CHAPTER 15

GOSSIP, REPUTATION, AND FRIENDSHIP IN WITHIN-GROUP COMPETITION

An Evolutionary Perspective

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INTRODUCTION

MEN and boys are substantially more aggressive than girls and women, according to early findings by aggression researchers. When developmental and social psychologists began to study nonphysical forms of aggression, however (e.g., those that did not involve hitting, pushing, or yelling), they discovered a very different pattern. These harmful nonphysical forms of aggression, such as gossip, ostracism, breaking confidences, and criticism (Owens, Shute, & Slee, 2000a, b), appeared to be more often used by females than males, at least in children and adolescents (e.g., Bjorkqvist & Niemela, 1992; Galen & Underwood, 1997; Lagerspetz, Bjorkqvist, & Peltonen, 1998.) In this chapter we review theories of human nonphysical aggression, where gossip and reputation play central roles. We then address aggression among non-human primates, where between-group physical defense of territories and within-group physical competition for resources like food and mates are key. Under certain social and ecological conditions, resource competition involves within-group coalitions and alliances. Whereas human between-group competition over territory mainly involves physical aggression among coalitions of men, we propose that within-group competition over material and social resources mainly involves nonphysical aggression among both men and women, sometimes in coalitions (cliques). Because access to resources often depends on having a good reputation, within-group aggression frequently utilizes gossip to harm the reputations of competitors. We propose that human friendships are analogous (and probably homologous) to within-group alliances in non-human primates, and similarly serve to increase successful competition for within-group resources by enhancing the effectiveness of gossip and reputational attacks, a strategy we term informational warfare. We conclude by offering testable hypotheses for this model.

THREE TERMS FOR NON-PHYSICAL AGGRESSION: INDIRECT, RELATIONAL, AND SOCIAL AGGRESSION

Over the past few decades, developmental and social psychologists and other researchers have developed three theoretical constructs to characterize the suite of behaviors and psychological phenomena that are aggressive—that is, executed in order to harm another—but that do not involve the use of physical force, such as hitting or the use of weapons, to inflict bodily damage. These constructs include *indirect aggression*, *relational aggression*, and *social aggression*.

Indirect aggression, coined by Feshbach (1969), was adopted and elaborated by researchers in the late 1980s who sought to compare overt physical aggression, typical of boys, to forms of aggression that seemed to be more apparent in girls. The distinction between physical aggression and indirect aggression was confirmed by factor analysis. Items loading on the indirect aggression factor described various types of social manipulation in which aggressors would harm victims by, for example, lying about them behind their backs, calling them names, or attempting to exclude them from friendship groups (Lagerspetz, Bjorkqvist, & Peltonen, 1988). These researchers emphasized that the indirectness or covertness of the aggression is aimed at separating the perpetrator from the aggressive act, where the aggressor does not want the victim to know the aggressor's identity, perhaps with the intent of avoiding retaliation (Bjorkqvist, Lagerspetz, & Kaukianian, 1992; Lagerspetz, Bjorkqvist, & Peltonen, 1988; Bjorkqvist, 2001).

Relational aggression, introduced by Crick and colleagues in the 1990's, includes behaviors whose intent is to damage a peer's relationships and standing within the social group. As in indirect aggression, these behaviors could be covert, but they also include direct confrontations. Other examples of relational aggression include ostracism and ending a friendship. In their review, Voulgaridou & Kokkinos (2015) summarize relational aggression (p. 2):

> Relational aggression . . . includes behaviors that damage or threaten to harm relationships, acceptance and inclusion through manipulation of peer relationships (Crick, 1996; Crick, Ostrov, & Kawabata, 2007). Relationally aggressive behavior primarily involves the direct manipulation of peer relationships and does not include negative facial expressions or gestures (Crick and Grotpeter, 1995). These

> behaviors may be confrontational (e.g., excluding a peer from the social group) or non-confrontational (e.g., character denigration) and may or may not involve members of the social community. (Archer & Coyne, 2005)

Social aggression is a broad construct for nonphysical aggression that includes all the phenomena that fall under indirect aggression and relational aggression, such as the manipulation of group acceptance through alienation, ostracism, character defamation, and rejection. It also includes phenomena that are nonverbal, like negative facial expressions and gestures, which were explicitly excluded from relational aggression (Crick & Grotpeter, 1995), as well as direct social confrontations that would be excluded from indirect aggression (Cairns et al., 1989; Galen & Underwood, 1997; for reviews, see Heilbron & Prinstein, 2008; Card et al., 2008; Voulgaridou & Kokkinos, 2015).

THREE TERMS, ONE PHENOMENON?

Reviews of the literature on indirect, relational, and social aggression (e.g., Archer, 2004; Card et al., 2008; Heilbron and Prinstein, 2008; and Voulgaridou and Kokkinos, 2015) concur that the three constructs overlap to a considerable degree, and that there is no consensus about which term should be used.

In his meta-analysis, Archer (2004) prefers the term *indirect aggression* to describe nonphysical aggression among humans, as historically it was the first construct that was explored. Card et al. (2008) argued that indirect aggression excludes nonphysical aggression: “The term *indirect aggression* is also limited in that it excludes more direct attacks on social well-being.” (p. 1186). But like Archer (2004), Card et al. (2008) felt that historical precedence should be honored. In their 2008 meta-analysis on direct and indirect aggression, Card et al. use indirect aggression to include indirect aggression, relational aggression, social aggression, and covert aggression; direct aggression includes physical aggression and direct, overt, verbally aggressive behaviors like yelling, taunting, and threatening. Factor analysis studies cited by Card et al. support these categorizations (Card, 2008, p. 1186).

Heilbron and Prinstein’s, 2008 review, which summarizes research on the development these nonphysical forms of aggression, favors the term *social aggression*, arguing that it is most all-encompassing of the behaviors that make up nonphysical aggression. Bjorkqvist (2001), however, pointed out that the term *social aggression* includes physical aggression, as any physically aggressive act involves at least two actors: a perpetrator and a victim.

In their recent review of relational aggression in adolescents, Voulgaridou and Kokkinos (2015) prefer the term *relational aggression* because it describes nonphysical forms of aggression that include behaviors and phenomena where the act is direct and where the victim can easily identify the perpetrator, like verbal confrontations, which would seem to be excluded by the indirect aggression construct.

Disagreements about precedent versus accuracy versus generality still exist. As all constructs intend to exclude physical aggression, these forms of aggression could also be described as nonphysical aggression. Here, we use these terms interchangeably to refer to all forms of nonphysical aggression.

Major Findings about Nonphysical Aggression

We will now review the most important findings about nonphysical aggression with the aim of linking them to the ongoing debate about gossip.

The Lack of an Important Sex Difference

In his meta-analysis of 124 studies of physical aggression, Archer (2004) found a very consistent, large male bias across cultures, a bias that appears at or before the age of 2, and that does not increase with age during childhood. He also found that the maximum sex differences in physical aggression occur well after puberty, between 18 and 30 years of age.

In his meta-analysis of sixty-one studies of nonphysical aggression, Archer (2004) found that a female bias increased with age from 6 to 17 years, reaching a peak between 11 and 17 years. He found little evidence of a sex bias in indirect among adults, however, and in the few cross-cultural studies of indirect aggression, there was either no sex bias, or a female bias. Archer also found that there were no sex differences in the experience of anger.

Card et al. (2008) conducted another meta-analysis of nonphysical aggression to clarify whether sex differences in aggression types were present, to see if physical and indirect were correlated, and to see what types of maladjustment were associated with each type of aggression (discussed under the next two subheadings). This meta-analysis included more studies than were available to Archer, focused on children and adolescents, included studies involving a wider range of aggression measurement methods, and used different statistical methods. They also explored variables that might be related to sex differences, but for which there were not necessarily any clear directional predictions, such as social norms, first author gender, the proportion of ethnic minorities included in the studies, and so on.

With regard to sex differences, Card et al.'s analysis corroborated Archer's (2004) conclusion: boys clearly use physical aggression more than girls, and girls use slightly more indirect aggression than boys, with the female bias in indirect aggression being statistically significant but trivial in effect size. The slight female bias was consistent across age, ethnicity, and country in which the data were collected. The authors conclude, "indirect aggression is *not* a 'female form' of aggression." (2008, p. 1209, emphasis in the original)

Nonphysical and Physical Aggression Are Strongly Correlated in Both Sexes

Card, et al. (2008) found that across ninety-eight studies, the average corrected correlation between the two aggression types was 0.76, meaning that about half (58%) of the variance in these two forms overlaps. The authors argue that the constructs are separate despite this considerable overlap. They also point out that accurately measuring indirectly aggressive behaviors is inherently more challenging because covert actions are more difficult to observe. Interestingly, the Card et al. also report a somewhat greater overlap for boys than girls.

No Strong or Consistent Association between Nonphysical Aggression and Maladjustment

High levels of physical aggression in childhood are associated with adult maladjustment, that is, with a high risk of being violent in adolescence and adulthood as well as a higher risk of substance abuse, accidents, depression, and suicide attempts; these associations are particularly clear for boys (Tremblay et al., 2004; Broidy et al., 2003).

Influential early studies of nonphysical aggression paralleled studies of physical aggression by investigating potential links between childhood nonphysical aggression and poor social and mental health outcomes in adolescence and adulthood; these studies are particularly associated with the term *relational aggression* (e.g., Crick and Grotpeter, 1995). Unlike physical aggression, however, nonphysical aggression in childhood is not consistently associated with poor outcomes at any age for either sex, probably because successful nonphysical aggression against one person requires good social relationships with other people (Card et al., 2008).

EVOLUTIONARY APPROACHES TO HUMAN PHYSICAL AGGRESSION AND DOMINANCE

Evolutionary theorists of human physical aggression unanimously view it as an evolved strategy to successfully compete for the social and material resources that increased biological fitness in our human and nonhuman ancestors (e.g., Archer, 2009; Burbank, 1987;

Buss and Shackelford, 1997; Campbell, 1999; Chagnon, 1988; Hawley, 1999; Manson and Wrangham, 1991, Sell et al., 2009; Van Vugt, 2009; Wilson and Daly, 1985; Wrangham and Glowacki, 2012; Wrangham and Peterson, 1996). They are also unanimous that it is physical injury, or the threat of it, that serves to deter or eliminate competitors.

High upper body strength appears to afford an advantage in physical fights (Sell et al., 2009). Most adult men have higher upper body strength than most adult women (Pheasant, 1983), and there is a large male bias in physical aggression that is present by about age 2 and persists throughout the lifespan, with male violence peaking during early adulthood (Archer, 2009). Evolutionary scholars largely agree that intrasexual selection resulted in the male-bias in physical formidability and physical aggression: due to their lower investment in offspring, males, more than females, benefit reproductively by competing with members of the same sex for access to members of the opposite sex (Trivers, 1972). In most mammals, including humans, this involves physical aggression directed toward male competitors. Males might also benefit by physically intimidating or coercing females (for review, see Archer, 2009).

Females, in contrast, due to their higher investment in offspring (e.g., pregnancy, lactation) are expected to compete with other females over access to resources. Unlike males in most other primate species, human males do provide resources to females. Hence, females might compete for access to males that are able to provide resources. Across cultures, physical fights among adult women are often over the means of subsistence (e.g., gardens, crops, money), and co-wives and other sexual competitors, as well as physical defense of their offspring (Burbank, 1987; Campbell, 1999).

The costs of physical fights (i.e., injuries) can be high for both winners and losers. Dominance hierarchies are thought to have evolved for the mutual benefit of avoiding the costs of a fight: when two animals are in competition over a resource, the one with higher rank in the hierarchy almost always obtains the resource without a fight (Maynard Smith & Parker, 1976; Drews, 1993). Dominance rank is often based on an individual's reputation for fighting ability, and it can also be inherited (e.g., Holekamp & Smale, 1991). In social species[1] that physically compete for material resources (e.g., food) and social resources (e.g., mates), dominance hierarchies are common (Schjelderup-Ebbe, 1922; Bernstein, 1981; Silk, 2007a,b).

In many primate species, dominance hierarchies are solidified, or challenged, via alliances with other group members (Harcourt & de Waal, 1992). For example, to maintain her rank, an alpha female might need to cooperate with a lower-ranking female in an alliance against the alpha's challengers. Thus, in species with complex social relationships, dominance hierarchies might involve intricate combinations of conflict and cooperation.

There is increasing evidence that humans, like many other social species, form dominance hierarchies, and that these are based on intricate combinations of agonism and prosociality (e.g., Hawley, 1999, 7). If so, this implies that human evolution was also characterized by potentially costly contests over material and social resources among within-group alliances, which in humans are termed "cliques." We return to this theme later.

Evolutionary Approaches to Nonphysical Aggression

Evolutionary theorists focusing on nonphysical aggression agree that it, too, is likely an evolved strategy to successfully compete for resources. (e.g., Campbell, 1999; Archer, 2009; Ingram, 2014; Hess, 1999, 2006, 2017; Hess and Hagen, 2002, 2003, 2006a,b; Hawley, 1999; Hawley, Little, and Card, 2008; Geary, 1998; and Buss and Dedden, 1990). These theorists have offered different accounts of why nonphysical aggression evolved as an alternative to physical aggression, and how, exactly, nonphysical aggression inflicts harm on competitors. Sex differences emerge as an important component in many of these accounts because there is a large sex difference in physical aggression (Archer, 2009) and early studies seemed to indicate that nonphysical aggression was more common in females than males (a view that is now known to be incorrect).

Campbell (1999) argued that indirect aggression evolved as an alternative to physical aggression because maternal care is more important to infant survival than paternal care is. Mothers with young children cannot risk the bodily harm that is associated with physical aggression, and engage in nonphysical aggression as a safer alternative. Further, indirectly aggressive strategies like gossip can separate the attacker from the victim, decreasing the likelihood of retaliation, and reducing the risk of physical harm, and idea endorsed by Archer (2004, 2009) and Ingram (2014), among others. (Presumably, males would also benefit from the reduced risk of physical harm afforded by indirect aggression.)

Geary (1998) and Buss & Dedden (1990) put forward theories to explain how indirect aggression harms competitors. Geary (1998, p. 250) argued that indirect aggression harms adversaries by "disrupt[ing]" the reciprocal relationships of unrelated female competitors, thereby inducing stress in female competitors. Disrupted relationships and stress indeed reduce fertility in other primates (Abbott, 1993; Smuts & Nicolson, 1989; cited in Geary, 1998). Geary suggested this might be a form of reproductive competition (1998, pp. 137–138,) where sex differences in hormonal responses to stress make indirect aggression an effective weapon against female reproductive competitors.

Buss & Dedden (1990, p. 398) suggested that, for example, using derogatory terms, makes "intrasexual competitors less attractive or appealing to members of the opposite sex," and explored sex differences in the content of the information. Schmitt & Buss (1996) further investigated the perceived effectiveness of these tactics in short-term and long-term mating competition.

Ingram (2014) argued that chimpanzee-like dominance hierarchies could not effectively regulate access to resources in the larger groups that characterize human societies. Instead, systems of indirect reciprocity (Alexander, 1987), in which a group member's cooperative and non-cooperative acts positively and negatively influence others' propensities to cooperate with her, leading to extended dominance hierarchies mediated by gossip and other nonphysical forms of aggression rather than physical aggression (Ingram, 2014).

Critique of Current Evolutionary Approaches to Nonphysical Aggression

Although each of these evolutionary theories offers important insights into indirect aggression and its relationship to physical aggression, each can be questioned on evolutionary grounds. Regarding Campbell and Archer's early arguments that sex differences in the costs of physical aggression explain the evolution of indirect aggression, we now know that males use indirect aggression as frequently as females. Thus, sex differences in the costs of physical fights might explain women's avoidance of physical aggression, but do not clearly explain the evolution of indirect aggression. Moreover, non-human female mammals all face the same high costs that human mothers face, and yet they still often engage in physical aggression, and consequently form female dominance hierarchies that help reduce the costs of physical fighting (Chapais & Schulman, 1980).

With regard to female physical aggression, it is important to distinguish intra- from inter-sexual conflict. Most anthropoid primate species, including humans, are sexually dimorphic, with a male advantage in body and canine size (Plavcan, 2001; Plavcan, 2012). Although human body dimorphism is modest—men weigh about 15% more than women—human upper body strength is highly sexually dimorphic, and in over 90% of chance encounters between an adult man and woman, the man would have higher upper body strength (Pheasant, 1983). Hence, in most anthropoid species, including humans, males would have the advantage over females in intersexual physical conflicts, which would select for female avoidance of physical conflicts with males.

Sexual body dimorphism says little, however, about the nature of *intra*sexual conflict. Females in many primate species have formidable canines, and it is increasingly recognized that there are many selection pressures on both male and female body sizes and fighting abilities. These can include male-male physical contests over mates and female-female physical contests over resources, but can also include, for example, benefits of higher or lower reproductive rates that select for smaller and larger female body size, respectively (Plavcan, 2001; Plavcan, 2012).

In summary, in species in which males have clear advantages in physical formidability over females, such as humans, females should avoid physical conflicts with males, but should not necessarily avoid physical conflicts with other females. In fact, physical fights among girls and women are not unknown, and when they do occur, fights are often over the means of subsistence and access to male resources (Burbank, 1987; Campbell, 1999). Campbell, Archer, and others have failed to explain why in human females the costs of female-female physical contests generally outweigh the benefits, but in other species the benefits often outweigh the costs.

Regarding the "indirectness" of indirect aggression, it is not clear how indirect it actually is, and the extent to which its putative indirectness protects attackers from retaliation. After all, retaliation could occur at a later time, which would be difficult for researchers to detect. A physically strong male victim of indirect aggression could inflict serious physical harm on his antagonist should he discover his or her identity (and in the small hunter-gatherer bands in which we evolved, would identifying the perpetrator be that difficult?). The putative ability of indirect aggression to avoid retaliation requires more investigation.

Regarding the ways in which nonphysical aggression inflicts harm, Geary's (1998) hypothesis that stress-induced endocrine disruption suppresses fertility provides a possible proximate mechanism by which indirect aggression could harm competitors. It does not provide an ultimate evolutionary explanation, however, because victims should have evolved endocrine systems that resisted disruption by verbal threats and harassment that did not actually reduce access to resources or cause injury. Why do victims remain vulnerable to stress-induced fertility reduction?

Buss & Dedden (1990) astutely pointed out that derogation of competitors might make them less attractive as mates (thus increasing one's own access to mates). But here, too, it is not clear why potential mates should avoid an individual simply because he or she was derogated by a competitor. If the derogations were baseless, the potential mates would erroneously pass up valuable mating opportunities, and should therefore have evolved to ignore derogations by competitors.

In our view, although there is widespread agreement that physical and nonphysical aggression are evolved strategies to gain access to contested material and social resources, several outstanding questions remain, including, (1) Why is physical aggression among women exceptionally infrequent? (2) Why did nonphysical forms of aggression evolve that are commonly used by both sexes? (3) Over human evolution, how did nonphysical forms of aggression harm competitors?

Drawing on the work of many others, we now sketch our evolutionary account of the evolution of physical and non-physical aggression in humans (Hess, 2006, 2017; Hess & Hagen, 2003, 2006a) that explains the rarity of physical aggression among women, the widespread use of non-physical forms of aggression by both sexes, and how the latter harms competitors.

THE EVOLUTION OF AGGRESSION OVER RESOURCES IN HUMANS AND OTHER SPECIES

Physical and nonphysical aggression appear to be human universals (Archer, 2004; Card et al., 2008). We therefore sketch one scenario by which both forms of aggression could have evolved, drawing heavily on comparisons with our primate relatives and also with social carnivores, which probably occupied an ecological niche similar to our hunter-gatherer ancestors (e.g., Stiner, 2002; Smith et al., 2012).

Humans are one of about 400 primate species, which diverged from other mammals about 65 million years ago (MYA; Fleagle, 2013). Whereas most mammals are solitary as adults, most primates are gregarious, that is, they live permanently as members of social groups.

The human lineage split from that of our closest relative, the chimpanzee, sometime between 6 and 13 MYA (Langergraber et al., 2012). Until about 2 MYA, this lineage comprised species that were bipedal but had ape-sized brains and appear to have subsisted mostly on plant foods. The first notable increase in brain size occurred with the appearance of the genus *Homo* some 2–2.5 MYA, around the beginning of the Pleistocene (Antón et al., 2014). Although there is little agreement about the social organization and diet of early members of our genus, most anthropologists would agree that they probably lived in multi-female multi-male groups and that meat was a valuable and increasingly important component of the diet (e.g., Antón et al., 2014).

The role of aggression in human evolution is particularly contentious. Our theory relies heavily on distinguishing between-group aggression, which we discuss first, from within-group aggression, which we discuss second.

Between-Group Competition for Territory

Most primate species are social. Many such species are territorial and vigorously defend their territories with physical aggression toward outsiders, but many others do not. Territorial defense among non-human primates (and other social animals) could be an analogy for human warfare (Crofoot & Wrangham, 2010).

Some anthropologists have argued that *lethal* competition between groups—warfare—was important throughout human evolution, basing their case on similar patterns of behavior in one of our sister species, the chimpanzee, on pervasive evidence of warfare in almost all modern human societies, and on clear evidence of warfare in the archaeological record of the last 10,000 years (e.g., Wrangham, 1999; Bowles, 2009).

Others vehemently deny any role for warfare in human evolution, basing their case on the putative rarity of warfare among contemporary band-level foragers, absence of archaeological evidence for warfare prior to about 10,000 years ago, on the apparent lack of warfare among our other sister species, the bonobo, and the rarity of lethal between-group conflict in other animals (Ferguson, 1997; Fry & Söderberg, 2013). For a recent overview of the ethnographic and archaeological evidence for warfare among hunter-gatherers, see Allen & Jones (2014). For a comparative analysis of lethal violence (not necessarily warfare) in humans and human ancestors relative to other primates and mammals, see Gómez et al. (2016).

We take a middle ground. There are solid theoretical and empirical grounds to suppose that human ancestors were territorial and were physically agonistic toward intruders, but physical defense of territories might or might not have involved lethal attacks.

According to some researchers, between-group agonism among non-human primates appears to depend on the presence or absence of collective action problems. Although territory is a valuable resource, defending it with physical aggression can be costly due to the risk of injury and death. If some members of a group pay the price of territorial defense but others do not, natural selection will favor the latter, and cooperative defense cannot evolve. In primates, the species that exhibit high levels of between-group agonism are those that appear to have solved the collective action problem by some combination of high degrees of relatedness among the dominant sex, small group size, and cooperative breeding, which all tend to align the interests of group members relative to outsiders (Willems & van Schaik, 2015). Modern humans often live in relatively small social groups with male philopatry and cooperative breeding, and according to this model should therefore aggressively defend territories (Willems & van Schaik, 2015), which they do (Dyson & Smith, 1978).

If meat were an increasingly important part of the diet in Homo, as it appears it was, then early humans could also be compared to social carnivores like lions, hyenas, African wild dogs, and wolves. These species also vigorously defend territories (for brief review, see Hagen & Hammerstein, 2009).

Thus, as both philopatric, cooperatively breeding primates, and as social hunters, human ancestors were probably territorial and defended their territories with coalitional physical aggression toward outsiders. This does not necessarily mean that human evolution involved much, or any, warfare. Lethal between-group aggression is rare even in territorial primates (Crofoot & Wrangham, 2010), and in social carnivores, although lethal inter-group aggression is common in wolves, it is rare in lions (Hagen & Hammerstein, 2009). In addition, human groups commonly *cooperate* with other groups, often forming alliances by marriage that play important roles in defense of large regions (Rodseth et al., 1991).

Thus, in our model, the male bias in physical aggression is explained, at least in part, by an evolutionary history during which closely related male human ancestors (but not female ancestors) collectively defended hunting territories with physically agonistic behaviors toward outsiders; these behaviors might or might not have involved lethal aggression (warfare).

Women, we propose, mostly avoided direct participation in territorial defense because it would have brought them into physical fights with men, whose advantages in upper body strength would have posed severe threats to female fitness. Similar views about the evolutionary importance of human male intergroup aggression have been expressed by many others, including Tooby & Cosmides (1998), Sell et al. (2009), Wrangham & Glowacki, 2012, and Bowles (2009). Male-biased agonism between groups does not, however, explain why women rarely physically fight other women within groups.

The Impact of Within-group Resource Competition on Social Behaviors in Non-human Primates

In the 1970s, biologists realized that social living would generally decrease biological fitness because it increased competition for resources and exposure to parasites (e.g., Alexander, 1974). Thus, gregariousness must have some valuable fitness benefit that compensated for these fitness costs. For primates, this benefit is thought to be either improved defense against predators (van Schaik, 1983) and/or a competitive advantage in competition over defensible resources (Wrangham, 1980).

Despite the benefits of group living, such as better protection from predators, within-group competition for resources still has a profound impact on primate social relationships. Primate social relationships can vary widely among different species, and even among the same species living in different ecologies. According to the *socioecological models* of primate sociality, the distribution and value of food resources plays a central role in determining the intensity of within-group competition, and thus patterns of social relationships.

Frugivores Have Complex Social Relationships that Provide Advantages in Within-group Competition over Food

When resources are scarce, valuable, and clumped, and thus *monopolizable*, primates will compete aggressively or *contest* over them. These patterns characterize frugivores—primate species that rely mostly on fruit, which is a nutrient-rich food that is patchily distributed, and which is also only seasonably available. In frugivores and other primate species that rely on valuable, clumped food resources, within-group aggression is higher, and aggression tends to involve more complex aggressive strategies than just one-on-one physical fighting over monopolizable foods. Dominance is one such strategy.

Alliances and coalitions are also more common when food is monopolizable, because coalitions increase physical formidability in fights (e.g., Barrett and Henzi, 2002; Boinski, Sughrue, Selvaggi, Quatrone, Henry, & Cropp, 2002; Harcourt & de Waal, 1992; Isbell & Young, 2002; Kappeler & van Schaik, 2002; Koenig, 2002; Silk, 2002; Sterck, Watts, & van Schaik, 1997; Wrangham, 1980; cf. Janson, 2000). The term *coalition* refers to a temporary group of two or more individuals that forms to attack one or more individuals (Pandit & van Schaik, 2003). The term *alliance* refers to long-lasting relationships. Social relationships among frugivorous primates are characterized by dominance hierarchies, coalitions, and alliances.

Folivores Have Simpler Social Relationships Reflecting Reduced Within-group Competition over Food

When resources are abundant, not valuable, and dispersed, on the other hand, and thus not monopolizable, primates will not engage in aggressive competition for them. These patterns characterize folivores—primate species that rely mostly on leaves, which are low in nutrients, high in toxins, abundant, and relatively evenly distributed. The benefits of winning physically competitive bouts over such resources are small. Relationships of dominance and subordinance are less apparent, aggression and displacement are lower, and aggression is less likely to involve complex strategies such as dominance hierarchies, coalitions, and alliances. When resources are nonmonopolizable, instead of engaging in high-stakes contest competition, primates engage in low-stakes *scramble* competition.

Socioecological models also include factors other than food monopolizability versus nonmonopolizability, such as protection from infanticide and the defense and acquisition of mates by males (van Schaik, Pandit, & Vogel, 2006).

Important Caveats

The tight causal links between food distribution, feeding competition, and social structure posited by the socioecological model are increasingly challenged by studies of species that do not conform to key predictions. Some primate species inhabiting similar feeding ecologies exhibit marked differences in social structure, for instance, whereas some species with similar social structures inhabit markedly different feeding ecologies (Clutton-Brock & Janson, 2012; Silk & Kappler, 2017). It is not yet clear whether these and other discrepancies will require only modest modifications to the theory, or abandonment of it altogether. Explanations for the discrepancies include the possibility that the feeding ecology of some species has been misclassified, or that some species entering a new feeding niche have not yet evolved the corresponding social structure (phylogenetic inertia).

According to one critical review (Clutton-Brock & Janson, 2012), certain tenets of the socioecological model are fairly well established in primates and other mammals.

Food value and distribution, for example, are related to the intensity of competition and group size. Social hierarchies and coalitions, on the other hand, might not always be related to feeding competition but instead to competition over other "resources," such as breeding opportunities. Inspired both by the socioecological model as well as this and other critiques, we therefore consider the role of competition over food and other resources in the evolution of human sociality.

Did Ancestral Humans Contest Valuable Monopolizable Resources?

Meat, like fruit, is a valuable but scarce and patchily distributed resource, and is thus monopolizable. Members of the genus *Homo* living during the late-middle Pleistocene and later clearly hunted large game animals, bringing kills to central processing sites like caves, where the meat was consumed by several individuals (Stiner, 2002; Stiner et al., 2009). If the principles of the socioecological model applied, then early humans, perhaps especially females, should have competed for meat with their fellow group members using aggression, alliances, coalitions, and dominance hierarchies that are associated with contest competition.

Among modern hunter-gatherers, an important part of the meat-sharing process involves distributions that are directed by the hunter and other individuals to kin, spouses, sex partners, and reciprocally sharing partners (for review, see Kaplan & Gurven, 2005). Although these distributions are regulated by rules whose function appears to be to reduce conflict, complaints over meat sharing abound (Peterson, 1993).

Items other than meat are shared in modern foragers and small-scale horticultural societies, and, importantly, these items are also scarce, valuable, and monopolizable. These items can include tools, weapons, medicines, scarce nutrients, status items, artifacts, and raw materials needed for manufacturing artifacts. Social resources like mates, hunting partners, and exchange partners can also be valuable, limited, and monopolizable. Tiger and Fox (1971) argued that in humans, social rank was equivalent, indeed homologous, to dominance hierarchies in our primate ancestors. They emphasize human male dominance hierarchies and access to females, similar to patterns seen among males in non-human primates. Because humans rely on monopolizable material and social resources, we should expect them to contest over access to them.

Evidence from the developmental literature supports the view that humans compete over both material and social resources. Hawley summarizes what children compete for (1999, p. 105; citations in the original omitted):

> In general, resources are anything outside the individual essential for survival, growth, and development … Although no one would deny that monkeys must compete for ecological resources in the environment (e.g., food, water), it is not

> clear that children in peer groups must . . . But developmentalists are quick to recognize that optimal growth and development require much more than nutrients and hydration; important resources include social contacts . . . , play partners . . . , and cognitive stimulation . . . Thus, it should come as no surprise that developing humans are highly motivated to seek out others for interaction opportunities (e.g., peers and adults) and novelty for cognitive and physical stimulation (e.g., toys). Research in diverse domains such as motivation . . . and children's friendships . . . indicates that children, indeed primates in general . . . , are highly motivated to access social partners and novel stimuli. To the extent that novelty and peers are limited, individuals must compete for them in various ways . . . Therefore . . . resources can be social or material.

There is an important difference, however, between human and nonhuman contest competition: Humans have language.

REPUTATION MEDIATES ACCESS TO RESOURCES

Humans often obtain contested group resources via their reputations; in other words, they increase and defend access to resources, including food, mates, and care, by increasing and defending their reputations. Although Tiger & Fox (1971) acknowledged the importance of prestige in the evolution of human social rank, it was Barkow (1975, 1989) who emphasized that in humans, within-group hierarchies were usually established by striving for prestige within particular culture settings, rather than by physically fighting. As in other species, human reputations *can* involve fighting ability (Alexander, 1987; Chagnon, 1988; Hess, Helfrecht, Hagen, Sell, & Hewlett, 2010), but they are usually based on a much broader range of behaviors and capabilities such as being able to provide valuable group benefits (Gurven, Allen-Arave, Hill, & Hurtado, 2000; Sugiyama & Chacon, 2000), being able to take risks and come out winning (the "show-off" or "costly-signaling" models: Gintis, Smith, & Bowles, 2001; Hawkes, 1991; Smith & Bliege Bird, 2000), being a good reciprocator of benefits received (i.e., reciprocal altruism: Cox, Sluckin, & Steele, 1999; Enquist & Leimar, 1993; Pollock & Dugatkin, 1992), and having been observed to give benefits to others (i.e., indirect reciprocity: Alexander, 1987; Leimar & Hammerstein, 2001; Nowak & Sigmund, 1998). Experimental economists, whose research involves study participants sharing real money with other participants or keeping it for themselves, have shown that a sharing strategy can persist in an evolving population when players establish reputations as donors (e.g., Milinski, Semmann, Bakker, & Krambeck, 2001; Milinski, Semmann, & Krambeck, 2002; Wedekind & Milinski, 2000).

This empirical and theoretical research demonstrates that individuals must have reputation for being able to provide valuable benefits to others in order to receive benefits from others. A reputation is based on information about one's traits, behaviors, intentions, abilities, and culturally-specific competencies, and this information can be obtained via direct observation, or from other individuals. Reputations can be strongly impacted by the transfer of information about these various behaviors and capabilities, in other words, gossip.

GOSSIP AS A STRATEGY TO MANIPULATE REPUTATION

Several theories have been put forward for the evolution of gossip, including "cultural learning" (e.g., Baumeister, Vohs, & Zhang, 2004), "social learning," such as learning norms or one's place in a group (e.g., Eckert, 1990; Fine, 1977; Fine & Rosnow, 1978; Gottman & Mettetal, 1986; Suls, 1977) or acquiring new and important knowledge (e.g., Watkins & Danzi, 1995), strategy learning (DeBacker, 2005), social comparison (e.g., Wert & Salovey, 2004), a mechanism for showing off one's social skill and connections, and therefore one's mate value (Miller, 2000), norm learning and enforcement, sanctioning, social control, or "policing" (e.g., Wilson, Wilczynski, Wells, & Weisner, 2000, Villatoro, Giardini, & Conte, 2011; Giardini & Conte, 2012), a means to maintain the good reputations of allies (e.g., Brenneis, 1984), and a means to maintain the unity, morals, and values of social groups (e.g., Gluckman, 1963). Dunbar (1996, 2004) proposed that gossip (and language more generally) evolved to facilitate social bonding and social cohesion in the very large groups that characterize human primates, but recent research by Grueter, Bissonnette, Isler, & van Schaik (2016) failed to find support for this hypothesis.

The importance of gossip for the evolution of human cooperation, especially via indirect reciprocity, has recently received considerable attention (e.g., Leimar & Hammerstein, 2001; Giardini & Vilone, 2016a, b; Wu, Baillet & van Lange, 2016a, b, c.). Gossip has been demonstrated to increase cooperation via indirect reciprocity in experimental economics games (e.g., Milinski, this volume; Sommerfeld et al., 2007), where reputational information impacts contributions to a shared pool of resources (e.g., Beersma & van Kleef, 2011), or where information about the past behaviors of cooperative partners impacts participants' inclinations to engage in future cooperation (e.g., Feinberg, Willer, & Schultz, 2014.) Recent research has also explored how varying the quantity and quality (i.e., noisiness) of gossip impacts cooperation in experimental economics games, such as the Public Goods Game (Giardini & Vilone, 2016a)

Despite numerous theories of the evolution of gossip, it is unclear how gossip differs from any other use of language (about gossip and language, see Mangardich and Fitneva, this volume). For reasons that are still obscure, human language evolved to permit one person to communicate detailed information about themselves and their environment, including their social and nonsocial environment, to another person. "Gossip" is the exchange of information about the doings of others. It is therefore probably fruitless to consider the evolution of gossip independently of the evolution of language. Indeed, Bloom (2004) opines, "[i]t is tempting to ask about the origins and functions of gossip, but this temptation should be resisted. From a psychological perspective, gossip is likely to be an arbitrary and unnatural category . . . it is a domain where the most interesting aspects of mental life are laid bare." We agree. Gossip, defined as the communication of information about others, is therefore *informative*, and not necessarily aggressive, competitive, cooperative, or pedagogical.

Nevertheless, we and many others have proposed that socially competitive strategies evolved that use gossip (language) as one tool. If one's reputation impacted his or her access to scarce, contested material and social resources in ancestral environments, as reputation does todays' small scale and large scale societies, selection should have favored psychological adaptations for the strategic manipulation of reputations in ways that benefitted oneself. Attack would involve transmitting negative information about the behaviors and traits of one's competitor(s) to resource providers, and withholding positive information about the behaviors and traits of competitors from resource providers. Strategies would also include transmitting positive information about oneself to resource providers (i.e., bragging), preventing the spread of negative information about oneself (e.g., punishing disseminators of such information), or challenging the veracity of negative information about oneself (e.g., providing alibis). In this process, the reputation of the attacker would improve relative to the reputation of the attacked, thereby increasing the attacker's access to contested group resources (Barkow, 1989, 1992; Buss & Dedden, 1990; Emler, 1990; Leimar & Hammerstein, 2001; McAndrew & Milenkovic, 2002; Paine,1967; Radin, 1927; Hess, 2006, 2017; Hess & Hagen, 2006a). On this view, one way that indirect aggression harms adversaries is by harming their reputations.

INDIRECT AGGRESSION IS BETTER THAN PHYSICAL AGGRESSION FOR WITHIN-GROUP COMPETITION

We argue that when it comes to *within-group* competition, indirect aggression is usually better than physical aggression. Members of one's local group provide valuable reproductive, kinship, political, economic, military, and other benefits to fellow group members. Within-group physical aggression involves injuring a fellow group member. Although this physical harm might increase the aggressor's access to a contested resource, it also reduces the victim's ability to provide benefits to other group members. Physical aggression within groups can also reduce the group's ability to compete with other groups. Within-group violence would therefore involve costs to the attacker well beyond the simple risk of injury associated with a physical attack. Knauft (1991) notes that in hunter-gatherers "interpersonal aggression and violence tend to be unrewarded if not actively devalued by men and women alike." Finally, winning a physical fight might gain a resource today, but unless it permanently alters dominance rank or seriously injures or kills the adversary, another fight with the same individual might be necessary to gain a resource tomorrow.

In contrast, gossip, whether it has a positive or negative impact on the reputation of the subject, can involve important information that fellow group members would want to know. Individuals *benefit* from knowing accurate information about other members of their community. Therefore, although many societies have norms against gossip, especially negative gossip, gossip should be discouraged less than physical aggression. Successful negative gossip against a competitor reduces the competitor's reputation, and thus access to material and social resources from potentially many group members and potentially for long periods of time, thus increasing the aggressor's access to resources, perhaps permanently.

Gossip and physical aggression also differ in the precision with which they can be used to strategically harm a competitor. Physically harming a competitor compromises the victim's ability to provide benefits to other community members in a sweeping manner. Injury or death damages or destroys a victim's ability to forage, to engage in intergroup conflict, to provide vital care to children or the ill, to accomplish multiple, valued tasks, and so on. Moreover, the relatives and allies of the victim might have to pay additional costs of caring for the victim while he or she heals. Gossip, in contrast, can be customized to benefit the attacker by strategically targeting a particular aspect of the victim's reputation. Negative gossip can target a competitor's reputation as a good mate, while sparing her reputation as a caretaker. Gossip can be used to decrease a competitor's access to specific contested resources, without preventing the competitor from providing resources to other community members; this makes gossip a good weapon for within-community competition.

Men do use physical aggression for within-group competition with other men, and to dominate and coerce women (Smuts, 1995). Pair bonding provides an additional possible explanation for women's avoidance of physical aggression: physical conflicts between women could draw in their husbands and other male relatives, who could use their advantages in physical formidability to either suppress female fighting, or to engage with each other in proxy fights. Nevertheless, a study that compared levels of physical violence in chimpanzees to that in humans found that whereas mortality from between-group violence was similar in the two species, humans had much lower levels of within-group physical aggression than chimpanzees (Wrangham et al., 2006).

According to our theory, then, there is little-to-no sex difference in nonphysical aggression because both men and women regularly compete with fellow group members for the good reputations that enhance access to the social and material resources that are important to both sexes (for an alternative view, see Davis, Vaillancourt, Arnocky, Doyer, this volume). Within groups, nonphysical aggression simply outperforms physical aggression much of the time.

Friendships, Cliques, and Informational Warfare: The Coalitional Manipulation of Reputations

Nonhuman primates form coalitions and alliances with other members of their groups to improve their ability to contest resources. Hess (2003, 2006, 2017) proposed that alliances, that is, friends and cliques, are valuable in human contests over monopolizable resources where the "weapon" could be physical aggression, a point emphasized by De Scioli & Kurzban (2009), but would more often be reputational manipulation via gossip. Cooperating individuals would be more powerful than individuals in using information to attack the reputations of their competitor(s) because of the improved abilities of coalitions to strategically collect, analyze, and disseminate reputation-relevant information. Allies provide more ears and eyes to collect negative information about competitors, more brains to analyze this information, and more mouths to disseminate it (see Hess, 2006 for a detailed discussion of "informational warfare theory"). In addition, information transmitted by multiple individuals may be more believable. For example, Hess & Hagen, 2006b ran a series of experiments and found that participants believe gossip more, not when it is simply reiterated, but when it is transmitted by multiple, independent sources without a clear conflict with the target of the gossip. Further, while coalitions might be able to better attack competitors' reputations with negative gossip, they would also be better able to defend coalition members' reputations by providing alibis, withholding negative gossip, and transmitting positive gossip about allies. Finally, coalitions might also be better able to deter negative gossip attacks by competitors against coalition members by threatening competitors with retaliatory negative gossip.

Based on the observation that "competing through competition" (i.e., competing coalitionally) is so widespread in primates, Chapais (1996, pp. 19–20) suggests that coalitional competition probably reflects a phylogenetically primitive process. Humans, Chapais argues, pool not just physical power but also goods, services, and information to enhance the acquisition and defense of resources. Along similar lines, Hess (1999, 2006, 2017) proposed that for humans, coalitional aggression relies not just on enhanced physical capabilities, but also informational capabilities, particularly those involving information relevant to reputation. Ostracizing others and disrupting their social relationships—key features of indirect aggression—harms competitors, in part, by depriving them of access to information and the allies that would help them make best use of it.

Concluding Remarks

Nonphysical forms of aggression prominently feature the use of negative gossip to harm the reputations of competitors. They are commonly used by both sexes and are associated with the use of physical aggression, but unlike physical aggression, do not appear to be linked with adult adjustment problems. Evolutionary theorists of aggression concur that nonphysical forms of aggression probably evolved to increase access to material and social resources in competition with others, but disagree on (1) why an alternative to physical aggression evolved, (2) the role, if any, of sex differences, and (3) how, exactly, nonphysical aggression harms competitors.

Using evolutionary principles and comparisons of humans with non-human primate relatives, we propose a strategic account of the aggressive use of gossip that emphasizes within-group competition: when access to contested group material and social resources depends on having a good reputation, individuals and cliques collect, analyze, and disseminate information to improve their own reputations relative to competitors. Over human evolution, gossip could have been used by either sex to compete in multiple domains such as increasing access to food, mates, and valuable social partners. Between-group competition for territory, in contrast, relied more heavily on physical aggression by men because men have a substantial advantage in upper body strength, and because men probably benefitted more from acquiring and defending territories.

Several testable hypotheses can be derived from this model. Is gossip used more than physical aggression in the context of within-group aggression, whereas physical aggression is used more than gossip in between-group competition? Do contestable, valuable resources lead to more negative gossip about a competitor? Do participants allocate resources based on reputation, giving more resources to those with better reputations and fewer resources to those with poorer reputations? Are individual differences in indirect/relational/social aggression better explained by differences in the experience of within-group competition than by sex? Do allies allow better collection, analysis, and dissemination of gossip in reputational contests? Future research may explore these and other hypotheses.

Note

1. Social species permanently reside in groups, in contrast to solitary species in which “groups” comprise brief dyads for mating, or mothers and infants only.

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