



Evidence for bullying can be seen in historical records from cultures as diverse as ancient Greece [Golden, 1990], ancient Rome [Rawson, 2003], medieval China [Hsiung, 2005], medieval Europe [Orme, 2001], and renaissance Europe [Cunningham, 2005]. Bullying in these historical societies took the form of hazing, physical and verbal bullying, as well as indirect social bullying resulting in the exclusion and isolation of individuals. Interpreted from a traditional point of view, these data could suggest that bullying is the result of maladaptive development occurring on a staggering cross-cultural, environmental, geographical, and historical scale. But perhaps bullying is not solely the result of maladaptive, problematic development. The prevalence and ubiquity of adolescent bullying suggest an alternate explanation: adolescent bullying may serve an adaptive purpose for some adolescents.

Unfortunately, influential, traditional theories of aggression and bullying generally view this behavior solely as maladaptive and thus do not address the possibility that bullying may be adaptive [Berger, 2007]. For example, traditional theories have been shaped by theory and research suggesting that aggressive behavior is a function of imitating aggressive role models [e.g., Bandura, 1978] and/or due to deficient social skills and social information processing [Crick and Dodge, 1994, 1999]. However, researchers have begun to question the assumption that bullying is a consequence of impairments in social skills, in part because theory-of-mind research has shown that children who bully do not seem to lack social understanding [Shakoor et al., 2011; Sutton et al., 1999]. Furthermore, bullying does not appear to be strongly associated with other environmental factors that often engender maladaptation, including cultural variables such as low socioeconomic status [Berger, 2007] and poor parent-child relationships [Veenstra et al., 2005; Volk et al., 2006]. This leaves an unsatisfactory gap between theory and empirical data, insofar as research findings do not adequately illuminate the dysfunction underlying bullying, or delineate the developmental pathways leading to its emergence. Fortunately, evolutionary psychology may offer a more parsimonious explanation of the data. Specifically, evolutionary psychology offers the hypothesis that some adolescent bullying may not be maladaptive. Instead, it may be the result of an evolved adaptation toward bullying [Kolbert and Crothers, 2003; Volk et al., in press].

Evolutionary developmental psychology suggests that some behaviors develop because they are at least in part due to evolved mental adaptations that are a response to past evolutionary pressures [Bjorklund and Pellegrini, 2000]. An evolved adaptation is a physical

trait or behavior, tied at least probabilistically to (if not the direct result of) genes, that increases the likelihood that an organism would successfully reproduce and pass on those genes down to future generations [Dawkins, 1989]. Thus, for bullying to be an evolved adaptation, it must display two necessary components [Williams, 1966]. First, it must solve adolescent problems ultimately related to reproductive success (in a way that is plausibly linked to past environments). Second, it must be heritable. That is, it must be reliably related to the specific expression of one or (almost certainly) more genes.

### ADAPTIVE NATURE OF BULLYING

We therefore begin by examining whether bullying meets the first prerequisite—that it is adaptive toward problems faced in the ancestral environment, which is where any evolution related to bullying would have occurred [Alcock, 2001]. This Environment of Evolutionary Adaptation (EEA) is not a single time or place, but rather is the combination of environments in which adolescents evolved [Irons, 1998]. While we cannot make definitive observations of these past environments, we can infer some basic properties of the EEA. We believe that adolescents had two important goals from an evolutionary perspective: growth/health/survival and securing appropriate mating opportunities [Konner, 2010]. The ultimate biological/evolutionary meaning of life is passing on genes [Dawkins, 1989]. This requires organisms to survive long enough to successfully reproduce. Lacking the ability to directly test the goals of survival and reproduction in the EEA, we instead rely on data from modern bullying supplemented by data from hunter-gatherers and historical records to determine the adaptiveness of bullying [Marlowe, 2010; Volk and Atkinson, 2008]. It should be noted that adaptations do not require that the individual consciously and efficiently pursues the goal in question [Geary and Bjorklund, 2000]. Instead, evolutionary theory dictates that she must simply behave in a way that does, on average, improve her reproductive fitness, whether or not she is consciously and/or efficiently addressing that problem [Daly and Wilson, 1988; Ellis and Bjorklund, 2005].

That said, we would like to address three important semantic issues related to the evidence for adaptiveness. First, we would like to note that bullying is not a homogenous behavior, and that different forms of bullying are likely to have arisen in response to different selection pressures. Volk et al. [2006] identified five forms of bullying, including racial/ethnic, verbal, physical, sexual, and indirect/social, each of

which may serve a particular function. New forms of bullying such as cyberbullying [Raskauskas and Stoltz, 2007; Wade and Beran, 2011] further complicate the matter. While we explicitly explain specific forms, functions, and evolutionary origins of some bullying subtypes later in the current manuscript (e.g., sexual bullying), a lack of data on specific forms of bullying means that we often refer to bullying in general. While these generalizations remain true at the aggregate level, it is important to note that they may not always hold for all the individual forms and functions of bullying.

Second, we would like to draw attention to the fact that bullying is not the same thing as general aggression. All bullying is aggression, but not all aggression is bullying [Hawley et al., 2010]. For example, the establishment of dominance hierarchies among many mammals involve brief contests to determine a hierarchy that results in low levels of future aggression other than between evenly-matched aggressors [Alcock, 1988, pp. 402–406]. The lack of serious harm and repetition means these incidents do not qualify as bullying. Nor do more serious and harmful dominance conflicts between two evenly-matched individuals, as there is a lack of clear power imbalances. Thus, when we refer to evidence based on general aggression readers should consider it to be less conclusive than evidence based specifically on bullying.

Third, bullying done by “pure” bullies may differ in important ways from bullying done by bully-victims who are both bullies and victims. Thus, unless otherwise stated, we use “bullying” to refer to bullying done only by “pure” bullies. In particular, as we discuss later in the current manuscript, there is reason to believe that the bullying conducted by individuals who are both bullies as well as victims of bullying has more of a reactive function and may be a product of dysregulation, and therefore may be less objectively adaptive than the bullying performed by “pure” bullies.

With those caveats in mind, we begin by exploring two functions of adolescent bullying directly related to evolutionary survival and success: health/survival and sex. Both of these functions operate on the dyadic level of two individuals (i.e., they can operate exclusively between a single bully and a single victim). They are thus independent of the social group, unlike other forms of bullying that depend upon the actions of other individuals (e.g., bystanders) or the gaining of social dominance/status to obtain their effects [Kolbert and Crothers, 2003]. We refer to this latter form of bullying as occurring at the level of social groups rather than dyads. The benefits for an individual's health/survival and sex resulting from bullying at the

level of social groups will be discussed separately in the third section on adaptive functions related to dominance.

### Individual-Based Somatic Functions of Bullying

A key potential function of bullying is whether it is associated with positive outcomes for growth and survival (i.e., somatic resources). These positive outcomes could be the result of bullying itself and/or they could be inherent characteristics of bullies that are correlated with, but not necessarily caused by, bullying. Somatic resources do not directly transmit more genes into future generations, but larger, healthier, longer-lived individuals are likely to obtain better reproductive success [Allal et al., 2002; Archer and Thanzami, 2009; Gallup et al., 2007]. There is no direct evidence that bullying causes greater or faster physical growth, but there is evidence that bullies (particularly male bullies) tend to be larger and stronger than non-bullies [Gallup et al., 2007; Olweus, 1993].

Hunter-gatherers (e.g., Aboriginal Australians, Hadza, !Kung San) may offer a more salient test of the somatic benefits of bullying as they face greater survival obstacles compared to adolescents in developed nations [Lee and Daly, 1999; Volk and Atkinson, 2008]. Mortality rates are high among youth, approaching an average of 50% mortality to age 15 as compared to 1% among youth in developed nations [Volk and Atkinson, 2008]. We suggest that if bullying is related to somatic benefits, bullying should be more valuable (and thus prominent) when resources are scarce. There is indeed evidence of this among hunter-gatherers. The Ik were displaced hunter-gatherers who experienced extreme resource deprivation, and whose adolescents were highly involved in bullying over life-and-death physical resources such as obtaining food from others vs. starving to death [Turnbull, 1972]. Within the brief time that they had experienced this deprivation, the youngest generation participated more actively in bullying than their parents, who in turn were more involved than the grandparents, who fondly recalled past times of plenty and group cohesion [Turnbull, 1972]. In a similar vein, an incident of food scarcity prompted greater levels of indirect bullying between families of Utku Eskimo [Briggs, 1970]. Thus bullying for “lunch money,” or more directly, lunch itself, may be an important function of bullying.

Another important ancestral factor for bullying is competition not for material resources, but for the jobs that lead to those material resources. While these kinds of opportunities were sharply limited in egalitarian hunter-gatherer societies [Lee and Daly, 1999],

they became very important as civilization introduced increasingly specific and competitive job markets. Bullies in historical societies did indeed often bully and compete for limited, zero-sum jobs or apprenticeships [Cunningham, 2005; Golden, 1990; Hsiung, 2005; Orme, 2001; Rawson, 2003]. The winners of these contests would gain the necessary resources to promote their survival and reproductive success. This kind of bullying is still seen in modern society, particularly in lucrative professions that possess limited enrolment, such as law schools [Flanagan, 2007].

Besides obtaining material resources, bullies may also acquire physical protection for themselves and their resources by building a tough reputation, increasing their position in a dominance hierarchy, and/or gaining allies, all of which would prevent further conflicts and minimize certain costs, such as physical injuries or loss of tangible resources. Adolescent boys who are perceived as being tough also enjoy protection from aggression as their reputation makes other boys less likely to physically aggress against them even if provoked by insult [Archer and Benson, 2008]. These benefits may extend to their general health too. There appears to be a link between stress (as measured by hormonal cortisol levels), health, and social dominance, suggesting general health benefits to those who win social competitions such as those involved in bullying [Flinn, 2006; van Honk et al., 2004]. Individuals at the top of a dominance hierarchy and/or those with sufficient physical resources (e.g., socioeconomic status) may experience less stress, and thus fewer health issues associated with chronic stress as compared to those without dominance and/or physical resources [Newman et al., 2005; Sapolsky, 2004]. This is consistent with findings that show bullies tend to have some health benefits such as less frequent sore throats, coughs, colds, and breathing problems than victims, and bully-victims, and no more total health problems than neutral, uninvolved children [Fekkes et al., 2004; Wolke et al., 2001]. This evidence regarding health and survival is contrary to the prediction of standard theories of bullying as a maladaptive response to poor environments [Rigby, 2003]. Furthermore, several studies note that pure bullies (excluding bully-victims) report equal or better mental health than uninvolved adolescents and victims [Berger, 2007; Ireland, 2005; Juvonen et al., 2003; Volk et al., 2006; Wolke, et al., 2001]. Bullying is also positively linked with other positive mental traits such as theory of mind ability, cognitive empathy, leadership, social competence, and self-efficacy [Caravati et al., 2009, 2010; Vaillancourt et al., 2003].

So although the directionality of some of the relations cannot be determined, the evidence as a whole

suggests that adolescents involved in bullying have at least equal and in some cases better physical and mental health than victims and uninvolved youth. Furthermore, it seems that these positive outcomes may be partly attributable to bullying providing greater access to somatic (especially in hunter-gatherer societies where there is food scarcity) and material resources, affording protection from aggressive attacks, and, more generally, resulting in lower levels of stress. Consequently, we believe the evidence supports the adaptive functioning of bullying in potentially enhancing prospects for health and survival, which in turn increases, opportunities for current and future reproductive success.

### Individual-Based Sexual Benefits of Bullying

A second key potential adaptive function of bullying at the individual level is increasing opportunities for sex. The survival of the fittest is a biological term that refers not to survival of the strongest, fastest, or healthiest, but of the best reproducer [Alcock, 2001; Dawkins, 1989]. We therefore consider the evidence that bullying is associated with increased reproduction, or at least mating opportunities, to be a key test of our hypothesis that bullying is an adaptation. The first line of evidence for this adaptive function is that bullies may in fact engage in more sex (as evidenced by increased dating/mating). Supporting the sexual adaptiveness of bullying for both sexes are data showing that bullies of both sexes appear to enter puberty and start dating at a younger age, are more active with members of the opposite sex, report greater dating/mating opportunities, and are more likely to be in a dating relationship [Connolly et al., 2000].

How does this occur? One reason may be that bullies display traits that are evolutionarily attractive to members of the opposite sex. While there are similar long-term mate preferences for both sexes [e.g., kindness, social skills, intelligence; Buss 1988a, 1988b], there are also important differences [Archer and Thanzami, 2009; Geary, 2010; Møller and Alatalo, 1999]. For boys, this means exhibiting primary traits such as physical strength, dominance, material resources as well as secondary traits such as physical attractiveness. These evolutionarily relevant traits advertise a boy's future ability to provide and protect for a mate, as well as to provide her with good genes. For a girl, this means displaying traits of attractiveness and resources that signal her future fertility and potential to care for his children.

These male and female traits are in line with the evolutionarily-derived hypothesis that boys and men are more tolerant toward risk due to greater average female investment in offspring combined with a

greater variance in male reproductive success [Daly and Wilson, 1988; Geary, 2010; Hrdy, 1999; Trivers, 1972]. While the average number of children is obviously equal between the sexes, men are much more likely to have either no children, or many more children than average, with dominant/powerful men having many more than subordinate/powerless men [Daly and Wilson, 1988]. For example, 69 is the highest number of children born to a single (unfortunate) woman, wife of Feodor Vassilyev (b.1707–c.1782) who was a peasant from Shuya, Russia. In 27 pregnancies she gave birth to 16 pairs of twins, seven sets of triplets, and four sets of quadruplets. In contrast, the most prolific father of all time is believed to be the (highly dominant) last Sharifian Emperor of Morocco, Mulai Ismail (1646–1727). In 1703, he had at least 342 daughters and 525 sons and by 1721 he was reputed to have 700 male descendents. Yet even this impressive number is far lower than the total number of children believed to be sired by Genghis Khan and his descendents. This family dynasty, which included some of histories' most dominant and violent men, in the world, ruled an empire with a larger territory than any other before or since. Yet they were not only socially dominant, they also translated that dominance to the global gene pool as they are believed to be the paternal ancestors of at least 8% of Asian men, or 0.5% of the world's population, which is roughly 35 million people [Zerjal et al., 2003]! Thus, like virtually all mammals, human men are literally physically and mentally built toward accepting riskier competition because the relative gains and losses are much higher, justifying the increased willingness to engage in risky competition [Geary, 2010]. Just as the physical adaptations of increasing muscle mass and testosterone levels appear to prepare boys for success at intraspecific competition [Geary, 2010], so may their heightened propensity for bullying [Kolbert and Crothers, 2003].

As previously mentioned, male bullies appear to generally display the primary traits of strength, dominance, and material resources [Gallup et al., 2007; Olweus, 1993; Turnbull, 1972]. Boys who bullied other boys were also more accepted by girls [Veenstra et al., 2010], suggesting that the traits they display are indeed attractive to the opposite sex. Given that physically attractive individuals are seen as desirable mates, further evidence that bullying may be a tool used to increase sexual opportunities would come from the data showing that attractive individuals are more likely to be targeted by bullies. In fact, adolescents of both sexes who rated themselves as highly attractive were not only more likely to be victims of sexual bullying, but also to have been perpetrators, observers, or

friends with perpetrators [Cunningham et al., 2010]. Similarly, female adolescents who rated themselves as attractive had higher odds of being victimized relationally through the spreading of rumors or social exclusion [Leenaars et al., 2008]. These lines of evidence suggest a plausible connection between sexual or relational bullying, physical attractiveness and opportunities for sex. Attractive victims of sexual bullying, which includes making sexual jokes, comments or gestures [Volk et al., 2006], may be targeted by bullies trying to signal their sexual interest, and thus to increase sexual opportunities. Consistent with this idea, targets of sexual bullying are more likely to be reproductively viable [i.e., early puberty vs. younger children; Craig et al., 2001].

In a related vein, both sexes may use indirect intersexual bullying, particularly "pushing and poking" harassing courtship behaviors, as public or private efforts intended to gauge a potential partner's sexual interest at the same time as minimizing the costs of rejection (humiliation) or retaliation [from the target or their friends/family; Pellegrini, 2001]. For example, this might entail making unwanted but noncommittal jokes or comments about the attractiveness of, or desire to date, a particular member of the opposite sex. In contrast, relational bullying such as spreading rumors or excluding individuals from social groups is likely used to denigrate characteristics of attractive opposite-sex adolescents who may be seen as rivals in intrasexual competition for mates, as is discussed in greater detail below in regard to the group-based benefits of bullying [e.g., Benenson, 2009].

Additional research indicates that another important individual-based function of sexual bullying may be to coerce members of the opposite sex to establish dating/mating opportunities, [Cunningham et al., 2010; Pellegrini and Long, 2003]. Given that adolescence is a period of sexual maturation, it is not surprising that the number of adolescents involved in romantic relationships increases with age and sexual maturity [Collins, 2003]. Coercive sexual behaviors, including bullying, typically emerge during this age period as well [McMaster et al., 2002]. Furthermore, sexual harassment is correlated with the onset of puberty for cross-sex harassment, but not same-sex harassment [McMaster et al., 2002; Pepler et al., 2006], underlining its reproductive correlation.

Evolutionary theory predicts that due to the lower potential costs of boys' reproduction, and the greater costs incurred by girls, boys should generally be more aggressive and less selective in choosing mates [Geary, 2010; Trivers, 1972]. In agreement with this proposed evolutionary reproductive strategy of boys, it is adolescent boys who are the most common perpetrators

of sexually coercive or harassing intersexual behaviors [McMaster et al., 2002; Pepler et al., 2006]. While there is no doubt that such tactics can be offensive toward their target, it is clear that similar forms of sexual aggression can lead to sexual access in adults [Lalumière et al., 2005; Walker, 1997]. Although not well-studied among adolescents, we presume this is also the case for adolescent intersexual bullying. Cross-cultural research suggests that there exists similar sexual coercion among traditional cultures such as Samoa or the Yanomamö [Chagnon, 1983; Nardi, 1984].

Intersexual bullying may also be used to maintain relationships by operating as a form of jealous control. Connolly et al. [2000] note that bullies' aggressive tendencies tended to carry over into their romantic relationships, as did Pellegrini [2001]. There is preliminary evidence that general sexual aggression in relationships is preceded more often by cues of infidelity than general physical aggression [Camilleri and Quinsey, 2009]. Land [2003] reported that vignettes of sexual bullying among adolescent included themes of jealousy. Among adolescent females, intersexual bullying of partners appears to be a way of obtaining control over one's partner [Capaldi et al., 2004]. For these girls, aggression and bullying toward their partner help ensure both their partner's fidelity, as well as their continued provisioning of resources [Capaldi et al., 2004]—a key evolutionary consideration for future mothers [Geary, 2010; Hrdy, 1999]. Young women's intersexual aggression and bullying differs from men's in that their aggression is typically of a lower intensity [reflecting women's lower tolerance for risk, Geary, 2010; Hrdy, 1999, 2009], and it occurs more frequently in the context of mutual partner aggression [perhaps reflecting a suboptimal situation; Capaldi et al., 2007]. Thus, intersexual bullying appears to be used as a mechanism to increase a partner's fidelity, which in turn would have benefits with regard to enhancing reproductive fitness. Male intersexual bullying in response to the threat of a female partner's infidelity would increase the probability of the male investing parental resources in protecting and providing for his offspring (as opposed to unknowingly raising the child of another man), and thus ensuring that his child survives to pass on her genes. On the other hand, female intersexual bullying directed toward an unfaithful male partner would heighten the chance of the offspring being protected and provisioned by the father, thus boosting the likelihood that the child survives to pass on his genes. In summary, adolescent bullying appears to be often related to sexual attractiveness and offers increased opportunities for dating, mating, and mate-

control. These outcomes are again not predicted by traditional models emphasizing the maladaptive origins of bullying.

### **Group-Based Benefits of Bullying: Dominance**

A third function of bullying is that it may be used to obtain benefits in both somatic and sexual domains through attainment of dominance and/or social status [Kolbert and Crothers, 2003]. Bullying for dominance and status (we use the terms interchangeably) is really bullying for social resources that can in turn be translated into current or future adaptive benefits in somatic, sexual, and/or parental domains. Specifically, the peer relationships of higher-status individuals (especially when grouped with other high-status individuals) provide social resources that give them the power to influence, persuade, or compel others, and to enhance their own access to resources. In large part then, dominance achieved by bullying would serve the same functions as individual-level bullying by securing somatic resources and mating opportunities. So are bullies in fact more dominant than non-bullies?

Dominance has been found to be positively associated with both bullying and peer nominations of dating popularity among adolescents [Pellegrini and Long, 2003]. Bullying is also positively correlated with peer nominations of power [Vaillancourt et al., 2003], social prominence [Zimmer-Gembeck et al., 2005], student and teacher ratings of perceived popularity [de Bruyn et al., 2010; Estell et al., 2007; Juvonen et al., 2003; Rodkin and Berger, 2008], and peer leadership [Estell et al., 2007], all of which relate to dominance and control over resources. Indeed, Hawley [1999] has posited that aggression in general is frequently used as a means to control resources [i.e., Resource Control Theory; Hawley, 2007]. While not tested directly, we believe it is likely that adolescent bullies are similarly able to utilize social dominance to obtain and control valued resources. It is clear that adolescents are very sensitive to issues of dominance and social power as witnessed by bullies targeting only those who were not protected by people who could harm the bully [Veenstra et al., 2010]. However, as in sexual bullying, there again are important evolutionary sex differences between boys' and girls' motives and methods for dominance-oriented bullying. We start by examining girls' bullying for dominance and social power.

Girls who bully not only show a greater desire for male acceptance, they also show higher levels of male acceptance [Dijkstra et al., 2008]. However, this intrasexual competition comes at a cost as they are less

positively accepted by other girls with whom they are presumably competing [Olthoff and Goosens, 2008]. Evolutionary theory suggests that girls should have a lower tolerance toward risk given the less variable reproductive outcomes (see further discussion below) and their greater likelihood in assuming a future role as the primary caregiver to a child [Geary, 2010]. Consistent with this theory, and with data on girls' general aggression and risk tolerance [Archer, 2009; Vaillancourt, 2005], adolescent girls' bullying for dominance relies more on verbal and indirect social bullying than on riskier direct and physical bullying [Volk et al., 2006]. As employed by boys and girls, indirect bullying is particularly difficult for adults to observe [Craig and Pepler, 1998]. From an evolutionary perspective, adolescents' sophisticated Theory of Mind [Wellman, 1992] would have allowed them to engage in covert, indirect bullying [Caravita et al., 2010] that offered many of the same benefits as overt, direct bullying while reducing the likelihood of adult punishments and victim retaliation. Even among the most outwardly peaceful cultures, adult hunter-gatherers appear to employ gossip and social exclusion as effective aggressive or bullying strategies [Briggs, 1970; Ingold, 2004; Lee, 1979; Marlowe, 2010; Thomas, 1989; Turnbull, 1972]. Thus, while it may be less effective in obtaining immediate short-term goals due to the lack of immediate leverage over one's target, indirect bullying likely evolved as an effective long-term tactic that allowed adolescents (particularly girls) to apply the (albeit diminished compared to direct) social power of bullying over long periods of time without incurring negative sanctions in return.

With regards to the content of their bullying, much of girls' intrasexual bullying appears to consist of insults that emphasize other girls' sexual promiscuity or perceived flaws in physical appearance [Shute et al., 2008]. As discussed above, these are the traits that are believed to hold strong evolutionary value for men who have evolved general preferences for sexual fidelity and attractiveness in women desired as long-term mates [Buss, 1988a, 1988b]. So when these traits are attacked by bullies publicly, these insults appear to be a way of reducing the appeal of a competitor to possible mates, thereby raising the bully's relative appeal and status [Timmerman, 2003]. Adolescent girls can also use indirect bullying tactics such as social exclusion or rumors to compete over potential sexual partners by not only damaging others' reputations, but by attempting to socially limit competitors' access to potential partners [Benenson, 2009; Owens et al., 2000]. Having high social status is likely to enable adolescent girls to bully more effectively using indirect or relational means, as it puts them in a position

to exert social control, as powerful individuals, and as members of popular groups. Consistent with this contention, adolescents with high levels of perceived popularity, social preference, and social prominence have been found to be more likely to engage in future relational aggression [Cillessen and Mayeux, 2004; Zimmer-Gembeck et al., 2005]. Thus, for adolescent girls, dominance plays an important role in obtaining and controlling access to boys [Benenson, 2009; Geary, 2010; Hrdy, 1999], demonstrating that indirect bullying for female dominance can be a valuable tool for girls.

Direct bullying may be particularly salient for boys, who more than girls, are believed to channel much of their aggression and bullying toward members outside of one's friendship group [Maccoby, 2004]. This includes physical bullying, which is likely to carry higher costs of general physical aggression such as retaliation, punishment, and likelihood of being caught [Rivers and Smith, 1994]. As previously mentioned, stronger adolescent boys are more likely to engage in bullying [Gallup et al., 2007], as are more aggressive adolescent boys [Bollmer et al., 2006]. Both of these factors may enhance the appeal of the risky physical bullying, leading to the higher levels of physical bullying used by boys [Volk et al., 2006].

Besides the previously discussed individual reputations for toughness, bullying may generate a powerful incentive for boys to be part of the bullying in-group [Sherif and Sherif, 1970] in order to avoid being members of an out-group who are more likely to be targeted [Cillessen and Mayeux, 2007]. As famously demonstrated in the Stanford Prison Experiment, the creation of a scape-goat(s) can generate powerful forces that amplify both in-group cohesiveness and out-group aggression [Zimbardo, 2008]. Bullying someone from an out-group who is not a friend and who you do not need to rely upon may further allow boys to engage in costlier, more damaging, forms of bullying. Thus, bullying for adolescent boys may be a means of increasing in-group power and cohesiveness. Research has shown that boys are in fact more likely than girls to engage in solidarity in the face of conflict [Benenson, 2009], highlighting both the potential importance of coalitions among boys and their willingness to use riskier forms of bullying to cement those coalitions [Archer, 2009; Geary, 2010]. This may have been particularly important from an evolutionary perspective if being a victim of severe physical bullying lead to severe injury or death among boys.

While anthropologists have not directly measured bullying among pre-industrialized adolescents, many cultural ethnographies often refer to highly aggressive, bullying boys, in warrior agriculturalist cultures

such as the Ache [Hill and Hurtado, 1996], Huron [Trigger, 1969], New Guinea Highlanders [Heider, 1991], and Yanomamo [Chagnon, 1983]. In contrast to modern hunter-gatherers, in these cultures, men actively band together to protect their women and territory from raids by bands of neighboring men [similar to chimpanzees; Goodall, 1986]. This lifestyle places a premium on male aggression, cooperation, and status [Chagnon, 1983]. In particular, the greater reproductive variance of men in more stratified societies increases the potential benefits of bullying for dominance/status [Daly and Wilson, 1988], while at the same time greater social acceptance of violence lowers the social costs of bullying, particular toward members of an out-group. The fact that an estimated 90% of “pre-civilized” human cultures engaged in war/raiding at least twice per year [Keeley, 1996] suggests that historically there have been ample opportunities for male adolescent bullying to serve an adaptive function in protecting and promoting the welfare, power, and reproductive success of its practitioners. Nor did the potential evolutionary utility of bullying and violence end with the dawn of civilization, as witnessed by the bloody politics of Ancient Greece [Golden, 1990], Rome [Rawson, 2003], and China [Hsiung, 2005], as well as the previous examples of Mulai Ismail and the Khan family.

What is more, members of these coalitions may be desired as companions not only by other boys who want to be part of the “in-group,” but also by girls who are attracted by the member’s ability, as a high-status, powerful individual, and as a member of a cohesive and high-status group, to protect and/or provision them and any future offspring [Buss, 1988a, 1988b]. Consistent with this contention, dominant male adolescents have a higher level of dating popularity [Pellegrini and Long, 2003] and perceived popularity was associated with increased adolescent sexual activity at a 2-year follow-up assessment [Mayeux et al., 2008]. Bullying boys who achieve dominance and/or perceived popularity may therefore enjoy increased mating success as a result. Boys’ bullying of boys was in fact specifically related to greater acceptance by girls in grades 5 to 8 [Veenstra et al., 2010]. Thus, besides promoting in-group solidarity, boys’ bullying for dominance and popularity facilitates intrasexual competition for dating and mating opportunities, which provides a powerful social incentive for male adolescents to engage in riskier, more severe, overt forms of bullying than girls, thereby explaining one of the most common findings in the bullying literature. Boys bully more often, more directly, and more intensely than girls [Berger, 2007; Olweus, 1993; Volk et al., 2006] because the potential rewards are greater

than the potential risks among boys as compared to girls.

## GENETIC BASIS OF BULLYING

Having examined the adaptiveness of bullying, we turn to the second component of evolved adaptations. Recall that evolutionary adaptations require a genetic linkage that allows natural or sexual selection to alter the ratio of genes in future generations based upon the effects of the adaptation [Dawkins, 1989; Williams, 1966]. Without this linkage, evolution is unable to select for adaptive behaviors. Thus, it is a necessary, but not sufficient, prerequisite for bullying to have some kind of genetic linkage that would have allowed evolution to act upon it as an adaptation. In humans, complex behaviors are almost certainly polygenic [Hernderson, 1982]. This means that their expression depends upon the effects of multiple genes. As such, we do not expect there to be one, or even only a few, genes that control bullying. Instead, we expect bullying to be related to a host of genes, including those that are already known to control for a wide range of developmental factors including: temperament [Goldsmith et al., 1999], personality [Eysenck, 2006], and general aggression [DiLalla, 2002]. This is an important point, because it means that the developmental factors believed to increase the likelihood of bullying [e.g., personality; Book et al., in press] were already linked to genes. Thus, an adaptation for bullying would not require the more complicated and statistically unlikely event of evolving an entirely new suite of traits. Instead, to the extent that bullying increases success in natural or sexual selection, the frequency of this behavior in the population may increase as a function of a heightened prevalence of the genes that predispose individuals to greater involvement in bullying. Links in the literature between bullying and aspects of personality such as lower agreeableness and higher levels of aggression [Bollmer et al., 2006; Olweus, 1994; Tani et al., 2003] provide a plausible mechanism by which this could occur. Genetic-based individual differences in temperament may also play a role, because research has shown that bullies exhibit a higher level of negative emotionality than do uninvolved peers, reacting to stressful situations or provocations with stronger emotions [Pellegrini and Bartini, 2000]. Furthermore, their ability to inhibit impulses toward aggressive behavior is limited by deficits in behavioral regulation [Marini et al., 2006], and a relative lack of fearfulness [Bacchini et al., 2008]. Thus, the existing genetic links with these individual traits mean that the evolution of bullying did not necessarily require the evolution of new mental adaptations. Instead, it could

have required the much simpler and more probable event of modifying the existing genotypes for temperament, personality, and/or aggression, to magnify the probability that bullying occurs [a process known as exaptation; Gould and Verba, 1982].

Indeed, a recent behavioral genetics study of the heritability of bullying provides some evidence that genetic factors play a role in the development of bullying. The investigators found that in a cohort of over 1,000 10-year-old twins genetic differences accounted for 73% of the variation in victimization and 61% of the variation in bullying, with environmental factors accounting for the rest of the variation [Ball et al., 2008]. This does not mean that 61% of bullying is due to genetic factors, or that bullying is primarily determined by genetic rather than environmental factors. Rather, we simply take it to mean that there is sufficient genetic linkage for evolution to have acted upon bullying. Without any genetic linkages, evolution could not have influenced traits related to bullying. Therefore, we only argue that bullying satisfies the second necessary criterion for an adaptation—it is heritable/has genetic links and is thus selectable by natural or sexual selection.

Further evidence for the genetic plausibility of bullying as an adaptation comes from viewing the phylogenetic (large-scale evolutionary) history of the behavior, as repeated phylogenetic adaptations offer strong evidence for the plausibility of a genetic linkage [Carroll, 2005]. From a phylogenetic perspective, bullying appears to have a long evolutionary history among a wide range of social animals other than humans. Bullying as a means of obtaining social dominance is in fact a relatively common social adaptation in the animal world [Alcock, 1988; Archer, 1988; Lorenz, 1966]. Indeed, dominance achieved through bullying is often signified by the expression “establishing a pecking order,” which is drawn from data on chickens showing that they literally rely on repeated aggressive pecking to establish social hierarchies [Masure and Allee, 1934]. In other animals, dominance hierarchies may have evolved to serve an anti-bullying function by minimizing aggressive interactions over limited resources by reducing the likelihood that more powerful (i.e., dominant) animals will make potentially costly and likely unnecessary aggressive challenges against weaker (submissive) animals that also pay some of the same costs during such a fight [Alcock, 1988, p. 239]. This appears to be most common among animals that do not socialize intensively for long periods of time (e.g., deer), whereas bullying appears to exist among social animals who maintain intensive social contact for prolonged periods of time (e.g., many social carnivores).

Female alpha wolves, African wild dogs, and banded mongooses will employ bullying in an effort to prevent subordinate females from mating and producing pups in order to commit the pack’s resources solely to the alpha’s pups [Bell et al., 2011; Creel and Creel, 2002; Mech, 1970; Scott, 1991]. Dominant animals of all these social carnivores will also frequently bully the weakest member of the pack, presumably over resources, often resulting in its death or its dispersal from the pack [Cant et al., 2010; Creel and Creel, 2002; Mech, 1970]. Dominant female spotted hyenas put their abnormally high levels of testosterone to work by bullying weaker females and males from group kills [Stewart, 1987]. **Dominant hyena mothers also pass on their dominance status to their offspring, who can then bully other youngsters, and sometimes even adults, to gain privileged access to resources such as food** [Stewart, 1987; van Lewick and Goodall, 1978].

Among primates, similar behaviors are seen in a wide range of species whereby dominant females gain greater access to food resources and male protection, and both privileges get passed on to their offspring [Smith, 2005, pp. 184–187; Wrangham, 1980]. Dominant male primates often get greater access to mating opportunities either directly by bullying females or indirectly by bullying away male competitors [Hrdy, 1999; Thompson, 2010]. Male chimpanzees have been observed to bully, either as individuals or as a coalition, subordinate males in order to prevent them from mating, while female chimps bully other females over access to food resources [Goodall, 1986].

Combined, research on genetic linkages to traits associated with bullying and evidence for bullying among nonhuman animals strongly support the possibility of a genetic basis for bullying in humans. Admittedly, this is an area of research that has not been thoroughly studied, but the research done to date supports a human genetic linkage with bullying.

### WHY ARE NOT ALL ADOLESCENTS BULLIES?

Clearly, if bullying was purely adaptive and was biased by strong genetic predispositions, one would predict that all adolescents should engage in it all the time. However, statistics clearly indicate that they do not. A large number of adolescents do not engage in bullying [Berger, 2007]. Why? As with many other adaptations [e.g., an adaptive preference for fat and sugar; Birch, 1992], bullying comes with costs as well as benefits. We emphasize that human evolutionary behavioral strategies are not believed to be fixed, unresponsive, genetically pre-determined programs. For

example, given the potential long-term costs of violent conflicts over food, the Ik bullying behaviors previously discussed may reflect a facultative adaptation that presents itself in response to the difficult environments and/or during times of drought or famine that are believed to have frequently plagued hunter-gatherers [Lee and Daly, 1999].

A facultative adaptation is an adaptation that is expressed only under certain environmental circumstances [Underwood, 1954]. Other adolescent behaviors believed to be facultative adaptations include earlier sexual maturation and behaviors as a result of father absence [Belsky et al., 1991; Ellis, 2004]. These sexual behaviors and the heightened levels of bullying (particularly risky physical bullying) may both share the common cause of adolescents engaging in behaviors that discount future investments (because they are less likely to pay off) in favor of present investments [even if they carry future costs as those costs are less likely to occur; Del Giudice and Belsky, 2010]. So under harsh conditions, it may make more sense to invest all your resources in whatever option helps you reproduce now, even if that means sacrificing better long-term options. If bullying is a facultative adaptation (and we believe it is), this would partly explain why not all adolescents engage in bullying because they do not experience the necessary environmental precursors to trigger bullying. Instead, bullying should be more prevalent when adolescents receive cues that motivate them to embrace their present at the expense of their future.

Facultative adaptations are designed to be sensitive to the costs and benefits of engaging in a particular behavior in a particular environment. Thus prospective bullies should consciously or unconsciously weigh the personal and environmental factors that influence their odds of success (e.g., body size, positive peer support, target's weakness, lax supervision) against those factors that influence their odds of failure (e.g., personal weaknesses, likely adult punishment, negative peer responses, target's defenses) prior to engaging in bullying behavior. Archer and Southall [2009] have argued that male prisoners engage in just this sort of cost vs. benefit analysis to determine their bullying behaviors. Individuals who possess the appropriate temperament, personality, and requisite physical and/or social power would be more likely to positively evaluate their chances of success at bullying. But if environmental factors are not conducive to success (e.g., strong adult sanctions, cultural taboos against violence, etc.), these predispositions should not lead to bullying [Volk et al., in press]. This would explain why not all children, even those with the "right" predisposing factors, engage in bullying. Note that this expla-

nation is not incompatible with traditional aggression theories of social learning [Bandura, 1978] and/or social information processing [Crick and Dodge, 1994]. Rather, an evolutionary explanation explains when and why adolescents should be sensitive to environmental cues and/or particular forms of social information.

An alternative (and complementary) explanation for bullying sometimes not being adaptive is that bullying is a heterogeneous behavior [Marini et al., 2010; Volk et al., 2006], and that the type of bullying involvement likely affects its adaptiveness. Specifically, an important theoretical and empirical distinction has been made between bullies and bully-victims [individuals who are both bullies and victims, see Marini et al., 2009]. Research has shown that bully-victims are less adept at prosocial behavior, less athletic and attractive, lower in social competence and self-control, and higher in activity level than bullies, victims, or uninvolved children [Estell et al., 2007; Haynie et al., 2001; Marini et al., 2006; Rodkin et al., 2008]. These attributes fit well with both popular stereotypes of bullying as well as the general maladaptive view that bullying is the result of individual and/or environmental developmental insults rather than an adaptive response to one's environment [see Berger, 2007, for a review]. Bullying performed by bully-victims is not linked to positive outcomes in social dominance and intrasexual competition. Like bullies, they were lower in social preference and peer liking, and higher in peer disliking [Estell et al., 2007; Pellegrini, Bartini, & Brooks, 1999; Rodkin et al., 2008]. However, in contrast to bullies, bully-victims were ranked lower than uninvolved participants, bullies, or victims, in teacher-rated popularity and peer nominations of perceived popularity [Estell et al., 2007; Rodkin et al., 2008]. Furthermore, bully-victim status was not correlated with dominance, was associated with fewer reciprocated friendship nominations, and these individuals had more peer relationship problems than did bullies, victims, or uninvolved peers [Marini et al., 2006; Pellegrini et al., 1999]. Notably, these peer relationship problems include both a lack of friendships and dating opportunities [Marini et al., 2006].

Several other lines of research suggest that the bullying practiced by bully-victims is less likely than that of "pure" bullies to be selective with respect to potential targets and to the social context, which would likely reduce its adaptiveness. First, as indicated, bully-victims are characterized by a lack of social competence and self-control, and their bullying is seen as a product of emotional dysregulation [Estell et al., 2007; Haynie et al., 2001; Marini, et al., 2006; Rodkin

et al., 2008; Schwartz et al., 2001]. In addition, bully-victims are more apt than bullies to engage in reactive aggression [Salmivalli and Nieminen, 2002], a subtype of aggression that is retaliatory, emotional, and impulsive in nature, and less planned, goal-directed, and calculated than proactive aggression [Hubbard et al., 2010]. Given their impulsivity, emotional volatility, and predilection for uncontrolled, unplanned, emotional acts of aggression, bully-victims may be more likely than “pure” bullies to direct their acts of bullying toward ill-advised targets (e.g., popular children; boys’ bullying girls) without taking social context into consideration, and to thereby experience more sanctions and social disapproval from their peers. It then follows that the bullying of bully-victims would be ineffective and/or maladaptive in regard to achieving protection from aggression, social dominance, or competing for sexual partners. Again, this points to two different pathways to bullying. The first is the likely adaptive behavior of pure bullies that is characterized by selective behavioral choices and relatively positive outcomes. The second pathway is more similar to the traditional maladaptive view of bullying [Smowkowski and Kopasz, 2005] wherein bully-victims employ bullying strategies ineffectively as a result of poor inhibition, cognition, and/or social skills [Crick and Dodge, 1999; Marini et al., 2008].

Clearly then, for many bully-victims, bullying is not likely to be an adaptive solution to modern or past problems. Yet even successful “pure” bullies suffer from losses in peer nominations of liking and acceptance [e.g., Bachini et al., 2008; Caravita et al., 2009, 2010; Dijkstra et al., 2007, 2008], face potentially severe costs from retaliating victims or punishing adults, and often engage in co-related antisocial behaviors that are harmful to the bully [Juvonen et al., 2003; Volk et al., 2006]. This does not invalidate our hypothesis that bullying is an evolved adaptation. Rather, it again highlights the fact that like many adaptations, bullying is a flexible response that reflects a balance of costs vs. benefits. Rather than diminishing the role of the environment in explaining bullying, an adaptive evolutionary view of bullying highlights the importance of the interplay between evolved individual predispositions and their fit with local environments. Finally, we do not want to reject out of hand the possibility that even the behavior of bully-victims may be adaptive in certain respects. A recent analysis of insecure styles of attachment suggests that even though they are strongly correlated with numerous negative developmental outcomes, insecure attachments may represent evolved adaptations for maximizing one’s success in low-quality, unstable developmental en-

vironments [Ein-Dor et al., 2010]. The same logic may apply to bully-victims, but that remains to be tested.

### ANTI-BULLYING INTERVENTIONS FROM AN ADAPTIVE PERSPECTIVE

Clearly, researchers must consider the interplay of environment and personal goals in order to properly understand adolescent bullying. An adaptive view of bullying suggests that it will more likely be used when the benefits of bullying outweigh its costs. Unfortunately, few intervention efforts or studies have taken this perspective on bullying [Merrell et al., 2008]. We have argued that the evidence no longer solely supports a purely maladaptive definition of bullying.

Numerous attempts have been made to design and implement anti-bullying intervention programs [see Rigby, 2010 for examples]. Unfortunately, as one would expect of an evolved, adaptive, species-wide behavior, bullying has proven to be remarkably hard to prevent. A large meta-analysis of the effects of anti-bullying interventions revealed that, on average, they produced relatively few positive effects [Merrell et al., 2008]. These results are supported by a more recent meta-analysis of the nonsignificant effects of random-design experimental anti-bullying interventions [Ttofi and Farrington, 2011]. We believe this may be due in large part to the fact that within many interventions, bullying is often treated as a homogeneous, maladaptive response rather than a flexible, heterogeneous, and adaptive response. Many programs take the approach that bullying is the result of faulty social reasoning or abilities on behalf of the bully by focusing on empathy training, social justice, fostering bullying to victim cooperation, and social skills training [Merrell et al., 2008; Rigby, 2010; Smowkowski and Kopasz, 2005]. This may well apply to some bullies (particularly bully-victims), but as we have discussed, most bullies do not appear to suffer from mental or emotional deficiencies that seriously impair their potential to positively interact with their peers. These programs are therefore not likely to reduce bullying as intended. Instead, bullies appear to apply their abilities toward bullying in order to gain resources and/or advantages for themselves. Programs such as “zero-tolerance” ask bullies to give up an advantageous behavior without gaining anything in return—not a recipe for likely success [American Psychology Association, 2006; Dane et al., 2011].

This does not mean that the problem is insurmountable or that bullying is hopelessly genetically predetermined and resistant to environmental influences. Indeed, consistent with our facultative explanation of

bullying, a wider meta-analysis including pre-/post- and age-cohort designs did show a significant positive effect of anti-bullying interventions [Ttofi and Farrington, 2011]. Most importantly, this meta-analysis also examined the likely causal bases of success for these programs. The two variables that emerged as being most important were parent training and disciplinary methodology. This makes good sense for several reasons. First, bullying is, by design, difficult to detect, particularly by adults [Craig and Pepler, 1998]. This makes its detection and punishment problematic, so increased efforts in this respect are likely to be of value. Secondly, overt/direct forms of bullying are rare among hunter-gatherers [Kamei, 2005], a potential reason for the evolution of indirect strategies as we have argued. As previously discussed, the reason why overt bullying is low among hunter-gatherers is because of adult interventions and cultural disciplinary methods that make overt bullying a costly, and thus maladaptive, enterprise. So it should come as no surprise that modern anti-bullying initiatives that mimic these same environmental factors in modern environments also reduce bullying. Rather than focus on parent-adolescent bullying relationships that may not be the cause of bullying behaviors [Veenstra et al., 2005], these interventions are specific to increasing parental awareness of and intolerance toward bullying, as well as education in effective discipline strategies [Ttofi and Farrington, 2011]. Interestingly, the researchers also found that leaving the solution up to students (i.e., encouraging peers to “work it out”) actually increased bullying [Ttofi and Farrington, 2011]. This is consistent with our belief that it is not a failure of empathy, or communication problems, or misunderstandings that cause of much bullying. In most cases, bullies are proactively engaging in a behavior that achieves a desirable outcome using their position of power. Left to their own devices, they are not willing to relinquish that power or those benefits, and their less-powerful peers are clearly unable to persuade them to without adult intervention.

Bullies’ antipathy toward relinquishing functional power represents perhaps the most significant contribution of an evolutionary perspective for anti-bullying interventions. We strongly believe that successful interventions will need to not only focus on simply increasing costs to the bully (e.g., by converting bullying bystanders to victim defenders), but also on addressing the reward side of the equation. If the goal is to reduce bullying, and bullying is often the result of adaptive cost-benefit analyses, it only makes sense to not limit one’s interventions to just the cost side of the equation. Interventions should point out prosocial options that offer a better cost-benefit ratio

for bullies. For example, male bullies who display their physical strength and prowess by competing legally, but aggressively, in sports may obtain the same benefits as displaying their strength and prowess through bullying while incurring fewer costs. At the same time, the benefits of the strength display increase as sports lend themselves to a broader audience.

Furthermore, consistent with the concepts of resource control theory [Hawley, 2007], bullies could be shown, perhaps using a problem-solving-skills-training framework [Kazdin, 2010], that prosocial strategies can be used as an alternative to coercive strategies as a means to attain social dominance. For instance, using strength and athleticism to defend a victim from a bully is another way to display qualities that are attractive to female peers, but given its prosocial orientation the behavior would not incur disciplinary costs. As another example, instead of using relational or indirect bullying to enhance one’s social status and control of social resources, parents or teachers could discuss prosocial strategies that would accomplish the same thing, such as doing favors for people, which will increase not only the individual’s popularity, but the likelihood of reciprocation or cooperation from these peers at a later point in time. In fact, acts of charity or altruism are very popular “dominance” strategies among many hunter-gatherers [Lee and Daly, 1999]. It allows individuals to flaunt their resources while compensating for the loss of other’s status by provisioning them with said resources. Individuals who engage in this kind of display are often popular and liked [Boehm, 1993; Lee, 1979; Marlowe, 2010], in contrast to bullies who are popular, but who may not be liked (or disliked). From a social-information-processing perspective [Crick and Dodge, 1994], the key to this approach would be focusing on the adolescent’s social goal of attaining popularity or social dominance and using a problem-solving approach to help them attain that goal. When evaluating possible goal-directed responses, one could illustrate alternative prosocial strategies that achieve the desired benefits with far fewer costs.

We have also argued elsewhere that it would be beneficial to tailor interventions to the specific needs and predispositions of the child, rather than taking a one-size-fits-all approach [Volk et al., in press]. Our discussion herein on the adaptiveness of bullying points to the advantages of such an approach, as it is clear from the foregoing that the bullying of bully-victims differs in important ways from that of “pure” bullies. Given that bully-victims are relatively lacking in social competence and self-control, it may be that anti-bullying interventions

emphasizing social skills training [Rigby, 2010] may be more helpful for this subset of bullies than for bullies as a whole. Furthermore, given the impulsive and reactive nature of bully-victims' aggression, interventions designed to lessen emotional reactivity by teaching self-control and anger coping strategies [e.g., Lochman et al., 2010] may be more useful to this group than problem-solving approaches stressing the response evaluation biases that are more characteristic of individuals engaging in aggression proactively [Hubbard et al., 2010].

To summarize, we suggest that anti-bullying interventions can succeed, but if they are to prove more efficacious than current efforts [Merrell et al., 2008; Ttofi and Farrington, 2011], they should incorporate three evolutionarily-informed points. First, continue current efforts to increase the costs of bullying to the bullies [Ttofi and Farrington, 2011]. Second, recognize the adaptive nature of bullying by developing and/or promoting prosocial alternatives that allow bullies to achieve their goals of somatic resources, dating/mating, and/or dominance more effectively than through bullying. Finally, due to the heterogeneous nature of bullying, bullies, bullying contexts, and bullying causes, bullying interventions must be flexible enough to meet different individual needs. In particular, tailoring interventions to the differential needs, predispositions and biases of "pure" bullies and bully-victims would likely result in greater success.

## CONCLUSIONS

Bullying is an important topic of study for those interested in the development, health, and welfare of adolescents. Its negative effects for bullies, and particularly for victims, make it a serious risk factor for adolescents. Traditional views of bullying have proposed that it is the result of impoverished individual or environmental factors resulting in maladaptive development. While we do not dispute that this is likely the case for some bullies, we argue that for many more bullies their behavior may be the result of an evolutionarily adaptive predisposition to engage in bullying for somatic resources, mates, and/or dominance and status. In support of this hypothesis we point to the ubiquity of bullying across cultures, history, and geographic areas. We also point out the genetic heritability of bullying, as well as the plausibility of bullying providing an overall benefit to its practitioners despite potential costs to the behavior. Thus, our evolutionary view of bullying offers a powerful complement to traditional maladaptive theories of bullying. This evolutionary perspective can help inform and guide both current interventions as well as future research.

There are many important questions that remain to be asked and tested within this evolutionary framework. For instance, is bullying part of a more general antisocial lifestyle, or can it be employed more selectively by otherwise prosocial adolescents? Research on bistrategic children who alternate between prosocial and aggressive strategies [Hawley, 1999, 2007] suggest that it may be the latter, though it is possible that some cases of bullying represent a general lifelong antisocial trajectory. But this has not been tested with regard to bullying as opposed to aggression in general. Culture appears to play an important role in bullying prevalence, but do more unequal environments promote greater levels of bullying, especially risky male bullying? Do the goals of bullies shift from social dominance to physical subsistence in impoverished environments? Do bullies enjoy greater lifetime reproductive success compared to non-bullies? How do we operationalize and compare bullying across different species? These are just a sample of the potential questions that remain to be answered from an evolutionary perspective. The question we hope that we have answered is: Is bullying an evolved adaptation? We argue strongly that in many cases, it is, and that this has profound implications for future research and interventions.

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