Our work as trainers is grounded in concepts that we believe are critical to training and raising well-behaved dogs. For example, we believe that socialization is necessary and that it best done during puppyhood. We believe that dogs use body signals to communicate to us and to other dogs.

But why do we accept these ideas? Partly, we accept them because of the educated trial and error of experienced dog trainers before us who pass down their knowledge. But our ideas about how and why dogs behave and learn as they do also come from research published by scientists. Trainers who follow the science find ways to use findings into their repertoires, test them, and then disseminate them.

Which research studies are at the foundation of our training methods? One cannot credit any single study. Often a study, if its results are noteworthy, will trigger additional studies delving deeper into that topic. Thus, a group of studies form a body of informative work on a topic. That being said, one individual study can make a provocative or useful point by bringing new findings to the surface or challenging existing ones. Science works when existing paradigms are bolstered or challenged by new results and theories.

There are a dozen or so journals that publish studies related to domestic dog behavior. One journal, *Animal Behaviour*, has published more than 60 such articles since it was started in 1955. They are almost all interesting to a curious trainer.

What follows are studies on a couple of topics that I thought would be of interest to trainers who want to know more about the source of their training knowledge. These studies stand out because of the author, the body of work they represent, or the thought-provoking findings they uncover.

**Dog Behavioral Development**

In the 1950s and 1960s, scientists unpacked in earnest how dogs develop physically and behaviorally. John Paul Scott and John L. Fuller were leaders in this field. They published a book one might consider a “classic” entitled *Genetics and the Social Behavior of the Dog* (1965). Dr. Michael Fox, a prolific scientist from the University of Illinois, published remarkable work building on Scott and Fuller’s research.

Fox had a particular interest in “ontogeny” — what happens in the development of the dog from birth to adulthood. His research helped teach us that dogs go through development stages that influence their behavior.

His study, “The Ontogeny of Behavior and Neurologic Responses in the Dog” (1964), investigated stages of development in the dog brain. The goal of this study was to map the appearance and disappearance of reflexes. These reflexes would signal a change in the brain. Working daily with 45 puppies from birth to seven weeks old, Fox tested a huge number of reflexes, including response to light, holding the dogs off the ground to see how their legs extended, and response to toe pinches.

What he found was that, yes, reflexes did appear and disappear at certain times in the dog’s development. Those reflexes could be grouped into four time periods.

Fox found that those brain development periods, represented by reflexes, were more or less synchronous with changes in behavior identified by Scott and Fuller. For example, the reflex that enables puppies to hold onto and suck from the dam’s teats starts immediately after birth but wanes when the puppy moves from the neonate stage to the transitional behavioral stage at approximately 14 days of age. Reflex urination, interestingly, wanes on about the 21st day, when the puppy is in the socialization stage. Doesn’t it make sense to you, as a trainer, that when learning to be social, puppies would cease urinating as a reflex and begin to develop control over when and where they pee? Likewise, the startle reflex (the response that makes one jump when a loud noise happens, for example) develops when puppies begin to socialize. When one knows little about the world and leaves Mom to explore, reflex reaction to potential danger becomes more important.

Another study authored by Fox further developed thinking on puppy development. “The effect of early experience on the development of inter and intra species social relationships in the dog” (1967) explores the effects of restricted socialization on puppy behavior with humans and other dogs.

In this study, 47 puppies were divided into three groups, and each group was raised differently. The first group was isolated from other dogs from birth. (All care was from humans by hand, with little interaction beyond the basics of feeding and cleaning.) The second group was with their litter mates and mothers until three and a half weeks, and then isolated until twelve weeks. The last...
group was isolated from eight to twelve weeks of age. At the end of the twelve weeks the puppies were evaluated for their interaction with other dogs, humans, and toys.

The results will not surprise you. The dogs isolated from birth appeared to lack communication skills, and they became “dominant.” The study found that “the isolated hand-reared dogs were nonvocal, nonoral, nonaggressive and passive with peers when first put together. However, they rapidly became aggressive towards their peers following socialization and rarely engaged in group play. They tended to wander off alone and engage in self-play or to manipulate inanimate objects.”

Interaction with humans was more or less the same for all three groups of puppies. The dogs were fed by humans but had only a few minutes of contact a day. However, the ones with the most human contact and the least isolation did the most nuzzling and licking. The researchers felt the isolated dogs were “loveless.” Those dogs isolated after three and a half weeks and after eight weeks did not show effects as significant from social deprivation.

This study tells us several things: first, that dogs need other dogs to learn to how to respond to other dogs and to develop social behaviors; second, that social behaviors need to be reinforced through interaction in order to develop; and, finally, that dogs’ experiences during the initial three and a half weeks of life are particularly critical.

These studies and findings are part of a larger body of research that informs our acceptance of critical developmental stages in dog development. In recent years the dog behavioral development discussion has expanded to include the role of genetics in directing a dog’s predisposition to socialization (see Udell and Wynne, 2010). More attention is also directed at what kind of stimulation during early life can strengthen a dog’s natural abilities (for example, Battaglia, 2009).

**Does Breed Matter?**

Much of what we know about breed differences comes from breeders who have selected for behavior over the years and from the trainers who have worked with purebred dogs. Scientists, too, have tried to reveal breed differences.

Which is the smartest breed? It’s a question we often get as trainers. It is also a question that is difficult to answer; intelligence is such a broad concept. Maze tests are used to study some aspects of intelligence such as spatial memory and learning. In 1965, Orville Elliott and John Paul Scott conducted “The analysis of breed differences in maze performance in dogs.” In this study, more than 200 dogs representing five breeds (African Basenji, American Beagle, Shetland Sheep Dog, Cocker Spaniel, Wire Fox Terrier) were challenged to go through a maze. They were timed, and the number of times they went down dead ends was tracked. The behaviors they exhibited while in the maze were also noted. The dogs were tested on several days.

What did they find? They found that beagles had the best overall performance, but that Basenjis did the best on day one of testing. The Shelties tended to get stressed in the maze and the Wire Fox Terriers initially sought to bite their way out. What the researchers call “big waisted dogs,” presumably the largest from among their peers in the study, made the fewest errors; the authors surmise those dogs had more confidence in the maze environment. All of the breeds became more similar in their performance and completion times as the number of trials that they ran increased.

Simply based on the title and abstract, I hoped this study might shed light on the question of difference in breed intelligence. It did not, and it was educational for me as a non-scientist to read the study more thoroughly. What I learned from this experience was that this type of test does not thoroughly answer such a broad question. Indeed, a maze test of this nature is limited in its ability to tell us if one breed is smarter than another.

So, the question of breed intelligence remains, and there is newer research on the topic. Dr. Stanley Coren, author of the book *The Intelligence of Dogs*, created a ranking of breed intelligence based on the perception of experts. He did this by surveying obedience trial judges. He asked them to rank breeds by their ability to learn cues. The judges consistently ranked Border Collies in the top ten, together with Poodles, German Shepherds, Golden Retrievers, and Doberman Pinschers. New studies are attempting to more closely gauge breed intelligence by measuring performance in obedience and agility. That research is countered by studies suggesting that we perceive dogs to be more intelligent (and correspondingly more trainable) simply because of their physical capability. In other words, a dog who is more physically capable of a fast Down because of his body structure is perceived as more trainable and more intelligent (Helton, 2010).

In recent years breed differences have become important to trainers in a new way: breed can affect the way a dog behaves, specifically the ability to communicate. The study “Paedomorphosis affects agonistic visual signals of domestic dogs” (Goodwin et al., 1997) finds that the less dogs look like wolves, the less likely they are to communicate like wolves.

It is theorized that today’s dogs are descended from wolves, and that over time, dogs have been selectively bred for tameness and for features that look more like puppy wolves than like adult wolves. Paedomorphosis is defined as the retention of juvenile features in the adult animal.3

In this study Goodwin wanted to see if the loss of a wolf body correlates with the loss of wolf behaviors, and if any wolf behaviors that are retained are juvenile rather than adult behaviors. In other words, she asked if there
is behavioral paedomorphism to go along with physical paedomorphism.

She tested ten breeds of dogs. Those breeds were picked by a panel of experts who ranked each breed’s level of dissimilarity to the wolf. The least similar was the Cavalier King Charles Spaniel. The most similar was the Siberian Husky.

Then she pushed the dogs to offer behaviors by introducing stimuli such as toys and other dogs. The dogs were watched for exhibition of any of 15 specific wolf behaviors, and those results were tracked.

The results supported Goodwin’s hypothesis. The Cavalier King Charles, which was ranked by experts as being the least wolf-like, demonstrated only two wolf behaviors. Those behaviors that were shown were behaviors that show up in wolves under 20 days old. The Siberian Husky had a repertoire of fifteen wolf behaviors, including seven that are shown by wolves older than 30 days.

Interestingly, the dogs with few wolf behaviors (such as the Cavalier King Charles and the Norwich Terrier) showed no behaviors that are considered submissive in the wolf. The authors opine that submissive signals are used to reduce conflict over resources. Perhaps such small highly domesticated breeds have little use for submission cues, as conflict over resources is low because humans manage the resources. Contrast that with the Golden Retrievers. They frequently gave aggressive signals during play. The authors surmise this may be due to the fact that the costs of aggressive signaling are low when humans are around to mitigate conflict.

So there is behavioral paedomorphism — but why? The research suggests that as the body parts of the dog used for signaling have been altered through breeding (the face, eyes, ears, snout, tail) so has the brain. More recent research on this topic is evaluating the effect of the dog’s physique on the frequency of cues sent and elicited by dogs. Snout length seems to be particularly influential (Kerswell, 2010).

What are the implications for us as trainers? Those of us who do dog-dog introductions or play groups may want to be aware that two breeds may have different repertoires of behaviors. Could it be that what we see as aggression is related to a communication deficit? As trainers, do we need to be better at facilitating communication? How? By teaching dogs a Find It are we facilitating the delivery of submissive behaviors that have been lost in our domestic dogs?

**Trainers and Science**

As part of my learning about dog behavior research, I asked some leaders in our field what research studies they thought were important for trainers to know about. I had various responses: one said you could be a good trainer without knowing any of the scientific studies. Continued on next page
Others were wary about drawing attention to one study and not another, or one author, begging the question about what scientific knowledge is most important. Others were enthusiastic about empowering trainers to engage with the research. My personal feeling is that we are all practitioners in a field that can be bolstered by our input into and knowledge of the science. If you feel like I do, please let me know what you think science means to the principles and practice that define our work.

Many thanks to Ken McCort, Dr. Suzanne Hetts, and others who provided input as I was deciding what research to share with APDT members.

Endnotes

1. Another term is neoteny. Those familiar with the work of Dmitri Belyaev, who bred foxes for tameness will know that tame foxes, when bred with other tame foxes, gradually became more and more puppy-like in appearance.

References


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