

SECOND EDITION

Animal Behavior

for Shelter Veterinarians and Staff

EDITED BY

Brian A. DiGangi, Victoria A. Cussen, Pamela J. Reid, and Kristen A. Collins



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Animal Behavior for Shelter Veterinarians and Staff

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Second Edition

WILEY Blackwell



This second edition published 2022
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John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA

Editorial Office

111 River Street, Hoboken, NJ 07030, USA

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Library of Congress Cataloging-in-Publication Data

Names: DiGangi, Brian A., 1980– editor. | Cussen, Victoria A., 1979– editor.

| Reid, Pamela, 1960– editor. | Collins, Kristen A., 1976– editor.

Title: Animal behavior for shelter veterinarians and staff / editors, Brian A. DiGangi, Victoria A. Cussen, Pamela J. Reid, Kristen A. Collins.

Description: Second edition. | Hoboken, NJ : Wiley-Blackwell, 2022. |

Preceded by: Animal behavior for shelter veterinarians and staff /

editors, Emily Weiss, Heather Mohan-Gibbons, Stephen Zawistowski. 2015.

| Includes bibliographical references and index.

Identifiers: LCCN 2022016280 (print) | LCCN 2022016281 (ebook) | ISBN

978119618478 (paperback) | ISBN 978119618492 (adobe pdf) | ISBN

978119618508 (epub)

Subjects: MESH: Behavior, Animal–physiology | Veterinary Medicine–methods

| Animal Welfare | Cats | Dogs | Human-Animal Interaction

Classification: LCC SF412.5 (print) | LCC SF412.5 (ebook) | NLM SF 756.7

| DDC 636.088/7–dc23/eng/20220412

LC record available at <https://lccn.loc.gov/2022016280>

LC ebook record available at <https://lccn.loc.gov/2022016281>

Cover Design: Wiley

Cover Images: Courtesy of Brian A. DiGangi, Dana K. Trotta, Rachel Maso

Set in 9.5/12.5pt STIXTwoText by Straive, Pondicherry, India

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Foreword

The field of applied shelter animal welfare is undergoing rapid change, and it is an exciting time to witness the progress. Since we edited the first edition of *Animal Behavior for Shelter Veterinarians and Staff*, several developments drove rapid advancement in the field. In 2015, the first shelter medicine veterinary specialists were certified while we were writing the first edition. Once published, that textbook became required reading for their certification program. Those specialists, along with other scientists, have greatly expanded the literature on applied behavioral health of dogs and cats since then. Additionally, shelters are changing. The number of dogs and cats entering shelters continues to decline, and dogs and cats receiving behavioral interventions have increased. This is likely due to a shift in the population of animals coming into shelters, an increase in available resources (kennel space, staff, etc.) to support that population, as well as what you will see in this textbook: a growing sophistication of programs and processes to support the behavioral health of the shelter population.

The editors in this edition bring incredible depth and expertise to this book. All four editors have decades of experience working in animal welfare. Dr. Brian DiGangi is the Senior Director of Shelter Medicine at the ASPCA. Being dual board certified in Canine and Feline Practice and Shelter Medicine Practice allows him to bring a unique perspective and deep expertise to this body of work. Dr. Victoria Cussen is a Certified Applied Animal Behaviorist and Senior

Director of Applied Behavior Research for the ASPCA's Behavioral Sciences Team. With expertise in comparative cognition and canine behavior, she has a deep understanding of the scientific literature on animal behavior topics. Dr. Pam Reid serves as Vice President of the ASPCA's Behavioral Sciences Team. She provides specialized behavioral services, expertise in humane animal handling, behavioral evaluations, placement, and euthanasia recommendations for cruelty cases. Kristen Collins is an Associate Certified Applied Animal Behaviorist, and as Vice President of the ASPCA Behavioral Rehabilitation Center, she oversees all programs and operations with drive and compassion. Together, this revision will be an exemplary contribution to the field of shelter medicine and animal behavior.

This textbook will be a key resource for shelter professionals. Like the first edition, this content was written and edited by top leaders in the field. There are several new topics tackled in this text that will have a positive impact on thousands of sheltering professionals, from science-driven guidance when making decisions regarding behavioral well-being, to best practices during transportation of animals, to a focus on behavioral health for dogs and cats that are victims of cruelty or disaster, and much more. We look forward to seeing this edition published and used.

Heather Mohan-Gibbons, RVT, MS, ACAAB
Emily Weiss, PhD

Acknowledgments

First, we would like to thank the authors and editors of the first edition of *Animal Behavior for Shelter Veterinarians and Staff*. Dr. Emily Weiss, Ms. Heather Mohan-Gibbons, and Dr. Stephen Zawistowski astutely recognized the need for and importance of a book like this to further the progression of animal sheltering, and their work has laid a solid foundation on which we were able to capitalize. Their enthusiasm and advice as they handed over the reins for the second edition were much appreciated.

We would also like to acknowledge the support and encouragement of our colleagues. Drs. Lila Miller, Stephanie Janeczko, Chumkee Aziz, Erin Doyle, and Elise Gingrich provided thoughtful input on content, played roles as guest editors, and, perhaps most invaluable, served as sounding boards throughout the

process. Ms. Rachel Maso assisted in managing this project and enthusiastically took on the unenviable tasks of handling contracts and accounting. Ms. Laura Nelson assisted with preparation of figures, and Carey Parrack provided administrative support, allowing us to focus on content and manuscript preparation.

Finally, we would like to acknowledge the ASPCA's Executive Leadership Team, particularly Ms. Bert Troughton, Ms. Stacy Wolf, and our CEO, Mr. Matt Bershadker, for recognizing the value a project like this brings to the field of animal welfare at-large and allowing us to devote time to the effort.

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About the Companion Website

This book is accompanied by a companion website:

www.wiley.com/go/digangi/animal



The website includes:

- Appendices – downloadable PDFs from the book
- Videos – demonstrations of concepts and techniques presented by the authors

Part I

Foundations in Behavioral Health

Introduction

“Everyone is on the behavior team.” That is the philosophy of the ASPCA’s Behavioral Rehabilitation Center, a purpose-built facility designed to house, care for, and treat dogs with extreme fear. However, this philosophy is also applicable outside a specialized rehabilitation facility, even when staffing structure, roles, and responsibilities vary. This approach recognizes that all shelter personnel have important insights and impacts on the behavior and welfare of animals. A collaborative approach to sheltering—from intake to outcome and everything in between—representing the perspectives of medical, behavior, and operations team members, can result in enhanced delivery of care and ultimately improve the entirety of the sheltering experience for the animals and humans involved.

The topics, contributors, and scope of content throughout this book have been chosen and designed to highlight the interplay of all animal care team members toward a shared goal of happy, healthy pets enriching the lives of their humans. The reader will find authors with expertise in animal training, applied behavior, operations and programs, veterinary behavior, shelter medicine, and research—and in many cases authors have been intentionally paired to present as broad a perspective as possible on each topic.

Building upon the foundations laid in the first edition, this volume has been divided into

five sections intended to present an evidence-based approach to the current knowledge of animal behavior in animal shelters. **Section 1: Foundations in Behavioral Health** addresses fundamental concepts important for the application of the principles explored in the subsequent sections and features a new chapter to introduce the reader to learning theory (Chapter 3). **Section 2: Pets in the Community** describes the implications of community-wide programs on the behavioral health of shelter animals and features a timely new chapter on safety net programs to prevent pet relinquishment (Chapter 5). **Section 3: Dogs in the Shelter** and **Section 4: Cats in the Shelter** have each been expanded to accommodate the ever-growing knowledge base in topics that were presented together in the first edition. Chapters dedicated solely to advances in animal handling (Chapters 8 and 14), behavior assessment (Chapters 9 and 15), and housing (Chapter 10 and 16) for dogs and cats will focus on practical applications of both old and new concepts. In addition, Section 3 also features an entire chapter on the science and impact of play in dogs along with guidance for the successful, humane operation of playgroups (Chapter 13). **Section 5: Special Topics** encompasses a variety of timely and important topics with direct implications on animal health and welfare. New chapters feature frameworks for welfare

assessment and ethical decision-making (Chapter 19) and consider programming with particular impact on behavioral health such as animal relocation (Chapter 20) and the behavioral care of animals during disasters, cruelty cases, and long-term holds (Chapter 21). This section also includes an expanded discussion of behavioral pharmacology in animal shelters (Chapter 22) and introduces concepts in the care of small mammals (Chapter 23) and horses (Chapter 24).

The reader is encouraged to use all of the resources compiled to supplement the material in the text. Chapter appendices offer sample protocols and checklists that will help put new knowledge into practice. An online video

library is available to demonstrate many of the conditions, concepts, and techniques presented by the authors. General appendices provide ethograms of common canine and feline behaviors as well as a summary of behavior professional credentialing requirements.

Read from cover to cover, consult a chapter before writing a new protocol, assign a staff member to present a chapter at a staff meeting, or build a volunteer training session using material gleaned from your favorite chapter—choose whichever means of applying this material will most enrich you, the animals, and the people in your circles. After all, there is bound to be something valuable for everyone, because everyone is on the behavior team!

1

Introduction to Dog Behavior

Julie Hecht and Alexandra Horowitz

1.1 Evolutionary History of the Species

The domestic dog, *Canis familiaris*, is a member of the Canidae family, genus *Canis*, which also includes wolves, coyotes, and jackals. *Canis lupus*, the present-day gray wolf, is the domestic dog's closest living ancestor (Vilà et al. 1997), and the divergence began more than 10,000 years ago, possibly with early hunter-gatherers and then in association with early agriculture (vonHoldt and Driscoll 2017). The dog is the only domesticated species of the genus: that is to say, the only canid for whom artificial selection (selective breeding) by humans has usurped natural selection as a major mover of the species.

Considering dog behavior in the context of their wild cousins can at times clarify some common dog behavior. Wolves living among family members approach and greet those returning from hunting by licking—"kissing"—their faces. Licks are prompts for the wolf to regurgitate some of the kill just ingested. Similarly, a dog's "kiss" is a greeting, but it is also a vestigial interest in whatever it was an owner might have consumed since leaving the house (Horowitz 2009b). A dog's propensity to sniff peoples' genital area could be viewed as intrusive or "impolite," yet it is analogous to canids' olfactory investigations of

the genital and anal areas of conspecifics, which contain information about the identification, and perhaps recent activities and health, of that individual (Sommerville and Broom 1998). At the same time, there are numerous differences between dogs and wolves, particularly regarding ecological niche and social organization (Marshall-Pescini et al. 2017), and analogies between the two should be made with caution. Instead, dogs' intimate association with humans has had a seminal impact on every aspect of their being.

1.2 Dogs and Humans

Canis familiaris and *Homo sapiens* share a special relationship. They engage in the seemingly mundane—walking side by side in a park—to the complex—running an agility course or alerting a hearing-impaired person to a ringing telephone. In recent years, cognitive, behavioral, and physiological studies have added clarity to this unique interspecific bond.

1.2.1 Dog Interspecific Social Cognition

Dogs display behaviors that can give people the feeling of a shared experience and mutual understanding. Dogs monitor human behavior closely, are sensitive to human actions and attentional states, and act in accordance with

humans in coordinated and synchronized ways. For example, when unable to access a desired item, dogs may alternate their gaze between the item and a person to direct the person to retrieve it (Miklósi et al. 2000). Even as puppies, dogs readily respond to human communicative gestures, whether stemming from hands, the face, (e.g., the eyes), or other body parts (Reid 2009; Riedel et al. 2008). This propensity is even observed in some free-ranging dogs (Bhattacharjee et al. 2020), and personality, enculturation, and reinforcement history could also affect outcomes. Dogs take note of human attentional states from the eyes as well as head and body orientation—a dog being more likely to remove a muffin from a counter-top if a person’s back is turned or eyes are closed than if the person’s eyes are open (Schwab and Huber 2006). Dogs discriminate human emotional expressions such as happy and angry faces (Müller et al. 2015). A number of dogs have proved extraordinarily attentive and responsive to human language (Kaminski et al. 2004; Pilley and Reid 2011). Not all dogs attend to verbal cues (Ramos and Mills 2019), and the emotional content, tone, and intonation of human vocalizations are particularly relevant. Behavioral synchronization—staying close to and moving in pace with a person—has been observed in owned dogs and, to a lesser extent, between shelter dogs and caretakers (Duranton and Gaunet 2018). Dogs and humans also play together, and these vastly different species can attend to each other’s play signals; a dog’s play bow—or a person’s play lunge—is often responded to meaningfully (Rooney et al. 2001). People visiting a shelter searching for their new best friend may not be aware of the complex social exchanges underlying the dog-human relationship, but they may have experienced it with another dog and may even be seeking it out.

1.2.2 Dog-Human Relationships

Attachment theory initially described the affectionate bond relating to safety, security,

and protection between a child and caregiver, and it has since been extended to and identified between dogs and their caretakers (Bowlby 1958; Topál et al. 1998). Attachment is displayed through particular behaviors such as proximity maintenance, approach, and gaze toward a caregiver when reunited. Similar to infants, dogs display the “secure base effect” by exploring and playing more in a novel environment when in the presence of an owner than a stranger (Horn et al. 2013). Like the child-parent relationship, dogs can display different attachment styles described broadly as secure (explore and also seek contact) or insecure (avoidant, ambivalent, or disorganized) (Solomon et al. 2019). Dog attachment style and owner caregiving strategies both contribute to the dyad’s relationship (Rehn and Keeling 2016).

Early exposure to humans is important for normal dog social development, but attachment relationships can form later in life, multiple times, and toward multiple people. Gácsi et al. (2001) found that similar to owned dogs, shelter dogs displayed attachment behaviors toward a newly appointed “owner” (designated by three short interactions with the dog). Thielke and Udell (2020) found that, similar to owned dogs, dogs in foster care formed secure attachments, and leaving the shelter seems to further support relationship development. If adopters are concerned about shelter dogs forming bonds, these studies could provide comfort.

Biological mechanisms could also underpin the dog-human relationship. The neurohormone oxytocin is often highlighted for its role in bonding and affiliation, good feelings, and stress buffering. Studies find that pleasurable interactions such as gentle petting, light play, talking in a positive tone, greeting, and sharing gaze with a known person promote oxytocin release in both dogs and people (Kis et al. 2017; Powell et al. 2019b). Although oxytocin appears to contribute to the dog-human relationship, a positive oxytocin effect is not always observed (Powell et al. 2019a).

Researchers are also exploring whether administering oxytocin to dogs elicits affiliative and social behaviors. Findings to date are not straightforward. For example, Romero et al. (2014) found that oxytocin promoted affiliative behavior toward humans and other dogs, but Barrera et al. (2018) found that intranasal oxytocin did not improve reactions toward a stranger during a sociability test, as was expected. Additionally, administering oxytocin to dogs can be challenging, and Schaebs et al. (2020) found that a vaporizer mask—which requires training—administers oxytocin more reliably than the more commonly used intranasal spray. Regardless, unclear sex, neuter status, and breed differences have been identified, and outcomes are not always in the anticipated direction. In humans, for example, oxytocin has been linked to distrust of and preemptive aggression toward strangers (Sapolsky 2018). The utility and real-world use of oxytocin administration remains to be seen.

1.2.3 Relationships between Dogs

Dog relationships with conspecifics may differ from those formed with humans, and research in this area is in its infancy. Behavioral indicators of attachment toward the dam have been identified and, in some circumstances, the stress response can be reduced by the presence of a cohabitant dog (Mariti et al. 2014, 2017). Cimorelli et al. (2019) suggest that it is the individuals involved, not the species type, who impact the quality of the bond. They observed that while referencing/information seeking was more often found in dog-human relationships, both dog-dog and dog-human relationships shared similarities in terms of affiliation and stress alleviation (i.e., members of either species could provide more or less affiliation or stress alleviation). Taken together, dogs can have complex, amicable, and longstanding relationships with members of their own and other species. The potential for intra- and interspecies integration starts at the beginning of life.

1.3 Dog Behavioral Development

While genetics provide the blueprint for life, experiences—particularly those early in life—can impact dog behavioral development. Increased early life plasticity allows a growing dog to be affected by and responsive to environmental inputs, which in turn has the ability to affect immediate and future behavior. Understanding early life developmental periods goes hand in hand with identifying environments and experiences that support normal development and those associated with the development of pathological behaviors (behavior problems) and behaviors expressed out of context or excessive in terms of frequency, duration, or intensity (Dietz et al. 2018; Hammerle et al. 2015).

“Critical” or “sensitive” periods are specific weeks or months where behavior patterns emerge and environment, stimuli, and social exposure support development (Scott and Fuller 1965). Additionally, events during the prenatal period—such as in utero exposure to maternal stress—as well as subsequent dam care styles can influence puppy behavioral and cognitive development and later coping (Santos et al. 2020). While developmental periods have a clear progression (dogs will not play bow before opening their eyes), transitions between stages are more gradual than initially thought (Bateson 1979). The following periods are therefore guidelines—without hard-and-fast beginning and end points. Rates of development (heterochrony) can also differ among breeds. As well as among individuals.

1.3.1 Neonatal and Transitional Periods

In less than a month, pups move from complete dependence on the mother (zero to two weeks) to increasing autonomy (two to three weeks). Dogs enter the world without vision, hearing, or coordination, and they rely on tactile and simple olfactory sensations. They are unable to self-regulate temperature and spend most of their time sleeping, nursing, and in physical

proximity to the dam and littermates. Newborns display “kneading” or “swimming” behavior directed at the teat or milk source to attain food, and the dam initiates elimination by tactile stimulation. If isolated they make high-pitched calls—whines or yelps—that indicate distress and are frequently described as care soliciting (Elliot and Scott 1961). These early vocalizations transform into high-pitched, high-frequency “alone barks” that are contextually similar and also elicit attention (Yin and McCowan 2004). At around two to three weeks, eyes and ears open, and characteristic “dog” qualities begin to emerge such as walking and tail wagging, rudimentary elements of play, and a startle response (Case 2005). An interest in solid food may begin, and anogenital licking is no longer required for elimination.

Dam maternal care styles throughout these early periods vary in quantity and quality and contribute to pup development (Dietz et al. 2018). Experiencing brief mild stressors beginning from birth—such as human handling and brief separations from conspecifics—could have long-term beneficial effects on stress resilience (Gazzano et al. 2008). Brief, gentle exposure to social (human and non-human animals) and asocial (auditory and visual) stimuli can further support physical and cognitive development.

1.3.2 Sensitive or Socialization Period

Week 3 to approximately week 12 is a time of immense growth, particularly for species-specific social behaviors and learning opportunities. Approach and avoidance emerge early in this period, followed by more coordinated motor patterns, such as play fighting with littermates. Pups increasingly send and receive intraspecific signals, and vocalizations become more complex and are incorporated into social situations. Dogs identify littermate and species members, and social learning from conspecifics and humans has been demonstrated in puppies as young as eight weeks of age (Fugazza et al. 2018;

Serpell et al. 2017). Pups also show attention to and interest in humans, and from an early age they can follow human communicative signals like gaze or pointing (Riedel et al. 2008). A period of interest and investigation can be followed by wariness or fearfulness, particularly after week 5 and culminating between weeks 8 and 10 (Case 2005). The presentation of fear could be modulated by factors such as genetics, individual coping styles, or early life experiences (Rooney et al. 2016).

Premature weaning and early separation from littermates are inadvisable. Separated dogs miss valuable social exchanges, both observational learning opportunities and feedback on their own behavior. Dogs vary in weaning time even within breed, and weaning prior to two months has been associated with subsequent behavior challenges such as increased destructive behavior and possessiveness, excessive barking, and fearfulness (Pierantoni et al. 2011).

As suggested, the socialization period is the time when dogs acquire “behavior patterns appropriate to the social environment in which [an individual will] live, allowing them to coexist/interact with other individuals” (Blackwell 2010). Dog interest and comfort with all that the human environment has to offer should not be assumed simply because dogs are “domestic.” Instead, socialization involves short, repeated doses of enjoyable, varied experiences and exposing pups to social and non-social stimuli that will be part of *their* environment. Individual dog behavior should be closely monitored for indications of discomfort with consideration for under- as well as overstimulation (Howell et al. 2015). Pluijmakers et al. (2010) found that puppies between three and five weeks of age exposed to audiovisual playback—consisting of animate and inanimate objects and noises at normal volume—showed decreased fear of novel objects and unfamiliar settings compared to a control group who displayed increased stress-related behaviors.

Veterinary professionals recommend considering puppy socialization classes as early as seven to eight weeks and with a minimum of one set of vaccines (American Veterinary Society of Animal Behavior 2008). Early life restrictions can have profound effects on dogs. Numerous studies find that dogs raised in commercial breeding establishments (commonly known as “puppy mills” or “puppy farms”) or purchased from pet stores displayed ongoing behavioral and emotional challenges such as increased fear and aggression and difficulty with separation when compared to dogs not raised in such environments (McMillan 2017).

1.3.3 Juvenile and Adolescent Periods

The periods from approximately three to six months and six months to one to two years (during which sexual maturity occurs) have received much less attention than other developmental periods. The juvenile period is sometimes described as the secondary socialization period because, like early in life, experiences can affect developing personality. Harvey et al. (2016) conducted behavior tests with dogs at five and eight months and found that some traits like jumping, barking, and low posture during greeting were stable, while others such as obedience, lip licking, and body shaking were not consistent between the two periods. A retrospective examination of guide dog development found that owner-directed aggression decreased in German shepherds, Labrador retrievers, golden retrievers, and golden × Labrador crosses from 6 to 12 months, but German shepherds showed an increase in stranger-directed aggression during this period (Serpell and Duffy 2016). Reductions in trainability and responsiveness to owner commands have also been documented during these periods (Asher et al. 2020). Although they have long since shed their puppy appearances, these dogs are still very much in a period of transition and

growth. The dog-human relationship could benefit if people set their expectations with this in mind.

1.3.4 Senior Dogs

Senior dogs are members of the shelter population, and identifying normal, successful aging versus cognitive dysfunction merits consideration. Factors like breed, size, and weight can affect how long dogs live, and as they age, they can display a number of normal age-related declines in physical and mental functioning (Chapagain et al. 2018). Changes in levels of play and responsiveness to commands, enthusiasm for food, and increases in fears and phobias can be part of normal, successful aging (Salvin et al. 2011). Older dogs also display less social interest, diminished learning and memory, and less interest in novelty compared to young dogs (Kubinyi and Iotchev 2020). Normal aging can also affect a dog’s ability to cope with a social challenge such as a mild separation from an owner (Mongillo et al. 2013).

Canine cognitive dysfunction syndrome differs from normal aging and is summarized by the acronym DISHA: “Disorientation, altered Interactions with people or other pets, Sleep–wake cycle alterations, House-soiling and altered Activity level” (Landsberg et al. 2003). It parallels human dementia and Alzheimer’s disease. Locomotion may be erratic or aimless, dogs may be less responsive to social isolation or interactions with people, and an increase in destructive behavior or house soiling may be observed (Chapagain et al. 2018). A therapeutic diet aimed at enhancing cognitive function as well as behavioral enrichment like participating in dog training activities are both promising interventions for delaying cognitive decline (Chapagain et al. 2018; Szabó et al. 2018). Awareness of the differences between normal aging and cognitive dysfunction can enhance care for older dogs entering the shelter.

1.4 Dog Communication

Dogs engage in visual, acoustic, and olfactory communication, and each contributes to intra- and interspecific communication. Studies complement—and at times clarify—existing interpretations of dog behavior and communication.

1.4.1 Visual Communication

Identifying expressive and meaningful body parts is integral to dog communication and emotional expression (see Figure 1.1; see General Appendix A for a canine body language ethogram). Meaning should not be obtained from any single body part or behavior in isolation. Instead, meaning takes shape when considering the totality of dog communicative behavior as well as environment and social contexts. To this point, observing and describing behavior precedes ascribing function, and individual differences in behavioral expression are commonly documented—even in response to the same stimulus or context.

Research-based resources provide background for visual communication descriptions (Beerda et al. 1998; Bradshaw and Rooney 2017; Miklósi 2015; Schenkel 1967), and visual representations of dog behavior and communication, such as Aloff (2005) and more recently Chin (2020), aid the study and recognition of visual signals.

Dog size and postural movements are observed by dogs and people alike. Unlike body size, posture can be modified to expand or contract, the former suggesting confidence or alertness and the latter conveying fear, prevention or reduction of conflict, or affiliation (Schenkel 1967). Dogs reduce size in multiple contexts and with different communicative meanings. A dog lying on the back in “passive submission,” often with ears back, tail tucked, and the inguinal region exposed, deescalates conflict and inhibits attack. Dogs can also display a more inviting “belly-up” posture to solicit a belly rub. Alternatively, “active submission” may not be motivated by deference or a response to threat (Bradshaw and Rooney 2017). Instead, approach with low

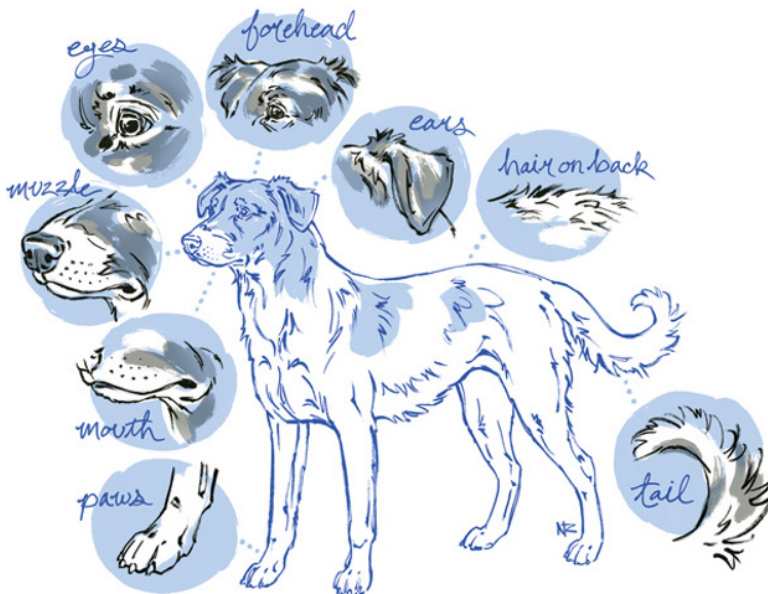


Figure 1.1 Body parts that contribute to canine visual communication. *Source:* Illustration created by and used with permission of Natalya Zahn.

posture, low wag, and muzzle (or mouth) licking is an affiliative display to gain food, greet, or maintain or restore social bonds.

In interspecific contexts—such as if a dog has done something an owner deems wrong—submissive displays can be misinterpreted as a dog’s knowledge of wrongdoing. Instead, behaviors such as freezing, approaching or retreating with a depressed posture, low and quick wagging, ears back, or rolling onto the back or lifting a paw are best viewed along ethological lines as cohesive displays and non-threatening appeasement postures to keep the group together. Research finds these behaviors are not indicative of a dog’s “knowledge” of misdeed or an admission of guilt (Horowitz 2009a).

Dog body posture can encourage “coming closer” (distance between individuals decreasing) or “backing up” (distance between individuals increasing), and a dog’s body-weight distribution offers subtle yet valuable information. A dog with weight shifted forward and upper body pressed over the front legs shows forward momentum, interest, confidence, or alertness. If a dog leans forward toward another dog—and the receiver leans back, looks away, or moves away—the second is engaging in conflict avoidance or communicating the dog’s desire to avoid closer interaction. If signals go unheeded, dogs may resort to defensive aggression over time and even fade out the use of distance-increasing signals.

Limbs are central to body-weight distribution and dog movement. While people may take note of limbs in the context of parlor tricks like “high five” or “give paw,” these gestures bear no social meaning for dogs apart from possible food reward or human praise. Instead, “offering a paw” is a submissive or appeasing display and, for example, may be performed in response to an upset owner. Sweating paws could indicate acute stress, but these are difficult to interpret as they could be related to other factors, like temperature (Polgár et al. 2019).

Piloerection is a physical response outside a dog’s control akin to getting goosebumps. This reflexive response can be seen in a dog’s hackles, or erect hair. Hackles run from the base of the tail to the shoulders, and because raised hackles indicate arousal in general, piloerection should be evaluated in conjunction with ear, tail, mouth, and overall body posture to assess specifics of the aroused state.

Tails are integral to communicative signaling. They can assume a range of heights, movements, and speeds, and even the side-of-wag offers meaningful information. Observing the tail-base provides details as to whether the tail is being carried along the midline or is raised or tucked. Generally speaking, a high tail indicates excitement or arousal, and a high tail can be seen in a variety of approach-oriented contexts ranging from greeting and playing to fighting and threatening; lowered tails suggest fear, submission, or appeasement/affiliation (Kiley-Worthington 1976). To explore the value of tails within intraspecific communication, Leaver and Reimchen (2008) designed a study where dogs encountered a mechanical dog outfitted with tails of different lengths (long or short) that could move or remain still. Dogs were more likely to approach the mechanical dog when the tail was long and wagging as opposed to when it was long and still, suggesting that absent other communicative signals, dogs interpreted a wagging tail as “friendly.” On the other hand, a short tail, whether still or wagging, was approached similarly, suggesting that short (or docked) tails might be more difficult to view or interpret. Tail absence or surgical shortening affects communication (Bennett and Perini 2003).

Probably the most noticeable component of the tail relates to movement. A tail wagging fluidly and loosely from side to side (usually at the level of the midline) is most readily associated with greeting or excitement. This “happy” tail might be accompanied by jumping, licking, running in circles, or other behaviors of arousal. A tail wagging low and quickly indicates nervousness or timidity. High, fast wags

indicate arousal, and they should be viewed with some caution. Arousal can take different forms, such as general excitement, interest in interacting, or even aggression. There are further individual variations in wags—circling, going more counter- than clockwise, banging—whose significance has not been studied (and should not be assumed). Tails can also lack movement and be held in a stiff, still position at all heights, which could either be the dog’s natural tail position or a postural display. Stillness is common in dog interactions: for example, play incorporates entire body pauses (including the tail) interspersed within fluid movements and play signals. Outside of play, a still tail should be evaluated along with the entire body to assess meaning.

While often imperceptible to the naked human eye, wags can be performed asymmetrically—more to the right or left of midline—and offer insight into stimulus perception or emotional valence due to brain lateralization hypotheses (Siniscalchi et al. 2021). For example, dogs wagged more to the right side when encountering an owner (suggesting positive valence), while the sight of an unknown, unfriendly dog, prompted more left-side wags (negative valence) (Quaranta et al. 2007). When observing other dogs wagging more to their left side (negative valence), the observer dogs displayed increased cardiac activity and more stress behaviors, suggesting dogs may assess tail asymmetries in their interactions with other dogs (Siniscalchi et al. 2013). Ultimately tails vary in appearance and position such as curled, tucked, or falling to one side, and tails should be evaluated in relation to a normal, relaxed position.

Dog facial expressions and head movements contribute to visual communication, and the mouth imparts numerous signals (Bradshaw and Rooney 2017). Observing whether the mouth is open versus shut is the first consideration, and further qualitative elements provide more detail. An open, relaxed mouth indicates a comfortable dog, while a “tight mouth” could indicate emotional or physical discomfort or fear. Yawns

can indicate a soporific state, but context and other behaviors may also indicate a stress-related behavior. The corners of the mouth, or labial commissure, are also meaningful. A “long lip” describes when the commissure is pulled back toward the ear and is often seen in fear, distress, or appeasement displays. In a submissive grin, the lips are retracted, and the teeth are visible, but the eyes may be squinty and the forehead smooth as well as ears pulled back. A “short lip” is pushed forward, forming a tight forward-moving “c” shape of the mouth. This is part of an aggressive display: the top of the muzzle is wrinkled, and the eyes are open and “hard”. Mouth positions may be fleeting and challenging to notice, and shelter staff and volunteers may benefit from concerted practice observing subtle dog mouth positions and their relation to other body positions.

Dog tongues hang generously from mouths during play, and a panting tongue in this context can be a sign of pleasure. Panting can also serve as an indicator of acute stress or physical discomfort (Beerda et al. 1998), especially when seen outside the contexts of activity or thermal stress. Oral behaviors, like mouth licking, are often—but not always—identified in situations of stress, pain, or uncertainty (Owczarczak-Garstecka et al. 2018), and they are also a component of appeasement and greetings/active submission. In one study, dogs viewing angry human faces displayed an increase in “mouth licking,” suggesting that they may find angry facial expressions aversive (Albuquerque et al. 2018). “Tongue flick” or “tongue out” is described as the tip of the tongue extended and retracted quickly outside food or eating contexts, while “snout licking” describes the tongue moving along the upper lip possibly near the nose (Beerda et al. 1998). Dogs also use tongues socially to investigate substrates and surfaces.

Eye-tracking studies find that dogs attend quickly to the eye region of other dogs (Somppi et al. 2016). A “hard eye” can be present before or during a threat and include a direct and

prolonged gaze, sometimes with dilated pupils. A stiff, unwavering body posture may accompany this type of eye presentation. Pupil dilation—caused by activation of the sympathetic nervous system—indicates arousal, but further contextual information is needed to determine whether it is distress or eustress (Polgár et al. 2019). Conversely, “whale eye” is a label applied when the sclera of the eye is visible; it can indicate discomfort or nervousness as it is most frequently caused by gaze aversion. Eyes can also assume an inviting softer, squintier, more almond-shaped appearance, which can be accompanied by a wrinkled brow.

Ears are varied in natural presentation and carriage. Some are permanently pricked, while others droop to the side. Ear carriage is best evaluated by looking at the base of the ear, and the pinna—the external part of the ear—can be assessed from “maximally backwards” to “maximally forward” (Schilder and van der Borg 2004). Even in long-eared breeds like basset hounds, “ears back” can be noted by paying attention to the base. Ears pressed back are generally associated with greater levels of fear, submission, retreat, or even defensive aggression. Alternatively, ears forward suggest interest, attention, alert, or approach.

The body parts that contribute to dog visual communication merit discussion because people can have difficulty attending to actual in situ dog behavior (Tami and Gallagher 2009; Mariti et al. 2012). People often make assumptions and personality assessments about dogs based on *appearance* rather than *behavior*. In one study, an image of a yellow dog was rated as more agreeable, conscientious, and possessing emotional stability as compared to an image of the same dog with black fur (Fratkin and Baker 2013). Surgical procedures like tail docking and ear cropping can also affect personality attributions, and modified dogs have been perceived less positively—more aggressive and dominant, and less playful and attractive—than their natural counterparts (Mills et al. 2016). Awareness of the potential to make assessments based on

appearance rather than behavior, coupled with an understanding of where to look for dog visual signals, can help people in their interactions with dogs.

Additionally, artificial selection and dog morphological diversity can impede social signaling and visual communication (Bradshaw and Rooney 2017). For example, brachycephalic dogs lack the highly flexible and expressive faces of more lupine-type dogs, and hair or fur can prevent visible piloerection. Ultimately, some dogs may be physically unable to signal, or their signals may be difficult to notice, and dog behavior should be considered in light of what is physically possible for that dog.

1.4.2 Acoustic Communication

Social animals tend to have wider vocal repertoires than asocial animals, and dogs make a lot more noise than other canids, both in quality and quantity. Dogs whine, yelp, growl, howl, and bark (Lord et al. 2009) in addition to other less-described vocalizations such as pant-laughing and grunting, to name a few.

Howls and barks are loud and noisy. Howls carry for long distances, while barks are for shorter-range communication (Feddersen-Petersen 2000). Both attract attention and can be socially facilitated, although some dogs bark more than others even in the presence of the same stimulus. Barks vary in acoustic property and duration, but each is repetitive and loud. Barks performed in different contexts sound different from one another, so barks from a “stranger approaching,” isolation, or play context will each sound distinct (Yin and McCowan 2004). Tonal and high-pitched barks indicate fear or desperation (e.g., “alone” bark), while low-pitched barks that are harsher with little amplitude modulation are described as aggressive (e.g., “stranger approaching” bark) (Pongrácz et al. 2006).

Barks are one of the lesser-appreciated vocalizations and are associated with dog relinquishment and “misbehavior” (Wells and Hepper 2000). Problems with barking can stem

from bark quantity (frequency), quality (style or context), or even perceived annoyance (Pongrácz et al. 2016). Yet barking can be affected by altering its consequences, and positive reinforcement procedures have been found effective. Even pairing a neutral stimulus with a tasty treat has been found to decrease barking (Protopopova and Wynne 2015). Barking can be increased or decreased, and people can modulate barking if necessary.

Growls, too, are nuanced, and dogs attend to these differences. Growls can indicate growler size (Taylor et al. 2010), and they are performed in agonistic as well as play contexts. Faragó et al. (2010) recorded growls in three contexts: guarding a bone, growling at an approaching stranger, and during play. These growls were then played to dogs as they approached a bone that was sitting in front of a crate that, unbeknownst to them, had speakers concealed inside. Dogs were more likely to retreat when they heard the “my bone” growl than when they heard the “threatening stranger” growl. People may have more difficulty than dogs in evaluating growls, and people should attend to both dog behavior and context to infer meaning (Faragó et al. 2017).

1.4.3 Olfactory Communication

Dogs are known for their noses and with good reason. Compared to microsmatic, or “poor smelling,” animals like humans, dogs have physiological structures that prioritize smelling and can detect and discriminate a large number of, what are for humans, imperceptible odors (Horowitz 2009b). Scent particles enter the dog’s nose both by sniffing and regular breathing (Neuhaus 1981). These particles then enter the nasal cavity, where a mucus lining covers the olfactory epithelium and mediates olfaction—smelling (Furton and Myers 2001). Considerably more genes code for olfactory receptors in dogs than in humans (Quignon et al. 2003).

Compared to humans, dogs seek out and access a much wider set of contextual and

social information through smell, and olfaction is a major part of dog intra- and interspecific social encounters. Dogs, like many mammals, have a secondary molecule-detection organ, the vomeronasal organ (VNO), that is directly involved in social communication and pheromone assessment (Adams and Wiekamp 1984). Distinct from the main olfactory epithelium, the VNO is located below the nasal cavity, and its receptors also carry information to the olfactory bulb. This chemosensory organ is ordinarily viewed as responsible for pheromone detection in urine, feces, and saliva as well as glands in the anogenital region, mouth, and face. Using odor cues, dogs can discriminate conspecifics as well as identify something unique about themselves compared to other odors (Bekoff 2001; Horowitz 2017). Horowitz (2020) also found that dogs can distinguish their owner’s odor from that of a stranger. Additionally, dogs appear to take note of human odors associated with fear or happiness (D’Aniello et al. 2018).

Dog social encounters are marked by close olfactory inspection, particularly of the head and anogenital area. Body sniffing is common between dogs when they first meet, either on or off leash (Bradshaw and Lea 1992; Westgarth et al. 2010). Initial encounters are typically short, and dogs often explore the environment instead of furthering the interaction, a phenomenon that has been described in free-ranging dogs and at dog parks (Howse et al. 2018; Ward 2020). In the samples studied, often self-selected groups at dog parks or open spaces, post-greeting aggression and even play were relatively rare. Direct encounters between dogs at shelters may be rare, and dogs tend to be on leash (or in kennels), and interactions might be thwarted due to shelter operational protocols. Without the opportunity for direct olfactory investigation, these dogs might experience tension, restraint, or frustration upon seeing other dogs, which could affect subsequent intraspecific interactions.

Olfaction also plays a role in dog interactions with people. For example, the anogenital