STRUCTURE AND *Movement*

Luck Comes When PREPARATION *Meets* OPPORTUNITY

By Dr. CARMEN L. BATTAGLIA

In humans and canines, body structure can be related to overall health. If a human has legs that are bowed out or bowed inward or if the spine is curved, that person is likely to suffer from pain and other health problems. The same can be true for canines and their structure even though there are structural differences between the species. Regardless of one's breed, correct structure can be related to correct movement and good health.

Dog experts consider breed standards the single best guide to understanding what is correct structure and correct movement. Standards are designed to reflect not only a breed's appearance and architecture but also their purpose, function and temperament. Breed standards are not checkbox lists of requirements, but rather a description, giving a detailed "word picture" of the ideal dog. They are written statements that describe the desirable and undesirable attributes of each breed. Due to the great variability between breeds, there is no one standard that fits all breeds. What is good conformation for a terrier may not be good conformation for a working dog.

Differences occurring between breed standards can be related to the variations found in a breed's function and purpose. For example, those that herd and hunt must travel over long distances. Their length of leg will not be the same as those whose function and purpose requires speed. While there are many differences between breeds and individual dogs, there are also common factors that link them together. For example, all breeds have an excellent sense of smell and hearing and have the same number of bones which are tied together by the same number of muscles, tendons and ligaments. The ways in which they are connected and positioned determines the architecture of a breed. Factors that separate one breed from another are found in their country of origin, history, and purposes for which the breed was developed. Collectively these factors influence the size, shape, weight, length of bone, coat and color of a breed.

STRUCTURE

Our knowledge of dog anatomy helps to explain why breeds are known for their special and unique traits and colors. While there are many structural variations between breeds, common to all is the desire for correct balance and angulation, which are two of the fundamental concepts used when evaluating dogs.

Balance is a term associated with the appearance and structure of a dog's body. The term refers to the symmetrical proportion of the parts in relation to each other. It also means the relative proportion of the parts to each other. Angulation is another term associated with a dog's body. It refers mainly to the bones of the front and rear assemblies and their angles at the hip and shoulder joints. When evaluating structure, judges look for the same angles at the shoulder and hip joints. Dogs with good balance and angulation as seen in pictures #1 and #2 will

Picture #1 and #2 – Balance and Angulation

have a smoother stride then those who lack balance and have fewer angulations.

HEAD

The overall shape of the head, combined with the size and shape of the ears and eyes, coupled with the planes of the head, are traits that give a breed its unique appearance. For these reasons the head is considered the hallmark of a breed. It is one of the most distinguishing parts of a breed and it influences a dog's overall appearance which is called breed type. The term "breed type" includes the silhouette, head, body proportions, coat and color. By definition "breed type" means that a dog looks like its breed. Some dogs will come closer to their breed standard than others. This explains why there are many variations in "type" within a breed. Oftentimes when two or more breeders meet in discussion, the following phrase will be heard, "We have two types in our breed; one type is used for obedience and another type for conformation". This is an incorrect use of the term "type", because by definition it means the dog looks like its breed. Thus, regardless of their faults, every breed will have only one "type", but they all will have many variations in "type".

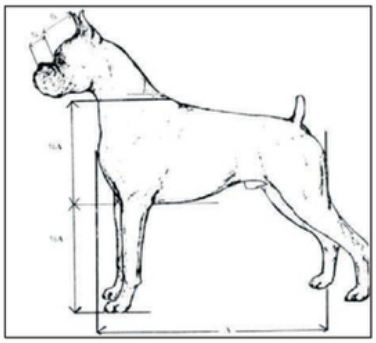
BODY

Breed standards are used to describe the architecture of a breed's body proportions, size and shape. Most are described as either square, nearly square, long or rectangular. The breed's ideal body size (height and length) can be found in the breed standard. Height is generally measured the same way in all breeds unless otherwise stated in the standard. For most, height is measured from the withers to the ground. Some standards are more specific about height. The terminology used in the Brittany standard calls for the height at the elbow to be approximately equal to the distance from the elbows to the withers.

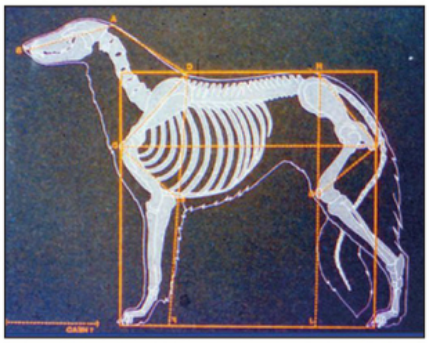
Body length is not measured the same in all breeds and, unless specified in the standard, length is measured from the point of the forechest to the point of the rump. Here again there are breed differences as noted in a few examples. For example, the Wire Fox Terrier and Belgian Tervuren breeds measure the length of body from the shoulder point to the buttocks. The Canaan dog standard measures length from the point of the withers to the base of the tail. For the Cavalier King Charles Spaniel, length is measured from the point of the shoulder to the point of the buttocks. For the Akita it is from the point to the sternum of the point of the buttocks. For the German Shepherd Dog it is measured from the point of the prosternum to the rear edge of the pelvis or ischial tuberosity. For the Irish Red and White Setters, length is measured from the point of the shoulder to the base of the tail.

BODY SHAPE

The standard for the Boxer describes the body as square as pictured in #3 and #4. Picture #4 illustrates a nearly square body. It is not uncommon to see breed standards that describe the measurement of height and length in other ways. Some breed standards describe the dog's body proportions as a ratio as seen in the following breeds:



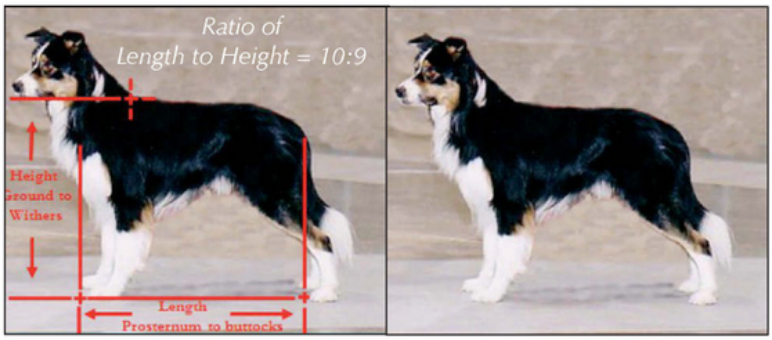
Picture #3 – Square



Picture #4 – Nearly Square

The Border Collie standard describes the body proportion as a ratio as 10 to 9. The Doberman Pinscher standard describes height and length as 7 to 6 and the German Shepherd Dog standard describes the dog as longer than tall, with the most desirable proportion as 10 to 8½.

The American Kennel Club allows breeds that have a disqualification for size or weight if stated in their breed standard to be



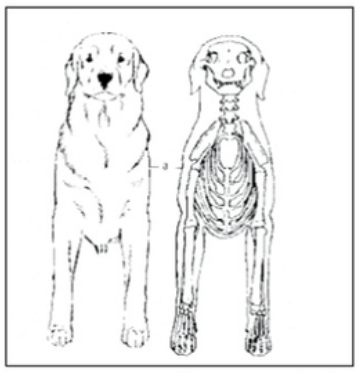
Picture #5 – An Example of 10:9 Length to Heigh Ratio

measured or weighted in the show ring. Breed standards that do not provide statements for a disqualification for size or weight must be measured or weighted outside the ring.

FRONT ASSEMBLY

The dog's front assembly begins with the top of the shoulder blade which is called the withers. The front assembly includes the forearm, front legs, pasterns and feet. This series of bones is important because the front assembly carries sixty percent of the dog's body weight and is only attached to the body by muscles, tendons and ligaments. The front assembly only includes a large number of moving parts. When standing still, the front legs should appear as two straight columns of support from the hip joint or shoulder to the ground. This does not mean perpendicular, but a straight line from the shoulder or hip to the pad. The front legs should appear as two straight columns of support as illustrated in Pictures #6 and #7.

Any deviation from the single column of support is considered a fault. This means that the elbows should not bow out and the feet should not toe in or out.

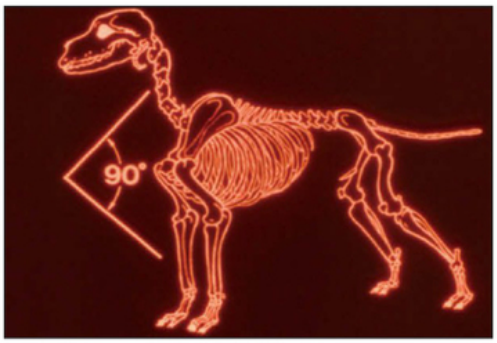


Picture #6 and #7 – Straight line – shoulder to pad

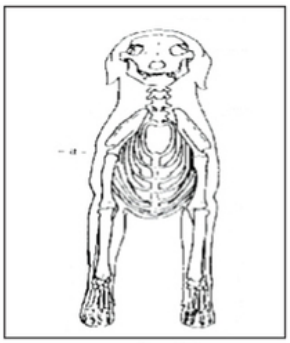
LAY-BACK AND LAY-IN

Shoulder Lay-back and Shoulder Lay-in are two important elements of canine structure that influence movement. Unfortunately, the importance of the shoulder blades and how they are positioned is a subject not well understood by many newcomers. The term "lay-back" of shoulders means the tilt of the shoulder blades toward the back end or rump of the dog. Shoulders that are "laid-back" influence the dog's potential to extend its front legs forward. The length of the upper arm or scapula and the degree of lay-back of the shoulder blades together influence the length of reach of the front feet when a dog is in motion. Most experts believe that the ideal shoulders should have an upper arm that is equal in length to the shoulder blade as seen in Pictures #8 and #9.

The second term related to the shoulder blades is called the "lay-in" of the shoulder blades. This phrase means the tilt of the shoulder blades toward each other (Picture #9). The "Lay-in" of the shoulder blades tends to influence how the dog will put its front feet on the ground when in motion. As speed increases from a walk to a trot, the feet tend to move toward a center line in order to maintain balance. Breeds with shoulder blades that are not "layed-in" (tilted) toward the spinal column generally do not move toward a center line or single track. A good example is the Bulldog which has a four-tracking gait and the Corgi which has a two-tracking gait. Both breeds have shoulder blades that are more upright with shoulders blades that do not tilt inward toward the spinal column.



Picture #8 – Shoulder blade = Upper arm



Picture #9 – Shoulders Lay-in

TOPLINE

The topline is formed by the withers, back, loin and croup. This is the area from the base of the neck to the base of the tail. In most breeds, the preferred topline is level, meaning that this area should be flat and strong. Level does not necessarily mean parallel to the ground. There are exceptions to breeds with level toplines. Some breed standards describe an arched topline such as the Whippet and Greyhound.

REAR

The rear assembly is another important part of dog anatomy. It is less fragile than the front assembly because it is attached to the body by the hip sockets. This makes the rear assembly less likely to be affected by environmental and management problems. The rear assembly involves the vital hip joint which connects the femur to the tibia and fibula at the knee joint. It gives the dog forward thrust and drive. When in motion, the entire rear leg assembly should extend and flex through the hock to drive the dog forward. When standing behind a dog, judges look to see if the rear hocks appear to be two short and straight columns of support that are parallel to each other and set just slightly outside the hip sockets as seen in picture #10 and #12.

Cowhocks are undesirable in all breeds (Picture #11). They are weak and greatly impair efficiency and power of movement. Cowhocks cause rear pasterns to turn inward toward one another. This fault causes the stifle to turn out and the feet to toe out.

Unfortunately not all of the virtues and faults can be seen when dogs are standing. This is why it is necessary to see them in motion and at different speeds. Evaluations in the show ring include three basic forms of examination - standing and the individual examination, side gait, and observing movement from the front and rear.

Part II will discuss many of the faults and virtues of structure when dogs are in motion and at different speeds. After reading Part I and II the reader will have a better appreciation for the importance of good structure standing and in motion.

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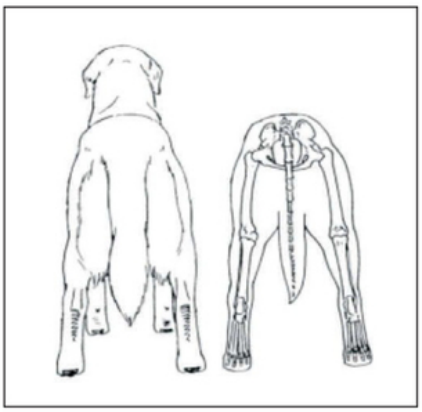
ABOUT THE AUTHOR

Carmen L. Battaglia holds a Ph.D. and Master's Degree from Florida State University. An AKC judge, researcher and writer, he is a respected leader in promoting ways to breed better dogs. He is the author of many articles and several books and is a popular guest on many TV and radio talk shows. His seminars on breeding dogs, selecting sires, choosing puppies and the super dog have been well-received by breed clubs all over the country. Those interested in learning more about his articles and seminars should visit the website http://www.breedingbetterdogs.com

Picture #10 – Parallel

Picture #11 – Cowhocks



Picture #12 – Underneath

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PART II

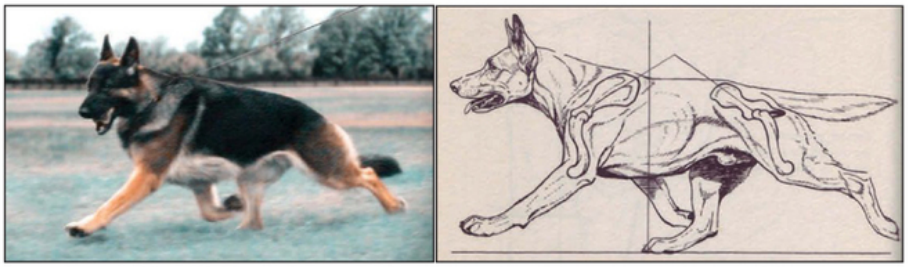
Part I discusses the structure of canines when they are standing. Part II focuses on structure and how to evaluate it when a dog is in motion. To begin this discussion we can say that good structure is necessary for humans and canines. Those that have legs that are bowed - out or bowed - inward or a spine that is curved are likely to suffer health problems. While there are many differences between humans and canines, good body structure is common to both. Understanding the differences between dogs and breeds begins with one of the key skills required of breeders and judges. It starts with a breed's history, function and purpose. When taken together, these elements help explain structural variations, shapes and sizes. For example, those that herd and hunt usually travel over long distances. The length of body and leg for these breeds will not be the same as those whose function and purpose requires speed.

Movement

The ability to recognize correct and incorrect movement is an essential element of dog knowledge. Therefore, it is important to know what correct structure looks like when standing and in motion. Said another way, canine movement requires an understanding of the coordinated structure, especially in the front and the rear assemblies.

In this regard, one of the key elements of movement involves how dogs put their feet down as they move their body forward. Correct movement depends on the basic principles of good structure which is determined in part by nature, but generally speaking, effortless movement is good movement, and every dog attempts to move forward with the least amount of effort. Experts have long believed that the better dogs, when gaiting, will have more extension of their front and rear feet, and when coupled with a balanced body will produce more efficient movement. Therefore, anything that detracts from efficient movement is generally considered a fault. In evaluating the faults and virtues of dogs in motion, one can find many variations in the degree of severity and the frequency of their occurrences. In this regard, faults will vary from dog to dog and from breed to breed. Some faults can more easily be detected when dogs are in motion. Unfortunately, movement is often quicker than the eye can follow and in the confined space and limited time allowed in the show ring, evaluations are sometimes far from ideal. But the educated eye, that is, the eye that knows what to look for will not be easily misled. In the show ring, judges and breeders have developed a trained eye which knows to look for the carriage of the head, neck, back and spinal column. They should appear as a gentle curve moving forward with no waste of motion as seen in Picture #1. Those who evaluate movement have learned to appreciate the differences between breeds and the many ways they move.

Since all breeds do not move alike, it is necessary to learn about their structural differences. The Bulldog with its massive front does not move like the wolfhound with its long legs and muscular body



Picture #1 – Head carriage, neck, back and spinal column appear as a gentle curve

or the Beshone with its stylish gait and dignity of head carriage. But no matter the breed, big or small, they all attempt to move forward with the least amount of effort regardless of the individual quirks man has bred into them.

The dynamics of motion impose certain tendencies on all dogs. When they move from a walk to a trot, the sequence of their feet changes. When walking, three feet are on the ground supporting the dog as one foot moves forward. This is seen as the sequential movement of the legs. The right front foot and then the left rear foot and so forth. As movement increases from a walk to a trot, the front and rear legs tend to fall almost on a straight line in order to maintain balance. This causes the legs to converge towards a center line as speed increases. This movement is called the tendency to single track. Height and length of leg influences this tendency, which will be discussed later.

Three Principles of Movement

Movement experts and judges evaluate movement in the show ring three ways, from the side, going, and coming. These are the traditional techniques used to reveal the faults and virtues of a dog's gait. The diagonal carpet in the show ring is used by the judge to evaluate key parts of the front and rear assemblies when the dog is moving away, from, and towards the judge. Evaluating the front and rear assemblies begin with three principles of movement. The first is called a straight column of support. This means that the leg assembly forms a single column of support from the hip joint or shoulder to the ground (Picture #2).

Picture #2
Single Column of Support

Any deviation from the single column of support is faulty. This does not mean perpendicular legs, but a straight line from the shoulder to the pad. When faculty movement is noted, the cause can be related to several conditions such as loose shoulders, twisting hocks or cow hocks. The second principle is called the parallel movement of the legs on the same side of the body. This concept involves the coordination of the front and rear assemblies. They should move in parallel planes. As the dog moves toward the judge, the front leg on one side of the body should obscure the rear leg on the same side of the body. This is called moving in the same planes (Picture #3).

During the down and back exercise, the judge looks to see if the hind foot strikes in almost the same place as the front foot on the same side of the body. Dogs that are not able to align their legs in parallel planes generally have structural faults. The most common is called "crabbing" or "sidewinding" as seen in Picture #6. An example of how this principle occurs away from the show ring can be seen when an automobile is moving in the snow. While the vehicle has four wheels, it only leaves two tire tracks in the snow because the front and rear tires are traveling in the same plane. Puppies that have this problem of alignment often trip and fall. By the time most pups are adults they have learned not to trip themselves by moving their front feet to one side (crabbing or sidewinding) and avoid falling. In the show ring, judges use the diagonal runner and the down and back exercise to look for the first and second principles of movement (Picture #5 & #6). Crabbing has many causes such as height-to-length or the rear assembly that has more angulation than the front assembly or poor extension in front combined with a stiff back causing too much drive from behind. Because there is more than one reason for crabbing or sidewinding, one should be careful when assigning a cause for it. Picture #3 shows a Corgi that does not single track but does have legs that travel in the same plane. Picture #4 shows a dog that single tracks while traveling in the same plane.

Pictures #3 and #4 – Traveling in the same plane

There are other variations of movement involving the front and rear legs. For example, some dogs will single track with their front feet and move wide apart with their rear feet. Sometimes this movement is reversed. Picture #5 shows a dog that single tracks while traveling in the same plane. Of all the faults of alignment, picture #6 illustrates the most noticeable fault called crabbing or sidewinding.

Trot and Pace

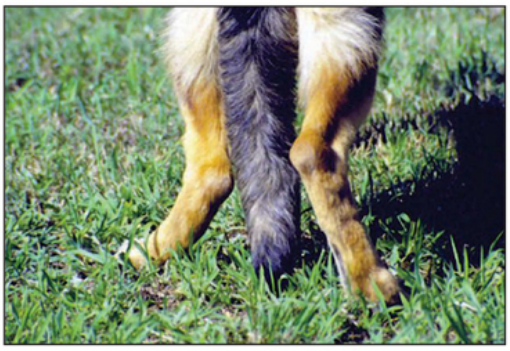
The trot and the pace are both two-beat gaits. The trot is the

Picture #5 – Single Track

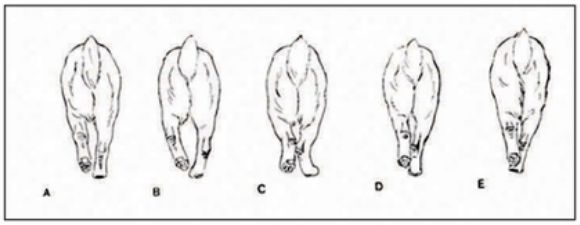
Picture #6 – Sidewinding or Crabbing

most common gait. It is a two-beat diagonal gait causing the front and rear feet to touch the ground together. The right hind, left front, right front, left hind, and so on. Because only two feet touch the ground at any time, the dog relies on forward movement to maintain balance with the hind feet following along the track left by the front feet. In the flying trot, which is characteristic of the German Shepherd Dog, all four feet are off the ground for a brief period of time. It is a faster gait than the trot but not as fast as the gallop in which the dog hurdles all of its feet off the ground at the same time. When a dog paces, both legs on one side of the body move as a pair. It is a lateral gait and considered to be incorrect in the American show ring. The pace is influenced by the relative height of the shoulder to the length of the body. A dog too short for its height tends to pace. But the pace can also be the result of an injury or fatigue. Therefore, one needs to be careful when assigning a cause for the pace.

Picture #7 – Hocks, Straight and Parallel



Picture #8 – Cow Hocks



Picture #9 – The rear pads point in different directions

The third principle of movement focuses on the rear hocks. When standing, they should appear to be straight and parallel and underneath the hip sockets. Imagine the rear hocks as two short and straight columns of support that are parallel to each other and set just slightly outside the hip sockets as seen in picture # 7. Dogs that have cow hocks (Picture #8) do not move with efficiency and will tire more easily when they gait.

Picture #9 illustrates five variations of the rear legs and how they might appear in motion. Many breeds have long coats which makes seeing the hocks more difficult. In these breeds, the recommendation is to look at the pads of the rear feet rather than the hocks while the dog is in motion. Notice the direction they are pointing.

Observing dogs in motion can also be complicated by the restrictions placed on the dog by the handler. Generally a dog and handler are considered a team, but too frequently, through intent or lack of attention, a handler can confuse a dog's movement with the lead. Under these conditions, it is not possible to evaluate movement when the lead is tight or when the lead is used to lift the front feet up so they barely touch the ground.

Under these conditions structure and movement cannot be adequately evaluated.

Motion Study

Pictures, diagrams and illustrations help in our understanding of structure when a dog is standing because most of the body parts are easy to see. When dogs are in motion, other factors influence what can be seen. For example, a dog's general health, a past injury, habit, or the effects of aging all complicate structural analysis and movement evaluations. In order to better understand these problems, Jones (2013) studied some of the subtle traits that can easily mislead an observer. Using detection-trained police dogs, Jones studied the early behavior and movement of lumbosacral disease in working dogs. This problem was selected for two reasons. First, the disease was found to be a problem in high-drive working dogs who often mask their clinical signs. Second, Lumbosacral disease was selected because it is an important cause of disability and premature retirement in working dogs (Linn et al 2003). By the time pain is evident and the faults of movement obvious, the disease has advanced. In order to learn more about structure and movement problems early in their development, two motion analysis experts, a 3-D motion digital camera and a canine bodysuit with sensors were used to capture and record joint and leg movements. This study used three detection-trained police dogs. Dog #1 was a four-year-old male German Shepherd Dog trained for detection and patrol

duties. Dog #2 was a four-year-old male Labrador Retriever trained for detection duties. Dog #3 was a four-year-old male Bloodhound trained for search-and-rescue duties. The use of high-tech equipment coupled with the observations by experts would appear to be straightforward except for the dogs. For Dog #1, the bodysuit was well-tolerated however; the dog became overheated quickly and required frequent rest periods. For dog #2, the markers on the body suit appeared to distract the dog and the dog repeatedly stopped during the test and tried to remove the suit. For dog #3, the markers did not appear to be a distraction, however loose skin movement over the joints caused inaccuracies in some observations and in data collection.

Motion Study

This study serves as a good reminder that even when experts used high-tech equipment and data analysis, they still encountered unexpected problems. A closer look at what occurred shows that understanding movement in the controlled environment of a laboratory is not always simple or obvious because there are many body parts in motion and dogs will often change directions and move at different speeds. Similar diagnostic problems can occur in the clinical setting of a veterinarian's office or in the show ring. Radiographs, palpations and sonograms are often used to identify and diagnose conditions of the joints, muscles, tendons and ligaments. While these technical protocols can rule out some problems, they do not explain a dog's genetics or why a dog's movement is correct or incorrect. In the show ring, judges face similar problems which require them to rely on experience, breed knowledge, ring procedure and skill in their effort to evaluate structure when dogs are standing and while they are in motion.

Conclusion

In the Jones study, high-tech equipment and movement experts evaluated structure in motion in the early stages of a disease when the most common symptoms are subtle changes in movement. Under these conditions, dogs will often mask their symptoms which can mislead evaluations. For example, when movement is less than smooth or when there is a reluctance to perform a simple task for which the dog has been trained, such as walking or trotting, structural faults can be misleading. For example, evaluating dogs that are searching high places, jumping into vehicles or onto obstacles, climbing stairs and bite work is similar to the animated movement seen at agility, obedience and field trials, but not the same as the movement on the flat surfaces of the show ring. What this study uncovers is that a dog's general health, a past injury, habit or the effects of aging, all complicate the results of structural analysis and movement evaluations. These subtle and often unnoticed factors can mislead even the educated eye. This study demonstrates that movement under the best conditions can be misleading and sometimes deceptive. For these reasons, evaluations in the show ring that require gaiting and the extension of the front and rear leg assemblies can become complicated when different speeds are involved.

The information presented in these two papers shows that the decision about structure and movement will oftentimes vary between judges, breeders and exhibitors. The lack of information and poor ring procedure sometimes influence decisions. Therefore, movement should always be evaluated at different speeds and more than once. Thus, we should not be surprised when in the less technical world of breeders, owners and judges the placements and rankings in the show ring will vary between and among the recognized experts.

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