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Dog Tips

1,002-Dog Study Reveals Unique Breed-Specific Behaviors

Have certain traits been favored, and therefore encouraged in different breeds? For example, Golden Retrievers are valued for their dependence on humans, and not so much problem-solving. Here's how 13 different breeds performed in specific problem situations.

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STORY AT-A-GLANCE

- A recent study by researchers at the University of Helsinki looked at how cognitive and behavioral traits differ among 13 dog breeds, including the Border Collie, Belgian Malinois, English Cocker Spaniel, German Shepherd, Golden Retriever, Labrador Retriever, and mixed breeds; the research team uncovered several differences in traits in the areas of social cognition, problem-solving ability, and inhibitory control
- For people familiar with the breeds involved in the study, the results will be unsurprising, for example, the Malinois excelled at both understanding human gestures, and spatial problem-solving
- Another recent study analyzed DNA samples from over 200 dog breeds, plus nearly 50,000 dog owner behavior assessment surveys to identify many of the genes associated with behavior in specific dog breeds
- The DNA analysis identified 10 major genetic lineages among hundreds of dog breeds: Terriers; Sheepdogs and Cattle dogs; Spitz and "Primitive Types"; Companion and Toys; Retrievers; Flushing dogs and Water dogs; Sighthounds; Pointing dogs; Scent Hounds and related breeds; and Dachshunds
- The research team focused in on livestock-herding dogs due to their easily defined breed-typical behaviors, i.e., their instinctive herding drive combined with unique motor patterns that move herds in complex ways

Previous studies have demonstrated that a dog's breed is one factor potentially affecting personality and behavior. Researchers at the University of Helsinki set out to discover how cognitive traits differ among dog breeds, and how the breeds perform comparatively.

The team measured differences between over 1,000 Finnish dogs across 13 breeds and uncovered several differences in traits in the areas of social cognition, problem-solving ability, and inhibitory control.

The 13 breeds were all medium to large, and each breed included at least 40 individuals. Breeds included the Border Collie, Belgian Malinois, English Cocker Spaniel, German Shepherd, Golden Retriever, Labrador Retriever, and the broad category of "mixed breed," among a few others.[1]

> *"The results suggest that different cognitive traits may have been favored in different breeds", doctoral researcher and study author Saara Junttila told Current Science Daily.*[2]

The study was published at the end of 2022 in the journal Scientific Reports.[3]

Study Found Significant Differences Between Breeds

The 1,002 dogs in the study were given a battery of cognitive and behavioral tests developed by **smartDOG** (a company owned by one of the study authors). In total, there were 7 cognitive tests and 3 tests measuring behavior. The researchers observed significant differences between breeds in the following tests:

- Inhibitory control
- Activity level
- Understanding human gestures (e.g., following a finger pointing in a specific direction)
- Greeting an unknown person
- Spatial problem-solving (e.g., getting around a V-shaped fence)
- Exploring a novel environment
- Attempting to solve an unsolvable problem — did the dog try to solve the problem by him/herself, or did he/she ask the human for help?

Per Junttila:

> *"We did not find breed differences in tasks measuring logical reasoning or short-term memory. These traits may not have been selected for in different breeds or these traits are more strongly affected by environmental factors, such as training methods, previous experiences, or the test situation itself".*[4]

Independent vs. Human-Dependent Breeds

According to Junttila, their study results offer new information about the traits that may have been favored (and therefore encouraged) in different breeds.

> *"For example, the most common and important role of the modern golden retriever seems to be that of a pet dog and family member," she explains. "This means that high inhibitory control and dependence on humans may be valuable traits, whereas problem-solving ability may not be as important. Other characteristics and traits may be valuable in other roles instead.*
>
> *The test battery included many tests where the results could not be evaluated as 'good' or 'bad.' For example, low performance in the inhibitory control test may mean that the dog has a high motivation for rewards, is easily aroused in training, and reacts quickly, all of which can be advantageous in training for working roles and dog sports.*
>
> *This may be why breeds, such as the Malinois and German shepherd, received such low scores in the inhibitory control test."*

Some highlights from the study results:

- The handsome, regrettably named **Hovawart** (in terms of appearance, think Golden Retriever that also comes in black with gold markings) stood out as one of the most independent breeds, as evidenced by his attempt to solve the unsolvable task by himself, never asking for human help.

- The flip side of that coin was the actual Golden Retriever, a very human-oriented breed who spent a lot of time asking humans for help.
- The Belgian Malinois excelled at understanding human gestures, with the Labrador Retriever a close second.
- The Malinois and **Border Collie** were the fastest at spatial problem-solving.
- The Border Collie also excelled at inhibitory control.

Junttila makes clear that these study results only offer information about how the 13 breeds perform in specific problem situations. She advises against drawing too many conclusions from the results to the more general behavior of specific dogs, since each dog is an individual.

> *"There is a possibility that the differences seen in our study were not based on genetic differences between breeds but rather due to variation in life experiences or training, since these have also been found to influence behavior in cognitive tests," the researchers wrote.*[5]

Another Study That Looked at Behavior in Specific Dog Breeds

Another recent study by researchers affiliated with the Dog Genome Project at the National Human Genome Research Institute analyzed DNA samples from over 200 dog breeds, plus nearly 50,000 pet parent surveys to identify many of the genes associated with behavior in specific dog breeds. The results of their study were published in the journal Cell.[6]

> *"The largest, most successful genetic experiment that humans have ever done is the creation of 350 dog breeds," notes senior author Elaine Ostrander, founder of the Dog Genome Project. "We needed dogs to herd, we needed them to guard, we needed them to help us hunt, and our survival was intimately dependent on that."*[7]

To be successful at their jobs, like humans, dogs need to demonstrate specific behavioral traits, but finding the genes behind those behaviors continues to challenge scientists.

> *"The inherent complexity of canine population dynamics features varying degrees of selective pressure for aesthetic and morphological traits," says lead study author Emily Dutrow, "some of which may be linked to behavioral traits, so pinpointing the genetics of canine behavior can be complicated."*[8]

10 Major Genetic Lineages Revealed

For the study, the researchers' goal was to uncover the genetic drivers behind the behavior traits that make dogs good at specific tasks. Toward that end, they compiled whole genome data from over 4,000 purebred, mixed-breed, and semi-feral dogs, as well as wild canids.

Next, they employed computational tools to identify 10 major genetic lineages among hundreds of dog breeds, solely on the basis of DNA data:

- Terriers
- Flushing dogs and Water dogs
- Sheepdogs and Cattle dogs
- Sighthounds

- Spitz and “Primitive Types”
- Pointing dogs
- Companion and Toys
- Scent Hounds and related breeds
- Retrievers
- Dachshunds

The researchers discovered that each of the 10 lineages corresponded to a specific category of breeds that evolved, for example, to hunt by scent vs. sight, or to herd vs. protect livestock. This finding indicates that common sets of genes are responsible for behaviors among breeds well-suited for similar tasks.

> *“What is interesting about these groups is that they include dogs that work around sheep, for example, in quite different ways: Border collies and kelpies are active herding dogs who control the animals by giving ‘eye,’ while big livestock guarding dogs like the Great Pyrenees tend to move with the animals as escorts rather than actively herding them,” writes author Mark Derr in Psychology Today.*

> *“Yet all three breeds are members of the Sheepdog and Cattle dog lineage. The key is to find the deep sources of their affinity for ‘herding.’ We are not dealing with a simple lockbox of traits but rather a whole suite of potential behaviors mixed and matched in virtually every dog.”*[9]

Dutrow believes this explains why both individual dogs and entire breeds have the ability to perform behaviors they aren’t necessarily “meant” to perform. “And, presumably, vice versa: the retriever who won’t swim,” adds Derr.

A Closer Look at Livestock-Herding Dogs

Next, the researchers surveyed pet owners to get a better understanding of the nature of the behaviors. Behavioral assessment surveys were sent to 46,000 owners of purebred dogs, and their responses allowed the research team to identify unique sets of behavioral tendencies among the 10 lineages.

One example: behaviors associated with increased prey drive were associated with the terrier lineage, which features breeds whose job throughout history involved catching and killing prey.

> *"Having established significant behavioral tendencies correlated with the major canine lineages, we then identified genetic drivers of these behaviors by performing a genome-wide association study on the DNA samples," says Dutrow.*

> *"We were particularly interested in livestock-herding dogs, who display one of the most easily defined breed-typical behaviors, characterized by an instinctive herding drive coupled with unique motor patterns that move herds in complex ways."*[10]

The researchers were able to locate specific genes involved in brain wiring in herding dogs. They found that “variants near genes involved in axon guidance, a process that shapes brain circuitry, appeared highly enriched.” In addition, they discovered an enrichment for genes important for development of areas of the brain involved in social cognition

and learned fear responses.

> *"When you get a certain input or stimulus, the degree to which that creates a reaction in different parts of the brain shapes how we behave," explains Ostrander. "So, if nerves within and between brain regions don't communicate in specific ways, then the behavior doesn't happen, and this is where axon-guidance genes come in to play."*[11]

Sheepdogs carry genetic variants that are often located near genes involved in ephrin signaling, which is an axon-guidance process involved in brain development and linked to behavior in other species (including humans). For example, the sheepdog gene EPHA5 has also been linked to human attention-deficit hyperactivity disorder (ADHD) and anxiety-like behaviors in other mammals.

The researchers believe these findings might help us better understand the high energy and hyper task-focused nature of sheepdogs.

> *"The same pathways involved in human neurodiversity are implicated in behavioral differences among dog lineages, indicating that the same genetic toolkit may be used in humans and dogs alike," says Dutrow.*

Unraveling the Mystery at Last?

Per Ostrander:

> *"Emily's methodology allowed her to capture the different histories of dog breeding across the world, in one approach, one experiment, and without prior assumptions. After 30 years of trying to understand the genetics of why herding dogs herd, we're finally beginning to unravel the mystery."*

From Derr's perspective, while there is clearly a genetic component to specific behaviors or behaviors more common to specific breeds than others:

> *"... there is also a great deal of variation within those breeds and, in this case, lineages, and this variation is the result of a whole host of factors, many of which are not due to specific proteins, but rather to regulatory forces that nudge an individual's genome in one direction or another."*[12]

Derr further observes that:

> *"The extensive analysis to which Dutrow and her colleagues subjected their samples indicates that the entire base splitting into lineages came earlier in the dog's development, which helps explain why some types of dogs seem more basic than others."*

Sources and References

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