I am using, present explicitly what assumptions I am making and why, and present all the calculations in black and white. Even more details are in the book, such as how the demographic data published in one of Chagnon's 1979 sources provide the Yanomamö population age pyramid for use in my calculations.

...If Napoleon Chagnon thinks that my calculation of age interval averages is wrong, well let's not forget the obvious. He is the guy that holds the individual age data for each man in this own sample. All Chagnon has to do is to tell us readers the actual age averages for the *unokais* and non-*unokais*. He collected this data, so if he thinks my estimates are "shaky," then let's hear what the actual age figures are. We will then see how accurate my estimate is of at least 10.4 years in age difference between the *unokais* and non-*unokais*. At the same time we will also see if Chagnon is correct in his assertions that the *unokais* and non-*unokais* are of comparable ages. We both can't be right. Instead of taking pot-shots at my estimates, why not come up with the actual figures? We will then have actual numbers regarding the age differences between *unokais* and non-*unokais* for the first time.

On April 3, 2008, Napoleon Chagnon posted:

...A. Fry's method for re-calculating ages from my data assumes that ages are relatively evenly distributed within each of my four age groupings. This is probably not true. The Yanomamö are illiterate and have no idea of their ages in years and I have to estimate their ages by "on-site inspection"—looking them over in person (and taking a photograph of them). Estimating ages is easier for the youngest people but difficult for adults. Consequently when I first census a village many people are estimated to be 20, 30, 40; a few are estimated be 25, 35, 45, etc. and none are estimated to be 22, 29, 33, etc. Also, some age estimates of individuals might be off more than others—I might estimate someone to be 25 when he might be in fact be 33—if that could be known.

...B. I have not claimed that *unokais* and non-*unokais* are of comparable ages in general: I put them into four different age groups and said that men within each of these groups were of comparable age. It is unlikely that there are 'huge' age differences within these categories.

On April 3, 2008, Douglas P. Fry posted:

...Chagnon has never published the actual average ages for the *unokais* (n =137) and the non-*unokais* (n=243), but he has claimed repeatedly that the *unokais* and non-*unokais* he compares are the same age (e.g., Chagnon, 1990: 95; Chagnon, 1992a: 205; Chagnon 1992b: 239-240; see Fry 2006: 289, note 11.) Mathematically, the *unokais* and the non-*unokais* cannot be the same age when they have these extremely different age distributions. Chagnon's four age categories does not adequately control for age distributions that are really different from each other. In my previous posting, I invited Napoleon Chagnon to share with us the actual average ages for the 137 *unokais* and the 243 non-*unokais*. Presenting the means and standard deviations for these two groups would help to clarify the situation. (By the way, sharing the mean ages for these two groups of men does not compromise confidentiality, an important ethical concern previously mentioned by Chagnon, but not applicable to the publication of aggregate statistics such as means and standard deviations for groups of men.)

On April 4, 2008, Douglas P. Fry posted:

...I hope that Dr. Chagnon will be forthcoming with the actual mean ages and standard deviations for the 137 *unokais* and the 243 non-*unokais* in his sample.

On April 5, 2008, Napoleon Chagnon posted

[Fry's] somewhat glowing accounts of ethnographies on various hunters/gatherers that show how they reportedly manage to constrain and restrain violence is supplemented with lessons from animal species which do the same. He ends with the hopeful suggestion that "This type of data presents us with a very different evolutionary model of aggression than does the *unokais* model that focuses on killing as a path to reproductive success." I get the feeling that my 1988 *Science* article MUST be repudiated in cultural anthropology lest it remain a viable 'model' of aggression, which I did not suggest it was, but a possibility that seems to bother Fry.

Unfortunately, this is my last post on this topic. I'm trying to finish a book and I don't have time to re-explain basic Yanomamö ethnography—nor is this the forum in which to do it. I also do not want to be confused with, as Mark Hubey put it in one of in his posting on 4/3, those anthropologists who '....prefer doing fourth grade arithmetic and fighting for decades over a problem that can be solved by undergrads.'

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Nonkilling Psychology

Edited by
Daniel J. Christie
and Joám Evans Pim

Center *for* Global **Nonkilling**

2012

First Edition: February 2012

ISBN-13 978-0-9822983-8-1
ISBN-10 0-9822983-8-2

Cataloging in Publication Data (CIP)

Nonkilling Psychology / Edited by Daniel J. Christie and Joám Evans Pim.
ISBN 978-0-9822983-8-1
1. Nonkilling 2. Peace. 3. Pacifism – Nonviolence.
I. Title. II. Christie, Daniel J., ed. III. Evans Pim, Joám, ed.

CDU - 172.4 : 327.36

A catalogue record is also available from the Library of Congress.

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"Since wars begin in the minds of men, it is in the minds of men that we have to erect the ramparts of peace."

(Preamble of the UNESCO constitution, 1945)