

How to do Your Own Conformation Analysis for Gait

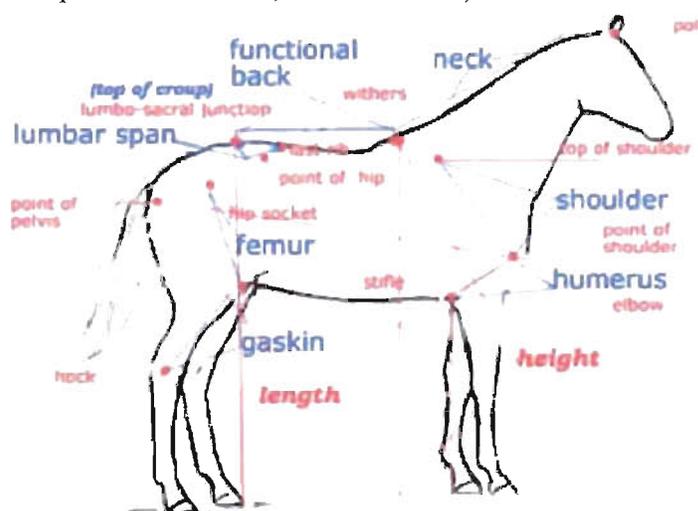
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Basic conformation analysis can tell you a lot about your horse's potential for performing a specific gait, as well as giving you an idea of how he will do that gait. The proportions of a horse's body, and the angles of various parts of his body provide a clear picture of which body frame or position he will be most likely to use. Although the basics of straight legs, strong joints and well proportioned, balanced bodies are the same for gaited and non-gaited horses, some body proportions and angles in gaited horses will differ a little from the ideal for non-gaited horses, and there will also be differences observed between horses that prefer different easy gaits. (For instance, a horse that prefers a running walk will not be built the same way as one that prefers a fox trot, in most cases.)

What measurements mean:

While the proportions of the entire body combine to determine **how** a horse will carry himself, the most important measurements for gaited horses are those of the proportions of the spine, from poll to tail, and of the hindquarters. These measurements determine to a great extent how a horse will carry his back and body, and as a result, which gait he will perform.

[The body length of all horses is determined by measuring from the point of the shoulder to the point of the buttock.] Horses that hard trot well in true collection tend to have the following conformation traits of the spine:



Proportions of the spine for trotting horses (ideal)

Neck (poll to withers)	Same length as crest of withers to root of tail
Withers to Lumbo-sacral junction	Less than 39% of body length, ideal 33%
Lumbar span (lumbar vertebrae)	Less than 35% of withers to lumbo-sacral junction
Withers to root of tail	Equal or slightly less than poll to withers

Horses that are likely to do a pace or stepping pace have very different proportions of the spine. They tend to have a longer back, longer loin, and sometimes a shorter neck than horses that trot, fox trot, running walk, or do one of the racking gaits.

Proportions of the spine for horses that are inclined to pace/stepping pace (travel hollow)

Neck (poll to crest of withers)	Shorter than crest of withers to tail
Withers to Lumbo-sacral junction	More than 45% of body length
Lumbar span (lumbar vertebrae)	More than 40% of withers to lumbo-sacral junction
Withers to root of tail	Longer than poll to withers

Each type of gaited horse, depending on how he gaits, will vary between these two extremes. The more lateral his gait, the closer the proportions of his spine will be to the "ideal" for pacing horses. The more diagonal his gait, the closer these proportions will be to the "ideal" for a trotting horse. In a very preliminary study, the following proportions were observed in horses that *naturally* preferred a specific easy gait. (For this study, naturally meant that they did the gait with ordinary keg shoes, set at their natural angle, or barefoot, with no weights, action devices, or other gimmicks. Most of these horses also did their gait while being led, without a rider.)

Spine proportions for sample horse that fox trot, rack/saddle rack, and running walk compared to Ideal trotting proportions as percentage of body length.

Part measured	Fox Trot	Saddle rack	Running walk	Ideal Trot
Neck	57%	55%	59%	60%
Withers to Lumbo-sacral junction	53%	54%	55%	39%
Lumbar span	20%	28%	23%	18%
Withers to tail	56%	57%	60%	60%

Hindquarters: The proportions of the hindquarters of a horse determine how easy it will be for him to his haunches and round his back. Generally, the shorter and steeper his hip and pelvis, the more difficult it will be for him to lower his haunches and raise his back, and the more likely he will be to do some type of lateral gait.

Hip and Pelvis measurements/angles for sample horses that fox trot, rack/saddle rack or running walk, compared to ideal proportions for trotting horses.

Part measured	Fox Trot	Saddle rack	Running walk	Ideal Trot
Hip (level from hip bone to buttock) % of body length	32%	31%	32%	33%
Pelvic angle	32 degrees	37 degrees	30 degrees	25 degrees

Height measurements: In addition to the length measurements that give a picture of a horse's spine and his ability to use his hindquarters, height measurements give an idea of how a horse will move and what his resting body position is likely to be. A horse that is rump high (higher in the croup than the withers) will have trouble lowering his hindquarters to round his back. A horse that is equal at withers and croup will be well balanced and able to round his back moderately. A horse that is higher at the withers than the croup will be very inclined to travel with lowered hindquarters and may not be able to do an easy gait because of the position of his back. To determine whether your horse is rump high, measure from the top of his croup straight to the ground, and from the highest point of his withers to the ground using the level height measuring stick with a cross bar. If you don't have one of those, you can use a rigid measuring tape and hold a long carpenter's level across to the horse's withers or croup

at the top of it. When the bubble is centered, you have the bar straight, and will have the height measurements you want.

Legs: Front and hind legs, their length and proportions, determine the type of reach a horse will have, and also have an impact on a horse's ability to lower his hindquarters and round/raise his back. Horses with long hind legs in comparison to front legs, for instance, will find it much more difficult to lower their haunches from the lumbo sacral junction, and may have "downhill" conformation that inclines them to a lateral gait. Ideally, well-balanced horses will be equal in height from the ground at the crest of the withers and the highest point of the croup, and will also be close to the same length from the ground at their elbows and stifle joints. This type of balance is essential for trotting horses, but is not as common in horses that are inclined to pace or stepping pace.

Leg measurements a proportion of height at withers of sample horses that fox trot, saddle rack/rack, or running walk compared to sample trotting horses.

Part measured	Fox Trot	Saddle rack	Running walk	Ideal Trot
Shoulder	37%	36%	37%	36%
Forearm	28%	27%	28%	27%
Front Cannon	18%	18%	19%	18%
Elbow to ground	57%	54%	57%	54%
Stifle to ground	64%	62%	69%	60%
Hind cannon	26%	27%	27%	26%

Measurements for motion: Finally, in addition to the basics of height and overall body carriage, some measurements/proportions of a horse's body give a picture of how he will move his legs. The angle and length of the shoulder and humerus bones determine how high and long a step a horse is likely to take in front. Generally, the longer the shoulder and the more sloping it is (approaching 45 degrees) the longer a step a horse will take in front, and the longer and lower the humerus angle (approaching 30 degrees) the lower the action of the front legs. A short, steep humerus, combined with a long sloping shoulder, will limit the horse to higher, shorter steps than a slightly steep shoulder combined with a relatively horizontal but long humerus. Ideal for reach and scope of motion is a humerus that is long enough for the elbow of the horse to fall in a direct line under the crest of his withers.

The proportion of the femur and the gaskin (from stifle to hock) determine how long a step and how much propulsion upward a horse is likely to develop in his hind legs. A femur and gaskin that are equal in length provide strength and upward thrust, but may limit the length of step a horse takes. A femur that is longer than the gaskin provides a lot of power for the hindquarters, encouraging a horse to travel in a rounded, truly collected position. This type of hind leg is found in trotting horses, particularly those that excel in dressage. Most gaited horses tend to have gaskins just a bit longer than their femurs. This provides for a longer or higher (hocky) step in back, and may be a factor in overstride in some gaits.

Getting started:

To determine the important proportions of your horse, you will need to measure his body. The best way to do this is to start with your horse standing on a flat, firm surface (concrete slabs or rubber mats over a level floor are ideal) and to pose him so that his cannon bones are vertical (not parked out, not

standing with his hip cocked and each hoof pointing in a different direction).

You will need:

1. A flexible tape measure (one that measures in centimeters is useful, but you can use an inch measuring one, too)
2. A good vertical measuring stick with a top arm, or a stiff measuring tape and carpenter's level.
3. Charts (see below) and clipboard to write measurements on.
4. Guide chart for finding various measurement points. (see below)

SKELETAL CHART 1

SKELETAL MEASUREMENT CHARTS					
HORSE _____					
A. HEIGHT AT WITHERS _____					
B. BODY LENGTH _____					
Part measured	centimeters	% of height at withers	Inclines to reach?	Inclines to hollow/pace?	Inclines to trot/round?
<i>Shoulder</i>					
<i>Forearm</i>					
<i>Front cannon</i>					
<i>Elbow to ground</i>			<i>Compared to height, higher % gives longer reach</i>		
<i>Femur</i>				<i>If shorter than gaskin</i>	<i>If equal or longer than gaskin</i>
<i>Gaskin</i>				<i>If 1/2 again longer than femur</i>	<i>Equal or shorter than femur</i>
<i>Stifle to ground</i>			<i>Compared to height, higher % gives longer reach</i>	<i>Much higher than elbow to ground</i>	<i>Same as elbow to ground</i>
<i>Hind cannon</i>				<i>Total of femur, gaskin and hind cannon more than 15% above height</i>	<i>Total length of femur, gaskin and hind</i>

				contributes to pace	equal to height at withers contributes to trot/round
Front pastern		Should be no more than 3/4 no less than 1/2 of cannon			
Hind pastern.		Same as above			

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It is also very useful to have another person to help you write down measurements as you get them, to handle the tape measure, and in some cases, to handle the horse. For measuring angles of joints, you will need to take a full, straight, side on photograph of the horse, posed with front and hind cannons vertical, (standing "square") and a protractor. You may have one left over from high school, can borrow one from a neighbor kid, or spend a couple of dollars on one at any place that carries school supplies.

SKELETAL CHARTS 2

LENGTH MEASUREMENTS					
Part measured	centimeters	% Body length	Inclines to reach?	Inclines to hollow/pace?	Inclines to round/trot?
Neck (poll to crest of withers)			Same or longer than withers to tail	Shorter than withers to tail	Same as withers to tail
Withers to Lumbo-sacral junction				More than 45% of body length	Less than 39% of body length
Withers to tail					
Lumbar span				More than 40% of length from withers to lumbo sacral junction	Less than 35% of length from withers to lumbo sacral junction
Hip				25% or less of body length	At least 31% of body length
Hip socket placement from front of pelvis				Short iliac pelvis	Long iliac pelvis
humerus			More than 23 % of body length		

ANGULATIONS

Part measured	Angle	Inclines to reach?	Inclines to hollow/pace?	Inclines to round/trot?
<i>Shoulder blade</i>		Approaching 45 degrees increases reach		
<i>Humerus</i>		Approaching 30 degrees increases reach, steeper inclines to high action		
<i>Pelvis</i>			Shallower than 20 degrees or steeper than 40 degrees	Approximately 20 degrees

Horses are inclined to pace if they have camped out hind legs (hock joint falls behind a line dropped from the buttock when cannon is vertical) very open angles at the hock but closed at the hip and stifle, long lumbar spans, long functional backs (withers to lumbo sacral junction) short necks and short hips. All these factors make it difficult for them to round and raise their backs.

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Start first by measuring your horse's height at the withers and his length, from the point of his shoulder to the fullest part of his buttocks (at the point of the pelvis). These two measurements will be used later to determine proportions so that you can compare your horse to others of different size. [While "real" measurements will be very different between a 14-hand horse and a 16-hand one, the proportions, as a percentage of body height or length will be comparable between the two.]

Measure all bones from the center of the joints on either side of them. For example, measure the front cannon from the center of the "knee" joint to the center of the fetlock joint. Some will be easier to find than others. Typically, the four most difficult points to find are the lumbo-sacral junction, the top of the shoulder, the top of the femur/hip socket, and the front part of the lumbar span. To find these points, you will need to "feel around" on your horse's body.

To find the *lumbo-sacral junction* where the lumbar spine meets the fused, sacral spine, you can often just look for the highest point of the horse's croup. If you can't see that, or are not sure that it is the correct location, pinch or press with your fingers on either side of the horse's spine, over the loin area. He should flex downward from the pressure, and the area of his croup at which he flexes (the "hinge") lies directly over the lumbo sacral junction.

To find the *top of the shoulder blade*, first find the point of the shoulder, which is a large knob, about the size of a baseball, below and to the side of the place where your horse's neck attaches to his chest. Feel that knob, then run your hand up along the bone that connects to it, feeling a sort of groove as you go. (It may help to run your hand back and forth over the bone to feel this.) Follow that groove up until you feel a flat, fan shaped bone forming a rounded bump under your hand. Find the center of that fan, the highest point of the bone, and viola! you have the top of the shoulder blade.

To find the *top of the femur/ hip socket* feel along your horse's pelvis about halfway between the "hip bone" and the point of the pelvis at the back. You may be able to feel a slightly harder place along this

line, under the thick muscle. If you can't find it, ask your friend to lead your horse, and feel for the joint again. It will move under your hand and you should be able to locate it, or at least be close enough to it for a general idea of how to measure it.

To find the *front of the lumbar span* feel along the underside of your horse's belly, to find his ribs. Then follow up along the last rib, until you get close to the spine. (You will not be able to follow that rib all the way up to the backbone, but you should be able to get close). Remember that the ribs curve as they come out of the spine, so that the top of that last rib will be closer to the horse's withers than the bottom of it.

Meaningful measurements, converting to proportions:

Once you have your measurements, convert them to proportions, using simple math. Convert all length measurements into proportions of the body length of the horse, and all height measurements into proportions of the height of the horse at the withers. If you can't remember how to do it, the easiest way is as follows: If your horse's front cannon is 27 centimeters, and his height at the withers is 56 centimeters high, to convert this to proportions you would determine that X is to 100 as 27 is to 56. Cross multiply, then divide 2700 by 56 and you will get 48.2 % as the value or percentage of the front cannon compared to the height at the withers. Round off all numbers up at 5 and down at 4, or you will get bogged down in tiny percentages of difference when you measure a number of horses.

After you have measured a few horses, compare what you have found to the way they travel, and to the charts given here as "sample horses." Remember that there will be individuals that vary a great deal from the averages given here, just as there are plenty of trotting horses that vary from the "ideal" proportions given for them. Conformation proportions will not be 100% predictors of the gaits horses use, but they can give you an idea of how yours may choose to travel under saddle.