

Animal Behavior

for Shelter Veterinarians and Staff



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Emily Weiss, Heather Mohan-Gibbons, and Stephen Zawistowski

Introduction

As recently as the last decade, there were few professional training opportunities for the veterinarian, vet tech, animal behavior professional, or shelter professional in the area of shelter animal welfare. The publication of *Shelter Medicine for Veterinarians and Staff* (Miller & Zawistowski) published in 2004, with a second edition released in 2013, exceeded original expectations regarding uptake and interest. The textbook provided not only practical information focused directly on shelter medicine but also standard husbandry procedures, management of feral cats, shelter behavior programs, and behavioral pharmacotherapy in the animal shelter. The work compiled within that textbook inspired the need for a comprehensive text focused more specifically around behavior.

Why aim a behavior textbook toward shelter veterinarians and shelter staff? We propose there are many reasons. There is an abundance of evidence pointing to the powerful relationship between physical and psychological or emotional health. By decreasing behavioral stress, we can also reduce the incidence of illness and disease resulting in more animals with an opportunity for live release.

Many animal welfare organizations acknowledge the human-animal bond as a way to promote pet adoptions. However, some fail to recognize and support an understanding of the “human” part of that relationship as key to ensuring that dogs and cats stay in their current home or are successful when rehomed. We have included chapters that provide the information needed to support both humans and animals in establishing and maintaining pets in their current or future homes.

The field of animal sheltering has rapidly increased its skills and knowledge, and the need for information regarding the behavioral health of shelter dogs and cats is greatly needed. Our work with shelter professionals (vets, line staff and behavior professionals) through ASPCApro.org reaches thousands of people, hungry for more information. Our focus here is to compile into one text the research around intake risk regarding behavior, promoting behavioral well-being in the shelter, and the human-animal bond in regards to shelter animals.

The field of Applied Animal Behavior as a formal academic discipline is fairly new. The application of structured applied animal behavior in a shelter environment is even more recent. There have been numerous publications on animal behavior topics relevant for animal shelter managers and professional staff. However, most of these publications have appeared in a diverse selection of professional journals that reflect the interests of many disciplines. Many shelter staff do not have the time or opportunity to access this work and contemplate how to apply it in the day-to-day operations of their shelters. One of our goals with this text was to recruit authors familiar with various aspects of this diverse literature and ask them to review the relevant material and distill it in a fashion that would be immediately accessible to staff working in animal shelters.

In 2010, the Association of Shelter Veterinarians published *Guidelines for Standards of Care in Animal Shelters* (2010). This groundbreaking publication opened the door to an important and continuing dialogue around best practices for such topics as sanitation, preventive medical care, housing, enrichment, and husbandry. Many chapters within this textbook will provide those organizations interested in meeting the guidelines with the tools to implement the necessary changes.

Our objective in developing this textbook was to provide a deeper understanding of pets in our communities and how they end up in shelters; expose shelter professionals to an understanding of dog and cat behavior and how it influences our care of dogs and cats in the shelter environment; how to develop programs that maintain and enhance the behavioral health of dogs and cats in the shelter; describe techniques supported by research for improved adoptions and other ways to support dog and cats postadoption to increase retention and highlight human behavior that impacts increases or decreases in shelter risk.

While traditional animal behavior textbooks do not focus on the human animal, success within a shelter environment involves a strong interface with the human animal, and our ability to understand that interface will provide our field with many more opportunities for live outcomes and decreased intake in the communities in which we work.

We have chosen to organize the text into four sections with the first section focused on pets within the community. The second and third sections focus on dogs and cats in shelters, respectively, and the final section focuses on the processes and behaviors at play in the transition from shelter to home.

In [Section 1](#), *Pets in the Community*, the five chapters provide a basic introduction to both dog and cat behavior. [Chapters 1](#) and [2](#) review current research in the field that is providing new insights into the behavior of dogs and cats, their social structures and organization, communication, and cognition. [Chapter 3](#) evaluates the research on behavior risks for relinquishment. Medical conditions will often influence the behavior of dogs and cats, and these topics are reviewed in [Chapter 4](#). Free-roaming cats are a significant animal welfare concern, and

[Chapter 5](#) describes the behavior of free-roaming cats and how this influences an organization's efforts to intervene on their behalf.

Managing dogs and cats in the shelter is more than feeding them and cleaning their kennels or cages, and this is covered in [Section 2 for dogs](#) and [Section 3 for cats](#). Proper care begins with intake and initial assessment of each animal as an individual ([Chapters 10](#) and [14](#)). Reducing stress and providing a positive environment for the dogs and cats must begin with the first moments of their entry in the animal shelter. [Chapters 11](#) and [15](#) review the data and concepts behind the physical facilities and husbandry practices that provide dogs and cats with a safe and supportive environment. Behavioral health requires a proactive effort to alleviate stress and boredom. Responsive and engaged animals will better tolerate the restrictions of the shelter environment and be more attractive to potential adopters. Behavioral modification, training, and enrichment are covered in [Chapters 8](#) and [9](#) for dogs and [Chapters 12](#) and [13](#) for cats.

[Section 4](#) may be unexpected by many reading this text on animal behavior. It has a strong focus on the human part of the human-animal bond. [Chapter 13](#) considers the dynamics that underpins the adoption process. Staff that may be highly attuned to the behavior of the animals in their care must also understand people that come to adopt those animals and provide them with a new home. [Chapter 14](#) provides a background for communicating with potential adopters. [Chapters 15](#) and [16](#) review opportunities to provide families with support and assistance to ensure that pets can make a successful transition to a new home and stay there. Finally, [Chapter 17](#) provides an update on research on lost pets and the strategies that lead to them returned to their homes.

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SECTION 1
Pets in the community

CHAPTER 1

Introduction to dog behavior

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Domestic dog evolution and behavior

Dog evolutionary history

What is a dog? The answer can come in the form of a description of the dog's characteristic behavior, physical description, or evolutionary history. We will begin with the latter. The domestic dog, *Canis familiaris*, is a member of the Canidae family, genus *Canis*, along with such territorial social carnivores as the gray wolf (*Canis lupus*), the coyote (*Canis latrans*), and the jackal (e.g., *Canis aureus* and *Canis mesomelas*). 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 prime mover of the species.

A debate rages about how long ago, and where, a distinct species of dog appeared, given conflicting evidence from archeological sites and genetic analyses. There is much more agreement on one point: that dogs descended from wolves. *Canis lupus*, the present-day gray wolf, is the domestic dogs' closest living ancestor, as both species are descended from some proto-wolf some tens of thousands of

years ago. Archeological evidence suggests that the divergence between wolf and dog began up to 50,000 years ago, with the advent of early human agricultural societies (Clutton-Brock 1999). Whether the divergence was a singular, one-time event or whether it happened at different times and multiple locations is still in debate (e.g., Boyko *et al.* 2009; Larson *et al.* 2012; Thalmann *et al.* 2013). Genetic evidence, from mitochondrial DNA, suggests that wolves and dogs began diverging much earlier, even 145,000 years ago (Vilà *et al.* 1997).

Dogs' domestication probably began with a human interest in animals who were relatively docile, perhaps willing to approach—or at least not flee from or attack—humans. The social nature of canids contributes to their interest in others, as well as the proto-dogs' flexibility in seeing humans as nonthreatening. This hypothesis was famously tested by the geneticist Dmitry Belyaev by creating a kind of “domesticated” fox out of a Siberian farm-fox population simply by selectively breeding only those who reacted without fear or aggression to human approach. Over 40 generations, he had created foxes which looked and acted in many ways like familiar domestic dogs (Belyaev 1979; Trut 1999).

For millennia, dogs were bred for use for tasks (e.g. guarding and hunting) or as companions. Quite recently, in the 19th century, artificial selection began to be driven by an interest in creating pure breed lines, for show and competition in dog “fancies,” dog shows. Thus, the diverse array of breeds seen today is a result of specific breeding over the last century and a half for physical traits and temperament which suited the newly formed breed “standards” (Garber 1996). While some current dog breeds resemble ancient representations of dogs in art, no breed can be traced to those ancient dogs. As we will discuss, the diversification into breeds, some with exaggerated physical

features, has led to the rise of inherited diseases which can be painful or even fatal (Asher *et al.* 2009). Isolated populations of purebred dogs now serve as useful models for naturally occurring cancers and diseases found in both humans and dogs (Breen & Modiano 2008).

Dog behavior in an evolutionary context

The story of domestication is informative because it gives the observer of dog behavior the background with which to interpret what she sees. That is, the dog is by no means a wolf but will share some behaviors with present-day wolves. Present-day dogs are highly designed by humans, have many behavioral and physical traits as a direct consequence of this design, and the affiliation between dogs and people is long-standing. Dogs are veritably members of human society and families (Horowitz 2009c).

Knowledge of the behavior of dogs' wild cousins, gray wolves, helps give clearer explanation for many common dog behaviors. For instance, viewed in the context of a human family home, a dog's propensity to sniff at the genital area of visitors to the home may seem odd, intrusive, or even "impolite." Viewed in the context of canid social interaction, though, it is clear that the dog's sniffing is analogous to all canids' olfactory investigation of the genital and anal areas of conspecifics (Sommerville & Broom 1998). These regions are rich with glandular secretions which carry information about the identification, and perhaps recent activities and health, of the individual. The dog in the human household is simply trying to find out about this human visitor (Filiatre *et al.* 1991).

Another dog behavior, the dog's licking of an owner's face upon the owner returning home, is commonly viewed as an expression of love. Indeed, many owners refer to this behavior as dog "kisses." Looking at wolf behavior again

clarifies the interpretation. Wolves, living in family packs, approach and greet any wolves who are returning to the pack after hunting. The packmates lick—“kiss”—his or her face. Their licks are prompts for him to regurgitate some of the kill that he has just ingested. Similarly, a dog’s “kiss” is a greeting, to be sure, but it is also a vestigial interest in whatever it was an owner might have consumed since leaving the house (Horowitz 2009c).

On the other hand, dogs’ artificial selection history is explanatory of important differences in the behavior of wolves and dogs. Foremost among them is the dog’s ability to (and desire to) look at the eyes of humans for information or to solve a problem. Since mutual gaze is a vital part of human communication, dog behavior which seemed to match this human behavior may have been preferred and selected (Horowitz & Bekoff 2007). Indeed, the modern dog’s eyes are more rounded and forward-facing than those of wolves (Clutton-Brock 1999), and their faces have many neotenous (baby-like) features which human adults are predisposed to find appealing and human-like (Hecht & Horowitz 2013). The dog’s eye-gaze enables much of the species’ success at tasks of social cognition, such as following a human’s gaze or pointing arm or hand to a source of food or interest (e.g., Agnetta *et al.* 2000; Soproni *et al.* 2001), something characteristic of human-human interaction but quite unusual in nonhuman animal populations, in which to stare at another’s eyes is a threat (Fox 1971).

An understanding of the development of different dog breeds, and each’s use and habitual behaviors, is also explanatory in looking at the “average” dog’s behavior. In early domestication, breeding would have been somewhat haphazard, but by the time of the Romans, there were physically distinct breeds bred for particular functions: as guard dogs, sheep dogs, and companion (lap) dogs

(Clutton-Brock 1995). The kinds of breeds and the uses for breeds multiplied in the Middle Ages and through the present day extending to employing dogs as both herders and as guarders of livestock; as hunting dogs—tracking, pointing at, or retrieving game; as load-carriers (e.g., sled dogs); as assistance dogs (in guiding blind persons or aiding those with other physical disabilities); and as therapeutic companions. In some cases, successful job performance may require extensive breeding (sled dogs) or training (glycaemia alert dogs) (Huson *et al.* 2010; Rooney *et al.* 2013).

When selective breeding for physical traits and behavioral tendencies of specific, named purebreds began in earnest, in the late 19th century, modifications occurred which, while useful in carrying out the desired task, may be undesired in nonworking contexts. Moreover, given the degree of inbreeding, these behaviors are often intractable and tenacious (as described further in section “[Breeds and behavior](#)”). Even in mixed breeds, some degree of these behavioral tendencies may endure.

Dog interspecific social cognition

Among social species, dogs are unique: They have the potential to interact as smoothly with a separate species as with their own. *Canis familiaris* and *Homo sapiens* engage together in everything from the seemingly mundane—sitting side-by-side on a park bench—to the complex—running an agility course, working together to detect explosives or locate animal scat, or alerting a deaf person to a ringing telephone. Even village dogs, who often retreat when approached by humans, live in the vicinity of people (Ortolani *et al.* 2009).

Companion dogs are often described by owners as having clear constructed identities, particularly that they are

“minded, creative, empathetic, and responsive” (Sanders 1993). Relationships with dogs run so deep that they are sometimes mentioned in obituaries along with other survivors of the departed (Wilson *et al.* 2013)—suggesting that for many, dogs are placed within the familial structure (Hart 1995).

Magic is not behind humans’ feelings of connectedness toward dogs. Instead, companion dogs display social behaviors that support and reinforce the relationship, such as sensitivity to human actions and attentional states, and acting in accordance with humans in coordinated and synchronized ways. For example, dogs unable to access a desired item will alternate their gaze between the item and a nearby person (i.e., the behavior dogs perform when a ball rolls under the couch and you ultimately get it for them) (Miklósi *et al.* 2000). Dogs readily respond to human communicative gestures, whether stemming from our hands, face (e.g., eyes), or other body parts (Reid 2009). Dogs take note of our attentional states, particularly eye contact as well as head and body orientation—a dog being more likely to remove a muffin from a countertop if an owner’s back is turned or eyes are closed than if the owner is sitting in a chair with eyes fixed on the dog (Schwab & Huber 2006). Dogs also attend to the tone of human voice and behave appropriately (according to humans) when spoken to in a cooperative or a forbidding tone (Pettersson *et al.* 2011).

While training can enhance a dog’s ability to perform in social interactions (e.g., guiding-eye dogs and detection dogs), there are everyday examples of dogs showing complex, synchronized social exchanges with people. Kerepesi *et al.* (2005) found that companion dogs—not specifically trained—were able to engage in a cooperative interaction with their human partners that allowed for the completion of a joint task. In this study, people asked their

dog for blocks to help them build a tower, and dogs provided the blocks in a nonrandom fashion that indicated cooperation. Similarly, companion dogs show a great deal of social anticipation, which can enhance synchronization and feelings of mutual cooperation. Dogs even adopt new routines established by people, such as a short, pointless detour made by owners upon returning home after a walk (Kubinyi *et al.* 2003). Over time, dogs in this study even began to perform the pointless detour before their owner. Social coordination is also found in play, a common inter- and intraspecific activity. Play is essentially marked by coordinated movements and synchronized interactions. Dogs and humans attend to each other's play signals, and a dog's play bow—or a person's play lunge—is responded to meaningfully (Rooney *et al.* 2001).

While popular media often spotlight breed differences relating to social behavior, trainability, or “intelligence” (Coren 2006), research is mixed as to how artificial selection affects companion dog performance in human-guided tasks. In one study, dogs bred for cooperative interactions outperformed those bred for independent work on a human-guided task to locate hidden food (Gácsi *et al.* 2009). At the same time, there can be substantial differences between dog lines still selected and maintained for the original function and members of the breed not under continued election for performance (i.e., the difference between show dogs versus field dogs). In another study, subject dogs' ability to follow a human-demonstrated detour was independent of breed (Pongrácz *et al.* 2005). Udell *et al.* (2014) found that breed-specific predatory motor patterns predicted dog success in following human pointing gestures, with Border Collies and Terriers outperforming Anatolian Shepherds, a breed selected for behavioral inhibition. At the same time, Anatolian Shepherds significantly improved their

performance with little training. On that score, Border Collies Betsy, Rico, and Chaser have been empirically shown to possess extraordinary facility with human language, but so too have Bailey (a Yorkshire Terrier) and Sofia (a mixed breed) (Hecht 2012).

Dog interspecific attachment

Another meaningful mechanism underlying the dog-human relationship is that of *attachment*, a concept initially introduced to describe the affectionate bond between a human infant and a caregiver (Bowlby 1958). Initial examination of attachment relied on the “Strange Situation Test” (SST), a behavioral experiment in a novel environment designed to investigate specific behaviors from the infant toward the mother as opposed to a stranger (Ainsworth & Bell 1970). Attachment is evidenced through infant “behavioral preferences” for a figure of attachment (e.g., mother), such as proximity maintenance, distress upon separation, as well as comfort and increased exploration in her presence.

Ethological studies suggest that attachments form in many species, not just humans. A modified version of the SST was conducted between dogs and their owners (Topál *et al.* 1998). Like infants, dogs showed activation of attachment systems when in the presence of a stranger versus their owner, as well as the “secure base effect” where dogs were more likely to explore their environment in the presence of the owner than a stranger (Horn *et al.* 2013).

Subsequent studies found that for dogs, attachments can form later in life and even multiple times. Shelter dogs participated in the modified SST with someone assigned the role of “stranger” and another person assigned the role of “owner” (designated by three short interactions with the dog). Shelter dogs showed similar attachment behavior

toward the newly appointed “owner” (Gácsi *et al.* 2001). Service dogs, like guide dogs for the blind, experience numerous early-life relationships and show attachment behavior toward their subsequent blind owner, who they met later in life (Fallani *et al.* 2006; Valsecchi *et al.* 2010).

These studies appear to be in tension with the initial assumption that for human-directed attachments to develop, dogs should be brought into the new owner’s home at 8 weeks of age (Scott & Fuller 1965). Instead, while it is recognized that early-life exposure to humans is important for normal *social* development, dog *attachment* relationships can form later in life, multiple times, and toward multiple people.

Physiological mediators also underlie dog-human relationships. The peptide hormone oxytocin (OT) is involved in affectionate bonds and may help to mediate dog-human social behavior. For example, Kis *et al.* (2014) found an association between OT polymorphisms and human-directed social behavior in German Shepherds and Border Collies. Owners and dogs who engage in petting and light play both show OT increases (Odendaal and Meintjes 2003). While simply seeing a known person can raise dog OT levels, it is often the *quality* of the interaction that matters. Rehn *et al.* (2014) found that a familiar person engaging in “physical and verbal contact in a calm and friendly way” when greeting a dog was associated with a *sustained* increase in dog OT levels. In another study, owners who engaged in longer periods of gaze with their dog and reported a higher degree of satisfaction with their dog had increased OT levels over owners who did not report similar satisfaction and did not display high levels of gaze (Nagasawa *et al.* 2009). (Importantly, while owner OT levels increased, dog hormone levels were not examined, and it is plausible that what is enjoyable for people is not always the same for dogs, such as prolonged or persistent

direct eye contact.) At the same time, Jakovcevic *et al.* (2012) found that dogs characterized as highly sociable gazed longer at an experimenter's face, even when the behavior (gaze) was no longer being reinforced.

Dog relationships with conspecifics and other nonhuman species appear to differ from the relationships dogs form with humans. Behavior toward the dam and members of a litter are not customarily described as attachment relationships (Pettijohn *et al.* 1977). A study of older dogs living in the same house did not find behavioral indicators of an attachment bond between cohabitating dogs, although activation of the stress response was reduced when in the presence of the companion dog (Mariti *et al.* 2014). On the other hand, in a novel setting, shelter dogs showed diminished stress response, not in the presence of known kennelmates, but in the presence of a known person (Tuber *et al.* 1996). At the same time, when a companion dog dies, some owners report behavioral change on the part of the remaining dogs, such as change in appetite, sleeping, solicitation of affection, and use of space (Schultz *et al.* 1995; Walker *et al.* 2013).

Taken together, dogs have complex and long-standing relationships with members of their own and other species. They have preferred play partners (Ward *et al.* 2008) and engage in mutual resting and grooming with members of their own and other species—for the latter, particularly if the non-dog species was introduced early in the dog's life (Fox 1969; Feuerstein & Terkel 2008). Dogs can have meaningful and successful lives within the human environment, and their potential for success starts from the very beginning of life.

Dog development and behavior (early and late life)

Unlike *precocial* species (e.g., zebras, sheep, and some birds), born capable of moving around and caring for themselves soon after birth, *altricial* species (e.g., canids and humans) require substantial dependent care while they pass through a number of developmental stages in their first months of life. This time is marked by physiological maturation and the growth of sensory abilities that facilitate structured motor patterns and, ultimately, the presentation of adult dog behavior. During this time of intense physiological and sensory development, dogs are most malleable. They are essentially sponges, taking in information and readily updating and changing their behavior.

While the natural ecological niche for dogs is the human environment (Miklósi 2007), within this general environment, dogs are exposed to a wide diversity of anthropogenic settings. For example, there are an estimated one billion dogs on the planet, and the majority live as stray or village dogs (Lord *et al.* 2013): They live on the streets, scavenge from human refuse sites, and move and interact with conspecifics and other species on their own accords. In other parts of the world, dogs have entirely different surroundings and different roles to play. Dogs live in over one-third of US homes (AVMA 2012); many sleep in a bed with a person at night and are expected to stay home, possibly alone, during workdays (Horowitz 2014). Companion dogs are often expected to be leashed, urinate, and defecate in specified locations and interact (in a “civilized” manner) with a changing array of conspecifics and people. As mentioned, dogs can also perform a wide variety of working functions, and some dogs serve as subjects in medical labs. What is expected of dogs varies considerably based on the specific human environment in which the dog finds himself. Early-life experiences are instrumental to successful environmental integration.

In these early months, young puppies need considerable social support and stimulation—both from conspecifics and from humans—in preparation for the expectations that will be applied to them. The support and environmental inputs that puppies do or do not receive affects their developing personality and later behavior. A 20-year study at the Jackson Laboratory in Bar Harbor, Maine, set out to explore the behavioral and genetic underpinnings of behavior. The researchers found that “critical” or “sensitive” periods of development—specific weeks or months in which dogs develop particular abilities—along with early-life environmental inputs, were instrumental to normal development (Scott & Fuller 1965).

While developmental periods have a clear progression (a dog will not play bow before it has opened its eyes), transitions between each stage are more gradual than initially thought (Bateson 1979). The following periods are instead guidelines—without hard-and-fast beginning and end points—and individual dogs will move quicker or slower from one phase to the next. Rates of development (heterochrony) can differ between breeds as well as between individuals.

Neonatal period: birth to approximately week 2

Dogs enter the world unable to survive on their own. Direct contact with the mother, the dam—who provides food and initiates elimination by tactile stimulation—allows pups to proceed with physical and neurological development. Neonatal pups are without vision, hearing, or coordination and rely on tactile and simple olfactory sensations (Scott & Fuller 1965; Lord 2013). Unable to self-regulate temperature, newborns spend most of their time sleeping and in physical proximity with the dam and littermates. Although most elements of their sensorium are underdeveloped, neonatal pups appear responsive to

olfactory cues. Wells and Hepper (2006) found that neonatal pups (tested at 15 min and 24 h after birth) preferred water with the flavor aniseed when the dam had consumed aniseed during the pregnancy. Puppies did not show similar preference for vanilla, a different novel scent that the dam had not been exposed to—suggesting that gestational exposure (which has also been found in other mammals) is behind this neonatal preference.

While the majority of the neonatal period is spent prostrate (in a flat, pancake-like pose), newborn pups show behaviors associated with attaining food: “kneading” or “swimming” behavior directed at the teat or milk source. They also show discomfort: If isolated, pups display distress vocalizations, high-pitched calls—whines or yelps—that are frequently described as care-soliciting behavior (Elliot & Scott 1961). These early vocalizations later transform into other vocalizations that are contextually similar. For example, adult dogs produce high-pitched, high-frequency “alone barks” that may also elicit attention (Yin & McCowan 2004; Pongrácz *et al.* 2006).

Transitional period: week 2 to week 3

The maturation process of the first few weeks of life becomes more evident at 14–21 days, when puppies spend less time in a flat, pancake state and more time moving toward presenting typical dog-like behavior. Pup eyes and ears open, allowing for a startle response (Scott 1958). Motor patterns and social behaviors like walking and tail wagging begin, as do rudimentary elements of play. Because of dog’s increased sensorium, now is the time to start introducing novel items, and “exposing puppies to normal household sounds, smells, and sights; daily handling; petting; and gentle brushing” (Case 2005).

Sensitive or Socialization period: week 3 to weeks 12-14

This is a period of considerable growth (particularly of species-specific social behaviors) and many experiential and learning opportunities. Socialization is described as the process of adopting “behavior patterns appropriate to the social environment in which [an individual will] live, allowing them to coexist/interact with other individuals” (Blackwell 2010). Attention to a dog’s individual experiences during this period, particularly a dog destined for companionship, is essential.

Motor patterns develop and adult-like behaviors are expressed in a more coordinated manner. Social behaviors like approach and avoidance emerge, as do tail wagging, growling, and additional play behaviors (Bekoff 1974). Vocalizations become more complex and are incorporated into social situations. Adler and Adler (1977) suggest that as soon as puppies have the physical capacity to recognize conspecifics, social learning is possible. Puppies who watched their mother perform in narcotics detection during this developmental period were more likely to work in narcotics detection themselves (Slabbert & Rasa 1997). Pups also show attention to and interest in humans which includes affiliative, social behaviors like approach and tail wagging. Dog propensity to follow human gaze or pointing cues increases as dogs age (Riedel *et al.* 2008; Dorey *et al.* 2010).

Dogs are weaned in the first part of this period, between approximately weeks 4 and 8, though there are considerable individual differences in weaning behavior even within breed (Rheingold 1963). A study of the weaning of German Shepherd puppies and their dams found that when puppies attempted to nurse, dams responded with “inhibited bites” or growls, mouthed

threats, nibbles, and licks (Trivers 1974). In response, pups showed social behaviors, such as withdrawal and passive submission (Schenkel 1967). Dams also began to show “inhibited bites” toward puppies during play. Such social experiences are important for later social exchanges, see Appendix A.7.

This period is commonly referred to as a “sensitive” social period because pups can notice and interact with other species and novelty without hesitation—particularly before 5 weeks of age. Dogs show considerable exploratory behavior and approach novelty without hesitancy between 3 and approximately 5 weeks. As they grow, they can show hesitation to novel stimuli, and at about 8–10 weeks, this change magnifies, and some puppies display decreased comfort with new stimuli, like people, sounds, objects, and contexts (Case 2005). This presentation of fear could be modulated by both genetics and early-life experiences (Freedman *et al.* 1961; Uhde *et al.* 1992), and caution should be taken against exposure to noxious stimuli and situations, particularly during weeks 8–10.

Socialization in dogs

Socialization from week 3 to about week 14 is paramount. The American Veterinary Society of Animal Behavior recently issued a Position Statement recommending puppies start socialization classes early as 7–8 weeks and with a minimum of one set of vaccines (AVSAB 2008). As in other social mammals, early-life restrictions—both environmental and experiential—hinder later-in-life behavior and coping strategies and are associated with fear and anxiety (Scott & Fuller 1965). For example, puppies exposed to premature maternal separation were found to show higher prevalence of “destruction of objects, excessive barking, fearfulness on walks, fear of noises, possessiveness of toys, attention seeking, aversion towards

people of unusual appearance, play biting, tail chasing, pica, possessiveness of food, aggression towards unfamiliar people, and house soiling” than control dogs who remained with dams until 2 months of age, that is, through weaning (Pierantoni & Verga 2007).

Daily tactile contact is important, and there are benefits to starting even earlier than the third week. Daily gentle tactile stimulation and handling of puppies’ bodies between days 3 and 21 was associated with more exploratory behavior when alone, and such puppies were less quick to vocalize than puppies that were not handled (Gazzano *et al.* 2008). Daily engagement of the senses promoted dogs who were more active, sociable, and less neophobic than puppies not handled as such (Fox & Stelzner 1966).

Careful, early exposure to potentially noxious stimuli could help with later-in-life coping. Newborn rats handled and exposed to mild stressors showed less stress activation and more exploratory behavior than unhandled rats when exposed to novelty as adults (Núñez *et al.* 1996).

Pluijmakers *et al.* (2010) found that exposing puppies to audiovisual playback—consisting of animate and inanimate objects and noises at normal volume—between 3 and 5 weeks of age was associated with decreased fear to novel objects and unfamiliar settings. Puppies without exposure to the audiovisual condition show increased crouching, increased arousal—as indicated by rapid tail wagging—and increased locomotion, all of which are associated with stress or fear (Beerda *et al.* 1997). This early-life exposure is aimed to combat the fear response that can develop after 5 weeks. Still, socialization should not be performed by throwing dogs off the deep-end and into overstimulating situations, such as street fairs or lengthy social gatherings. Small doses of successful and enjoyable experiences are key, and dog behavior should be continually monitored for low-level indications of discomfort and distress (see section

[“Patterns of communication”](#)). Classical and operant techniques can be used to increase comfort during socialization.

Because of the importance of inter- and intraspecific interactions and exposure to stimuli and social experiences, shelters with puppies under their care should prioritize early-life socialization or find appropriate housing outside the shelter that can.

While restricted early-life environments can elicit profound behavioral changes in dogs, there is room for later-in-life behavioral flexibility. A recent study found that dogs who had lived in commercial breeding establishments, commonly referred to as “puppy mills” or “puppy farms,” were described by subsequent owners as displaying higher rates of “fear, house-soiling and compulsive staring” than a matched sample of dogs (McMillan *et al.* 2011). In 2013, the American Society for the Prevention of Cruelty to Animals (ASPCA) began a study investigating whether exposing fearful dogs to in-shelter counter-conditioning, habituation, and desensitization training plans could effectively mitigate dogs’ fear response before being placed into homes (ASPCA 2013). The ongoing success of the programs is a reminder that while experiences during early life are important to later-in-life behavior, dogs are malleable even beyond the sensitive period of socialization.

Aging dogs

The behavior and cognition of aging dogs is not typically considered part of the stages of dog behavioral development, but the realities of aging can be incredibly important to dog well-being. Just as young dogs undergo notable changes early in life, so do they experience changes later in life. Since adult and aged dogs are members of the shelter population (Shore & Girrens 2001),