Original Article

Bargaining power and adolescent aggression: the role of fighting ability, coalitional strength, and mate value

Aaron Sell [a,*], Manuel Eisner [b], Denis Ribeaud [c]

[a] School of Criminology and Criminal Justice, Griffith University, Mount Gravatt, QLD, 4111
[b] Institute of Criminology, University of Cambridge, CB3 9DA, Cambridge
[c] Chair of Sociology, ETH Zurich, CH-8092, Zurich

ARTICLE INFO

ABSTRACT

Basic models of animal conflict show that animals with more bargaining power can expect a larger share of resources and more frequently deploy aggression when challenged. Bargaining power comes from multiple sources including formidability (e.g. personal fighting ability) and cooperative value (e.g. mate value). Here, we apply this basic conceptual framework to human adolescents and test seven core hypotheses derived from this paradigm on a large sample of Swiss students (N = 1447; 15–17 years old). Three components of bargaining power were measured in males and females: fighting ability, coalitional strength, and mate value. Fighting ability and mate value reliably predicted aggression, aggressive attitudes, and delinquent behavior in both boys and girls. The effect of fighting ability on aggression was predictably larger and more robust in males than females. Coalitional strength also reliably predicted aggressive bargaining in boys but less consistently in girls. Regression analyses showed that the effect of each component of bargaining power was independent and survived numerous controls. Results support the thesis that individual differences in aggressive behavior result, in part, from individual differences in bargaining power.

1. Introduction

An organism can often benefit its own reproduction at the expense of another's. These conflicts of interest can be solved in one organism's favor if it can prevent the other from acting. One way of preventing another organism from acting is to "break" them, i.e. to introduce chaotic elements into their body that prevent the full functioning of their behavioral systems. This is aggression. Using this simple functional framework, biologists have made great strides in mapping the causal pathways that lead to animal, plant, and bacterial aggression (Huntingford & Turner, 1987).

Natural selection has designed a host of cognitive and perceptual adaptations in a variety of animal species that function to estimate and reduce the costs of aggression. Primarily, animals assess their probability of winning a given conflict, and then cede resources that would cost more to acquire than they are worth (Enquist & Leimar, 1983). These assessment mechanisms should – in theory – assess any cue that predicts the probability that pursuing a conflict will be a net cost for the assessor. Empirically, animals have been shown to assess both semi-stable variables (e.g. fighting ability) and variables that fluctuate from conflict to conflict; for example, when fighting over food, animals will be more likely to persist when they have been starved (Enquist & Leimar,

1987; Sell, 2011a), but they are also less likely to persist if there are perceptible cues that their opponent has been starved. For example, bald eagles will assess the distention of their opponent's stomach and cede food to hungrier opponents (Hansen, 1986). More commonly, these assessment mechanisms attend to cues of relative fighting ability (i.e. relative formidability). For example, red deer, toads, and feral horses respond functionally to auditory cues of body size (Clutton-Brock & Albon, 1979; Davies & Halliday, 1978; Rubenstein & Hack, 1992). Hermit crabs assess claw size and respond prudently (Neil, 1985), and humans attend to visual and auditory cues of upper body strength in men (Sell, 2012; Sell et al., 2009, 2010; Trebicky, Havlicek, Roberts, Little, & Kleisner, 2013; Zilioli et al., 2015). In addition to individual assessment, some animals assess the size of coalitions before group aggression, e.g. chimpanzees (Wilson, Hauser, & Wrangham, 2001).

The outputs of these assessment mechanisms and the outcomes of any aggression that follow are stored in neural tissue and result in patterns of deference called *dominance hierarchies*. Such hierarchies have been demonstrated in many social species such as domestic chickens (Maier, 1964), dark-eyed juncos (Cristol, 1992), Panamanisan insects (i.e. *Zorotypus gurneyi*, Chloe, 1994), chickens (Guhl, 1956), dark chub fish (Katano, 1990), hyenas (Owens & Owens, 1996), cockroaches (Ewing, 1967), and every social monkey and ape (Smuts, Cheney, Seyfarth, Wrangham, & Struhsaker, 1987). While dominance hierarchies are often referred to as a feature of a social group, the hierarchy itself exists in the brains of the individual animals that store information about relative bargaining power. The result is that animals with more bargaining power (i.e. the ability to impose costs, deny benefits or

* Corresponding author. School of Criminology and Criminal Justice, Griffith University, Mount Gravatt campus, Mount Gravatt, QLD 4111. Tel.: +61 7 3735 1170; fax: +61 7 3735 1033.
E-mail address: a.sell@griffith.edu.au (A. Sell).

otherwise exert control over the actions of another) leverage this power in ways that let them win conflicts of interest, attain preferential access to territory or mates, and in other ways benefit themselves at the expense of other animals. Indeed, the relationship between an animal's fighting ability (the largest component of bargaining power in many species) and the deference it receives from other animals is one of the most robust findings documented in evolutionary biology (see Archer, 1988; Huntingford & Turner, 1987; Kelly, 2008).

1.1. Evolutionary psychology of aggression

Evolutionary psychologists have applied some of these basic findings to humans, and used them to understand human aggression and bargaining behavior in many contexts (Archer, 1988; Eisner & Malti, 2015; Petersen, Sznycer, Sell, Cosmides, & Tooby, 2013; Pietraszewski & Shaw, 2015; Price, Dunn, Hopkins, & Kang, 2012; Sell, Tooby, & Cosmides, 2009; Tooby, Cosmides, Sell, Lieberman, & Sznycer, 2008).The theories have also been used to create a computational theory of human anger (Sell, 2006, 2011a, 2011b) that makes specific predictions about the role of bargaining power on entitlement, anger, and aggression. The recalibrational theory holds that human anger was designed by natural selection to bargain for better treatment both in the immediate environment and over time. Thus, anger deploys tactics both to win conflicts of interest and to recalibrate the target so that they place more weight on the angry individual's interests in the future (i.e. to raise their *welfare tradeoff ratio* or WTR, see Tooby et al., 2008). Because the limits of what one can expect from others can be negotiated with bargaining power, those individuals with more bargaining power should expect and demand higher WTRs from others (i.e. such individuals should be – and are – more entitled and more prone to anger; Lukaszewski, 2013; Price et al., 2012; Sell, Tooby & Cosmides, 2009). The theory thus predicts that anger-based bargaining (using cost-infliction or benefit-denial) will be tied to bargaining power such that more powerful individuals will deploy anger over a wider range of circumstances, insist on better treatment from others, and more frequently deploy aggressive bargaining tactics (Sell, Tooby & Cosmides, 2009).

Anger is one of the evolved mechanisms that trigger aggression, but it is not the only one. Other routes to aggression likely include predatory and hatred-based aggression (Sell, 2013), bargaining aggression activated by jealousy (Buss, 2000) or fear (Kalin, 1999), and others (Archer, 1988; Baumeister & Beck, 1999; Pinker, 2011). Regardless of the route to aggression, the models of animal conflict suggest that bargaining power would have both: i) increased the probability of aggression succeeding and ii) decreased the harmful future consequences of that aggression. In short, the human mind evolved in a context wherein bargaining power was associated with more efficient aggressive bargaining. Therefore, the human mind should be designed such that an individual's bargaining power will regulate the deployment of harmful behavior.

In short, those with more bargaining power should demand better treatment and more commonly threaten or deploy aggression against others. Furthermore, those individuals with bargaining power should believe that aggression is a more appropriate and efficient strategy than those without bargaining power. Finally, because bargaining power can be used to protect individuals against exploitation, those with bargaining power should anticipate that they are more protected from the consequences of aggressive behavior. We refer to this cluster of variables – e.g. entitlement, frequent use of aggression, and belief in the utility of aggression – as "aggressive bargaining."

1.2. Components of human bargaining power

Reproduction is an inherently difficult task requiring the solving of many adaptive problems. Because of this, there are multiple ways in which one individual can help or hinder the reproduction of another,

giving that individual multiple levers of bargaining power. We focus on three: fighting ability, coalitional strength and mate value.

1.2.1. Fighting ability

As with other animals, the ability to efficiently use physical aggression against a conspecific is a component of bargaining power in humans. Such aggression is particularly common among unmated human males (Wilson & Daly, 1985). Furthermore, sex differences in perceptual, motor, muscular, skeletal, energy, and behavioral systems show that males are – compared to females – better designed for physical aggression (Sell, Hone, & Pound, 2012). Research on the ability of humans to assess fighting ability in their conspecifics also supports this premise: both men and women are better able to estimate male fighting ability (Sell, 2012). Therefore, among males, those who are better fighters will expect better treatment from others and be more prone to use their fighting ability to bargain during conflicts (DeWall, Bushman, Giancola, & Webster, 2010; Hess, Helfrecht, Hagen, Sell, & Hewlett, 2010; Petersen et al., 2013; Price et al., 2012; Sell, Tooby & Cosmides, 2009). In short, while fighting ability is a component of bargaining power for both sexes (Burbank, 1994; Campbell, 2013), it is particularly important for males. This leads to two core predictions: #1: fighting ability will positively correlate with aggressive bargaining in males and #2: fighting ability will be less predictive of aggressive bargaining in females.

1.2.2. Coalitional strength

Although some species engage only in solitary aggression, others combine their efforts to magnify bargaining power (Chapais, 1996; Harcourt & de Waal, 1992; Silk, 2002). Humans are a highly cooperative species that uses coalitions both to enhance fighting ability (Fessler & Holbrook, 2013; Wrangham, 1999; Wrangham & Glowacki, 2012) and to benefit from collective actions (Ostrom, 2000; Tooby, Cosmides, & Price, 2006). Because coalitions can inflate both formidability and cooperative value, the size and strength of an individual's coalition are components of their bargaining power. Furthermore, factors such as specialized knowledge and skills, health, mutual interests, and many other factors are likely to determine the quality of the coalition one is accepted into, a selection process that occurs in both men and women and functions from at least early childhood (Drewry & Clark, 1985). Thus, one's coalition is not only a causal factor in bargaining power but also an indirect indicator of valued personal qualities that are likely to be components of bargaining power in their own right. For both these reasons, coalitional strength should predict aggressive bargaining in both males (prediction #3) and females (prediction #4).

1.2.3. Mate value

Evolutionary biologists understand mateships in social species to work as a competition, wherein individuals attempt to consort with mates that will be more likely to conceive healthy offspring (Møller & Alatalo, 1999) and – in investing species – show traits that predict the mate will be able and willing to invest in the offspring (Møller & Jennions, 2001). Humans – and other animals – evolved a sense of beauty that is comprised of perceptual and computational systems that estimate some of these features and output a magnitude that corresponds to the mate's desirability (Symons, 1995). While there are individual differences in mate preferences, there is also substantial agreement in which features are desirable in a mate within any given group (Cunningham, Roberts, Barbee, Druen, & Wu, 1995; Fink & Penton-Voak, 2002). This means that individuals differ in their "mate value" and that this difference enables men and women to bargain with the opposite sex for better treatment based on the contingency of entering a mating or romantic relationship.

Furthermore, many of the components of "mate value" also indicate an individual's quality as a trading partner or cooperative ally, e.g. health, longevity, competence, skills (Fink, Neave, Manning, & Grammer, 2006; Jones et al., 2001). This is supported by a wealth of