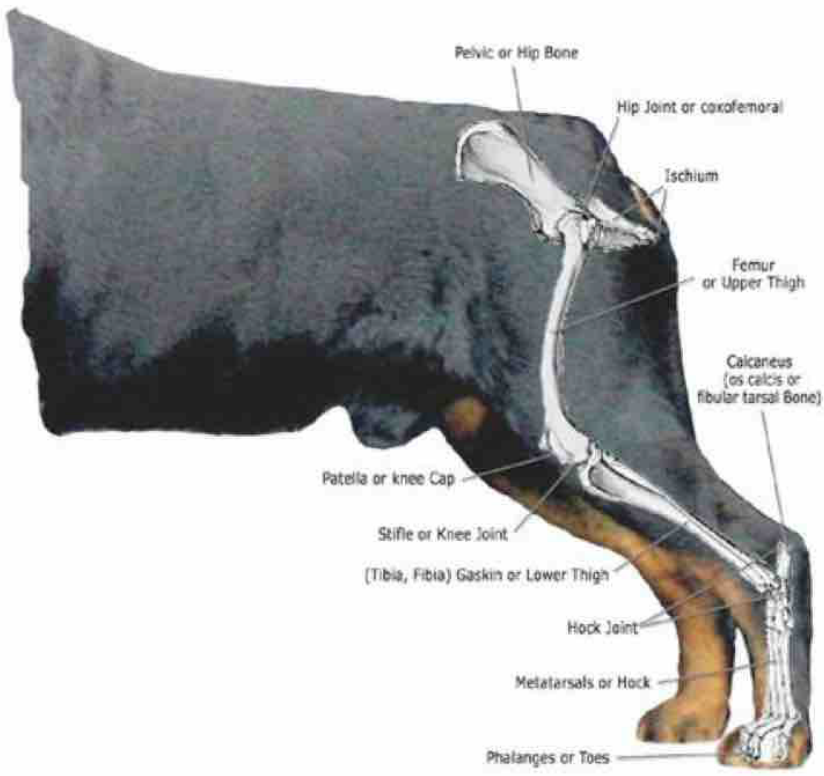
DYNAMICS OF THE REAR ASSEMBLY

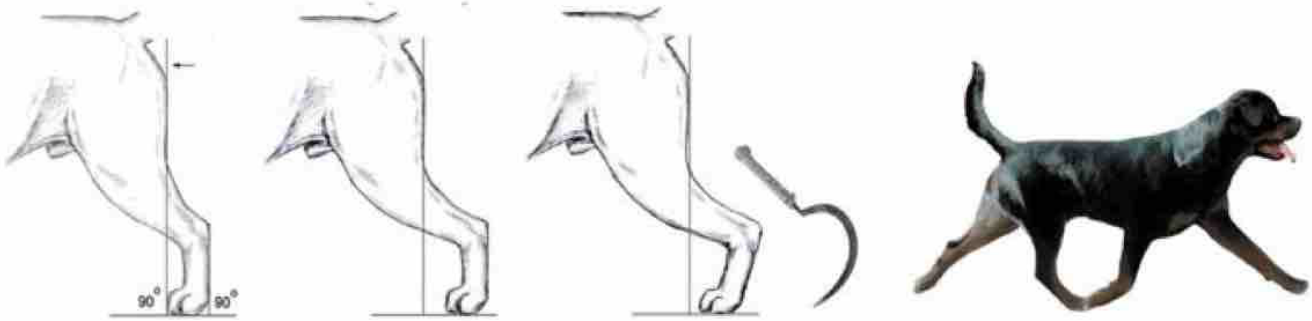
By Steven Robinson

It is increasingly apparent today the correct Rottweiler's rear assembly is under attack. Through out various breeds of dogs, it is common to see trends come and go. But some trends, unfortunately, are fundamentally flawed. It is such a travesty we are witnessing in the Rottweiler breed ring today. Over angulated rears, many of which are actual deformities, i.e. sickle hocks, are being embraced, promoted and awarded at shows by both breeders and judges alike. This persistent popularity of over angulated rears cannot be explained other than the result of judges & breeders not having a true understanding and appreciation for how the rear operates. The purpose of this article is to shed light on the basic operation of the rear, and to demonstrate why having excessive angles is not desirable for a Rottweiler. Especially since one of his traditional functions is that of a draft dog.

I will assume that the reader already knows the difference between a gallop, pace and trot and our Rottweiler's primary mode of travel is as a trotter. The trot is a very efficient endurance gait used by coyotes, wolves and other wild canines to travel vast distances without exerting too much energy. It is a ground covering gait animals use to keep moving for hours and is the typical gait of herding breeds. So, we will assess the efficiency of our Rottweiler's rear assembly at the trot, their most productive gait.



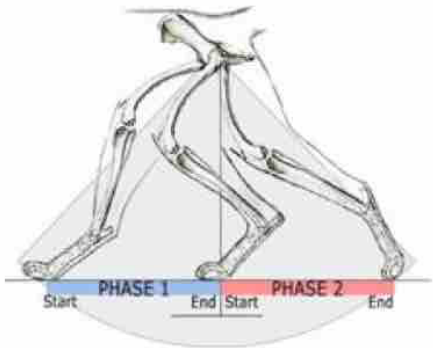
In the beginning of our standards, it gives a general description of our Rottweiler. Within the general description it states, the Rottweiler is to possess great strength, agility and endurance. To paraphrase, our Rottweiler is to embody great strength, great agility and great endurance. These three qualities provide a check and balance for determining what is correct for our Rottweiler. For example, a Rottweiler with too much substance will possess great strength but will lack in agility and endurance. On the other hand, a Rottweiler in need of substance may have great agility and endurance, but will lack in strength. It is only among those Rottweilers possessing correct substance that the embodiment of great strength, great agility and great



Left to Right: Correct Rear, Over Angulated and Sickle Hocked

endurance will be found. The use of these three qualities as a check and balance are just as applicable in evaluating the correctness of the parts of the dog as it is the whole. The rear assembly is no different. Our Rottweiler's correct rear assembly is one that embodies great strength, great agility and great endurance. It is a balancing act.

Rear Action Sequence



In the trot, one of the rear legs is lifted and extended forward opening the joints until the heel of his foot meets the ground. This is the beginning of phase one. As the leg moves backward, the angulation at the hock and stifle joints closes while remaining on the heel of the foot. Once this rear foot reaches a point directly below the hip joint, it marks the end of phase one and the beginning of phase two as the rear assembly ends the process of closing its angles and begins the process of opening its angles. It is in phase two that the primary push from the rear occurs. As the angles open, the toes of the rear foot first start to come into play by digging into the surface providing traction as the rear leg fully extends its angles backwards. This sequence of rear action repeatedly goes from right rear leg to left rear leg over and over. As the right leg goes through phase one and two, the left leg lifts from rear extension after phase two and begins closing its angles in the process of moving the leg forward and re-extending just before the start of phase one. Then, they switch.

The most essential information to remember about this is phase one of the sequence provides some support and lift to the dog's front, but does little in the way of contributing to forward momentum. Phase two is where most of the rear push occurs. There are two important reasons why phase one is ineffective in creating rear drive. One, the foot action of phase one occurs in front of the hip joint leaving it with no path for the energy generated to contribute directly toward forward momentum. In fact, the foot action in phase one creates a little resistance to forward momentum as it absorbs the impact of placing down its foot and in the resistance of closing the angulation. Second in phase one, the rear angles are in the process of closing and not in the process of opening. For opposing reasons, phase two is where most of the energy and push from the rear is generated. During phase two the foot action occurs behind the hip joint providing an easy, straight forward path of transference of energy through the hock, lower thigh, upper thigh, hip bone, back and on to our dog's front. Also, in phase two the rear is in the process of opening and extending its angles. Like the release of a compressed spring, the opening and extending of the rear angles creates rear push.

You can test this out on yourself. From a standing position, reach forward with one of your feet and try to generate some push forward with that leg while it is positioned in front of your hip. As you move your foot back once you are able to generate some push, notice the position of your foot in relation to your hip joint. You will find the foot will need to be behind the hip joint before a push in the forward direction can occur.

Remember the differences in, and effectiveness of, these two phases. Their importance is fundamental in assessing the correct rear assembly. We will come back to them later.

Angulation

I was at a national Rottweiler specialty show a few years back. The judge, a breeder judge, through the process of elimination by making several cuts during her selection process, had the dogs she liked lined up in the ring. The dogs were quite consistent in type and structure. While observing her judging a pattern became clear. It seemed the dogs having the most angulation in the rear were being moved toward the front of the line. The handlers quickly picked up on this and were employing every handler trick they knew to display as much rear angulation on their dogs as possible. In the end, every dog in her line up had extreme rear angulation. Several were even sickle hocked! From where I was sitting, I could hear various people sitting at ring side commenting on how nicely structured the rears were. It didn't seem to matter how much the rears over reached or the how the hocks didn't open up. The only thing that mattered was this illusion of power created by the bend at the stifel and hock joints.

As novices, one of the first things we learn about rear structure; angulation is a good thing to have. We start throwing the word around in conversation because it seems the more knowledgable thing to do. In fact, the term angulation is one of the most used and most misunderstood terms in all of the dog world.

It seems we quickly learn having straight angles is bad, and in turn, quickly surmise having more angulation

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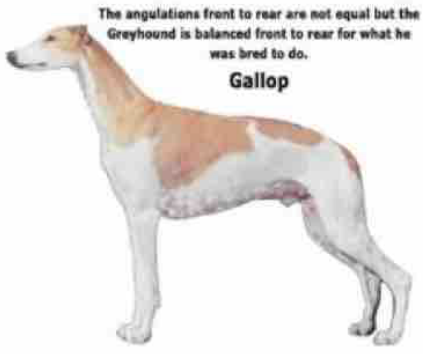
is a good thing. This is a result of the, "more is better" basic humanistic philosophy. In truth, it is often the golden middle which is best. This definitely applies to rear angulation. We need to think in terms of balance and moderation for our Rottweilers. Just as there are disadvantages to having a straight angled dog, there are also disadvantages to having an over-angled dog! Diligent students of structure eventually learn this. Some breeders never do!

Angulation is nothing more than a way to describe the amount of bend in the areas where various bones join in the front and rear assemblies. The primary factor determining these angulations are the proportional bone lengths of the various components of the front and rear assemblies. In the front assembly it is the shoulder blade and upper arm bone lengths which determine the angulation. In the rear assembly it is primarily the pelvic, upper thigh, lower thigh and hock which determines angulation. For the most part, a dog having the longer bone lengths has more bend in the area where these bones join and the result is a greater range of extension. This greater range of extension allows a dog to have greater reach. To a point, increased angulation can increase drive but too much angulation will decrease drive. At first glance, having greater reach sounds like a good thing; and for certain breeds and functions it can be. But having a lot of reach requires an appropriate length in body to prevent interference between the working arcs of the front and rear assemblies. If the dog does not have sufficient length, crabbing or some other means to compensate for the interference will occur. Breeds required to be shorter through the body need to be less angulated in order to remain synchronized front and rear. Breeds designed more for strength rather than speed, such as for draft duties, need to be less angulated. During the act of pulling, less energy is required to straighten a joint with less bend than to straighten a joint with more bend.



Effective Rear Angulation

The AKC breed standard states the hindquarter's angulation is to balance that of the forequarter's angulation.

This doesn't mean a dog having a shoulder blade and upper arm meeting to form a 90 degree angle should have the same angulation at the stifle. In fact, having balanced angulation front to rear has a lot to do with the breed's function and its primary means of travel. If your primary means of travel is the gallop, like sight hounds, the front assembly will be less angulated and the rear assembly will be more angulated. For trotting breeds, the most effective balance is for the front to be more angulated and the rear to be less angulated. This is the reality of the different gaits of travel. Balance does not mean equal angulation! The amount of angulation and its balance is totally dependent upon the breed's function and primary means of travel. Our Rottweilers' primary means of travel is the trot and to optimize his ability to trot and be balanced at the trot, his front should be more angulated than his rear. The FCI standard specifies the rear bones should meet to form obtuse angles (angles greater than 90 degrees and less than 180) Anything approaching either extreme is faulty rear angulation.

Bottom line, the front and rear assemblies are designed for different purposes. While trotting, the rear is meant to create and transfer kinetic energy to the back. The front assembly is designed to receive and distribute that energy. Together the front and rear have a give and take relationship. It requires a different set of angles to effectively create and give energy than is required to take and distribute energy.

Back to Effective Rear Angulation

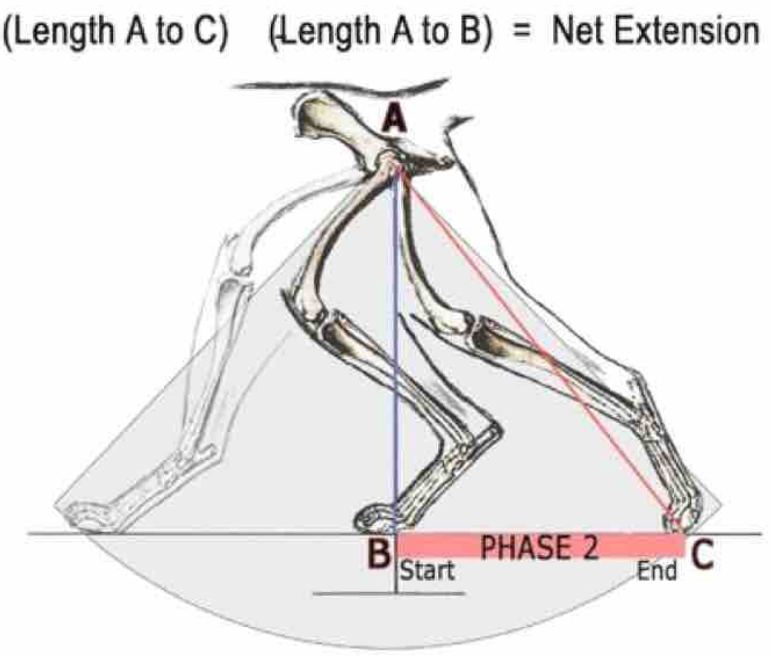
Contact with the Ground

Simply put, the longer a dog's rear foot remains in contact with the ground while moving, the greater the opportunity the rear has to generate drive. This is simple logic. Longer bone lengths in the rear will increase the length of time the foot can push off the ground. At the gallop, sight hound breeders are aware of the benefit of increased foot contact and developed an arch to the top line of their dogs so they can reach further under themselves while galloping and significantly extend their dogs foot contact time with the ground. This is a fact, but it isn't the only fact we need to be concerned with!

Mechanical Advantage

As with bench pressing weights, the greatest push or kick comes just before you fully extend your arms. This is because the joint's mechanical advantage over the weight or opposing force increases as the joint's angle opens. For our dog, the full extension of his joints gives a powerful push at the end of their stride. This is why draft animals are usually straighter angled.

Trotting breeds having too long of bones (very angulated), do not have enough stride length or foot contact time to fully extend their joints before the end of phase two. Because of this, they do not benefit fully from mechanical advantage. These dogs, who look like loaded springs while standing, will use more energy with each step, and because of this, they will have less stamina.



Taking Advantage of Both Conditions

So the trick in determining effective rear angulations is having rear bone lengths long enough, correctly proportioned and correctly positioned to maximize the foot's contact with the ground. While at the same time, making sure they are short enough to fully extend at the end of phase two in order to fully benefit from the increase in energy mechanical advantage provides.

It is a balancing act and this explains why the more moderately angulated dogs have the better sustainable rear drives! Their bone lengths are just long enough to allow the foot plenty of contact time to push off the ground and yet short enough to fully extend the joints allowing for maximum benefit from mechanical advantage.

Net Extension

Another area of importance is the net extension applied during the back reach in phase two. The net extension is the measured difference between the distance from hip joint to the paw at the beginning of phase two when the rear angles are closed and the distance from hip joint to the paw at the end of phase two when the rear angles are open. Net extension is a key component to determining the amount of rear drive a dog can generate. This is where rear angulation has proven to be deceptive. Many times dogs displaying less angulation while standing possess greater net extension than dogs displaying more angulation while standing. Because, the only angulation which can be opened in phase 2 is the angulation which is closed in phase 1. If the length of phase 1 or 2 are shortened or compromised, it lessens the net extension. When phase 1 is shortened, less bend between the stifle and hock joints is created and results in less bend opening in phase 2. When phase 2 is shortened, there isn't enough length of back reach to fully open the bend created in phase 1. This is why phase 1 and phase 2 are equally important in creating rear push.

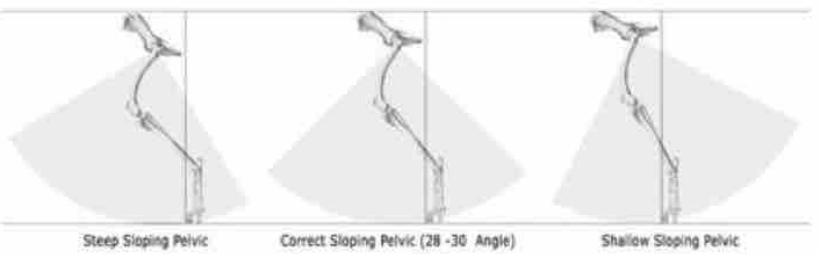
Pelvic Slope's Effect on Angulation

The angled slope of the pelvis helps determine the angulation you see when the dog is standing. Dogs having the same proportions and length to their bones of the rear assembly, can visually display different angulation depending on the slope of their pelvis. Notice the changes in the amount of angulation associated with the different pelvic slopes in the figure below. A dog with a steeply angled pelvis will display more turn in the stifle and hock than dogs having more a moderate or lesser angled pelvis. Again, this is dependent upon all bone proportions being the same.

Another point the figure demonstrates is how pelvic slope controls the balance and lengths of phase 1 and phase 2. It is this control of the working arc of the rear assembly that makes the pelvic slope one of the most important aspect of the rear assembly.

So, looking beyond the angles of the stifle and hock is important for accessing the true angulation of a dog's rear!

To re-iterate, over angled rears are a structural weakness robbing our breed of optimized strength and endurance. This should never be tolerated in our Rottweiler! ■



The Effect of Pelvic Slope on the Angulation and Working Arc of the Rear