

## Original Article

## Alternative behavioral measures of postconflict affiliation

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Animals are known to affiliate after conflicts rather than avoid each other. Affiliation can occur between former opponents or between a former opponent and a third-party, and is more common between individuals with high-quality relationships. We investigate postconflict (PC) affiliation in 3 species of corvid (crows) to examine how both sociality and analysis method influence this behavior. We hypothesized that 1) there will be no former opponent affiliation because the highest-quality relationships in these species are between mates who never fight, therefore eliminating the need to repair this relationship; and 2) colonial rooks and jackdaws will show third-party affiliation with partners, whereas the territorial Eurasian jays will not show this behavior because they lack high-quality relationships outside of the breeding season when their data were collected. PC affiliation is generally analyzed using the latency to first affiliative contact, however this method has limitations. We explore 2 different measures: the frequency and duration of affiliation across each observation session. There was no evidence of former opponent affiliation in rooks or jays, but some in jackdaws according to affiliation durations. Rooks and jackdaws showed third-party affiliation with mates according to affiliation frequencies and durations, and jays showed third-party affiliation according to affiliation durations, but with any individual, not just mates. We suggest that PC affiliation is best investigated using more than first affiliation latencies, and that the frequency and duration of affiliation may indicate whether affiliation is used to address PC stress. *Key words*: analysis method, consolation, corvid, postconflict affiliation, reconciliation, sociality. [*Behav Ecol*]

## INTRODUCTION

Social species that have conflicts usually have some form of conflict management behavior to reduce the associated costs (Aureli et al. 2002). These behaviors can involve pre-conflict management (e.g., conflict avoidance, using greetings and grooming to reduce tension to make aggression less likely), third-party interventions during conflicts (e.g., agonistic support), postconflict (PC) affiliation (e.g., friendly interactions between former opponents [former opponent affiliation] or a former opponent and a bystander after a conflict [third-party affiliation]), and redirecting aggression to bystanders (e.g., to distract their opponent or manage dominance relationships; see reviews in Scucchi et al. 1988; Aureli et al. 2002; Koyama and Palagi 2006).

We examine 1 conflict management behavior in detail, namely, PC affiliation, and also consider PC aggression. PC affiliation usually occurs between individuals that share a valuable relationship, which is one that provides fitness benefits (see review by Arnold et al. 2010). If individuals interact frequently and provide mutual benefits, affiliative interactions after fights can facilitate a full or partial return to a stable relationship and reduce conflict-related stress or aggression (Aureli et al. 2002; Fraser et al. 2009). In addition to relationship value, compatibility (the amount of affiliation exchanged)

and security (the consistency of interactions between individuals) can influence the likelihood of occurrence of PC affiliation (Cords and Aureli 2000; Fraser et al. 2009).

The costs and benefits of participating in PC affiliation vary according to the role the individual played in the conflict (the aggressor or the victim) and the initiator of the affiliation. For example, the costs of conflicts can be higher for victims (the individual that was attacked) than aggressors (the individual that attacked the victim) because victims may be at a greater risk of receiving more aggression after conflicts, both from their former opponent and from bystanders (see review by Arnold et al. 2010). Victims can offset these costs using PC affiliation: initiating former opponent affiliation or affiliation with a bystander may appease the aggressor and/or bystander, thus reducing the likelihood of receiving further aggression (Arnold et al. 2010). Conflicts may cause stress for both aggressors and victims, and PC affiliation (former opponent and/or third-party affiliation initiated by former combatants or third-parties) may function proximately to reduce this stress and ultimately to repair the relationship such that both individuals can continue to benefit from repeated interactions (Arnold et al. 2010). Bystanders can benefit from third-party affiliation with former opponents after conflicts to reduce stress and their risk of receiving aggression if former opponents are agitated after fights (Fraser et al. 2009). In addition, victims and aggressors may benefit by affiliating with their former opponent's affiliates to indirectly repair the relationship between the former combatants (Fraser et al. 2009). In this case, the bystander may benefit from indirectly repairing the relationship between the former combatants

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