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Post-Conflict Affiliative Behaviors Towards Humans in Domestic Dogs (*Canis familiaris*)

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Social species need conflict-resolution mechanisms to maintain group cohesion and diminish aggression. Reconciliation (affiliative contact between opponents) and consolation (affiliative contact between the victim and an uninvolved third party) have been postulated for this function in various species. The purpose of this work is to study post-conflict affiliative behaviors toward humans in domestic dogs. This study has looked into post-conflict affiliative behaviors in domestic dogs toward their owners. To this end, a conflict situation was created where the animal was scolded by one of the owners for "stealing" human food. Behaviors were recorded along a period of 3 min and 30 s before and after the scolding. Results show that dogs exhibit affiliative behaviors (significant increase in closeness, gazing, and tail wagging) as well as appeasement behaviors (averting eyes, low tail carriage, lowered ears, lip licking, and crouching) toward the owner that scolded them (reconciliation). In other words, this is the first work that presents reconciliation in dogs in a conflict situation with humans. It discusses the importance of this phenomenon in the dog-human bond.

A conflict can be defined as a situation in which two or more individuals act according to incompatible goals, interests or attitudes. As a consequence, they behave in a different way compared to a non-conflict situation (Aureli, Cords, & Van Schaik, 2002). They inevitably arise among social species in the context of competition for food, mates or other limited resources, with the possibility of even engaging in aggression (e.g., Aureli et al., 2002; Koski & Sterck, 2007). This would jeopardize the benefits obtained for group life such as better access to resources or protection from predators (Cools, Van Hout, & Nelissen, 2008; Packer & Ruttan, 1988). Conflicts are costly because they generate an expenditure of time and energy, increase the risk of injury, and may damage the relationship between opponents (Aureli et al., 2002; Romero, Colmenares, & Aureli, 2009). Therefore, one of the major challenges for these species is to avoid conflict and, if not possible, diminish the negative consequences thereof (de Waal, 2014).

Different kinds of friendly exchanges have been proposed after the conflict that might alleviate such negative spin-offs (Aureli et al., 2002). *Reconciliation* is defined as any friendly contact between opponents occurring soon after a conflict (de Waal & van Roosmalen, 1979; Palagi & Cordoni, 2009). Among the functions assigned to reconciliation figure the following: preventing aggressive escalation of conflicts thus reducing the likelihood of renewed attacks (Aureli & Van Schaik, 1991; Aureli et al., 2002; Cords, 1992; Kutsukake & Castles, 2001), repairing relationships damaged by conflict between social partners (de Waal, 2014; de Waal & Aureli, 1997; de Waal & Yoshihara, 1983), maintaining group cohesion (Aureli et al., 2002; Baan, Bergmüller, Smith, & Molnar, 2014), and restoring tolerance between opponents (Cords, 1992). Additionally, it is believed that it contributes to reducing post-conflict stress (e.g., Aureli & Van Schaik, 1991; Koyama, 2001).

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Reconciliation is a conflict management mechanism that has been observed in numerous species, especially in non-human primates (for a review, see Aureli et al., 2002). However, in recent years systematic studies have been conducted in other species, like the bottlenose dolphins (*Tursiops truncatus*: Weaver, 2003), spotted hyena (*Crocuta crocuta*: Wahaj, Guse, & Holekamp, 2001), and domestic goats (*Capra hircus*: Schino, 1998). Even though post-conflict affiliative behaviors vary across species, certain behavior patterns like grooming, body contact, and vocalizations tend to be more extended (Aureli et al., 2002; de Waal & van Roosmalen, 1979). However, for some species like longtailed macaques in experimental settings (Cords, 1993) proximity appears to be enough for postconflict resolution.

On the other hand, both the victim and the aggressor may receive affiliative behaviors from a third party not involved in the conflict (also known as triadic affiliations). We speak of *consolation* when the affiliative interaction is initiated by a third party toward the victim of a conflict, and of *solicited consolation* when it is the victim that starts such contact (Baan et al., 2014; Fraser, Koski, Wittig, & Aureli, 2009). Finally, appeasement has been defined as those responses made by an individual to reduce aggressive behaviors in a potential aggressor (van Hooff, 1967).

Consolation could work as an option when reconciliation is not possible and act as a substitute (Wittig & Boesch, 2010), thus safeguarding victims and other group members (Call, Aureli, & de Waal, 2002; Koski & Sterck, 2009; Palagi, Cordoni, & Tarli, 2006). In addition, some authors propound that it might help decrease post-conflict stress levels (Fraser, Stahl, & Aureli, 2008; Kutsukake & Castles, 2004), although there is no conclusive evidence as stress indicators are not usually measured (Das, Penke, & van Hoof, 1998).

In a similar way to reconciliation, consolation and solicited consolation have recently been reported in multiple species like stump-tailed macaques (*Macaca arctoides*: Call et al., 2002), rooks (*Corvis frugilegus:* Seed, Clayton, & Emery, 2007), ravens (*Corvux corax*: e.g., Sima, Pika, & Bugnyar, 2016), horses (*Equus caballus*: Cozzi, Sighieri, Gazzano, Nicol, & Baragli, 2010), red-necked wallabies (*Macropus rufogriseus*: Cordoni & Norscia, 2014), dogs (*Canis familiaris*: Cools et al., 2008), and wolves (*Canis lupus*: Baan et al., 2014; Cordoni & Palagi, 2008, 2015; Palagi & Cordoni, 2009).

With regard to canids, reconciliation was detected in a group of wolves (*Canis lupus*) in a zoo, where both aggressors and victims initiated post-conflict affiliative contacts with similar frequency (Cordoni & Palagi, 2008). Likewise, Palagi and Cordoni (2009) reported post-conflict contact with a third party in captive wolves. Unsolicited contact mostly occurred between valuable partners, while post-conflict affiliation with a third party was reciprocal. Also, the presence of reconciliation and consolation behaviors has been reported in free-ranging wolves living in protected areas (Baan et al., 2014). Finally, Cordoni and Palagi (2015) found that affiliations toward the victim (consolation) in captive wolves helped protect the victim, thus reducing the likelihood of renewed attacks and reinforcing the relationship between the third party and the victim. Moreover, they seem to act as a substitute for reconciliation. On the other hand, affiliations toward the aggressor (*appeasement*) were intended to avoid new attacks.

As far as we know, the only earlier record in domestic dogs (*Canis familiaris*) is a work by Cools et al. (2008) showing the presence of both reconciliation and post-conflict interactions with a third party (consolation) in dogs living in kennels. Also, close individuals, defined as those that shared the same kennel, exhibited less conflict in general and higher level of conciliatory contacts than those less related. However, no research has yet been conducted to look into the presence of post-conflict affiliative behaviors in dogs toward humans.

The bond between individuals seems to determine the rate of post-conflict affiliative behaviors. The valuable relationship hypothesis propounded by Waal and Yoshihara (1983) predicts that the more valuable the relationship between two individuals, the more post-conflict affiliative behaviors will occur (Aureli et al. 2002; Fraser, Schino, & Aureli, 2008; Watts, 2006). Dogs and humans share a close bond where dogs depend on humans to access most valuable resources (Bentosela & Mustaca, 2007; Udell, Dorey, & Wynne, 2010). This relationship has the features of an attachment bond, similar to those reported in chimpanzees and human babies (Siniscalchi, Stipo, & Quaranta, 2013; Topál, Miklósi, Csányi, & Dóka, 1998). These positive interactions generate pleasure, attachment, and diminish stress responses in both species (e.g., Hennessy, Williams, Miller, Douglas, & Voith, 1998; Jennings, 1997; Odendaal & Meintjes, 2003). Furthermore, domestic dogs seem to have acquired remarkable social abilities to respond to human communicative cues (e.g., Hare & Tomasello, 2005; Miklósi, Topál, & Csányi, 2004; Oliva, Rault, Appleton, & Lill, 2015). These abilities would result from an interaction of domestication effects, experiences during the early sensitive period, and learning throughout the dog's lifetime (e.g., Udell et al., 2010).

In other words, the relationship between dogs and owners may be categorized as a valuable relationship, considering that they share a home and obtain mutual benefits from their life together. Hence, a proper bond is of particular relevance, with most interactions being positive and conflicts minimized. Therefore, our purpose is to study the presence of post-conflict reconciliation including appeasement behaviors and consolation in dogs toward their owners. To this end, an owner will place food in a plate within the dog's reach, and when the dog picks the food he will scold the animal and stare at it fixedly for 30 s. Another owner will be present but acting passively. Post-conflict interaction is compared to interaction before the conflict. An increase in affiliative (e.g., stay near and in contact, gazing) and appeasement behaviors (e.g., lip licking, crouching, averted gaze) toward the owners is expected.

Method

Ethical Statement

This study was carried out in strict accordance with the ethical standards of the Comité de Investigación y Cuidado de Animales de Laboratorio (CICUAL, Institutional Animal Care and Use Committee) and complied with the current Argentine law of animal protection (Law 14346). All owners expressed their consent for the participation of their dogs in this study.

Subjects

Twenty-four domestic dogs (*Canis familiaris*) were evaluated, of which data from 7 were not included in the study—one because it did not show any interest in food, another because it did not show any change in behavior during the scolding, two because of fear responses to the experimenter, two because the owner did not follow the instructions, and another because of a filming error. The final sample consisted of 17 adult dogs between 1 and 12 years of age (M = 6.23 years), 10 males and 7 females of various breeds (one Labrador, one Shih Tzu, one Border Collie, three German Shepherds, one French Bulldog, one Samoyed, one Poodle, and eight mixed breeds). The owner who scolded the dog (O1; see below) was female for 10 dogs and male for 7 of them, while the one who remained passive (O2) was female in 9 cases, and male in 8. The families were recruited through postings on-line. The inclusion criteria were that the dogs should be living with the family for at least one year and that they had at least two owners. Those dogs that, according to their owners, showed signs of aggression or excessive fear toward humans were excluded. The animals had ad libitum access to water during the trial. Owners were asked not to feed their dogs for 3 hours prior to our visit so that they should be motivated by the food.

Materials

Five pieces of cooked chicken were served on a plastic plate with plastic cutlery to simulate a meal made for the owner. The plate was placed on a table or bench within the dog's reach, where it remained until the owner removed it after the dog ate. A Sony DCR 308 camera was used to record the behaviors to be subsequently analyzed. Additionally, a brief questionnaire was provided to the owners in order to gather demographic information about the animal, including questions regarding who is mostly in charge of the dog's training and what they do when the dog misbehaves or disobeys. The evaluation was conducted at the dog's home in a quiet room with no distractions from other animals or people.

Procedure

First, the experimenter (E) entered the room without interacting with the animal for nearly 5 min, so that the dog should get used to her presence and not interfere with the development of the trial. During this time, the owners were handed the questionnaire and, based on the data obtained, the owner who interacts with the dog more often was chosen to correct the dog during the experiment (Owner 1, O1), while the other owner was present at the scene but behaving passively (Owner 2, O2).

The procedure comprised three phases:

Phase 1: Baseline. In this phase, 3 min of interaction between the dog and its owners were evaluated that would act as paired control in the experiment. In this phase, both owners pretended to be distracted doing a daily task such as reading and using their cell phone. During this period of time they ignored the dog.

Phase 2: Creation of Conflict. Soon after Phase 1, the O1 picked a plate with a fork and knife from the refrigerator or cupboard with five pieces of chicken and placed it on a table or bench within the dog's reach. Then, he turned his back to the dog and the plate until the dog ate. If after 3 min the dog did not pick the food, the owner would put the plate on the floor and wait until the dog ate the chicken or for a maximum of three more minutes. Once E told O1 that the dog had eaten, the owner scolded the dog verbally, as he usually does. After the verbal scolding, the O1 remained staring at the dog fixedly with an upset face for 30 s. Then, the O1 put the plate out of the dog's reach to prevent it from stealing more food and went back to ignoring the dog, resuming the activity he was performing in Phase 1. For his part, O2 pretended to be distracted doing something else.

Phase 3: Post-conflict. Similar to Phase 1. For 3 min both owners pretended to be distracted with some activity and ignored the dog. At the end of the trial, the owners would pet and play with their dogs as they usually do.

During testing there were two owners present, as well as a female experimenter who filmed the dogs' behavior. We also place a steady camera on a tripod to capture the whole situation. Both cameras were SONY DCR 308 and dogs behaviors were analyzed afterwards from the videos collected (see Data Analysis).

Figure 1. **Image of the generated conflict.** (A) The dog is taking the human food from the plate. (B) The target owner (O1) is scolding the dog. (C) The owner remains looking fixedly at the dog during 30 s after the scolding.

Measures

We assessed 11 variables, taking into account both the 3 min before and 3 min after the conflict phase, as well as the 30 s before and 30 s after the scolding. Note that the conflict started after the 3 min baseline phase. To measure the 30 s previous to the

scolding we extracted frame by frame samples from the video 30 s before the scolding and 30 s after it. Then, the owner returned to his previous position (as in Phase 1) and another 3 min observation phase began. Therefore, there is no overlapping in the samples collected.

The variables measured as a duration (closeness, contact, gaze, averting gaze, tail wagging, body posture, and ambulation) were scored continuously and are expressed in the accumulated time in seconds the animal displayed the behavior. Measurement in frequencies was used to score discrete behaviors (lip licking, crouching), which are expressed as the total number of times the animal displayed the behavior. A single event was coded as the behavior starting and finishing.

Affiliate behaviors – reconciliation and consolation.

1. Closeness: Time (s) spent close (less than 75 cm) to O1, O2, and E.
2. Contact: Time (s) spent in contact with some part of the body of O1, O2, and E.
3. Gaze: Time (s) spent gazing toward O1, O2, and E.
4. Tail wagging: Time (s) the dog wagged its tail quickly toward the O1.

Appeasement behaviors.

5. Averting gaze: Time (s) in which the dog turned the head away or downward to avoid O1's eye contact.
6. Lip licking: Number of times the dog licked around its mouth.
7. Crouching: Number of times the dog crouched near the ground with all its body.
8. Lowered ears: Time (s) the dog spent with its ears back or down.
9. Lowered tail: Time (s) the dog spent with its tail between its legs.

Other behaviors.

10. Body posture: Time (s) spent lying down or sitting.
11. Ambulation: Time (s) when movement was observed in any of the 4 limbs.

Data Analysis

The 3 min elapsed before and after the conflict were measured continuously and the cumulative duration or frequency of the different behaviors was compared over both periods. The whole data set was codified by one of the authors and 30% of the data were independently coded by another of the authors; reliability between measures was high (Spearman's correlation coefficient, 3 min before the scolding $r_s = 0.83$, $p < 0.001$; 3 min after the scolding $r_s = 0.95$, $p < 0.001$).

Additionally, the 30 s before and after the scolding when the owner remained staring at the dog were recorded frame by frame at a rate of three frames per second (0.33 s). These measures were coded independently by two of the authors. The reliability of the measures in the pre- and post-conflict phases was very good (pre-conflict: $r_s = 0.995$, $p < 0.001$; post-conflict: $r_s = 0.998$, $p < 0.001$). For the purpose of the analysis, the frame by frame measurement was converted into seconds and is reported according to this measure.

Considering that none of the variables had a normal distribution, non-parametric tests were used for their analysis.

The time spent close to, in contact with, and looking at each of the persons present on the scene (O1, O2 and E) was compared, both during the 3 min before the conflict and in the 3 min after the conflict, using a Friedman test. In the cases where significant differences were identified, post hoc pairwise comparisons were performed. Also, we compared the frequency and duration of each behavior during the 3 min before and after the scolding. To this end, the Wilcoxon test was used. These same analyses were conducted with the measures obtained during the 30 s before and after the scolding. Tests were all of the two-tailed type, where $\alpha = 0.05$. For statistical analyses, SPSS v. 19 and Infostat software packages were used.

Results

Behaviors During the 3 min Before and After the Scolding

During the 3 min prior to the scolding, the dogs spent an average of 26.88 ± 48.46 s close to O1, 31.08 ± 54.85 s close to O2 and 28.24 ± 36.48 s close to E. No significant differences were found in the time the dogs spent close to each of them, Friedman's test, $X^2_2 = 0.39$, $p = 0.82$. There were no differences either in the time spent in contact to O1, O2 and E, $X^2_2 = 0.35$, $p = 0.83$. Regarding the time they spent gazing to each of them, we found the dogs looked significantly more to the E than the owners, $X^2_2 = 10.03$, $p < 0.01$, (least significant difference in mean ranks = 10.12, $p < 0.05$).

During the 3 min after the scolding, the dogs spent 50.42 ± 59.42 s close to O1, 36.49 ± 64.86 s close to O2 and 6.87 ± 11.72 s close to E. The time they spent close to each person did not differ from what could be expected by chance, $X^2_2 = 4.50$, $p = 0.10$. Regarding the time they spent in contact with each of them, we found the dogs spent significantly more time in contact with O1 than O2 during this period, $X^2_2 = 6.38$, $p = 0.04$ (least significant difference in mean ranks = 6.13). Finally, the dogs spent significantly more time looking at E than O2, $X^2_2 = 8.32$, $p = 0.01$ (least significant difference in mean ranks = 10.56).

When comparing the frequency and duration of the observed behaviors, we found the dogs spent significantly more time close to the O1, Wilcoxon test, $Z = -1.98$, $p = 0.04$, in the 3 min after the scolding than in the first 3 min (baseline). Dogs also spent more time close to the E during the 3 min prior to the scolding than the following 3 min, Wilcoxon test, $Z = -2.05$, $p = 0.03$. No other significant differences were found (all values $p > 0.20$) (See Table 1).

Behaviors During the 30s Before and After the Scolding

During the 30 s before the scolding there were no significant differences in the time the dogs spent close to O1, O2 and E, $X^2_2 = 1.59$, $p = 0.45$. However, during the 30 s after the scolding the dogs spent significantly more time close to O1 than O2, and more time close to O2 and O1 than E, $X^2_2 = 28.71$, $p < 0.001$ (least significant difference in mean ranks = 4.38. Regarding the contact with each person, the dogs spent more time in contact with O1 than the other two people, both before and after the scolding, before scolding: $X^2_2 = 10.00$, $p < 0.01$ (least significant difference in mean ranks = 4.83); after scolding: $X^2_2 = 11.67$, $p < 0.01$ (least significant difference in mean ranks = 6.69). In line with this, the dogs gazed significantly more at the E than both owners, before the scolding, pre scolding: $X^2_2 = 6.16$, $p = 0.04$ (least significant difference in mean ranks = 9.40); and during the 30 s post scolding dogs looked significantly more at the O1 that at the O2 and the E: $X^2_2 = 26.33$, $p < 0.001$ (least significant difference in mean ranks = 5.41; Figure 2).

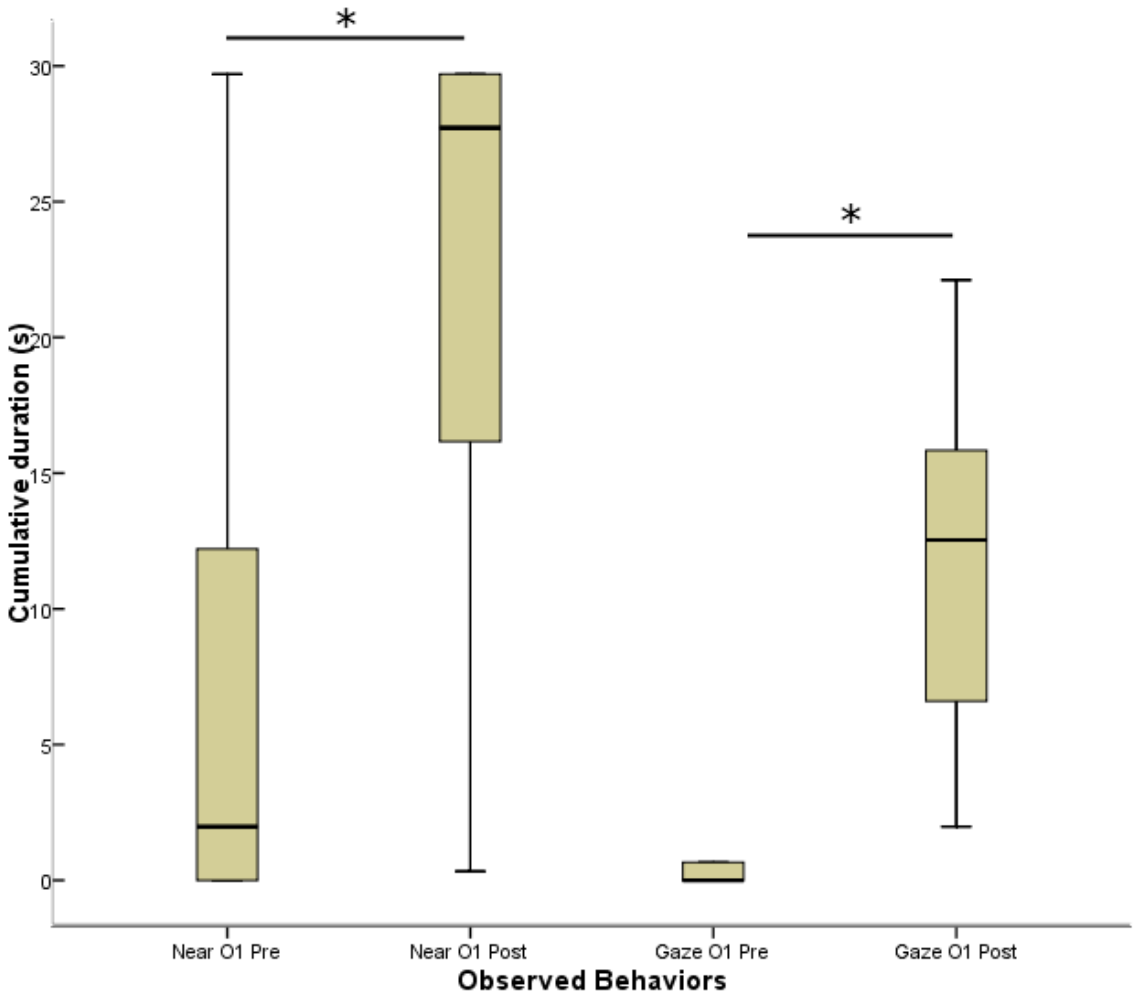

Figure 2. **Median, first and third quartile of total amount of time in seconds dogs spent near and looking at the target owner (O1) during the 30 s before and after the conflict.** Whiskers represent the maximum and minimum values observed.

When comparing the time the dogs spent performing each of the behaviors in the 30 s before and 30 s after the scolding, we found they spent significantly more time close to O1 after the scolding than before it, $Z = -2.95$, $p < 0.01$. Meanwhile, they spent more time close to E before the scolding than after it, $Z = -2.33$, $p = 0.18$; and there were no significant differences between the time spent close to O2 in each phase. In line with these results, the dogs gazed longer at O1 after the scolding than before it, $Z = -3.62$, $p < 0.001$, and gazed at E longer before than after the scolding, $Z = -2.83$, $p < 0.01$. Regarding O2, there were no significant differences in the time the dogs spent gazing at them before and after the scolding, $Z = -1.20$, $p = 0.21$. In addition, there were no differences in the time the dogs spent in contact with each of them before and after the scolding (all values $p > 0.10$). Finally, the dogs spent more time wagging their tail rapidly toward the O1 after the scolding, $Z = -2.55$, $p = 0.01$.

We found the dogs avoided the O1's gaze, Z = -3.52, p < 0.001, lowered their ears, Z = -2.55, p = 0.01, and tail, Z = -2.66, p < 0.01, more after the scolding than before it. In addition, frequency of snout licking, Z = -3.19, p = 0.001, and cowering, Z = -2.55, p = 0.01, was higher after the scolding (Figure 3). No other significant differences were found (all values p > 0.15) (See Table 1).

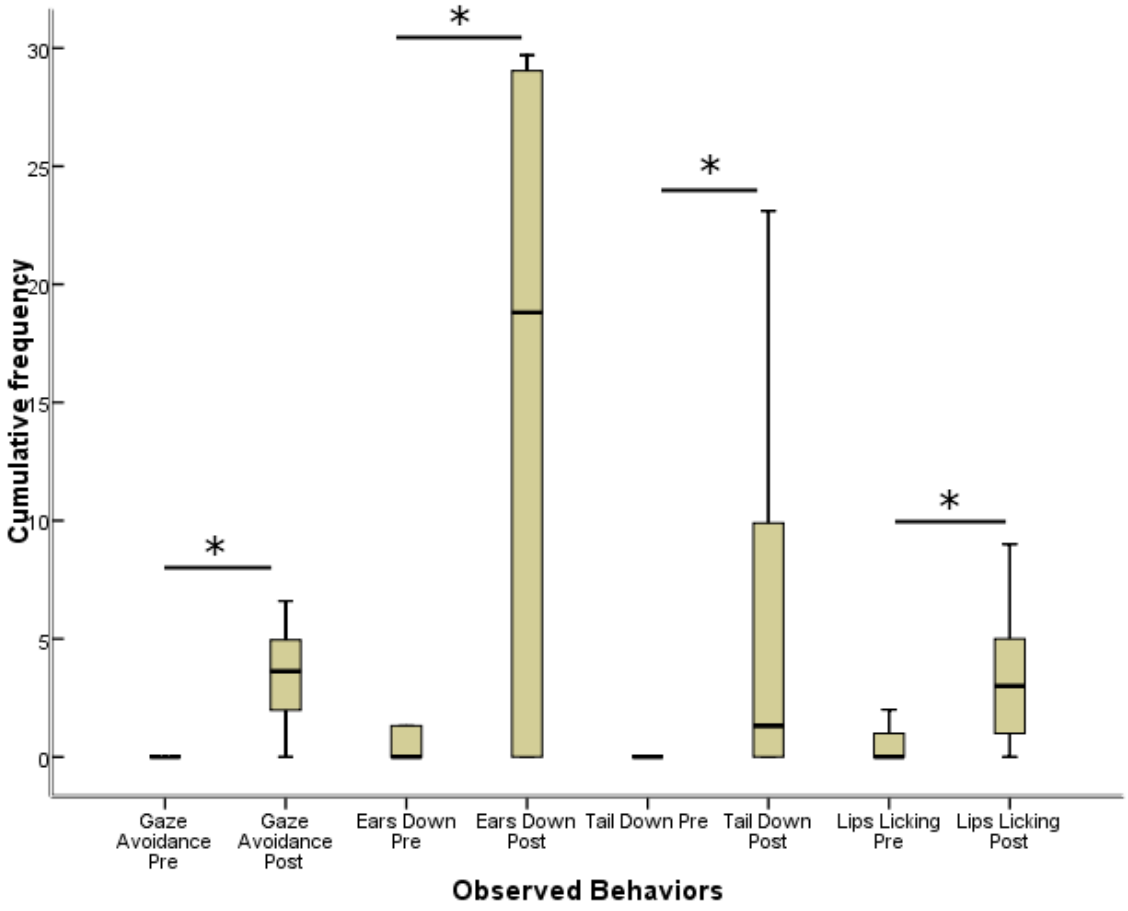

Figure 3. **Median, first and third quartile of total:** (1) avoiding the target owner's (O1) gaze, (2) amount of time in seconds that dogs spent with their ears down, (3) amount of time in seconds that dogs spent with their tail down and (4) number of times (frequency) that dogs licked their lips during the 30 s before and after the conflict. Whiskers represent the maximum and minimum values observed.

Table 1

Mean (SD) of the Measures Taken During the 3 min Before and After the Conflict and in the 30 s Before and After Scolding

Variable		3 min pre-conflict	3 min post-conflict	30 s before scolding	30 s after scolding
	O1	31.09 s (51.85)	50.42 s (59.42)	8.00 s (11.16)	22.05 s (10.24)
1. Closeness	O2	26.88 s (48.46)	36.49 s (64.89)	7.57 s (11.58)	3.18 s (7.25)
	E	28.24 s (36.48)	6.87 s (11.72)	2.54 s (6.80)	-----
	O1	1.57 s (5.16)	2.01 s (4.65)	4.29 s (9.98)	2.80 s (6.20)
2. Contact time	O2	0.65 s (1.93)	0.03 s (0.13)	-----	0.37 s (1.14)
	E	0.31 s (0.69)	0.17 s (0.47)	-----	0.02 s (0.08)
	O1	7.58 s (8.39)	6.65 s (7.00)	0.80 s (1.55)	11.28 s (6.09)
3. Gaze	O2	6.25 s (7.78)	5.78 s (9.63)	1.40 s (3.89)	0.47 s (1.76)
	E	29.88 s (34.26)	24.43 s (32.08)	4.76 s (7.52)	0.27 s (0.37)
4. Tail wagging		33.07 s (43.44)	20.24 s (29.69)	3.73 s (6.65)	9.84 s (9.50)
5. Averting gaze		0.06 s (0.24)	0.18 s (0.55)	0.01 s (0.11)	4.25 s (3.17)
6. Lip licking		0.76 (1.60)	0.88 (1.17)	0.53 (0.87)	3.35 (2.74)
7. Crouching		-----	0.06 (0.24)	-----	0.61 (0.86)
8. Lowered ears		-----	0.12 s (0.33)	3.90 s (7.87)	15.06 s (13.25)
9. Lowered tail		-----	0.06 s (0.24)	0.58 s (2.40)	6.13 s (9.23)
10. Body posture		77.85 s (67.15)	94.19 s (68.30)	16.62 s (12.86)	12.52 s (9.02)
11. Ambulation		50.78 s (51.89)	48.97 s (47.33)	6.13 s (7.28)	4.48 s (3.02)

Note. Variables 1-5, 8-11 are expressed in seconds. Variables 6-7 represent the mean frequency of behaviors. O1: The target owner who scold the dog. O2: Passive owner. E: Experimenter.

Discussion

A social conflict arises when a group member develops an inappropriate behavior according to its status or access to resources (Jensen et al., 2011). In our work, the conflict is defined by the fact that the dogs access a resource (human food) under the control of people. The owner therefore displays an aggressive response that initiates a series of reactions in the animal. Specifically, our results show for the first time the presence of reconciliation in dogs after a conflict with a person.

Considering the periods of 30 s before and after the scolding, the reconciliation was manifested as an increase in closeness to and gaze at the owner with whom the dogs had previously had the conflict, while the closeness to and gaze at the neutral owner did not vary between the pre and post-conflict periods. Also, more tail wagging was noted after the scolding, compared to a control period prior to the conflict.

The mechanisms to mitigate the effects of a conflict include not only affiliative behaviors like approaching and contact but also appeasement behaviors. Escalated aggression can be avoided by using communicative displays and by regulating access to resources according to conventions such as dominance (Preuschoft & van Schaik, 2000). As we previously state, appeasement can be defined as those responses made by an individual to reduce aggressive behaviors in a potential aggressor (van Hooff, 1967). This definition agrees with the descriptions made by Rugaas (1997), who defines *calming signals* as behaviors that calm or appease the receptor avoiding open aggression. In this sense, Matos et al. (2014) showed that dogs displayed at least one calming signal after an aggressive encounter with another dog and that such

behavior reduced the likelihood of renewed aggression. The most frequently observed signals were turning head, freezing, licking nose, and looking elsewhere. According to these descriptions and by underscoring the idea that dogs display reconciliation behaviors toward their owners after a conflict, in our study they showed increased gaze avoidance, crouching, ears and tail lowering, and lip licking. However, some appeasement responses may also be noted in the face of stressful manipulation. For instance, dogs displayed more appeasement gestures which include licking the lips, lifting a paw, looking elsewhere, and lying down when petting them above on the head and shoulder (Kuhne, Hößler, & Struwe, 2012). In this sense, reconciliation may reduce the dog's stress. However, our data do not let us conclude what emotional responses arise during this situation.

Similar behaviors were observed in a work by Horowitz (2009) where owners scold their pets for disobeying and the seeming "guilty" behaviors are recorded. Some of these behaviors included looking elsewhere, giving the paw, rolling over their back or flank, fast or slow tail wagging, lowered head, tail and/or ears, moving away from the owner, and licking. These behaviors appeared when dogs were scolded, regardless of whether or not they obeyed the prohibition imposed by their owners, discarding the fact that dogs might feel guilty. Horowitz's (2009) work demonstrates that dogs do not exhibit behaviors that might be categorized as guilty but rather respond to cues issued by their owners when scolding them. Therefore, "the guilty gaze could be a fearful gaze anticipating the owner's punishment" (Horowitz, 2009, p. 451), and these conducts are similar to submissive behaviors observed in conflicts with conspecifics, especially in wolves. Thus, in this sense, Horowitz's (2009) results and ours would be similar. After a conflict with their owners, dogs would display submissive behaviors probably to avoid punishment. The evidence for this explanation comes from a work by Hetch, Miklósi, and Gácsi (2012) who demonstrate, through a questionnaire, that owners scold dogs less with submissive or *guilty* behaviors.

Regarding the 3 min period, it was observed that dogs remained more time close to O1 compared to O2 and E in the second 3 min phase. This result indicates that dogs may approach a person as a reconciliatory behavior after a conflict. On the other hand, one limitation of the present study is the presence of a stranger. During the first 3 min, when the owners showed indifference, the dogs gazed longer to the E. It is possible that dogs have detected the presence of a stranger with a camera as a novel stimulus and this might have favored a s exploratory responses toward the stranger.

Likewise, it is striking that most reconciliation and appeasement behaviors were observed only for 30 s. This could be due to the fact that during that period the person continued to direct his attention to the dog. After that time, the person was indifferent and pretended to be busy doing something else for the following 3 min (Phase 3). This behavior might have been interpreted by most dogs as the end of the conflict. In everyday life, scolding occurs with certain frequency, so that dogs should have learned the cues indicating conflict termination. In future studies, it would be interesting to keep the person's attention toward the dog so as to evaluate the duration of reconciliation responses.

The presence of the O2 in the experimental design was included as a way to evaluate whether the dogs showed consolation behaviors directed to a uninvolved third party. However, we did not find any significant increase in affiliative responses toward this owner after the conflict. Wittig and Boesch (2010) suggest consolation could be a substitute option when reconciliation is not possible. For instance, after some serious conflicts, getting close to the aggressor could result in renewed aggression (e.g., Aureli et al., 2002). In this case, it could be assumed that the dogs may not have needed a substitute mechanism such as consolation, given that the conflict was not violent and they could freely direct their affiliative behaviors toward the O1. Therefore, posconflict consolation between humans and dogs cannot be ruled out, as it could

possibly appear in more severe conflicts where reconciliation was not possible or carried the risk of negative consequences for the animal. In this sense, a limitation of our work is that we managed to evaluate only the reconciliation initiated by the victim and the consolation request since the persons remained passive. It would be interesting to see in further studies whether dogs provide consolation to a person in a conflict situation.

Another important point to bear in mind is that in our study the conflict took place in a foraging context. It would be relevant to assess whether in other situations where food is not involved dogs resort to the same conflict attenuation strategies.

In conclusion, reconciliation and appeasement behaviors would play a key role in maintaining a positive bond with the owner and re-establishing group cohesion. Given the importance of this bond and that the dog depends on its owner to access valuable resources, these behaviors become especially relevant.

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