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It takes more to forgive: The role of executive control

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Abstract: The target article's evolutionary approach provides an excellent framework for understanding *when* and *why* people retaliate or forgive. We argue that recent findings on the basic processes in forgiveness – particularly, the role of executive control – can further refine the authors' proposed model. Specifically, the lack of executive control may restrict the explanatory power of relationship value and exploitation risk.

The adaptationist analysis of revenge and forgiveness as offered by McCullough et al. provides a very welcome overarching theoretical framework to better understand these concepts. As the authors note, empirical research on revenge and forgiveness has been rather scattered, and mainly driven by mini-theories. The authors have done an impressive job to integrate a host of previously isolated findings to support their evolutionary approach to forgiveness and revenge. Their analysis leads to several interesting testable predictions about when people will be more, or less, likely to take revenge, and when they are more likely to forgive a transgressor.

The target article concludes with proposing a computational model that helps humans to decide whether to take revenge or forgive an offender, or essentially, which response offers the most fitness benefits. Ultimately this decision depends on perceived relationship value (as indexed by psychological constructs such as closeness and commitment) and perceived future exploitation risk, and their interaction. As cited by the authors, research with both human and nonhuman subjects has revealed strong support for the relationship value prediction (e.g., Finkel et al. 2002; Karremans & Aarts 2007; Watts 2006). Recently, in line with their evolutionary argument, we have demonstrated that the positive association between interpersonal closeness and forgiveness is robust across several different (both independent and interdependent) cultures – albeit with some cross-cultural variation regarding the strength of the association (see Karremans et al. 2011).

However, although the theorized computational system offers a very useful tool for understanding *when* and *why* humans forgive or take revenge, less attention is paid to the *how* of revenge and forgiveness. Recent studies have provided important insights into the basic processes that lead to forgiveness, demonstrating that executive functioning – in particular the cognitive ability to control and inhibit impulsive responses (as assessed with Stroop-like measures) – is an important facilitator of forgiveness (e.g., Pronk et al. 2010; Wilkowski et al. 2010; cf. Finkel & Campbell 2001). Whereas the initial impulsive response to a transgression often is to retaliate, individual differences in executive control are positively associated with the ability to inhibit such retaliatory and negative affective responses, and instead to respond in a forgiving manner (Pronk et al. 2010).

Importantly, it appears that individuals low in executive control have difficulty forgiving an offending relationship partner even when the partner is someone they feel close to – or, to use McCullough et al.'s terminology, *even* when relationship value is high. In a recent series of studies in primary schools, we have found initial evidence that 11- and 12-year old children are more likely to forgive their friends than non-friends, but crucially, that this "relationship value" effect was more strongly pronounced among children high in executive control (Van der Wal et al. 2012). In fact, although based on the relationship value hypothesis we should have expected stronger forgiveness when the transgressor is a friend rather than non-friend across the range, children low in executive control basically did not show this effect. Similar effects were found in a study with late adolescents, revealing that closeness only predicted forgiveness among participants high in executive control. These findings suggest that high relationship value generally leads to the recruitment of executive control in order to down-regulate negative emotions toward the offender, *unless* the individual lacks such executive control resources. Thus, relationship value is not always the best possible predictor of forgiveness – at least not for everyone, or under all circumstances (e.g., when executive control resources are temporarily depleted).

Admittedly, this literature has so far not looked at how executive control may be related to perceived exploitation risk. A possible prediction based on the authors' proposed model is that low executive control individuals may have more difficulty in estimating exploitation risk, which may prevent them from forgiving valuable relationship partners. Or, alternatively, low executive control might disrupt the entire computational process, failing to successfully integrate relationship value and exploitation risk information in order to decide whether or not to forgive.

The fact that low executive control hinders forgiveness, even in the face of high relationship value (and possibly, low exploitation risk), raises intriguing and complex questions. For example, and following the authors' adaptationist logic, do individuals low in executive control – which is strongly genetically determined (see Friedman et al. 2008) – adopt alternative strategies to minimize the fitness costs of their relative inability to forgive valuable relationship partners? Or, as with the example of sex differences provided in the target article, does executive control modify the costs and benefits of forgiving valuable others, such that the lack of forgiveness may be less detrimental to the valuable relationships of individuals low versus high in executive control? Do low executive control individuals in some way compensate for the loss of fitness benefits from their relative struggle to forgive? Although very speculative, perhaps low executive control individuals – or more broadly, any individual with a lower forgiveness propensity for whatever reason – may seek out relationship partners who possess particularly well developed conflict-resolution skills.

To conclude, whereas in the target article the authors have built an evolutionary theoretical account of forgiveness and revenge by integrating largely dispersed research findings, in turn this account inspires many novel and specific questions. However, although relationship value and exploitation risk are the factors that help to explain when and why revenge or forgiveness are the most adaptive and thus most likely responses, they may be limited in addressing how revenge and forgiveness actually occurs. Yet, knowledge about the basic processes that describe *how* forgiveness occurs also informs us about *when* forgiveness or revenge is the most likely response. Hence, we believe that recent findings on executive control and forgiveness – and more generally, any past and future findings on the role of the proximate cognitive and neural mechanism involved in forgiveness and revenge – can help to further inform and refine the authors' theoretical approach.

Revenge: Behavioral and emotional consequences

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Abstract: This commentary discusses dozens of ecologically powerful social-psychological experiments from the1960s and 1970s, which are highly relevant especially for predicting the *consequences* of revenge. McCullough et al. omitted this work – perhaps because of its misclassification as "catharsis" research. The findings are readily accommodated by Konečni's anger-aggression bidirectional-causation (AABC) model and can be usefully incorporated in an adaptationist view of revenge.

It is commendable that the authors of this excellent adaptationist account of an important aspect of human social interaction are concerned that "for some crucial questions about the revenge and forgiveness systems […] data are scant" (McCullough et al., target article, sect. 7, para. 2). However, this is not entirely accurate. The main objective of this commentary is to discuss some very relevant experimental work on revenge that has apparently escaped the attention of McCullough et al., in the hope that these neglected findings and the associated theoretical ideas can be usefully incorporated into their broad view.

Unlike the majority of findings cited by McCullough et al., the work in question is not from the domain of economic games, which is significant given the external-validity doubts that can be raised about games research with regard to the genuineness of participants' motivation and, especially, emotion. Instead, the data come from social-psychological behavioral experiments published in the1960s and 1970s (in top-tier journals), in which ecologically powerful procedures were used that the subsequent human-research regulations made difficult to implement. Furthermore, some of these experiments dealt with issues that may arise in long-term human dyadic relationships; such data may contribute to the authors' complex analysis of repeated "effective updating" (sect. 3.1.1, para. 2).

The key questions are these: What are the behavioral and emotional *consequences* of revenge? How might these outcomes influence both the avenger's (AV) and the initial offender's (IO) computations of the present and future costs and welfare tradeoff ratios (WTRs)?

Most of the data come from a three-stage research paradigm: (1) IO's offense against AV (such as insults); (2) AV's behavioral retaliation against IO (such as fictitious electric shocks); and (3) obtaining dependent measures of AV's arousal, anger, and *additional* behavioral aggression against IO. These experimental results are informative about the short- and longer-term, both internal (sympathetic arousal, rated anger) and external (additional aggressive behavior), consequences for AV (and for IO as the target of any additional aggression) of the retaliatory actions previously executed by AV against IO.

To summarize the data which have been obtained *as a function of revenge*:

1. A sharply *reduced* amount of *immediate* (*additional* – that is, post-revenge) *aggression by AV against IO* (and also against substitute or "scapegoat" targets) – not only in comparison with the behavior of would-be avengers who did not have a prior opportunity for retaliation (Doob & Wood 1972; Konečni & Doob 1972; Konečni & Ebbesen 1976), but also of those who were required to perform tasks (math problems) that minimized the likelihood of anger-producing rumination (Konečni 1975a). In fact, even observing the IO (allegedly) in pain (Bramel et al. 1968) or (allegedly) hurt by someone else (Doob & Wood 1972) decreased the amount of retaliatory aggression directed by the offended person at the culprit.

2. A significantly *decreased level of AV's physiological arousal* (that had been sharply raised by IO) compared to various control groups (Hokanson & Burgess 1962; Hokanson et al. 1963; Hokanson & Shetler 1961). Revenge decreases physiological arousal quickly. More generally, because aggressive responses apparently succeed in terminating noxious stimulation emanating from others more effectively than other responses, *ceteris paribus*, they acquire arousal-reducing properties (Konečni 1975a; Patterson & Cobb 1971).

3. Auxiliary findings that are theoretically congruent with those in point (2) have also been obtained: As a function of behavioral revenge against IO, avengers display a restored affinity for complex stimulation (Konečni et al. 1976) and a reduced level of alcohol consumption (Marlatt et al. 1975).

4. A significantly *lower level of AV's self-rated anger*, compared to participants without a retaliatory opportunity, but, importantly, *as high a level of AV's dislike for IO* as that observed in appropriate control participants (Konečni 1975a; Konečni & Doob 1972).

The entire observed pattern of findings, (1) to (4), can be accommodated by Konečni's (1975a; 1984) anger-aggression bidirectional-causation model (AABC). The model also predicts, because of the data in the above-mentioned points (2) and (4), that the *future* execution of aggressive acts by AV against IO would be more likely in long-term dyads (and occur sooner in the offense-revenge sequence): The original angry, righteous avenger may become an anger-free ("cold-blooded") bully who strikes with little or no provocation. Such pre-emption complicates the computation of long-term WTRs beyond what McCullough et al. have proposed for revenge, possibly with large errors along the long road of adjustment or even a complete breakdown of the relationship (often with dire consequences). *Retaliatory pre-emption* – an unprovoked attack camouflaged as retaliation for an (imaginary) offense – is also relevant for the computation of "indirect [third-party] deterrence" (sect. 3.1.2).

Another important fact – predicted by the AABC model – that should influence the computations by both AV and IO is that the *amount* of revenge is strongly affected by the random arousal-related circumstances in which the initial offense occurs. Specifically, the amount of revenge has been observed in experiments to increase as a function of additional (*unrelated*) stressors that are present concurrently with, or immediately following the initial offense. When AVs do strenuous physical exercise (Zillmann et al. 1972) or listen to loud and complex tones (Konečni 1975b), their retaliation against IOs is more severe than that performed by controls. Therefore, from both AV's and IO's computational perspective, the context of the initial offense is important – as is the perceived intentionality of both the offending and vengeful actions.

The research described above has been largely ignored – for various (bad) reasons. It was pigeonholed as "catharsis" and falsely related to the outmoded "hydraulic" model of Freud and Lorenz, or to Aristotle's "pity and terror" – but, significantly, not to Plato's correct judgment of the benefits of revenge. There was the dubious idea that watching boxing films, fantasy aggression, or children attacking inanimate targets (none of these genuine *vengeful* activities) should reduce aggression – yet the opposite, and correct, result is predicted by the AABC model. A slew of inadequate experimental procedures has been used to disprove straw "catharsis" hypotheses and reach the socio-politically desirable conclusion that "aggression breeds aggression" (something easily achieved, according to AABC). Fortunately, sound evolutionary thinking (in the target article) has finally imposed a reality check on wishful thinking.

The fuzzy reality of perceived harms

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Abstract: We review two subjective (mis)perceptions that influence revenge and forgiveness systems. Individual differences predict more (e.g., narcissism) or less (e.g., empathy) revenge, with the opposite pattern for forgiveness. Moreover, differences in victim versus perpetrator perceptions can influence revenge and forgiveness systems, perpetuating never-ending cycles of revenge. These two examples point to the need for