Informational warfare:

Coalitional gossiping as a strategy for within-group aggression

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Abstract

Evolutionary scholars often emphasize the strategic benefits of coalitions in male aggression and warfare. Theories of human female coalitions, however, have not recognized any competitive function for coalitional behavior, and instead emphasize mutual nurturing and help with childcare; this is despite the fact that a significant body of research has shown that relationships among nonhuman female primates do serve competitive functions. We argue that relationships among human females, like those among human males and among female nonhuman primates, in part serve competitive aggressive, functions.

Women and men often engage in indirect aggression (e.g., gossiping and ostracism). To date, studies have not considered the strategic benefits of forming coalitions for the purposes of indirect aggression. We outline a strategic approach to coalitional indirect aggression, which we term *information warfare*. We then present two studies that test various predictions derived from this approach. We find that friends increase perceived offensive capabilities for indirect aggression, i.e., the ability to inflict reputational harm on an adversary, and that friends also increase perceived defensive capabilities, i.e., deter negative gossip. We also test more general gossip-as-competition hypotheses. These result support the hypothesis that women's coalitions have a competitive function. Finally, this article describes a subject pool that is of potential interest to social science researchers who are in need of study participants: those of Amazon.com's online-accessible Mechanical Turk workforce.

Physical aggression and the evolution of coalitions

Evolutionary accounts of human coalitional relationships often emphasize the role of physical aggression among men in obtaining valued, limited resources (Chagnon, 1988; Kurzban, 2001; Tiger, 1969; Tooby and Cosmides, 1988; Wrangham and Peterson, 1996). When physical force determines access to important resources like food, territory, and mates, alliances and coalitions provide a distinct advantage to their members – larger groups will almost always outcompete smaller groups or individuals for the valued resource. Evolutionary theorists' emphasis on male coalitional aggression has also lead to an emphasis on between-group conflicts over mates and other determinants of male fitness in non-state societies, that is, *warre* (Chagnon, 1988; Hobbes, 1651).

Coalitional relationships in women, in contrast, are not viewed as having been shaped for aggressive competition for scarce resources. The 'tend and befriend' account of women's relationships, for example, emphasizes the evolutionary benefits of mutual nurturing, caregiving, and emotional support (Taylor, et al., 2000), and Smuts emphasizes female relationships providing protection from male aggression (Smuts, 1992, p. 13-14, Smuts and Smuts, 1993, especially p. 34-35).

These evolutionary theories of men's and women's cooperative relationships leave the impression that women's relationships serve benign or defensive functions but not competitive, offensive functions, which seems to be inconsistent with the well-established finding among nonhuman primates that both females and males often form alliances and coalitions to better physically compete for limited resources. In addition, much coalitional aggression by nonhuman primates of both sexes occurs *within* groups. This raises the possibility that within human groups, both sexes engage in coalitional

aggression. In humans, these coalitions would be referred to as factions or cliques, but for consistency with the primate literature we will continue to use the terms 'coalition' and 'alliance.'

Our paper proceeds in two parts, theoretical and empirical. First, we partially map theories of primate coalitions and dominance onto humans. We, like many others, conclude that human within-group competition often takes the form of competitive gossip. Further, drawing inspiration from the primate models, we argue that coalitions provide an advantage in the use of gossip to compete for a good reputation. Second, using social psychological methods, we test aspects of the coalitional theories as mapped onto humans. In particular, when competing with fellow group members using gossip, we test whether men and women take into account the presence or absence of their own allies and those of their competitors.

Primate socioecological models

Within and across primate species, female-female relationships within groups vary substantially. Female olive baboons regularly form alliances with other females to compete against fellow group members, for example, whereas female chacma baboons rarely, if ever, form alliances with other females (Barton, Byrne and Whiten, 1996). The *socioecological* model looks to ecology to explain this variance (e.g., van Schaik, 1989; Sterck, Watts, and van Schaik, 1997; Silk, 2002a,b; Isbell and Young, 2002; Wrangham, 1980).

Female primates often live in groups. Whatever the benefits of group living, it has the cost of increasing competition for resources among group members (Alexander, 1974;

van Schaik, 1983), and access to resources is the primary constraint on fitness in primate females (Trivers, 1972; Wrangham, 1980). Under the socioecological model, ecological conditions predict the degree to which females directly compete for resources within groups, which, in turn, predicts the nature of female relationships.

Contest competition

With regard to within-group competition only, resources that are valuable, clumped, and easily monopolized by one or more group members lead to strong within-group *contest* competition, involving intimidation and physical displacement of competitors. The overt, within-group agonistic interactions of contest competition, in turn, select for alliances, coalitions and dominance hierarchies.

Alliances and coalitions directly enhance physical competitiveness for contested resources. They also indirectly enhance access to contested resources by aiding an individual's ability to maintain or increase rank in the dominance hierarchy.

Dominance hierarchies (Schjelderup-Ebbe, 1922), found in a wide range of group-living primates and other taxa (Bernstein, 1981; Silk, 2007a,b), are characterized by a consistent outcome in agonistic relations (Drews, 1993); that is, when two animals contest a resource, the one with higher rank in the hierarchy almost always obtains the resource without a fight. Dominance hierarchies are thought to have evolved for the mutual benefit of avoiding the cost of a fight (Maynard Smith and Parker, 1976). In some cases, dominance rank is determined by observable qualities, such as age, sex, and body size. In others, however, it might be determined by the outcomes of previous interactions, in other words, by the animal equivalent of individual *reputation* (e.g., Drews, 1993). In

primate dominance hierarchies, maintaining or increasing rank often requires allies (Harcourt and de Waal, 1992, Chapais, 1996, Silk, 2007a). In a typical example, females will intervene on behalf of kin in a conflict against an unrelated, lower ranked female.

Frugivores, whose food resources are high-value, clumped, and therefore monopolizable, are a category of primate that tends to display these social patterns.

Scramble competition

In contrast, ecological conditions in which resources are low-value, dispersed, and abundant—and that therefore cannot be monopolized or need not be monopolized—select for within-group *scramble* competition. Displacement efforts and aggression rates are low (because one animal's access to food is not limited by the efforts of another), as are the benefits of dominance hierarchies and establishing and maintaining alliances and coalitions. Folivores, for example, tend toward scramble competition rather than contest competition because leaves are usually abundant and non-monopolizable.

Data from several primate taxa generally support these and other predictions about within-group female competition derived from the socioecological model (e.g., Barrett and Henzi 2002; Boinski, Sughrue, Selvaggi, Quatrone, Henry, and Cropp 2002; Isbell and Young 2002; Kappeler and van Schaik 2002; Koenig 2002; Silk 2002a; Sterck, Watts, and van Schaik, 1997; but see Janson 2000). (The model addresses many other relationships between ecological and social variables that we do not discuss here, such as between-group competition, predator avoidance, infanticide, kinship and philopatry; see, e.g., Isbell and Young 2002.)

Male coalitions

If females go where the food is, then males go where the females are (Silk, 2002a). Male primates, too, often form within-group alliances to directly increase access to the resource that primarily constrains their fitness, fertile females, or to indirectly increase access to females by maintaining or increasing rank (Pandit and van Schaik, 2003). The primary socioecological factor that seems to account for much variability in coalition formation among males is the extent to which a single, dominant male can monopolize mating access to group females. Complete monopolization by a single male tends to preclude coalition formation, as does complete lack of monopolization by any male, whereas intermediate access to females encourages diverse types of coalitions (Pandit and van Schaik 2003, van Schaik et al. 2004, van Schaik et al 2005). The term *socioecological model* is often used to refer to a group of closely related theories of female coalitions partially described above, but to simplify our discussion we refer to the models of both female and male within-group coalitions among nonhuman primates by the term.

Would the socioecological models apply to humans?

Insights from the socioecological models that might be applicable to humans are (1) there is often considerable within-group competition for resources, like food and mates; (2) valuable, monopolizable resources give rise to dominance hierarchies that limit the costs of physical fights among group members for these resources; and (3) for both females and males, when valuable resources are monopolizable, alliances and coalitions

could be useful in obtaining them directly, as well as indirectly by helping to increase one's rank in dominance hierarchies.

Chapais (1996, pp. 19-20) makes the point that because "competing through cooperation" (i.e., via alliances and coalitions) is so widespread, it probably reflects a phylogenetically primitive process in primates. Humans might therefore have inherited the basic psychological architecture for seeking allies and forming coalitions to increase success in contests over resources and dominance. Humans, however, have unique cognitive abilities such as language, and are highly prosocial compared to most primates, widely sharing food and other valuable resources (see below). Consequently, Chapais argues, humans appear to have extended their primate legacy well beyond simply pooling physical power to also competitively pool services, goods, and information. Hence, monopolizable resources could include social and cultural resources in addition to food and mates, and competition might involve prosocial behaviors such as providing (and not just defending) goods, valuable services and, via language, information.

Monopolizable resources in human groups

Over evolutionary time, how monopolizable were food and other valuable resources in human groups? Although evidence for central place foraging by early *Homo* is controversial (O'Connell et al. 2002), there is clear archaeological evidence from the late middle Pleistocene on that *Homo* hunted big game, returning large packages of valuable, potentially monopolizable meat to caves and other central sites where it was processed and consumed by multiple individuals (Stiner 2002). With the exception of the tolerated theft model (Blurton Jones, 1984, 1987), most theories of food sharing among

contemporary foragers agree that although meat is widely shared, its distribution is controlled by the hunter or other individuals, and can be directed to, e.g., offspring and other kin, spouses, sex partners or reciprocal partners (for review, see Kaplan and Gurven 2005).

In addition to meat and other valued foods, contemporary small-scale societies, including foragers, rely heavily on other kinds of resources that are valuable, limited, and potentially monopolizable; these include artifacts, medicines, or territories, or resources of a more social nature, such as status items, rights and responsibilities, the benefits of spiritual and ritualistic activities, particular social positions, and various types of social partners. Social partners can be limited in the sense that individuals with a particular benefit to offer, as well as a desire to receive a particular benefit offered by another, are finite in the social landscape. Such 'monopolizable' social partners include, for example, cooperators in specific foraging activities, political allies, exchange partners for particular items, knowledge, or services, and, of course, mates. With regard to mating partners, men can benefit by competing for fertile and sometimes multiple mates. However, human fathers, unlike most mammalian fathers, often invest significant material and social resources in offspring (e.g., Hewlett, 1992), and consequently women, too, often compete for monopolizable, high-quality mates (e.g., Campbell, 1999).

Human dominance hierarchies, reputation, and access to resources

Female dominance hierarchies are common in animals, including primates (van Schaik, 1989; Archie, et al., 2006; Holekamp, et al., 1997; Owens & Owens, 1984; Creel

and Waser, 1997), yet the study of dominance in humans has focused on males, perhaps as an artifact of a focus on physical coercion (Hawley et al. 2008). It is now widely recognized, however, that though girls and women rarely physically aggress they often use non-physical forms of aggression such as negative gossip and ostracism, which are often referred to as indirect, relational, or social aggression (for a review of this substantial literature, see Archer and Coyne 2005). When these forms of aggression, as well as prosocial behavior, are considered, dominant males and females appear remarkably similar. Based on recent studies, Hawley et al. (2008) conclude that despite some sex differences in dominance, across all age groups the most dominant members of a social group are both male and female, and that the aim of achieving dominance is resource control. They further conclude that high dominance males and females are attractive to others, typically have high centrality in social networks, and are often bi-strategic, using both indirect aggression and prosocial behavior to attain and defend dominance (see also Henrich and Gil-White 2001).

Prosocial behavior—providing benefits to others—is probably important in achieving dominance among humans because many of the valuable and monopolizable social and material resources that are important to individual fitness must be obtained from other people. Empirical studies suggest that in small, kin-based societies, a reputation for prosocial behavior is, indeed, an important mediator of access to social and material resources that are provided by others, such as food, mates, protection, and care (e.g., Chagnon, 1988; Gurven, Allen-Arave, Hill, and Hurtado 2000; Hawkes, 1991; Hawkes, 1993; Hawkes, O'Connell, and Blurton Jones 2001; Marlowe, 1999; Patton 2000; Smith & Bliege Bird 2000; Sosis 2000; Sugiyama and Chacon 2000). Good reputation predicts

increased receipt of contributions in experimental economics games (e.g., Milinski, Semmann, Bakker, and Krambeck 2001; Milinski, Semmann, and Krambeck 2002; Wedekind and Milinski 2000), and reputation is central to several theories of human cooperation (e.g., indirect reciprocity theories: Alexander, 1987; Leimar and Hammerstein 2001; Nowak and Sigmund, 1998; 'health-insurance' theories: Gurven et al. 2000; Sugiyama and Chacon 2000; 'show-off' or 'costly-signaling' theories: Gintis et al. 2001; Hawkes, 1991; Smith & Bliege Bird 2000; and reciprocal altruism models: Cox, Sluckin, and Steele, 1999; Enquist and Leimar, 1993; Pollock and Dugatkin, 1992). In summary, in order to maximize the benefits one acquires from others one must achieve and maintain a reputation for being able to provide valuable benefits to others.

Ascending a human dominance hierarchy, then, requires both intimidation and a good reputation. However, reputation, like dominance rank more generally, is *relative*. One's reputation can increase simply because a competitor's reputation has decreased.

Reputation manipulation and gossip

If reputation did mediate access to contested social partners and the resources they provided in the environment of evolutionary adaptedness (EEA), there would have been a selection pressure for adaptations to manipulate reputations to one's own benefit by impugning the reputations of competitors or enhancing one's own reputation (or the reputations of one's kin and allies), and withholding information that enhanced the reputation of competitors or damaged one's own.

'Gossip' is a construct that captures the notion of information exchange about the doings of others. Theories of gossip tend to fall into one of two camps. The first camp

sees gossip as enhancing group cohesion and social bonds (e.g., Gluckman, 1963; Dunbar, 1996; Wilson, et al., 2000). Dunbar (1996), for example, argues that once hominin groups exceeded a certain size, grooming consumed too much time and was therefore replaced by gossip as a means to strengthen social bonds. Gluckman (1963) and Wilson, et al. (2000) similarly argued that gossip functions to transmit and reinforce group social norms.

The second camp sees gossip as an aggressive, competitive strategy aimed at enhancing one's reputation relative to others (Barkow, 1989, 1992; Buss and Dedden, 1990; Emler, 1990; Leimar and Hammerstein 2001; McAndrew and Milenkovic 2002; Paine, 1967; Radin, 1927). As Brenneis (1984) notes about the Bhatgaon of Fiji, for example:

> [I]ndividual reputation is central to one's actual social position. A man's reputation is subject to constant renegotiation through his own words and deeds and through those of others. Villagers are quite sensitive to perceived attempts by others to lower their reputations; the fear of reprisal by the subject of a gossip session has an important constraining effect upon the form of those sessions. Reputation management is a constant concern in disputes, for conflict often arises from apparent insult, and the remedy lies in the public rebalancing of one's reputation with that of one's opponent.

Numerous behavioral studies confirm gossip is used aggressively among males and females (e.g., Archer and Coyne, 2005). Experimental research has also shown that people use gossip competitively. McAndrew and Milenkovic (2002) found that participants were more likely to pass on negative information than positive information about potential adversaries. They also found that subjects were quite likely to share positive information about friends and relatives, but not negative information.

Although our approach aligns much more closely with the second camp than the first, we agree with Bloom (2004) that gossip is probably not a natural kind and therefore has no single function; thus, both camps could be correct. To simplify discussion in this paper, however, we narrowly operationalize 'gossip' as the collection, analysis, and strategic dissemination of information relevant to reputation, with the aim of increasing one's reputation relative to one's competitors.

Although we recognize that gossip is not always true (Hess and Hagen 2006a), the theoretical complexities of deceptive gossip are formidable. We therefore further restrict our definition of gossip to true information. This means, under our definition, that negative gossip about a competitor informs fellow group members that the competitor genuinely failed to behave properly, or actually does possess some undesirable trait.

Is indirect aggression better explained as a female, or as a within-group, aggressive strategy?

Research on indirect aggression, such as gossip and ostracism, has usually found a female bias, at least in children and adolescents. Evolution-minded scholars, including Archer and Coyne (2005), Archer (in press), Campbell (1999), Geary (1998), and Hess (2006) have proposed *why* females, compared to males, might be more inclined to engage in indirect aggression. However, the female bias in indirect aggression appears rather small (across age groups, mean weighted d = 0.21, CI: 0.09 – 0.33) and might even disappear among adults (Archer 2004, cf. Hess and Hagen 2006b) – indirect aggression is almost as common in men as women. We suggest that the most important distinction, then, might not be male vs. female aggression, but within- vs. between-group aggression.

Between-group competition clearly involves much physical aggression, which is perpetrated almost exclusively by men. It is possible, however, that within-group competition among adults involves primarily indirect aggression, which is widely used by both women and men (Archer and Coyne 2005).

For within-group competition, we believe on theoretical grounds that indirect aggression is superior to physical aggression. Within-group physical aggression entails the risk of injuring a fellow group member. Although this might reduce competition for a resource, injuring a competitor also reduces the benefits he or she can provide to other group members, such goods and services, protection from predators, and military strength. It also puts the aggressor at risk of injury, similarly reducing the benefits he or she can provide to other group members. Physical aggression within groups would often undermine their ability to compete with other groups. Within hunter-gatherer bands, therefore, neither men nor women tend to reward interpersonal aggression and violence, and most actively devalue it (Knauft 1991).

Further, in humans access to resources depends heavily on a reputation for providing benefits to others. Negative gossip by A against B, if it is true, provides valuable information about B to other group members, and might very well reduce the flow of benefits, such as a mate, to B without necessarily impeding B's ability to provide benefits like food to the group. Physical aggression by 'A' against 'B,' in contrast, would not necessarily decrease B's reputation or deter others from providing benefits to 'B.' We therefore view indirect aggression as simply more effective than physical aggression for much within-group competition by adult men and women.

Human coalitions

Both men and women clearly engage in within-group contest competition for limited material and social resources (e.g., Hawley, 1999; Hawley, et al., 2008); it follows that both sexes should exhibit the alliances and coalitions that are associated with contest competition under the socioecological models. The data show that between groups, men aggress coalitionally, often with kin, for the kinds of limited resources described above (e.g., Chagnon, 1988; Wrangham and Peterson, 1996; Keeley 1996). There appears to be little if any evidence, however, for coalitional competition among women either between or within groups. As Rodseth, et al. (1991) pointed out, unlike female bonds in other primates, the close, affiliative bonds women form with other women are not used aggressively in physical competition. Indeed, though some evidence indicates individual women do occasionally aggress physically against each other (e.g., Burbank, 1994), there is no evidence that women regularly form alliances or coalitions to physically compete for contestable resources. Rodseth et al., 1991 concluded that relationships among women:

> seem to be characterized by high degrees of noninterference mutualism, i.e., cooperation that does not impose a cost on any 'third party.' This varies little with residence pattern, so that even unrelated women in the most extreme patriarchal societies…regularly engage in peaceful cooperation toward common goals with close and enduring friendships (e.g., Abu-Lughod, 1986). Such an observation would seem mundane if it were not for the striking contrast with dispersing females in other primates. (p. 232).

Despite the apparent evidence against coalitional aggression in women, we propose that coalitional relationships among women, just like the other primates, also arise in

response to aggressive within-group competition for valuable, monopolizable resources; unlike other primates, this aggression relies not on physical but *informational* capabilities. When engaged in within-group competition over monopolizable resources, members of either sex can benefit by strategically pooling their efforts in managing reputation-relevant information. In this sense, coalitional aggression in humans is not limited to males or between-group competition, as has been implied by evolutionary theories emphasizing only physical aggression.

Informational warfare theory

As we discussed above, maintaining or increasing rank in primate dominance hierarchies often requires the intervention of allies in physical contests. In humans, increasing rank could require the intervention of allies in reputational contests involving gossip. There are several reasons why coalitions could be beneficial in reputational contests; we focus on benefits involving the acquisition, analysis, and dissemination of *information* about the undesirable acts and traits of competitors.

Wilson (1997) and Wilson et al. (2004) argue that in addition to activities such as hunting and warfare, cooperation can also evolve in the context of cognitive activities, such as perception, memory, attention, and decision-making; for cognitively difficult tasks, two (or more) minds are better than one. We apply and extend this idea to reputational competition, where one 'difficult task' is discovering the objectionable acts committed, or the undesirable traits possessed, by one's opponent. This task can be difficult because it requires observing rare events, or acts or traits that are usually concealed. Few readily admit to cheating on a spouse, failing to help others in need, or

lacking some essential skill. Another difficult task is to defend oneself against such attacks by, e.g., providing convincing alibis or alternative explanations for one's behavior.

We term reputational conflicts between coalitions *informational warfare*. Despite our focus on within-group competition, we use this term because it connotes aggressive competition between coalitions rather than individuals. Human groups are often hierarchically structured – groups nested within groups nested within groups – with coalitional competition occurring at multiple levels. We argue that in reputational conflicts, coalitions are often superior to individuals for the following reasons.

Improved information collection

Coalitions provide more eyes and ears through which to *collect* accurate information about competitors. Information can be difficult to obtain because people try to actively conceal certain behaviors (e.g., cheating, theft), because key behaviors or demonstrations of abilities occur infrequently (e.g., reaction to enemy attack), or because cues to the occurrence of key behaviors are too subtle to notice without careful attention (e.g., susceptibility to mild infections). The more individuals there are trying to collect information that is rare and difficult to obtain, the more likely it is to be found.

Improved information analysis

Accurate perception of the meaning and import of social information usually requires considerable background knowledge of the key actors. A coalition, in aggregate, frequently possesses a far more complete knowledge of the history and current situations of potential competitors than would any single individual. Additionally, correctly interpreting a piece of gossip also often requires experience: if "A" previously implied

“B”, then it might also imply “B” now. Again, coalitions possess more collective experience than individuals. In these ways, the cooperative analysis of reputation-relevant information resembles coordinated ‘detective work,’ where the goal is to figure out what really happened (cf. Wilson, et al., 2004).

Improved information dissemination

Coalitions can provide more vectors (mouths) though which to strategically disseminate information. Further, some coalition members may have ties to important recipients of certain information.

Greater believability for information recipients

Information reported coalitions might be more *believable*. Random error (noise) can degrade information as it is communicated among different parties, but the probability that multiple accounts contain the *same* random error decreases rapidly as the number of parties transmitting the information increases. Information reported by multiple parties is also more believable because lies are difficult to coordinate and entail different costs and benefits for different people. The benefits of lying might outweigh the costs of lying for one party, but are less likely to do so simultaneously for multiple parties. Thus, information reliability increases when multiple, independent sources attest to the same story. Hess and Hagen (2006a) showed that gossip believability decreased with the addition of noise and information that gossipers may have ulterior motives; gossip believability increased with reiteration, source multiplicity, and source independence.

Improved defense against attacks

Defensive manipulation of the reputations of oneself, one's kin, and one's allies can be just as important as offensive manipulation of the reputations of one's competitors. For the reasons outlined above, coalitions may protect members' reputations by providing alibis and evidence against harmful accusations.

More effective threats of attack

Coalitional threats of reputational harm can deter the actions of competitors. A credible threat to one's reputation may prevent him or her from attacking the reputation(s) of the party making the threat, and it can also cause the potential victim to refrain from attempting to acquire resources contested by the party making the threat.

Existing empirical support for informational warfare

Ethnographic and psychological studies of gossip and conflict show that people gossip in groups, and that a primary objective of such gossiping is to diminish others' reputations. Goodwin (1980, 1982, 1988, 1990a, 1990b) studied the phenomenon of the 'he-said-she-said' gossip dispute. In ethnographic studies of play, communication, and group formation in inner-city children, Goodwin (1980) found that the conflicts of female neighborhood playgroups took the form of coalitional, verbal confrontations. Girls presented their stories such that hearers became aligned with speakers, then formed consensus against absent parties (Goodwin, 1990a). Goodwin described how girls strategically distributed gossip and recruited allies against a third party:

> [The] storyteller skillfully works to align hearer *with teller against an absent third party*. A coalition of what the girls call "two against one" (storyteller and hearer against absent third party) is established in the immediate interaction. From the teller's perspective, the offended party's alignment is important for bringing forth a future confrontation. From the recipient's perspective the fact that at least two parties agree on a particular version of an event provides a warrant for bringing action against a third party. (Goodwin, 1990a)

Goodwin (1982) also suggests that when verbal confrontations among girls occur, the accuser usually wins, due, in part, to the accuser's alliances. In contrast to the general assumption that girls tend to avoid conflict, Goodwin (1990a) suggested that they in fact compete fiercely with other girls, and that the competition reveals a coalition structure among girls:

> As the data presented here vividly show, within the he-said-she-said storytelling event, girls react with righteous indignation when they find that their character has been maligned. They display an intense interest in initiating and elaborating disputes about their rights (not to be talked about behind their backs) that differentiate offending and offended parties. Alignments taken up during such disputes clearly demarcate who stands within the bounds of an inner circle of friends, as well as who is regulated to that circle's periphery. (Goodwin, 1990a)

Leaper and Holliday (1995) similarly showed that adult females use gossip to promote solidarity in an "us vs. them" manner. Proveda (1975) suggested that gossip is the weapon by which girls manipulate information, and that this manipulation of social information appears to explain how girls' coalitions differ from boys' coalitions:

> Gossip, of course, is the major weapon which girls use to regulate information about each other. This method of informal social control accounts for the tighter clique structure among girls than boys, as well as the nature of peer group solidarity among girls. Girls frequently describe other girls as friendly and well-liked within their own group, but unfriendly to

> outsiders. It is apparent that the clique is crucial in the regulation of information about peers. What is known to one member of a clique is known to all; therefore, it is important to control and limit the association patterns of the clique. The vulnerability of girls to revealing or not revealing information about the self makes girls much more sensitive to social criticism than boys. In this sense, the girl's fate rests with the fate of the clique….

Work by Owens, et al. (2000a, 2000b) on indirect aggression showed that "intimacy" was achieved within groups of female friends when non-members were derogated, and that derogating others was often needed to gain acceptance into (or maintain a position in) a particular group, suggesting the group nature of female competition. Other aggressive tactics identified by Owens, et al., such as ostracism, breaking confidences, and discussing victims, are all inherently cooperative forms of competition (i.e., at least two interacting aggressors are required). Lease et al (2002a, p. 91) cite Adler and Adler (1998, p. 65) in reporting that sociologically popular children use bullying (coercion, intimidation, ridicule, and assault) specifically for "solidifying the group and asserting power of the strong over the vulnerability of the weak."

In a US school population, Xie, Cairns, and Cairns (2002) found that whereas 97% of physically aggressive conflicts (characteristic of boys) involved dyads, 70% of socially aggressive conflicts (characteristic of girls) involved at least triads. Supporting the idea that coalitions facilitate the dissemination of information, Owens, et al. (2000b) found that "the girls in the present study revealed that the act of revenge often involves utilizing other members of the group through the spreading of a rumour or organizing to ignore or exclude the other." Adler and Adler (1998) showed that telephone conversations of popular children focused largely on gossiping and rumor mongering designed to secure

social position. Laidler and Hunt (2001) observed of female gangs in the San Francisco Bay Area:

> …we find gang girls spending a great deal of energy 'bitching' or casting doubt on others' reputations. This crosscultural process operates not only as a mechanism of social control, but also of distancing and confirming one's own reputation.

By definition, cooperators work toward a common goal, and in the case of informational warfare, the goal is to reach a consensus about the significance of reputation-relevant information. Describing gossip among Polynesian Nukulaelae, which is more commonly a female activity, Besnier (1989) wrote, "In order to create a successful gossip session, gossips must ensure that their audience shares their own feelings and attitudes toward the specific topic of the gossip." Besnier argued that collusion was a main feature of gossip among the Nukulaelae, and discussed how gossipers delayed the introduction of key elements of a story so that their listeners took an active role in the co-production of gossip. Along these lines, Eder and Enke (1991) found that a supporting response to an initial negative gossip statement about another caused other conversation participants to subsequently make *only* negative comments that were in agreement with this evaluation (early challenges to the evaluation, which were relatively infrequent, led to less conformity). Gottman and Mettetal (1986) similarly found that four-and five-year-olds gossip in a process leading to extremes in opinions against the discussed party, creating an atmosphere of "we against others."

The literature on dominance in humans similarly shows that highly dominant individuals, who often rely on indirect aggression, appear to have numerous allies insofar

as they are often the most popular, most liked, and most central members of their social networks (Hawley et al., 2008 and references therein).

Present studies

Previous psychological studies have shown a male bias for coalitional aggression (e.g., Kurzban 2001; Johnson et al. 2006; Van Vugt 2007). The studies below test aspects of the hypothesis that, when the domain of competition is within-group, reputational, and involves social information, both women and men will show evidence of cognitive adaptations for coalitional aggression. In particular, we explore the impact of coalition strength on aggressive gossiping among women (studies 1 and 2) and men (study 2 only) using scenarios in which the study participant interacts with a fictional competitor. Participants' increased coalition strength should increase perceived ability to attack competitors with negative gossip (study 1); competitors' increased coalition strength, on the other hand, should deter negative gossip by participants (study 2). In addition, we test some predictions of the more general hypotheses that gossip is used competitively, that content of the transmitted gossip should be specific to the nature of the competition, and that the increased value and contestability of the disputed resource should increase negative gossip and decrease positive gossip (study 2).

We used the software package R 2.6.2 for all analyses (R Development Core Team 2008). To compare means, we used the Welch t-test, which does not assume equal variances (note that the effective degrees of freedom of this test are estimated using the Welch-Satterthwaite equation; unlike the Student t-test, this value usually does not equal 2n-2). R uses the same underlying linear model for computing ANOVA, ANCOVA, linear

regression, etc. For models with only factor variables, we report values that are typical for ANOVA (df, SS, F, p). For models with both factor and interval variables, we report treatment contrasts, standard errors, t, and p. Treatment contrasts report the difference between each level of the factor and a base level; for interval variables, the regression coefficient is reported. Contact the first author for complete study stimuli.

Study 1: Does the closeness of real-world cliques increase perceived likelihood of reputational harm to a fictional adversary?

Method and predictions

To determine whether real-world friendships influence perceived ability to retaliate with gossip, 75 members of one college sorority read a scenario and imagined themselves in it. The scenario placed the participant at a party with several members of her sorority, including a fictional member, Nina. The participant talks to Nina's boyfriend throughout the party. At one point during the party, the participant inadvertently walks into a closed room and sees Nina and another man, a known troublemaker, taking cocaine. Later, Nina's boyfriend walks the participant home after the party. The next day, the participant learns that Nina has been gossiping to other sorority members that the participant was interacting inappropriately with her boyfriend during and after the party. The participant knows, however, that it was Nina who was acting inappropriately.

The dependent variable, NINABADREP, was a composite score of the participant's agreement with nine statements about the reputational consequences to Nina of the events

in the scenario, such as “Nina will get a bad reputation in the Greek community” and “It will get around that Nina is a liar.” Responses could range between 9 (strong disagreement with every statement) and 90 (strong agreement with every statement). High NINABADREP scores indicated a perceived high likelihood that negative information about Nina’s behavior would spread.

Participants also rated how close they were with each of their four real best friends in the sorority house (1 = not at all close to 10 = extremely close), as well as how close each of those friends was with each other (e.g., “How close is your 2nd closest friend with your 4th closest friend?”). The first independent variable, SELFCLOSE, was the sum of each participant’s perceived closeness with her best friends, a simple measure of dyadic relationship quality. The second independent variable, FRIENDSCLOSE, was the sum of each participant’s perceived closeness among her best friends, a simple measure of coalition quality. These provided measures of participants’ real-world coalition stength.

Women who are close should be more willing and able to cooperate effectively, and should be more effective than women who are less close at retaliating against a person who has derogated one of their friends. We therefore predicted that the closer the participant was with her friends, and the closer her friends were with each other, the higher the NINABADREP score would be.

Previously, in a study of cliques in a real-world social network (a college sorority), Hess (2006) found that one clique member’s perception of closeness to the other members of the clique correlated positively with those other members’ average perceived closeness to her ($r = .41$). In addition, the member’s perception of closeness among the other members also correlated positively with those members average perceived

closeness to one another (r = .57). These results suggest that clique members tend to agree about their closeness to one another, a finding that partially validates our method.

	N	Range	Mean	Std. Dev.
NINABADREP	74	12-80	45.4	14.0
SELFCLOSE	75	17-40	32.5	4.6
FRIENDSCLOSE	74	13-59	39.4	9.9

Table 1: Summary statistics for variables in Study 1.

Results

See Table 1 for variable summary statistics. Loess regression plots of NINABADREP vs. SELFCLOSE and NINABADREP vs. FRIENDSCLOSE revealed non-linear relationships. For lower values of the 'closeness' variables, NINABADREP increased linearly with increasing closeness; for higher values of closeness, however, NINABADREP plateaued. This nonlinear pattern precluded the use of linear regression. We therefore performed a median split of both closeness variables, and then computed a 2 X 2 ANOVA. This analysis showed that, contrary to predictions, including SELFCLOSE did not significantly improve the model (test not reported), so we then computed a t-test comparing NINABADREP vs. high and low values of FRIENDSCLOSE. Participants who reported above-median values of FRIENDSCLOSE reported significantly greater NINABADREP values, M = 48.8, compared to those who reported median or lower values of FRIENDSCLOSE, M = 42.0, Cohen's d = 0.50, t = -2.2, df = 67.4, p = 0.017.

Summary

We found that the closer a sorority member perceives her own real-world coalition to be, the more reputational harm she expects to come to a fictional adversary. This study

was observational (we did not manipulate the real-world network), so causation cannot be inferred.

Study 2: Do resource value, resource contestedness, and allies affect gossip?

Overview

According to the socioecological model, the higher value and more limited a resource, the more competition there is for that resource. We therefore wished to determine the effects of these variables on negative gossiping. According to informational warfare theory, allies should increase one's ability to inflict reputational harm on a competitor, and, via this increased ability to retaliate, help deter negative gossiping by competitors. To test the latter hypothesis, Hess (2006) conducted two pilot experiments among UCSB undergraduates in which participants gossiped about or tattled on a classmate. Negative gossip and tattling decreased in the conditions in which the classmate had a friend or clique, compared to the conditions in which the classmate had neither, supporting the hypothesis. However, this effect could have been due to an increased perceived friendliness of a competitor with friends, or to an increased perception of *physical* threat of a competitor with friends. Here we attempt to replicate these results using a study design that controls for confounds with friendliness and physical threat.

Specifically, we predicted that participants will (1) transmit gossip that is particular to the nature of the competition (i.e., the content of gossip is strategic rather than arbitrary);

(2) transmit more negative gossip and less positive gossip about a competitor when the competed-for resource is (a) highly-valuable and (b) highly-contested (these predictions derive from the socioecological model); and (3) gossip less negatively about a competitor with a strategically situated ally. In Study 2, in order to avoid potential confounds with, e.g., mating psychology, we decided to have participants encounter only a same-sexed fictional person in the scenarios they read. This study had two phases, the first to check the validity of our stimuli, and the second to test our hypotheses.

Study population

Amazon's Mechanical Turk

We recruited study participants from Mechanical Turk (www.mturk.com), an online "on demand, scalable workforce" organized by Amazon.com. Employers post tasks, termed Human Intelligence Tasks (HIT's), to a website. HIT's comprise a title, a reward (in dollars), instructions, and usually some means to upload results from workers. Typical HIT's include transcribing short audio recordings, identifying objects in photos, writing short movie and book reviews for an online website, and collecting information on the internet. The dollar amounts of rewards are small-to-modest. At the time of our study, over 90% of the rewards were $1.00 or less.

Anyone with an Amazon.com account can be a worker. Workers peruse the list of currently available HIT's, sorting and searching by, e.g., title, amount of pay, time to complete, date posted, etc. When they find a HIT that they are interested in, they can click on the title to read the full description. If they "Accept" the HIT, they then have a specific amount of time, set by the employer, to complete it. After the HIT is

"Submitted," employers review the work. If they deem it acceptable, they instruct Amazon to transfer the amount of the reward, in dollars or Indian Rupees, from the employer to the worker account.

Amazon.com requires all workers to be 18 years or older. Amazon does not reveal the identity of workers, instead assigning each an ID. Moreover, Amazon stipulates that employers not solicit identifying information from workers (employers can only communicate with a particular worker using the anonymous worker ID via the Amazon web site; workers can, at their option, directly contact employers, however).

We wrote custom software to administer our survey online. The software randomized the order of items and assigned participants to different experiments, and conditions within experiments, on a rotating basis (so that, e.g., experiment or condition would not be confounded with time of day or day of week). The Mechanical Turk service can optionally prevent workers from completing a given HIT more than once. We took advantage of this option, requesting that 720 different workers complete the survey. We had a total of 11 different conditions, resulting in about 66-67 participants per condition (not all experiments are reported here).

We posted our survey to Mechanical Turk with the title "5-minute survey", a 30-minute maximum time to complete, and a reward amount of $1.00. We briefly described our HIT as follows: "Read a short scenario and then answer questions about it." Seven hundred and fifty workers accepted our HIT, with the final survey received 5.35 days after initial posting. After viewing the consent form on page one of the survey, or the stimulus and questions on page two, 18 workers (2.4%) "returned" the HIT (i.e., notified the service that they had decided not to complete it); 12 additional workers (1.6%)

abandoned the HIT, providing us with demographic information, but no survey data. Hence, 96.0% of workers who accepted our HIT went on to fully complete it. An unknown number of workers saw the title or brief description of the HIT but decided not to accept it.

(The name "Mechanical Turk" is from the famous 18th century hoax in which "The Turk", a supposed automaton, routinely defeated human opponents in chess. In fact, a human hidden inside operated the device).

Demographics

The sample was female-biased, with 68.6% female and 31.4% male. Ages ranged from 18 – 89, median = 31, M = 33.5, SD = 10.8. Women were, on average, slightly but significantly older (M = 34.6) than men (M = 31.1, t = 4.1, df = 444.3, $p < .001$). Results from 597 participants are reported here.

We were interested in the number of different ethnicities in our sample, and decided to operationalize ethnicity as nationality. We asked participants to enter their nationality, providing a form that allowed entry of arbitrary text. Most of the responses were easily mapped to a nationality, but a minority of participants seemed to interpret this item as ancestry, providing responses such as "Italian-German-Mutt" or "white-Portuguese." Given that a large fraction of our population were US nationals, these types of responses were probably also from US nationals. We estimated that 75% of our participants were US nationals and 25% were not.

Gossip scenarios and statements

Testing this study's hypotheses (in Phase II) involved participants reading a scenario involving a fictional competitor about whom participants could transmit negative and/or positive gossip; participants read either a work or a family scenario, then read several negative and positive gossip statements about the competitor and indicated how likely they would be to tell the statement to a member of the environment in which the competition is taking place.

The names "Elizabeth" and "Dave" were chosen for the fictional person; based on US census data, they were among the most popular male and female names for children born during most of the past 50 years, but they were not specific to being born in a particular decade (e.g., "Ashley" was highly popular in the 1980s, but not before then, so it was not used because it could potentially suggest that the fictional person was in her mid-twenties). These are the female versions of the scenarios:

> Family scenario, Phase I validity check: "Imagine you have an elderly aunt and 10 cousins. One of your cousins is named Elizabeth. Although you are not close with her, Elizabeth lives in your neighborhood, so you know more about her than most other family members know."
>
> Family scenario, Phase II competition: "Imagine you have an elderly aunt who owns a very valuable painting. You have loved this painting since you were a child. Your aunt is moving into a retirement community, and she has said that she intends to give the painting to one of her 10 nieces and nephews. Elizabeth, one of your cousins, thinks she deserves the painting. Although you are not close with her, Elizabeth lives in your neighborhood, so you know more about her than most other family members know."
>
> Office scenario, Phase I and II: "Imagine you work in an office with about 10 co-workers, half men and half women. Your office is one division of a company that has done well in the last year. [A][B] Your desk is next to Elizabeth's, so you know more about her than most other people in the company know."

Office scenario substitutions [A]:

Phase I validity check: Elizabeth is one of your co-workers.

Phase II competition: The company has authorized your office supervisor to promote [one/three/five person/people] in the office, and you are a candidate. The promotion comes with a [small/large] pay raise. Elizabeth, a co-worker, is also a candidate for promotion.

Office scenario substitutions [B]:

Phase I, Phase II competition: *blank*

Phase II alliance: Elizabeth regularly has lunch with her good friend from [the office/her neighborhood], Jennifer.

Phase I: Checking the validity of our gossip stimuli

We created 10 work-related and 10 family-related gossip statements about the fictional person—statements that could, in Phase II, be transmitted as gossip. Each statement had a positive version and a negative version (for a total of 40 statements). See Table 2 for examples. See appendix for complete list of gossip statements. We needed to confirm that participants saw the positive and negative gossip statements we created as indeed positive or negative. We also wanted to confirm that participants saw our work- and family-related gossip as, in fact, work- or family-related.

	Work environment	Family environment
Positive statements	10 original; 9 after screening. Example: "Elizabeth is enthusiastic with customers at work"	10 original; 7 after screening. Example: "Elizabeth loves her siblings"
Matched negative versions	10 original; 9 after screening. Example: "Elizabeth is unenthusiastic with customers at work"	10 original; 7 after screening. Example: "Elizabeth hates her siblings"

Table 2: Categories and female examples of the 40 gossip statements to be rated in Phase I. Each gossip statement had a matched positive and negative version.

Methods

To confirm that each gossip statement was indeed seen positively when phrased in its positive form, and negatively when phrased in its negative form, 133 individuals recruited from Mechanical Turk rated 20 gossip statements on a 9 point Likert scale (1 = Reflects very negatively on Elizabeth, 5 = Neutral, 9 = Reflects very positively on Elizabeth). For each of the 20 gossip statements, each rater was randomly assigned either the positive or negative version. Women rated gossip statements in which all proper nouns and pronouns were female ("Elizabeth," "she") and men rated gossip statements in which all proper nouns and pronouns were male ("Dave," "he").

To confirm that work-specific gossip statements in their positive and negative forms indeed reflected more positively or negatively on workers than family members, and that family-specific gossip statements in their positive and negative forms indeed reflected more positively or negatively on family members than workers, half the sample (67) rated statements after reading the work scenario, and the other half (66) rated statements after reading the family scenario.

Results

For all gossip statements, the mean rating for the positive version was ≥ 5 ($\underline{M} = 7.0$, $\underline{SD} = 0.72$, range: 5.0 – 8.1), and the mean rating for the negative version was < 5 ($M = 3.3$. $SD = 0.67$, range: 1.8 – 4.8), confirming that, on average, positive statements were seen as positive, and negative statements as negative. When examined in the context of the family scenario, however, both positive and negative versions of one particular statement ("Elizabeth goes out to bars one night a month" vs. "Elizabeth goes out to bars

every Friday and Saturday night") were seen as negative, so we did not use these questions in Phase II. In addition, we required that that positive and negative versions of work-specific gossip statements reflect more positively or negatively on workers than family members, and that positive and negative versions of family-specific gossip statements reflect more positively or negatively on family members than workers. Some statements failed this test. One, regarding punctuality, was, in its negative form, slightly worse for family members than workers, although we had predicted the opposite. Another, regarding illegal drug use, was, in its negative form, slightly worse for workers than family-members, although we had predicted the opposite. Consequently, these statements were omitted in Phase II of this study (see Appendix; italicized statements were omitted from Study 2, Phase II analyses).

One additional pair of statements, regarding good taste in art and literature, was, in both positive and negative forms, slightly more important for workers than family members, although we had predicted the opposite. However, the family scenario in Phase II involved inheritance of a valuable painting, so instead of either deleting this statement, or including it in our mean gossip scores, we retained it as a separate variable.

Phase II: Testing predictions derived from informational warfare theory

In order to test predictions inspired by the socioecological models and derived from informational warfare theory, we added competition in varying degrees and forms to the scenarios, and measured participants' tendencies to transmit the gossip statements to others. Unlike in Phase I, participants in Phase II indicated their *likelihood* of transmitting

each gossip statement, not their assessment of whether the statement reflected positively or negatively on the target. Each participant was randomly assigned either the positive or negative form of each statement. Specific manipulations will be discussed next.

Prediction 1: Gossip content is specific to the competitive context

Methods

If gossip functions to reduce a competitor's reputation, and hence their access to contestable resources, then the content of the gossip should target dimensions of reputation most relevant to the particular competitive social context. To test this hypothesis, 130 participants read a scenario involving competition over a valuable resource. We manipulated the competitive context: half (64) the new participants read a version of the office scenario that now involved competition with the coworker over a promotion, and the other half (66) read a version of the family scenario that now involved competition with the relative over a valuable painting. We then asked all participants to "gossip" about their competitors: "All of the facts listed below are things you know about Elizabeth. How likely you would be to tell each fact to someone you work with? Please indicate by clicking on one of the 9 options, where 1 = Very unlikely to tell, 5 = Might tell, and 9 = Very likely to tell," followed by the office-environment gossip statements and family-environment statements about Elizabeth that remained after screening in Phase I (randomized for positive or negative versions of each statement, and in random order).

For each participant, one's mean tendency to relay positive gossip statements about the competitor was his or her Positive Gossip score; we similarly computed a Negative

Gossip score, where more negative values indicate a greater mean tendency to relate negative gossip statements. We computed the positive and negative gossip scores separately for office-related and family-related gossip, for a total of four scores.

We then computed a total office gossip score by adding our positive office gossip variable to the absolute value of the negative office gossip variable. We computed a total family gossip score similarly. From these we computed a GOSSIP-BIAS score—a tendency to report more of one type of gossip (office or family) than another. Across the entire sample, participants reported significantly more office-related gossip than family-related gossip, probably because after Phase I screening there were simply more office-related statements remaining. We were interested in a condition-dependent bias, however, so we eliminated the bias of the entire sample by first converting our total gossip scores to z-scores, and then subtracting the total family gossip z-score from the total office gossip z-score to create a GOSSIP-BIAS score (no longer a z-score). The GOSSIP-BIAS score ranged from -3.8 – 3.0, with positive values indicating a bias toward office-related gossip and negative values indicating a bias towards family-related gossip. For summary statistics of variables in this phase, see table 3.

We predicted that in the office condition, participants would relay more office-biased gossip than family-biased gossip, and vice versa in the family condition. In addition, because both scenarios involved competition over a valuable resource (a promotion and valuable artwork), we predicted that manipulating competitive context (office vs. family) would cause a greater shift in negative gossip scores relative to positive gossip scores.

The dispute in the family scenario involved inheritance of a valuable painting, so we also predicted that for one particular gossip statement—one which involved taste in art

and literature—there would be a greater tendency to relate negative gossip, and a reduced tendency to relate positive gossip, in the family vs. office scenario.

Variable	N	Range	Mean	Std. dev.
Positive office gossip score	130	1 – 9	5.16	2.01
Negative office gossip score	130	-9 – -1	-5.22	1.96
Positive family gossip score	130	1 – 9	4.24	2.22
Negative family gossip score	130	-9 – -1	-4.31	2.33
GOSSIP BIAS (office vs. family)	130	-3.8 – 3.0	0.0	1.27
Good taste gossip score	130	1 – 9	5.49	2.50
Poor taste gossip score	130	-9 – -1	-4.07	2.98

Table 3: Summary statistics for variables in Study 2, Phase II, Prediction 1.

Results

As predicted, GOSSIP-BIAS scores were positive (office-biased) in the office scenario, M = 0.95, and negative (family-biased) in the family scenario, M = -0.92, Cohen's d = 0.9, t = 12.3, df = 125, p < .001. As predicted, manipulating social context caused a significantly greater change in negative gossip scores than positive gossip scores, with the greatest negative office-related gossip scores in the office scenario, and the greatest negative family-related gossip in the family scenario (table 4).

```
                Df Sum Sq Mean Sq F value Pr(>F)
Pos/Neg          1 12.67  12.67 5.7734 0.01699 *
Office/Family    1 116.27 116.27 52.9687 4.3e-12 ***
Residuals      252 553.17  2.20
```

Table 4. The effect on the GOSSIP-BIAS score of context (office vs. family) and the positivity or negativity of gossip statements, $\eta^2 = 0.19$.

As predicted, participants relayed more negative gossip about taste in art and literature in the family (M = -6.0) than in the office scenario (M = -2.2), Cohen's d = 1.6, t = 6.1, df = 36.5, p < .001. Contrary to predictions, there was no significant difference in

participants' tendency to relay positive gossip specifically about taste in art and literature in the family, M = 5.6, vs. office scenario, M = 5.4, t = -0.33, df = 69.0, p = .74.

Predictions 2 & 3: Competition and allies impact gossip valence

To test the next predictions, we manipulated scenarios between participants on resource value, resource contestability, and allies. We conducted these tests of our theory using variations of the office scenario only. The dependent measure was participants' likelihood of telling negative and positive gossip to a coworker.

Controls: To improve out ability to detect effects, we needed to control for perceptions of the competitor across conditions that might influence participants' tendencies to transmit positive or negative gossip about them. We therefore included a perceived Friendliness rating of the competitor in our models as a control variable. We also controlled for a single-item index of Aggressiveness, the perceived tendency of the competitor to interfere with an adversary (Friendliness and Aggressiveness had only a small, though significant, degree of correlation, r = -0.11, p = .007, indicating these were largely independent dimensions of the competitor). For testing the protective effect of a friend against gossip, we included a measure of the Physical Threat posed by the competitor as a control variable as well. Finally, we explored the effects of participant Age and Sex. We only included any of these control variables if they significantly improved model fit.

Prediction 2a: Resource value impacts gossip valence

Methods

According to the socioecological model and informational warfare theory, the value of a resource should influence the use of gossip to help defend, or acquire, the resource. We manipulated the value of the resource (the promotion) by describing the attendant salary increase as either "small" or "large." When the salary was large, we predicted participants would show a greater tendency to relay negative gossip about the competitor, and lesser tendency to relate positive gossip.

Results

As predicted, relative to a "small" salary, a "large" salary increased participants' tendency to relate negative office-related gossip (Table 5, model 1). For positive office-related gossip, there was a significant interaction with Sex: when the salary was large men were significantly less likely to relate positive gossip statements (Table 5, model 2).

Prediction 2b. Resource contestability impacts gossip valence

Methods

According to the socioecological model and informational warfare theory, the degree to which a resource is contested should also influence the use of gossip to help defend, or acquire, the resource. We manipulated the degree of contestedness by stating that, of 10 co-workers, one, three, or five people would receive promotions, with the promotion in the first condition as the most contested resource, and the promotion in that last condition

as the least contested resource (in all of these conditions, the salary was described as "large"). When the promotion was highly contested, we predicted participants would show a greater tendency to relay negative gossip about the competitor, and lesser tendency to relay positive gossip.

Results

As predicted, a less contested resource resulted in a reduced tendency to relate negative gossip (Table 5, model 3). Contrary to predictions, contestedness had no significant effect on the tendency to relate positive gossip (Table 5, model 4).

	Estimate	Std. Err.	t-value	Pr(>|t|)	
Model 1: Negative gossip vs. salary size					
(Intercept)	-1.79	0.67	-2.66	.009	**
Salary(Large)	-0.75	0.27	-2.81	.006	**
Friendliness	-0.29	0.08	-3.42	.001	***
Aggressiveness	-0.43	0.07	-6.06	< .001	***
Model 2: Positive gossip vs. salary size					
(Intercept)	1.70	0.60	2.84	.005	**
Salary(Large)	0.65	0.37	1.76	.081	
Sex(Male)	0.86	0.47	1.83	.069	
Friendliness	0.66	0.09	6.98	< .001	***
Salary(Large):Sex(Male)	-1.70	0.67	-2.55	.012	*
Model 3: Negative gossip vs. contestedness					
(Intercept)	-2.80	0.56	-5.02	<.001	***
Number of promotions (1, 3, 5)	0.45	0.20	2.29	.023	*
Friendliness	-0.23	0.07	-3.10	.002	**
Aggressiveness	-0.37	0.06	-6.14	<.001	***
Model 4: Positive gossip vs. contestedness					
(Intercept)	4.18	0.51	8.14	<.001	***
Number of promotions (1, 3, 5)	-0.07	0.23	-0.30	.766	
Friendliness	0.29	0.08	3.42	.001	***

Table 5: Tests of informational warfare theory. **Model 1**: RSE(129) = 1.54, R^2 = 0.27, Adj. R^2 = 0.25, F(3, 129) = 15.8, p < .001. **Model 2**: RSE(128) = 1.78, R^2 = 0.31, Adj. R^2 = 0.29, F(4, 128) = 14.18, p < .001. **Model 3**: RSE(196) = 1.60, R^2 = 0.19, Adj. R^2 = 0.18, F(3, 196) = 15.46, p < .001. **Model 4**: RSE(197) = 1.87, R^2 = 0.056, Adj. R^2 = 0.047, F(2, 197) = 5.86, p-value: 0.003.

Prediction 3: Ally status impacts gossip valence

According to informational warfare theory, allies can help defend or acquire valuable contested resources by increasing reputational harm to adversaries, and by limiting reputational harm to coalition members. Our final prediction for Study 2 was that participants would gossip less negatively about a competitor who has an ally in the social environment in which the competition is occurring rather than an ally in a nonrelevant social environment (because local allies would be better at aiding the competitor in retaliatory gossip against the participant, providing alibis against the participant's negative gossip, etc.). In this experiment, we again used only the office scenario; there was only one promotion that was contested, and it came with a "large" (valuable) salary increase. We manipulated alliance status by describing the competitor as either regularly having lunch with a friend from the neighborhood (no explicit office ally, n = 66) or regularly having lunch with a friend in the office (an explicit office ally, n = 67). The dependent measure was, again, the likelihood of telling each gossip statement to a coworker, where the gossip statements were as described earlier.

We controlled for the competitor's perceived friendliness in two ways. First, as with our tests of predictions 2a and 2b, we included the participant's perceived Fiendliness rating of the competitor in our models as a control variable. Second, the competitor had a friend in both conditions; we only varied whether the friend was from the office or from the competitor's neighborhood. However, having a friend in the office might pose an increased *physical* threat, compared to having a friend from the neighborhood, and it might be this physical threat that deters gossip. We therefore tested whether the Physical Threat posed by the competitor differed between conditions, and we also included this

variable as a control variable in our models. In addition, as with our tests of predictions 2a and 2b, perceived Aggressiveness of the competitor, and participant Age and Sex, were included if they significantly improved model fit.

Results

As predicted, the presence of an explicit ally of the competitor in the office significantly reduced the tendency to relate negative gossip about the competitor compared to the presence of an ally from the neighborhood (Table 6, model 5). Though not a prediction, we also found that the presence of an explicit ally in the office also significantly reduced the tendency to relate positive gossip about the competitor (Table 6, model 6). There was no significant difference in the perceived Friendliness of the competitor with a friend in the neighborhood ($M = 5.68$) vs. in the office ($M = 5.78$), $t = -0.32$, $df = 130.8$, $p = .75$. There was also no significant difference in the perceived Physical Threat posed by the competitor with a friend in the neighborhood ($M = 3.06$) vs. in the office ($M = 2.63$), $t = 1.33$, $df = 129.8$, $p = .19$, and in fact the effect trended in the opposite direction, with a slightly higher perceived threat in the neighborhood condition. Regarding control variables, Friendliness improved the fit of models of both negative and positive gossip, whereas Aggressiveness only improved the fit of models of negative gossip. As a control variable, Physical Threat, Age and Sex did not improve either model, and so were not included.

	Estimate	Std. Err.	t-value	Pr(>|t|)	
Model 5: Negative gossip vs. alliances					
(Intercept)	-1.94	0.67	-2.88	.004	**
Office ally	0.86	0.29	2.99	.003	**
Friendliness	-0.41	0.09	-4.82	< .001	***
Aggressiveness	-0.40	0.07	-5.45	< .001	***
Model 6: Positive gossip vs. alliances					
(Intercept)	2.23	0.61	3.66	< .001	***
Office ally	-0.80	0.34	-2.40	.018	*
Friendliness	0.63	0.10	6.44	< .001	***

Table 6: Tests of informational warfare theory. **Model 5**: RSE(128) = 1.65, R^2 = 0.30, Adj. R^2 = 0.29, F(3, 128) = 18.58, p < .001. **Model 6**: RSE(130) = 1.93, R^2 = 0.26, Adj. R^2 = 0.25, F(2, 130) = 23.2, p < .001. RSE: Residual Standard Error.

Discussion

Researchers from multiple disciplines have proposed that physical and indirect aggression are strategies for resource competition. If the dissemination of negative gossip is strategic, its content should reflect relevant reputational characteristics of one's competitors. In support, we found that gossip about a competing coworker reflected his or her value as a productive office member, and that gossip about a competing family member reflected his or her reputation as it would be perceived by his or her family members. This effect was strongest for negative gossip. Additionally, we found that increased resource value and resource scarcity increased negative gossip about a competitor. Only men, however, decreased positive gossip about a competitor for a higher valued resource, and resource scarcity did not affect the tendency to relate positive gossip by either sex. Future theorizing about indirect aggression should make distinctions between the transmission or withholding of negative and positive gossip, and their potential interactions with sex. Together, these results support the view that gossip, at

least in part, is a competitive, aggressive strategy. Social bonding and social cohesion theories therefore cannot account for some important aspects of gossiping behavior.

With regard to our main hypothesis, that coalitions enhance offensive and defensive capabilities in indirect aggression, Study 1 showed that among sorority women, more tightly-knit real-world social networks predict higher expectations of reputational harm to an adversary. Study 2 found that a competitor's strategically-situated friend deterred negative gossip about him or her, compared to just having a friend in an unrelated social network. This result cannot be explained by the "friendliness" of the competitor because the competitor had a friend in both conditions, and there was no significant difference in perceived friendliness across conditions. In addition, this effect persisted after controlling for the perceived friendliness of the competitor. Finally, we note that having a friend in the office also significantly decreased *positive* gossip about the competitor, which would not be expected if the effect were due to increased perceived friendliness. Hence, the protective effect of a friend against negative gossip is unlikely to be explained by a confound with friendliness. In addition, there was no significant difference in perceived physical threat between the two conditions, and including physical threat as a control variable did not improve our models, so our results are also unlikely to be explained by an increased perception of physical threat posed by allies. Finally, in study 2 we found no significant sex differences in the effect of the office ally on gossip.

Limitations: Though "closer" real-world social networks predict higher expectations of reputational harm to an adversary, our study does not reveal *why* "closeness" has this effect. Similarly, although we have largely ruled out "friendliness" as an explanation for the protective effect of friends against negative gossip, and diminished the possibility that

increased physical threat is the explanation, we have not explained why friends have this protective effect. It could be, for example, that having a potentially mutual friend (i.e., a friend in the same office vs. one from the neighborhood) makes one seem less gossip worthy, which would explain the reduction in both positive and negative gossip. Future work should include development of an "indirect aggression formidability" instrument that could be applied to both individuals and cliques. If our hypothesis is correct, cliques should be seen as more formidable than individuals.

We have proposed that in addition to their advantages in physical aggression, coalitions might be effective in indirect aggression because information from multiple individuals might be more believable; abilities to collect, analyze, and disseminate information would be improved; and threats of retaliatory gossip would be more effective. Further, we have proposed that the benefits of human coalitions are not limited to male competition between groups. In contrast to non-agonistic theories of women's friendship (e.g., Taylor, et al., 2000), female alliances and coalitions may also be beneficial in within-group contest competition for resources, when the 'weapon' is not physical aggression but reputational manipulation and other forms of indirect aggression. Humans may therefore be a supporting data point for one general and powerful claim of the primate socioecological models—that, *for both sexes*, coalitions are useful for within-group contest competition, especially when attempting to maintain or improve rank or reputation, and contrary to the assertion that relationships among women "seem to be characterized by high degrees of noninterference mutualism, i.e., cooperation that does not impose a cost on any 'third party'" (Rodseth, et al., 1991).

Alliances and coalitions would also clearly be useful in alternative forms of competition not tested here, such as ostracism, enforcement of costly group norms, and punishment. In addition, coalitions can be useful for nonaggressive goals, such as helping friends with common interests, food sharing, and building a Mars lander (e.g., Tooby & Cosmides 1996; Kaplan & Gurven, 2005; Feldman et al., 2003). These benefits notwithstanding, improved information collection, processing, and dissemination of social and nonsocial information are important benefits of belonging to coalitions (Wilson, et al., 2004), regardless of the ultimate use to which the processed information is put.

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Appendix

All gossip statements screened in Study 2, Phase I; italicized statements were removed from Phase II analyses (for reasons, see text)

Elizabeth has a good understanding of the computer system at work.
Elizabeth does not have a good understanding of the computer system at work.
Elizabeth is willing to work late to finish a project on time.
Elizabeth is unwilling to work late to finish a project on time.
Elizabeth always contributes to gifts for colleagues at work.
Elizabeth never contributes to gifts for colleagues at work.
Elizabeth is punctual.
Elizabeth is not punctual.
Elizabeth never misplaces important documents.
Elizabeth regularly misplaces important documents.
Elizabeth rarely uses the phone at work for personal calls.
Elizabeth often uses the phone at work for personal calls.
Elizabeth never takes home office supplies from work.
Elizabeth frequently takes home office supplies from work.
Elizabeth is enthusiastic with customers at work.
Elizabeth is not enthusiastic with customers at work.
Elizabeth takes short lunch breaks.
Elizabeth takes long lunch breaks.
Elizabeth works well under pressure.
Elizabeth does not work well under pressure.
Elizabeth is good with children.
Elizabeth is not good with children.
Elizabeth has no credit card debt.
Elizabeth has high credit card debt.
Elizabeth always invites her parents to visit her.
Elizabeth never invites her parents to visit her.
Elizabeth does not gamble.
Elizabeth frequently gambles.
Elizabeth goes out to clubs one night a month.
Elizabeth goes out to clubs every Friday and Saturday night.
Elizabeth never uses marijuana or other illegal drugs.
Elizabeth sometimes smokes marijuana.
Elizabeth has good taste in art, literature, and music.
Elizabeth has poor taste in art, literature, and music.
Elizabeth loves her siblings.
Elizabeth hates her siblings.
Elizabeth has the same political views as most of her family members.
Elizabeth does not have the same political views as most of her family members.
Elizabeth is a safe driver.
Elizabeth is an unsafe driver.