Unraveling Canine Behavior: Insights into Communication Stress Signals, and Social Interactions

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ABSTRACT

An understanding of canine behavior is fundamental for enhancing human-dog relationships and promoting animal welfare. The review examines the physiological and environmental factors that influence a diverse array of dog behaviors, including yawning, blinking, tail wagging, growling, and sniffing. The primary focus areas include the impact of stress, social interactions, and breed-specific tendencies on behavioral responses. The article investigates how dogs communicate through body language, vocalizations, and postures, establishing connections between these signals and the dog's emotional and physiological states, particular emphasis is placed on behaviors such as ear posture pawing, and tail movements, underscoring their importance in interpreting stress, aggression, and affection. By synthesizing contemporary research, this review provides valuable insights into how canine behaviors are shaped by environmental stimuli, social dynamics, and evolutionary traits. The findings aim to enhance the comprehension of dog behavior among veterinarians, pet owners, and researchers, thereby fostering improved care, training, and management of companion animals.

keywords: canine, behavior, yawning, interactions, dog-human relationship, dog stress, dog interactions, dog behaviors, dog training, behavior review

INTRODUCTION

Since ancient times, the special animal known as the dog has carved out a large place for itself by overcoming many difficulties. When they belonged to the same Canidae family, they developed 40 million years ago. Their brains began to reorganize architecturally from that point forward. When they belonged to the same Canidae family, they developed 40 million years ago. According to current research, there are three primary groups of Canidae prey animals. 1. Red fox-like canid 2.South American canid 3.Wolf-like canid**.** If additional research is done, wolf-like canids may be found to be closely related to our dog species (based on genetic, morphological, and behavioral data). The gray wolf (*Canis lupus*) is one of their closest relatives. Dog behavior has been defined in a variety of ways. In the previous study, we saw that dogs exhibit a variety of behaviors. Almost every animal has some typical behavioral concerns that we encounter. Some actions, though, are more difficult to comprehend. We try to communicate with them without fully comprehending their physiology. It's crucial to understand dog physiology to comprehend their behavior. The type of behavior displayed at any particular time is determined by the canine's physiological state. Digging, barking, howling, mounting, and sniffing are all natural dog habits. Their sniffing behavior is genetically and morphologically inherited from their ancestors. Other sorts of dog behavior are expressed in many ways in addition to these. We will summarize our findings and learning after studying each aspect of conduct and term of behavior. Hormonal changes can be seen in each dog's behavior. South Asian countries have a greater rate of stray dogs than other countries. As a result, these wandering animals are subjected to stress in uncontrollable and uncontrolled settings. As a result of their stress, they behaved negatively to others. Dog Behavior may be categorized into many categories (explained below) based on past research and data, where conditional and

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unconditional dog behaviors have been established. In this context, behaviors will be addressed in depth. Occasionally, various breeds of dogs have displayed diverse behaviors that may or may not be related to each other. There is an identifiable diversity of common qualities that have been developed through many years of searching for certain traits. It is possible to predict the temperament of a canine at maturity by grouping dogs according to the task they were raised to accomplish. Early on, differences in breed characteristics can be noticed. Sporting dogs will be usually adventurous, following their noses wherever their noses take them, but will respond readily to calls from individuals they recognize. The next phases control the specific features of each activity based on their behavioral architecture.

Importance of the Study

Understanding canine behavior is essential for fostering improved interactions between humans and dogs, enhancing training methodologies, and promoting animal welfare. This review endeavors to address current gaps in knowledge by synthesizing recent research findings and providing practical insights into dog behavior intended for pet owners, trainers, and researchers. Furthermore, an emphasis on these behaviors carries significant implications for veterinary care and the formulation of effective behavioral interventions.

BEHAVIORAL CLASSIFICATION OF CANINES

Yawning & Blinking

Yawning is generally called contagious yawning (Madsen & Person, 2013). Previous studies have shown that CY (contagious yawning) in dogs stimulates human activity responses. Empathy appears to be connected to and regulated by CY, according to recent studies (Madsen & Persson, 2013). The dogs are also regulated auditory yawning by their familiar yawners' yawning sounds (Madsen & Persson, 2013). Familiarity-biased CY in dogs exposed to familiar and unfamiliar human yawns presented by a live model (Madsen & Persson, 2013). Yawning is a displacement activity that occurs when two opposing motivational inclinations are evoked at the same time in behavioral or emotional conflict situations (Csoltova et al., 2017). Let's have a look at how people blink. Blinking is the process of moistening the lenses of the eyes to remove infectious or other material, primarily dust particles. As a result, blinking is a widespread trait across all species. Blinking, on the other hand, might occasionally signify unusual conduct. Dalmatian breeds expressed stress via their head and body, with their ears stiff and kept back, head-turning, looking/turning away, blinking, lip-smacking, stretching, sniffing, agitated, tail wag—tip moving swiftly, and yawning when they were unconfident, according to research from (Demirbas et al., 2016). Blinking of eyes is linked to particular stress in dogs, which is defined as the loss of eyes for less than one second. Blinking of eyes is a part of the distinct stress signal of dogs (Stracke et al., 2011). According to the data from (Stracke et al., 2011) blinking of the eyes occurred 2.7 times a minute on average, which is far below the frequency for relaxed dogs (13.7 times a minute).

Snout licking

The nose of a dog is a critical sensory organ that also serves as the body's cooling mechanism. The nose is the main organ that allows him to communicate with a familiar individual. Snout licking, freezing, and other related behaviors were seen more frequently by one dog while engaging with an unknown dog in a recent study (Mariti et al., 2017). Other dogs' mouth-licking commonly occurs while interacting with a familiar dog (Mariti et al., 2017). Sometimes in aggressive behavior stressed dogs are indicating yawning, looking elsewhere, turning the head, nose licking, and paw lifting (Mariti et al., 2017). Social signals of dogs, such as looking elsewhere, yawning, nose licking, and turning head which a dog will show in dog–dog conflict situations, might direct the dog to humans as well(Kuhne et al., 2012). Snout/nose licking responses to the grouped behavior such as redirected behavior, displacement activity, appeasement gesture, etc. (Kuhne et al., 2012). From these studies, the data showed that dogs were showing snout-licking behavior while interacting with the familiar person by Specific gestures. The dogs in the "contact" and "no contact" condition manifested a significant increase in lip-licking (Csoltova et al., 2017). Snout licking, on the other hand, is necessary for dogs to keep themselves clean. Snout licking is a normal action that occurs in an unpleasant and unfamiliar scenario that may be triggered by dog-dog, dog-human, or dog-others iterating stimuli, according to the

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preceding description. It reveals when a dog is upset by an unknown odor that has elicited an unanticipated response.

Turning Head away

Sometimes researches show that the dogs are expressing multiple behaviors against a certain situation. Turning head away behavior responds to the sighs, depression, and unsecured situation. Many times they do so to avert eye contact. Turning the head away is a social signal of a dog which a dog will show in dog-to-dog conflict situations or may direct the dog to a human as well(Kuhne et al., 2012). According to the data from (Demirbas et al., 2016), we have received that head-turning, and looking/turning away have led to the predominant behavior of the dogs such as fear/anxiety. Moreover, (Demirbas et al., 2016) mentioned that Dalmatians and Dobermans had this certain behavior while they were in a fearful condition. Turning their head away means that the dogs try to diffuse the unfamiliar situation. Head-turning with other relevant signs was shown while they were interacting with the unfamiliar dogs (Mariti et al., 2017). And this is how they express their guilt.

Ears posture

The most significant point of view to know the dogs' behavior is about the ear posture of dogs. We can divide it into two types according to their ears' posture. One is pulling ears back, the second one is erecting ears facing forward. Firstly, we can discuss pulling your ears back. We can divide it into two behavioral structures that can highlight the two different behavioral patterns. We have studied that pulling ears back can be analyzed in both submissive and defensive-threatened behavior (Firnkes et al., 2017). Research showed that when the dog owners upright or crouched with their chests of the dogs, the dogs held their ears back close to the head (Rezac et al., 2017). From the recent study, we have found out that approaching with flattened ears, a forward craned head, a raised snout, and deep strong wagging of the tail lead to active submission. Active submission is the combination of the behavior of a dog in which the dog seeks its owner's attention by doing several behaviors such as crouched manners, bent tails, wagging often, ears folded back, etc. (Van den Berghe et al., 2019). Active submission also means helpful and friendly inauguration contact with social partners (Firnkes et al., 2017).(Firnkes et al., 2017) also showed that flattened ears were shown due to the de-escalation, and reduction of aggressive behavior of the counterpart.

On the other hand, many times pulling ears back close to the head occurs while insecurity in the spot, as well as the threatening and fearful situation, arose(Firnkes et al., 2017; Lakestani et al., 2014). Secondly, we come to the next part erecting ears facing forward. Then this can be divided into two parts. One is aggression with erecting ears and another one is relaxation with erecting ears. An offensive dominant dog can exhibit some dominant postures of the body. At the time of ending a conflict through aggressive behavior, cocked ears appeared (Firnkes et al., 2017). The research showed that the boxer, Border collie, and yellow Labrador breed act in playful and confident behavior that occurs them erected ears and relaxed. Moreover, they would show other relevant behaviors such as tail wagging, muzzle biting, eye contacting, upright stance, etc. (Tami & Gallagher, 2009). Now the additional problem is about the floppy ears dogs. (Tami and Gallagher, 2009) represented that their ears (Border collie) were going forward while playing with stooge dogs.

Pawing & Paw lifting

Pawing and sitting behavior is such a natural behavior of dogs that could mean being focused on the familiar person. On the other hand, paw lifting means to be aggressive behavior while interacting with other unfamiliar dogs. Let's discuss pawing behavior. The dogs embrace their owner by pawing them to get attention and love from their owners(Rezac et al., 2017). (Riemer et al., 2013) reported greeting test on puppies where they analyzed that the border collie puppies might be encouraged by calling their name and approaching. They could be pet and behave friendly. This is why the puppies pawed or rolled over the experimenters. (Rezac et al., 2017) disclosed that when the dogs greet their owners, they are doing nuzzling and pawing to get attention from their owners. The dogs more likely could do with their owners than the unknown person. They also could jump on and beg to be petted(Kiss et al., 2020). Moreover, a dog paws other dogs on the back to express its dominance. A dog also paws the owner's hand, leg, or clothing affectionately (Curb et al., 2013). (Mariti et

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al., 2017) found statistically that the dogs are shown paw-lifting behavior during the interaction with the unfamiliar dogs. In contrast, (Kuhne, et al., 2012) reported that the dogs with their owners displayed appeasement gestures that included paw lifting. Paw lifting is considered by stressed dogs as a sign of aggression while interacting with unfamiliar dogs (Lensen et al., 2019; Csoltova et al., 2017; Mariti et al., 2017; Rehn & Keeling, 2011).

Crouching & Standing

In the case of a critical or offensive scenario, certain studies have shown that crouching leads to stress behavior. Stress signals could never be led by a crouching posture. Furthermore, it demonstrates observable submissiveness. Crouched posture, bent knee, lowered head, and curled back were more likely stress signals in the dogs (Firnkes et al., 2017; McCullough et al., 2018; Rehn & Keeling, 2011; Van den Berghe et al., 2019). Standing manners have mentioned multiple signs. Standing manners are expressed both in aggressive and friendly behavior. (Lakestani, Donaldson and Warren, 2014) analyzed that Labrador showed a friendly manner by standing, tail wagging, etc. On the other hand, in their report, they said that some breeds (e.g. grey Bedlington, Husky, etc.) expressed their aggression standing still in a stiff posture. They added that standing manners could lead to a fearful situation. (Fallani et al., 2007) Showed that passive behavior (playful) includes standing and sitting with any particular orientation. From our following analysis, we have looked that crouching and standing behaviors are to be occurred in multiple manners. Sometimes they showed relaxed signs with these behaviors, sometimes they showed aggression in expressing those.

Stiffening Up & Staring

Sometimes it could be difficult to identify the stress condition or threatening behavior of the dogs. But by close observation, the behaviors and manners might get from them. Stiffening up means to become rigid body posture as well as muscles become rigid. Staring means looking at something with wide eyes while the head is directed and focused on the threat(Pfaller-Sadovsky et al., 2017). Stiffening up and staring occur indicating stress or threat while the dogs have faced. Moreover, the dog stress analysis can be done by staring and stiffening up(Hargrave, 2015)**.** Occurring attention towards something or owners led to staring behaviors(Rehn & Keeling, 2011). (Firnkes et al., 2017) showed that during defensive and offensive threatening behavior the dogs focused on staring at the test person with a tense posture. Furthermore, in case of interspecies conflict, threat, and defense this behavior occurs with other relevant behaviors. Staring at objects is a recognizable stress indicator for dogs (Hargrave, 2015). From our above analysis, we explain that both stiffening up and staring behaviors indicate that a dog is being stressed.

Growling

Growling is a vocalization of predatory animals including feline, canine, etc. It is a low guttural vocalization narrowly opened mouth (Pfaller-Sadovsky et al., 2017). Growling is a way of communicating with other animals (including pet owners). Most probably we have noticed that growling occurs due to aggression. Let's clarify the growling behavior in the following discussion. According to a recent study, growling can be divided into two parts such as aggressive growling and playful growling. Let's talk about aggressive growling. Aggression is defined by some particular signals received from the dogs. In case of an aggressive situation, initially the dogs growl as a threat to the opposite. The researchers found that while growling some more particular behaviors had been expressed such as raising hackles, baking, staring, etc. Many times, fearful conditions or perceived threats have been mentioned as growling. At this time, they growl to the unfamiliar dogs. However, the dogs showed their dominance through aggressive vocalization where they growled to maintain their dominance (Casey et al., 2013; Curb et al., 2013; Pfaller-Sadovsky et al., 2017; Van den Berghe et al., 2019; Zilocchi et al., 2015). Differently, it was noticed that agonistic dogs or other dogs have displayed playful growling as their nonaggressive features. An acoustical analysis of contextually different growls showed that the playful growling sound is smaller in duration than the aggressive growling(Bálint et al., 2013).

Snapping

Dogs are more likely rambunctious, fearful, and certainly not dangerous. Snapping of dogs is an instantaneous action of the head with sudden closing of the teeth causing an audible click. Snap is a warning not to do

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something like this with them. A dog in pain or threatened expresses snapping behavior at anyone who wants to touch it. The researchers proved that dogs are snapping along with biting, growling, barking, and baring teeth presenting them before the other recipient or unfamiliar person or other dogs. The aggressiveness would be better to show for facing uncomfortable conditions with their owners' proximity(McGuire et al., 2020; Siracusa et al., 2017). (McGuire et al., 2020) combined some behaviors such as growling, snapping, barking, etc. into the same category that would be mentioned as aggressiveness. Trying to scare strangers by standing erect, and raising their hackles the dogs sometimes express snapping along with growling and barking (Curb et al., 2013).

Tail Tucked Under

A dog's tail can tell us about its mind what to say or feel for a certain moment. Tucking tails between two hind legs means showing stress, fear, anxiety, nervousness, and so on. In unfavorable and fearful situations is more prominent to express the tucking tail behavior. Tucking tail is identified towards strangers rather than close acquaintances (Demirbas et al., 2016; Siracusa et al., 2017; Ujfalussy et al., 2017). (Lakestani, Donaldson and Warren, 2014) mentioned that the dogs display fear of tucking the tail under the body or legs with ears back and drawn-down lips. They also mentioned that sometimes these signs could not be interpreted in a dog's mind. It should be needed to observe facial expressions and other emotions. Moreover, while tucking their tail the dogs avoid eye contact, attempt escape, move backward, and hide somewhere else (Flint et al., 2018).

Tail-Wagging

Tail wagging refers to the movement of the tail from side to side or up and down. It is the most common behavior that does not mean any high-stress indicator (McCullough et al., 2018). (Rezac et al., 2017) mentioned that reuniting with the owner after a longer time of separation appears to promote positive stimulation in dogs, as seen by higher frequencies of tail wagging, physical activity, and overall attentiveness to the owner. Slow tail wagging has been noticed and tends to be performed more frequently in pampered dogs, and the proposal was made to express friendliness or arouse enthusiasm (Chaudhary, 2021). The analysis of (Ujfalussy et al., 2017) showed that the dogs exhibited more tail wagging while they were oriented towards their fosters than any stranger types. They also reported that there was no substantial difference in this variable between foster parents and close acquaintances. They also wagged their tails for a longer duration when orienting toward close acquaintances than any of the unfamiliar types. In this case,(Demirbas et al., 2016) discovered that stimuli-eliciting approach behaviors were linked to a larger amplitude of tail-wagging movements to the right side, whereas stimuli-eliciting withdrawal behaviors were linked to a higher amplitude of tail-wagging movements to the left side. If we look at the behavior of dogs associated with their aggression, tail wagging also refers to the identification of aggression associated with barking, growling, etc. When dogs show aggressive behavior, they frequently wag their tails more stiffly than when they pleasantly wag their tails (Lakestani et al., 2014).

Walking or Running Away

Walking or running away refers to the escape or flight behavior of dogs. While the dogs are facing conflict conditions, they walk away increasing their distance from the aggressor (Mariti et al., 2017; Van den Berghe et al., 2019).

Biting

The dogs have the most common biting behavior. Most biting does not mean to be aggressive but most often to be playfulness. Sometimes the distinction between normal and aggressive conduct preceding biting is tough to detect. It's tricky. Playfulness of dogs means when not engaging with people, any vigorous or galloping gaited activity aimed toward a toy, including biting(Fallani et al., 2007). In the case of aggressive behavior, a previous report has mentioned that while aggressiveness African wild dog (*Lycaon pictus*) ethogram showing social interactions used for behavioral analysis**.** It showed that the African dogs were showing severe biting, scruff biting, and snout biting. According to their analysis, snout biting means from the side or above, a dog seizes the receiving dog's snout between its teeth and holds it gently for a brief time. Moreover, scruff biting

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means the Bite was hindered by scuff orientation. On the other hand, an inhibited bite pulls on the receiving dog's fur; seems like playful behavior(Van den Berghe et al., 2019).

In addition, some domestic dogs who are protective of food, toys, or sleeping places exhibit resource-guarding violence, which includes biting(McGuire et al., 2020). In 2020 (McGuire et al., reported that according to reports of adopters, the dogs were biting, snarling, snapping as well as growling when valued objects were taken away(McGuire et al., 2020). However, According to studies, dogs are responsible for 60-95 percent of all animal bites on humans(Zilocchi et al., 2015).

Howling

Canines communicate in a variety of ways. Dogs howl to draw attention, make contact, and proclaim their existence. High-pitched sounds, such as emergency vehicle sirens or musical equipment, can also make certain dogs howl. As early as 3–4 weeks of age, wolves are capable of howling(Ausband et al., 2020). As *Canis lupus* a grey wolf is the closest relative of a dog, we hypothesize that a dog can also be capable of howling at 3-4 weeks.

A recent study reported that the usage of IoT (Internet of Things) technologies to control pet dogs left at home is becoming more common. This covers activities like automatic feeding, play equipment operation, and position detection. They use a deep learning method called the long short-term memory-fully convolutional network (LSTM-FCN) to evaluate time-series data and utilize bicubic interpolation to solve this problem and prevent severe deterioration in classification accuracy. They mentioned that the howling sound is a way for dogs to communicate their loneliness as well and they also analyzed that the whining sound is a typical form of howling to indicate separation anxiety, and it expresses both fear and obedience (Kim et al., 2018). According to the study, the howling is not a predatory warning signal. It's a long-distance intra-specific communication system that's utilized for territory marking, pack assembly, cohesiveness, and individual and pack recognition. Even so, it's reasonable to anticipate that animals (as possible prey) and people will interpret howling as a warning signal and become alarmed (Kořanová et al., 2021). Additionally, their research revealed the acoustic features of canid howling and discovered a striking resemblance to the warning sounds of technological sirens. According to their hypothesis, the effectiveness of sirens as warning signals has been enhanced by humans' inherent sensory tendency to be alerted by canid howling, with which they have a long history of cohabitation (Kořanová et al., 2021). In 2020,(Ausband, Bassing, and Mitchell, 2020)reported that during the mating season, *Canis lupus* wolves howl more often, but less after giving birth when pups are susceptible to predation. Due to physiological sensitivity to high temperatures, wolf activity and howling habit might be negatively affected(Ausband et al., 2020).

Lying Alert & Lying Rest

For a dog to learn, "lie down" is an important fundamental command. When requested, all dogs should know how to lie down. Owners can use the "down" command to get their dog to rest in a stressful circumstance or to keep him in a stay posture for a lengthy amount of time when they need him to calm down. According to the earlier research, we are about to follow that lying down posture has been divided into two behavioral types such as lying alert and lying rest. It was determined whether the dog's head was physically in touch with the ground or not. If it is touched, it is referred to as a resting position; otherwise, it is referred to as alert posture (Rehn & Keeling, 2011). (Rehn and Keeling, 2011) reported that Lying alert, investigating, and paying attention to anything in the surroundings are all examples of attentive behavior (Rehn & Keeling, 2011).

Panting

Panting is a common occurrence in happy, energetic dogs. It assists dogs in cooling down because they are unable to sweat like humans. Panting lets a dog quickly inhale, moisturize, and then exhale the air, therefore increasing the water evaporation from the nose and lungs of the dog. The body cools off from the inside by evaporating water. Panting was found a potential stress marker in dogs(Csoltova et al., 2017; McCullough et al., 2018). When a dog has olfactory detection the amount of time it spends panting can be utilized as a measure of dog detection efficiency because that would indicate reduced sniffing time(Brugarolas et al., 2016).

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Sniffing

Dogs are sniffing born. The scent of the canine brain is 40 times larger than humans and dogs can recognize odors at least 1,000 times better than a human can! The higher sense of smell of the dog is derived from 220 million olfactory nose receptors. It's little wonder that the smell of the dog is the major meaning, compared to the human pitiful 5 million.

Recent studies showed that asymmetric nostrils of dogs have been observed in some special incidents. During sniffing of distinct arousal odors, a right nostril bias was detected, supporting the right hemisphere's primary involvement in attending to frightening and disturbing stimuli. On the contrary, a change in the nostril from right to left happens when non-aversive stimuli are repeated. Their analysis reported that dogs have constantly utilized their right nose to sniff the smell of dogs and their left nose to sense human anxiety and human stimulation(Siniscalchi et al., 2016).

OUTCOMES AND DISCUSSION

This review comprehensively explores canine behavioral patterns by incorporating detailed visual representations to enhance understanding. Behaviors such as yawning, tail wagging, and ear postures were found to serve as reliable indicators of emotional states like stress, aggression, and relaxation. Human attention significantly influences these behaviors, with attentive interactions fostering positive engagement and inattentive ones leading to stress-related responses. Environmental familiarities play a crucial role in shaping canine reactions, further emphasizing the need for supportive environments to mitigate stress.

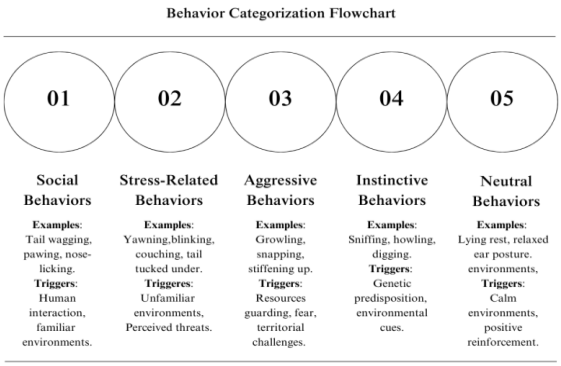

Figure 1 The Behavior categorization flowchart indicates the several categories with their examples and triggers.

The behavior categorization flowchart (Figure 1) organizes various behaviors into categories, such as social, stress-related, and instinctive actions, with their triggers and impacts. By visually mapping these behaviors, the review highlights the role of physiological states and external stimuli in shaping dog responses.

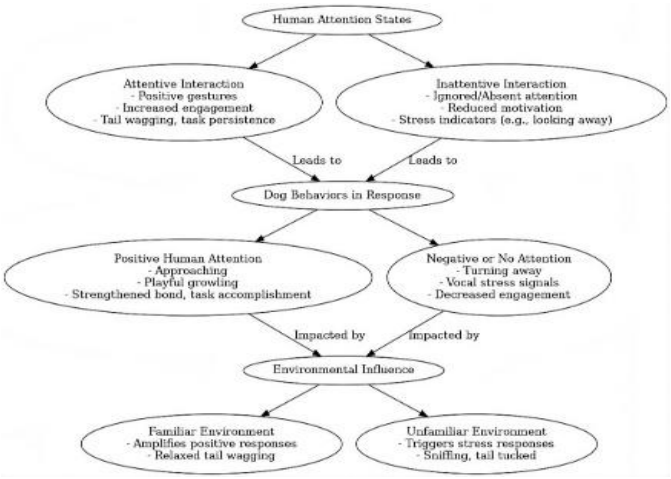

Figure 2 Dog-Human Interaction Model

Dog-human interaction model (Figure 2) highlights the significant influence of human attentiveness on dog behaviors. Attentive interactions foster positive engagement, such as tail wagging and task persistence, whereas inattentive interactions lead to stressful behaviors, including looking away and crouching. These findings underscore the importance of social cues in dog-human relationships.

CONCLUSION

This review sheds light on the compatibility of canine behaviors, offering a comprehensive understanding of how physiological, environmental, and social factors interact. By recognizing and interpreting behavioral cues, such as stress signals and social gestures, pet owners, and professionals can foster better communication with dogs, enhancing welfare and strengthening bonds. Future research should focus on integrating advanced physiological monitoring technologies to refine behavioral interpretations. These findings serve as a foundation for improving dog training practices, veterinary interventions, and overall quality of life for dogs in diverse settings.

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