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Editorial

# Appeasement, calming signals, and information capture: how do our subjects tell us what matters to them?

It has become increasingly common among dog people to talk of their dog 'appeasing' them. We more frequently hear descriptions of dog-dog behavior being couched in terms of who 'appeased' whom. "Appeasement" signals and behaviors have been said to advertise peaceful intentions, are generally regardless as those that inhibit, reduce or stop aggressive behavior between those in some interaction through engagement in behaviors incompatible with the aggression and are thought to be found only when such information is contextually relevant (e.g., in animals and contexts where fighting may establish, even temporarily, a hierarchy, pecking order or other social rule that avoids injury or death) (Hasson, 2009). To 'appease' is defined as (1) making someone pleased or less angry by giving or saying something desired; (2) to make a pain, a problem less painful or troubling, to bring to a state of peace or quiet, to calm; (3) to cause to subside or allay and (4) to pacify or conciliate by a concession of something valued, usually at the sacrifice of principles (http://www.merriam-webster.com/dictionary/appease; accessed 25 April 2017).

When "appeasement signals" are indicated 2 of these definitions are used. "Appeasement behaviors" have been defined as postures and attitudes that exhibited by the dog to calm both him or herself and others in situations of potential conflict (Rugaas, 1997) (definition 3). "Appeasement behaviors" have also been defined as signals such as yawning, moving in an arch, lifting a paw, licking the lips, lying down, and looking away (Pastore et al., 2014) that occur in agonistic encounters and that decrease the probability of the agonistic behavior continuing at the same or a higher level (definition 4). Proof of any true appeasing effect is rare (Wosegien and Lamprecht, 1989). What is being evaluated is not just the signals of 'emotional arousal' but also the physiological processes that contribute to the stress response (Koolhaas et al., 1999). The co-varying patterns of 'emotional arousal' (often called a non-specific stress response) and physiological responses may reflect different neurobehavioral responses to stressful and/or distressing situations (Koolhaas et al., 1999). If these different aspects of a phenotype comprise an informative signal they should be concordant.

The behaviors identified most consistently as "appeasement behaviors" in such research (Koolhaas et al., 1999; Pastore et al., 2014) - lifting a paw, looking or moving away, licking the lips – are all commonly reported stress and anxiety related behaviors. Mariti et al. (2017) characterize these behaviors as 'calming signals'. Ethological definitions of these behaviors routinely characterize them as intention movements, withdrawal from social interaction indicators, and indicators of risk or uncertainty, respectively (Overall, 2013).

For the function of an 'appeasement' behavior or signal to be met, one must both establish the concurrent changes in behaviors offered and responses received that are congruent with the postulated physiological responses, and the behavioral changes must proceed in a both a progression and predictive order that reflects the patterns consistent with the specific types of interactions and the probability of the different putative outcomes.

Kuhne et al. (2014) tested the first hypothesis – that "appeasement" behaviors are concordant with the postulated direction of physiological responses. Dogs' responses were grouped in 3 categories: 1. Redirected and social approach behavior (sniffing/licking on the floor, playing with inanimate objects), displacement activity (yawning, stretching) and appeasement gestures (flicking the tongue, lifting the paw). Freezing and withdrawing – respectively, passive and active behavioral responses to an uncomfortable situation – were also noted, but not included in the 3 main categories. The behavioral data were analyzed with cardiac response data (heart rate (HR) and heart rate variability (HRV) data) obtained from a Polar Systems heart monitor.

Appeasement gestures (flicking the tongue and licking the paw) differed statistically in duration and frequency among the test physical contact sequences and were primarily seen during the paw and muzzle test sequences. Displacement activities also differed significantly among the test sequences and were highest during the shoulder, ground and tail sequences of the physical contact. Dogs showed redirected behavior for a longer period of time and more frequently if being petted on the shoulder, chest, paw and tail. HR differed significantly among the test sequences, and was highest during the muzzle, neck and collar sequences.

Being petted on head, should or paws resulted in increased initiation of "appeasement gestures" and redirected behaviors, and these behaviors were engaged in for longer durations. Petting dogs and holding dogs around the head (neck, muzzle, or collar) resulted in an increased standard deviation of normal-to-normal R-R intervals (SDNN). Dogs manipulated in these body regions may feel more entrapped and less able to make behavioral choices. Furthermore, "appeasement gestures" (lifting a paw, looking or moving away, licking the lips) were positively correlated with HR, some which might be due to the motor activity involved in these behaviors. In this case, the "appeasement gestures" exhibited by these dogs in relation to the SDNN and HR measures are more in line with definition 4, above. However, "appeasement gestures" we also were negatively associated with root mean square of successive heartbeat interval differences (RMSSD) and RMSSD/SDNN ratio, suggesting that lower the vagal tone and

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sympathovagal balance – reduced vagal tone and balance are thought to be markers of increased stress - the more common the appeasement gestures. If these gestures are more common when stress levels are higher, definition 3, above, for 'appeasement' may be more appropriate here. This explanation is consistent with a change in vagal tone that was associated with dogs tolerating gestures that they, as individuals, disliked, as the authors suggest.

In the Kuhne study, at least 2 of the 4 common definitions of appeasement may fit responses of dogs in controlled situations established to cause stress and/or anxiety, so one could justify the carefully restricted use, as do the authors.

Expanding the data for these types of signals, Firnkes et al. (2017) examined 2 of the commonly studied "appeasement" signals, looking away and licking of the lips, in a standardized behavioral test when novel people behaved towards the dogs in a neutral, positive or threatening way. Both of these signals were more frequently given by dogs in threatening and conflict-ridden situations. In the Mariti et al. (2017) study of interactions between unfamiliar dogs, head turning, nose licking, freezing and turning away were the most common signals seen, and the signals were seen more commonly when the dogs interacted, rather than when there was no interaction. The confluence of these findings from these 2 different studies strongly suggest that these signals have a generalized function to signal uncertainty, potential risk, and an opportunity to alter the direction of the interaction, pending more information.

That the dogs in the Firnkes et al. study gave these signals less frequently in cases of overt threats and more often in less threatening circumstances is consistent with this broader conclusion. If these signals function both to signal uncertainty and a decreased risk of escalation of aggression by the signaler, such signals are only useful as a strategy when commitment to any course of action is flexible. That considerably more dogs engaged in looking away (a disengagement and extraction signal) than in licking their lips during a threatening stare ($G < 0.01$; G statistic $= 34.6486$) suggests somewhat different functions for these signals, a finding consistent with that of the authors that during 64.4% of the incidences of licking the lips, the dog made direct eye contact with the test person, and in 22.6% looked in the direction of the person. In only 13% of the licking situations was the dog petted while looking away. Here, licking may be consistent with definition 3 of appeasement, and the concordant gaze behavior may reflect monitoring of an outcome.

In the Firnkes study, other, more profound disengagement behaviors were noted in response to enhanced threats (which it is important to remember are inescapable, given the context of the study), and these were often accompanied by licking behavior in half of the dogs. Context matters, and we should remember that the behavior of experimenter would not have seemed contextually appropriate to the dog, in which case, both disengagement and signaling for more information (lip licking, an et epimeletic behavior) would have served to keep a leashed dog safer. Here, the meaning of the signal in one context may not be that in another, but in a combined signal analysis could indicate where the time for 'appeasement' has passed. As the authors note, their establishment of probabilistic associations between the signals and the situation does not confirm the function of "appeasement". The message from all of these studies is that patterns of co-variation of all behavioral, physiological and neurochemical responses (expect advances in functional imaging) matter, and the context in which they are exhibited is key. If we can start to think this way, we may be understand what these signals mean to the dog and anticipate when interactions will change a dog's behavior in ways injurious to the dog. That would be priceless.

While the Journal does not feature many papers about surgical pain control, the Giudice et al. (2017) contribution will be of interest to our readership because pain alters behavior, the management of pain is a mental health care and welfare issue, and the medications used in this study – tramadol and buprenorphine - are common in behavioral situations where pain may be a concern. The authors' findings that the pattern of pain intervention differs for the two medications should help clinicians make informed decisions that improve pain scores based on patterns of behavior that accompany the pain.

There are a number of truly excellent reviews pertaining to canine behavior in this issue. In the first, McMillan (2017) attempts to quantify behavioral outcomes across studies focused on source of dog. Survey studies have suggested that early experience and environment matters for dogs (Pierantoni et al., 2011). Early studies of social exposure demonstrated with fairly dramatic data that small amounts of exposure were sufficient to prevent neophobia (see Scott and Fuller, 1965). So it may not be surprising that other behavioral effects of early rearing have been largely ignored until recently. Modern neurodevelopmental studies like those in humans and rodents are lacking in dogs. Compounding the murkiness in our knowledge about early canine brain and behavioral development is an increasingly commercialized and little regulated puppy breeding and raising industry. McMillan (2017) critically exams all studies containing data on source of dog and later behavioral outcomes. The seven reviewed studies coalesce on putative roles for early post-natal and maternal experience that have been well documented in other species (e.g., humans, rodents, cats). Simply, if the way we bred and raised dogs had kept pace with what we have learned about epigenetics and neurobehavioral development from other species, commercial breeding establishments would not be allowed to exist in their present form.

In another exhaustive and critical review, Ziv (2017) exams effects of aversive training methods on dogs. The strength of this view is the reliance on observational and interventional studies to understand how dogs view such techniques and change in response to them. As with all good review's, Ziv's lays a logical framework into which new data can be fitted to refute or support the patterns he has elucidated. The preponderance of the data in published studies supports the risks of aversive training methods, and despite a balanced approach, can find little contextual evidence to support such techniques.

Pirrone and Albertini (2017) do an excellent job of reviewing the state of the art of using and validating dogs for cancer detection. Any metabolic process can release volatile compounds that may be detected by dogs. The problems arise in determining standards for dogs to assess. Pathological processes alter with time and odorants released likely alter, also. When we cannot know what the dog is evaluating, training becomes complex, and meticulous methodology and clear thought mandatory. The small studies, mixed results, and problematic assessment and training designs are clearly presented here along with the potential benefit of developing dogs as cost effective, early warning systems. However, at present, the enthusiasm over-rides the date. Pirrone and Albertini clearly and thoughtfully identify weaknesses that, if addressed, can benefit the field of canine detection in a broader scope.

Laboratory animals have long had superior welfare standards compared to pet animals. As legislation moves forward to identify areas where companion animal needs require redress, an understanding of history and cultural approaches to companion animals can provide a guide for likely successes and pitfalls. Cardoso et al. (2017) reviews the history of European welfare concerns for companion animals, and using the historical approach, suggests directions emergent legislation can use successfully.