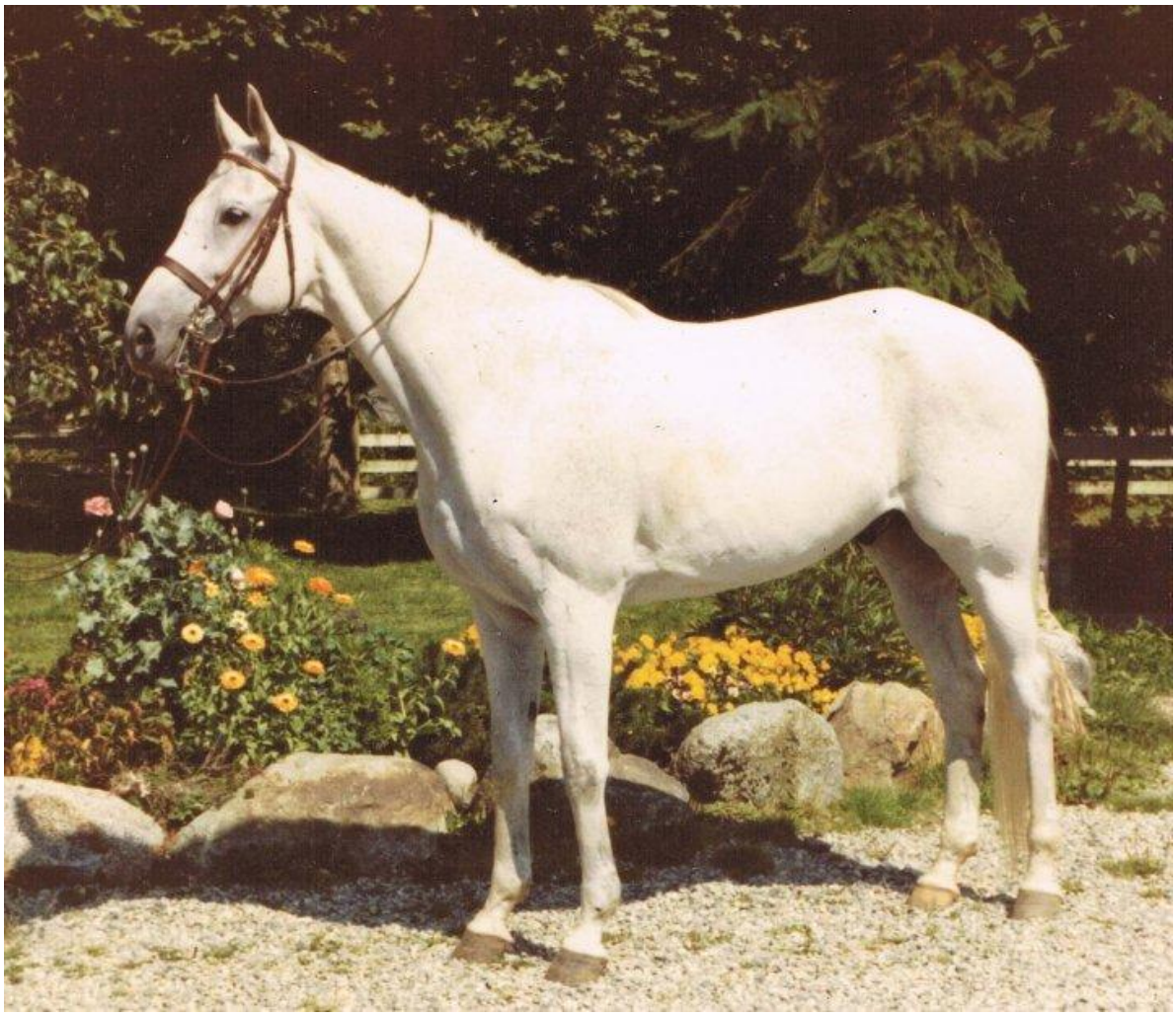
Conformation Assessment



Information compiled by

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Recommended Youtube videos:

Danny Marks Conformation 2008 Practical Horseman (1:30 minutes long - primarily concerned with elite jumpers; well worth the time)

Applied Anatomy and Biomechanics

Michigan State University series https://www.youtube.com/user/MyHorseUniversity

Conformation

- conformation is the way a horse is built
- con**form**ation (root word: ***form***)
- form meaning *shape*
- the study of *conformation* is the study of *biomechanics*
- biomechanics is the study of mechanical laws relating to the anatomical structure and function of biological systems, especially the forces exerted by muscles and gravity on the skeletal system
- undesirable conformation is athletically limiting
- good conformation is:
- attractive
- functional
- produces a better balanced horse
- produces a more athletic horse
- produces a sounder horse
- produces a stronger horse
- produces a better moving horse
- based on an *average*
- good conformation is an ***intermediate optimum***
- as the parameters/limits are of what is normal or average are pushed, this will make a horse more/less suitable for a discipline
- as the parameter/limits are pushed, this may make a horse more susceptible to the development of specific unsoundnesses
- conformation is concerned with:
- the correctness of bone
- length
- the measurement of the length of bones from end to end
- angles
- the measurement of the angle of joints where the bones intersect
- musculature

- proportions
- balance
- conformation is a very reliable predictor of
- soundness
- ability
- suitability to a discipline
- there are exceptions to every rule, however
- judging conformation is an evaluation of the degree of correctness of a horse's architecture (bone structure, muscling and body proportions)
- conformation analysis is the comparison of a horse to:
- a standard or ideal
- this will vary from:
- breed to breed
- discipline to discipline
- another horse(s)

Conformation affects

- orthopaedic health aka *soundness*
- longevity
- movement
- tasks
- how well the horse can perform
- disciplines the horse is suited for
- itself
- one conformation trait impacts another, and this can be either negative or positive

Conformation is typically not affected by

- the presence of blemishes
- fat
- colour and markings
- turn out
- learn to look beyond these things are they are not part of the horse's actual structure

Conformation is heritable

- the horse's conformation will be a combination of what the horse's ancestors looked like

- some conformation traits are congenital

Form to function

- when choosing a horse, consider its conformation in relation to its intended function
- a horse that is structurally suited to its discipline will
- have more rideability
- have more potential and scope
- experience greater soundness

Understand type

- *type* refers to general shape and suitability
- it is a set of characteristics of a horse that make a horse able to fulfill a purpose, *regardless of breed*
- *type* is more important than *breed* in evaluating a performance horse

- this is the 2014 Canadian Champion Connemara
- he is a cob type
- this is the same pony in action

Photo credit: Totem Photographic

What to look for when judging a horse for conformation

First:

- learn about conformation faults
- this tells you what to avoid
- learn what a 'good' horse looks like
- remember that *good* is just an average
- learn what the qualities of a *great* horse are
- this is much harder to discern
- these conformation traits allow the horse to be an elite competitor

When judging a horse for conformation:

- remember that ultimately, any well conformed horse will be more likely to possess the following qualities:
- soundness
- strength
- be well balanced
- have a good range of motion in the joints
- have straight, efficient movement
- establish your purpose
- ***for our purposes, we will be looking at a horse that would be suitable for one of the Olympic disciplines of***
- ***dressage***
- ***show jumping***
- ***eventing***
- look at the horse from a distance
- consider balance and proportion
- after this, you can put the horse under a microscope and take a closer look
- when you look at a horse close up, **first look at the feet** before anything else
- ***'no foot, no horse'***
- view the horse from:
- the front
- the rear
- both sides
- the horse must exhibit *vertical congruity*
- compare the left side to the right side

- do this with the legs (and not just the lower legs)
- consider foot size and shape, bones and muscling
- don't forget the face, as well (eyes, ears, nostrils)
- look in the mouth (both sides)
- feel the legs
- pick up the feet
- feel the tail bone
- check out the throatlatch area
- When discussing conformation (e.g., for a test):
- try to develop an organized, systemic approach
- start at the front, work to the back
- start at the top, work to the bottom
- When analyzing a photograph for conformation, you are at a huge disadvantage compared to if you were analyzing the horse in the flesh
- you are at the mercy of the pose
- optical illusions can appear based on how the horse is posed and what angle the photo is taken at
- a shrewd handler will know the tricks used to hide flaws
- Remember that, as my old vet Dr. John Gilray always said, *the perfect horse has yet to be born*

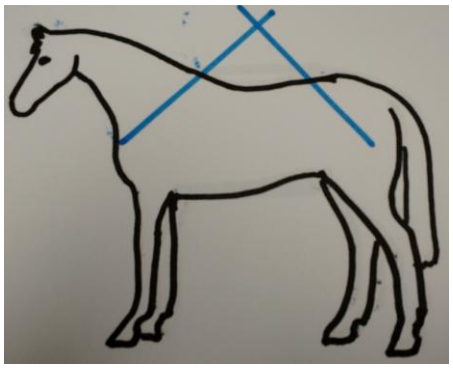
The two primary considerations when judging conformation:

Historically, it has long been accepted that the two main criteria for conformation are:

- ***balance***
- ***structural correctness***
- relative angles between body parts (Wrangel, 1887)

Balance

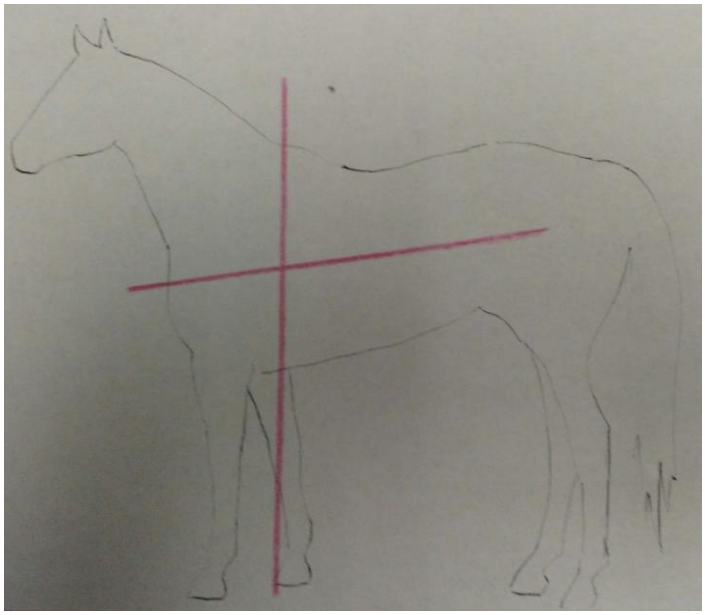
- Internationally renowned German dressage trainer Conrad Schumacher says, " *The horse must look impressive from 60 m"*
- Balance is the most important quality
- Balance is the equal distribution of weight
- Balance can be observed
- from a photo

- trick: *turn the photo upside down*
- *this allows you to see more easily if the horse is in balance*
- when the horse is standing still
- the horse will carry 60% of his weight on his forelegs
- the horse should appear level (or slightly uphill) from withers to croup
- 
- another indicator of balance is to compare the angle of the shoulders to the angle of the quarters
- the angles should be roughly the same
- this will allow the horse to not only move in balance, but to also keep a rider in balance
- 

- when the horse is moving
- the horse should shift his weight back and attempt to carry more on his hocks
- to observe natural balance, look for *digital advanced placement* (DAP)
- the hind foot will hit the ground slightly before the forefoot when at trot

Balance is closely related to the horse's Centre of Gravity (COG)

- the COG is determined by transcribing a line horizontally from the point of shoulder to the point of buttock, and vertically from the withers to the ground
- the point at which these two lines intersect is the COG
- it is the pivot point around which the horse balances



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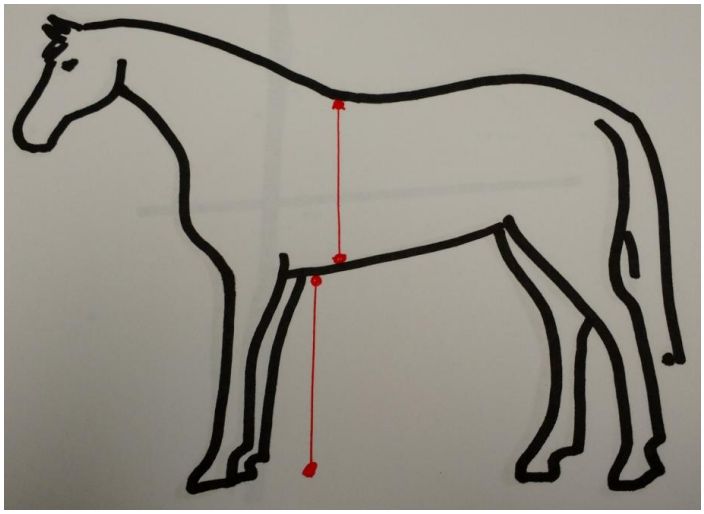
- the horse's centre of gravity will shift forward the faster it goes, as will the rider's
- what is important is that the two stay together comfortably in balance

- 

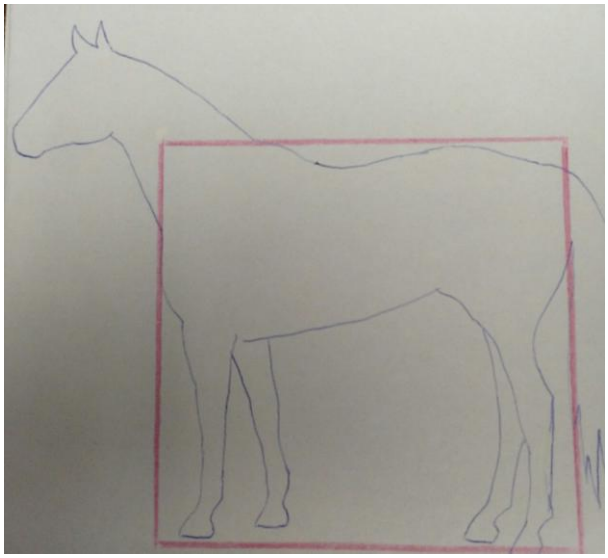
- balance is influenced by the following proportion ratios:
- length of neck and shoulder to back and hip 1:1
- length of neck to length of back 1:0.67
- topline of neck to underline of neck 2:1
- heartgirth depth to leg length 1:1
- length of scapula to humerus 1:0.5
- neck length to hind leg length 1:1

- throatlatch to length of head 1:1
- head length to measurement from outer eye to outer eye compared 1:0.5
- head length to crest of neck 1:1.5
- length of body to length of neck 1:0.33
- length of back to length of hip 1:0.67

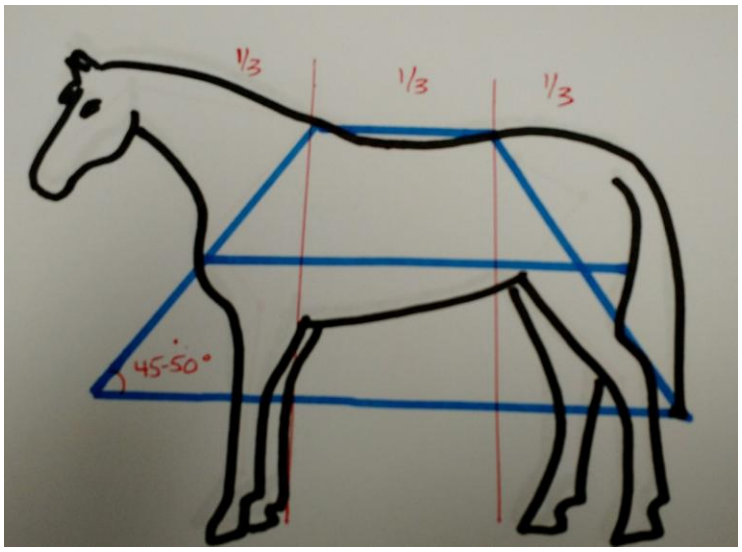
- 

Proportion

There is a strong correlation between a horse being proportionate and a horse staying sound through its career

- 

- the horse should be no longer than 10% of its height



the topline should be approximately divisible into even thirds

Smoothness

- the smooth blending of all the major body parts is important both aesthetically and structurally
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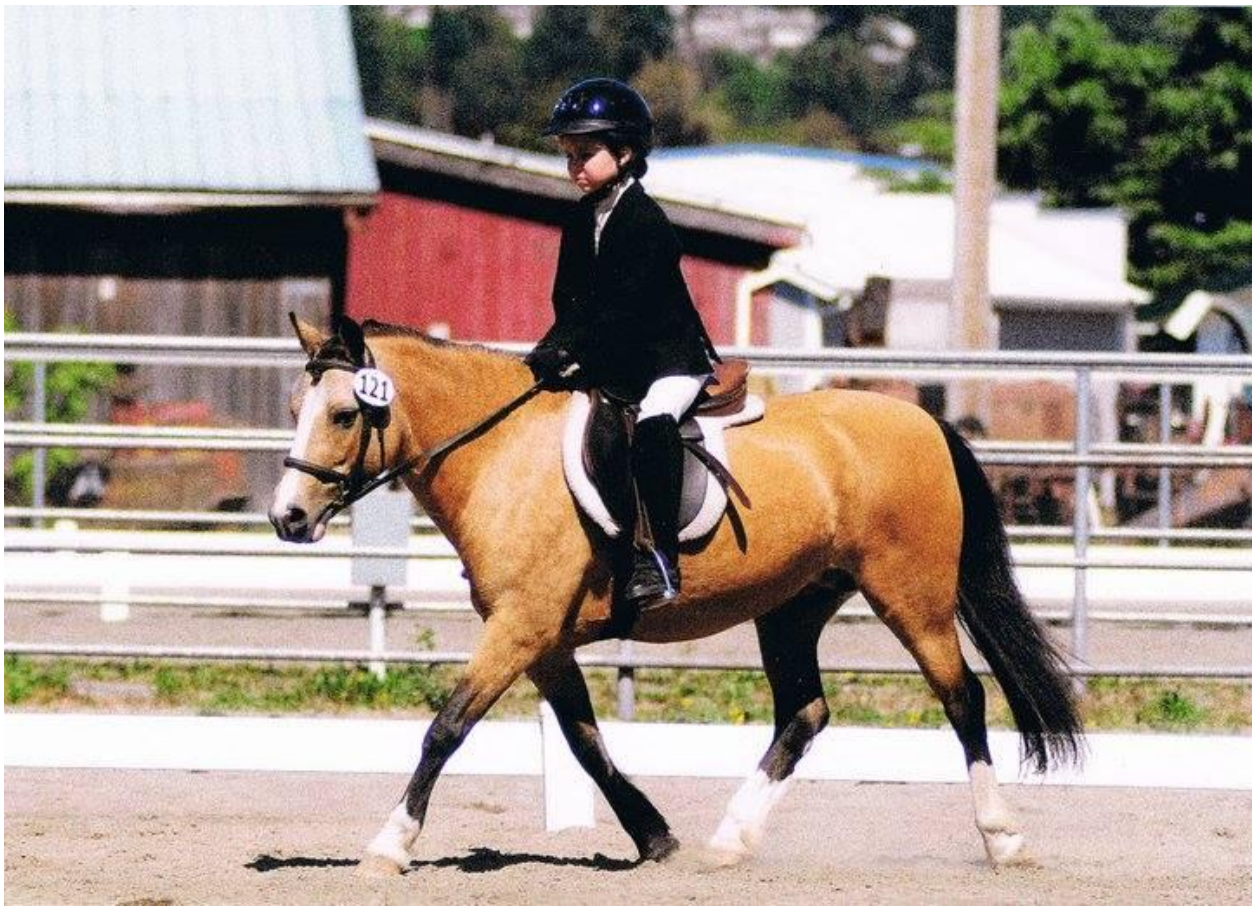
Quality and refinement

- overall appearance should be one of quality and refinement

Correct way of going

- a well conformed horse will likely move well, and a poorly conformed horse will be less likely to move well
- 

Height

- typically bigger is considered better
- care must be taken that the horse does not exceed the load-bearing capacity of the limbs

Other Considerations

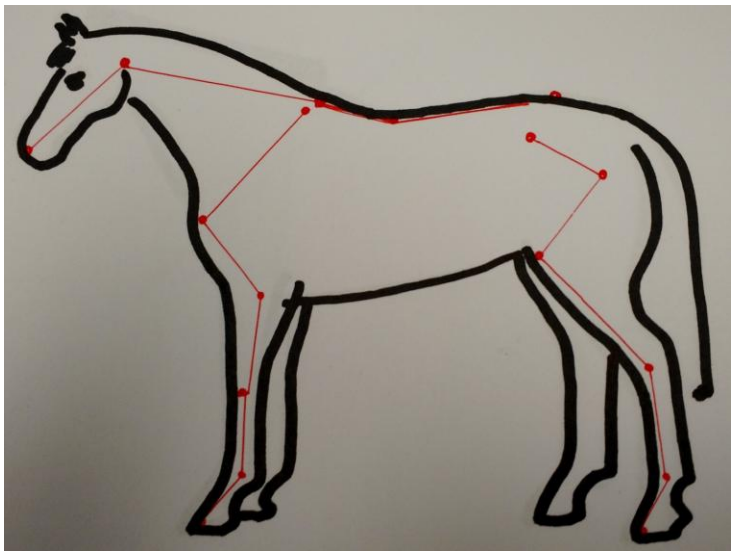
- Some other considerations when viewing a horse for conformation include:
- breed
- sex
- age

Structure = architecture

- the architecture of the horse is akin to his structural correctness
- structural correctness provides the horse with *mechanical advantage*

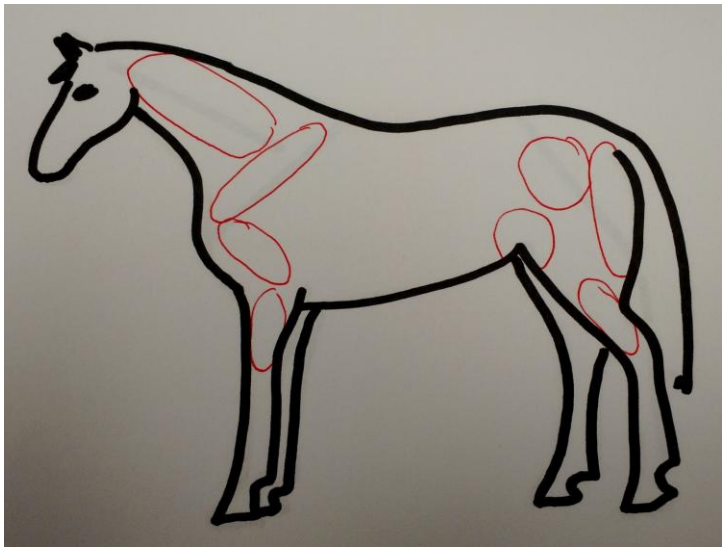
Angle and Length of Bones

- 17 anatomical markers are used to measure joint angles and bone lengths (Langlois et al, 1978)
- this is referred to as functional morphology
- this is a landmark-based science that uses morphometric markers to create a qualitative analysis of form by using measures of bone length and joint angles
- this is not a new science; there are numerous studies dating back to the 1920s

- 

Muscling

- muscling is the powerhouse of the horse
- muscle is used for propulsion
- horses in certain disciplines line dressage are akin to human weight lifters in the way they utilize their muscle
- type and amount of muscle needed varies between discplines

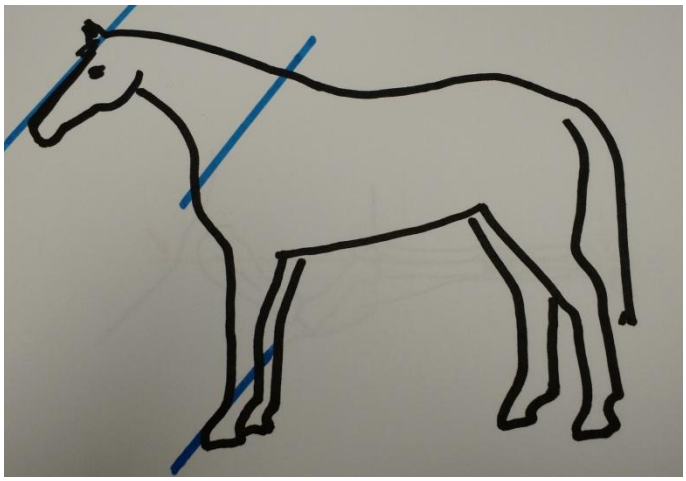


Assessment of the Horse

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - Qualities of a horse's head

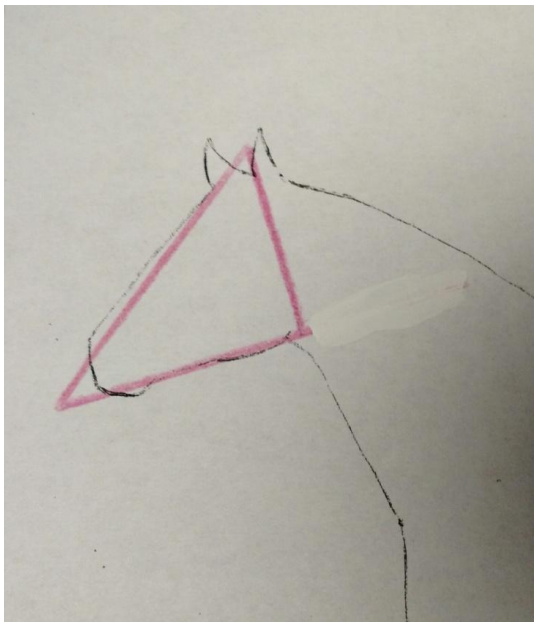
The Head

- 
- *consider breed*
- the shape of the head will be strongly influenced by breed standards
- this aspect of a horse's conformation has been strongly influenced by selective breeding over the generations
- for the most part, a horse's head doesn't affect his performance that much but it can affect his marketability
- there may be a minor correlation between head appearance and size, and ability and performance
- profile should be flat (with a few breed exceptions)
- the Arabian, in particular, is known for its dished or *concave* profile
- it is believed that this is an adaptation to reduce airflow resistance, thereby increasing aerobic endurance
- the Roman nose found in some breeds is a *convex* profile and is believed to play a role in warming air for horses coming from colder climates and also influences aerobic capacity

- the profile angle should match that of the shoulder and pastern
- 
- the horse's head is heavier in relation to its neck length than that of any other animal
- the average horse's head weighs 18 kg (40 pounds)
- *appearance:*
- the head should be proportionate
- this is critical as the horse uses its head as a counterweight for balance when it is moving
- head length is measured from poll to upper lip
- head length should be 2/3 the length of the topline of the neck
- 
- head length should be approximately 1.5-2X as long as the measure from the outside of the eyes across the face
-

- 

- a broad forehead will provide a large surface area for muscle attachments which help to open the nostrils
- the forehead should be:
- broad
- full
- flat
- viewed from the front, the head should be wide between the eyes, tapering to the muzzle (roughly diamond shaped)
- eyes should be:
- large and prominent
- well set on the side of the head
- the horse has more strongly developed monocular vision than it does binocular vision
- positioned 1/3 of the way down between the poll and the nostrils
- clear
- with eyelids of uniform curvature
- features should be well defined
- *dry head* refers to a head without a lot of excess flesh
- the head should be triangular viewed from the side

- 
- this gives room for the horse's sinuses, which takes up a good part of the interior of the horse's head
- the sinuses aid in lightening the head, which weighs approximately 18 kg (40 pounds)
- the sinuses aid in regulating body temperature
- other ungulates have the *carotid rete,* which keeps the brain cool during exercise
- the horse lacks a *carotid rete*
- the sinuses take on this role in cooling the head
- the lower jaw should be:
- well defined
- note that young horses (yearlings and 2 year olds) will often develop eruption bumps as adult teeth are emerging in the lower jaw
- clearly angled
- jaws should not be too narrow, otherwise poll flexion can be difficult
- larger jaws provide adequate room for muscular attachments
- traditionally, it was believed that one hand's breadth/4 fingers (7.2 cm) was needed in the intermandibular area near the junction of the head and neck
- a 2000 thoroughbred study of width-to-size ratio has *disproved* this as being necessary for a horse to have access to unrestricted airflow
- overly large jaws can make the head heavy, affecting the weight the horse has to bear on his forehand

- large jaws can make the head appear shorter
- the muzzle should be:
- tapering
- not overly fine
- the nostrils (nares) should be:
- large and able to flare
- small nostrils limit breathing
- small nostrils are often associated with a narrow jaws and muzzle
- not advisable for horses used in high speed activities
- even and the same size
- uneven nostrils could indicate paralysis on one side of the face
- the skin around the nostrils should be thinner and more pliable
- the cartilage around the wings of the nostrils help to keep them open when breathing
- lips should be:
- fairly thin
- the corners of the lips should be situated in a place where the placement of the bit will not come into contact with the teeth
- front teeth (incisors):
- bite meets evenly
- sound teeth
- regularly spaced
- ears should be:
- carried alertly
- proportionate
- finely pointed
- medium size
- situated just below the level of the poll
- positioned to allow ears to rotate forward, back and to the side
- *purpose of the head:*
- survival
- houses the brain
- which is approximately the size of a grapefruit
- provides sight
- provides hearing
- allows for eating and drinking
- allows for breathing

- horses are obligatory nose breathers and do not breath through the mouth
- allows for communication between:
- horse and handler
- horse and rider
- horse and environment
- horses are *flight animals* so react strongly in response to their environment
- aids in balance
- head and neck are used as a counterweight during movement
- *faults*:
- faults in the head may/may not be symmetrical
- lack of symmetry with some faults will make a fault worse
- lack of symmetry of bone structure can have a negative effect
- symmetry with other faults will make the fault worse
- faults affecting both eyes or both nostrils will have a very negative effect
- an overly large head will put extra strain on the forehand
- the horse will tire more easily and get heavy on the forehand
- disproportionately small head
- horse may lack ability to counterbalance
- *platter jaw*
- large, heavy jaws
- can unbalance or tire horse
- not refined
- adds weight
- can make it hard to flex at the poll
- *roman nose*
- convex profile
- can interfere with vision if excessive
- thought to be helpful in warming air via sinuses especially in northern breeds
- eyes:
- *pig eye*
- eye is too small
- can interfere with vision
- thought to be an indicator of poor temperament
- eyes too close together
- associated with lack of breadth of forehead
- may interfere with range of vision
- uneven eyes

- impaired vision of any kind
- missing eye could be
- congenital
- acquired
- ears
- *lop ears*
- low set, floppy ears
- although considered a conformation fault, can often be the sign of a laid-back horse
- *mule ears*
- overly long ears
- will not affect way of going
- purely cosmetic/aesthetic
- nostrils
- small nostrils
- limit ability to expand nostrils
- may interfere with ability to get adequate oxygen
- often associated with narrow jaw and/or small muzzle
- uneven nostrils
- may indicate paralysis of one nostril
- may interfere with ability to get adequate oxygen
- mouth
- brachygnathism of the mandible - overshot upper jaw aka *parrot mouth*
- front top teeth (upper incisors) extend past lower
- prognathism of the mandible aka *monkey mouth, sow mouth, bulldog mouth*
- overshot lower jaw - lower jaw is longer than the upper
- monkey mouth is less common
- both traits inheritable
- both are considered unsoundnesses
- both will affect horse's ability to graze and feed himself naturally
- small mouth
- corners of lips are too close to incisors
- bit and incisor teeth can interfere
- long mouth
- corners of lips are too far back
- bit and molar/wolf teeth can interfere
- fitting of certain bits and nosebands can be problematic
- large tongue
- can interfere with certain bits
- low upper palate

- can interfere with certain bits
- overly dished face
- can cause problems with draining of lacrimal ducts or tear canals

Throatlatch

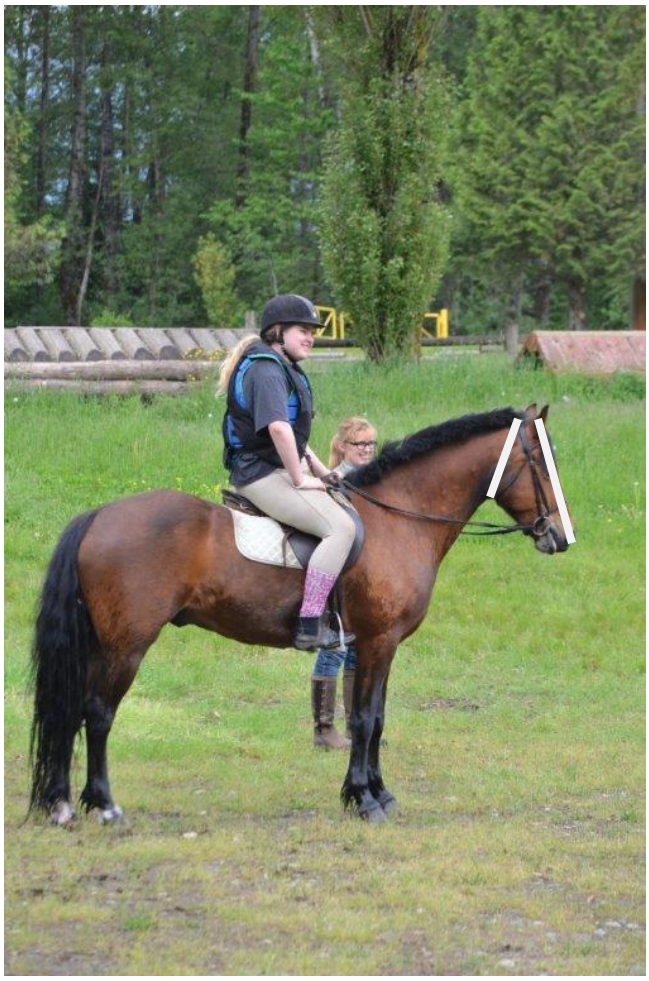
- *appearance:*
- clean
- dry head-to-neck connection
- trim
- measurement from poll to windpipe should equal measurement of length of profile
- well defined
- should be able to fit a fist between the branches of the jaws
- there should be adequate room for the larynx and the large muscular attachments
- this will allow the horse to flex at the poll and still breath
- *purpose*:
- capable of great flexion
- flexion at the poll has been implicated in 23% of cases of horses with impaired upper airway issues
- *faults*:
- an unyielding throatlatch is often correlated with a short, thick neck

Attachment of head to neck

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - Equine neck shape and attachment (0:46)

- the atlas (first cervical vertebrae; at the poll) allows for extension and flexion of the head at the poll
- this affects:
- balance
- ability to go 'on the bit'
- the angle at the atlas is very important
- it is one of the most important features of a horse's conformation
- acute angle:
- head and neck not well set on
- *cockthrottled* is an extremely acute angle
- this can result in compression of the larynx

- this can lead to respiratory insufficiencies
- the axis joint (second cervical vertebrae) immediately behind the atlas allows for lateral (side to side) flexion
- too much depth from ear to throat suggests commonness (lack of refinement) or jowliness



- the measure of the horse from poll to windpipe should be half to 2/3 the length of the head
- the horse who is too thick in the throatlatch will be hard to place on the bit
- the horse may tire easily

Neck

The way the horse carries its head is largely determined by how the horse's neck is conformed

- The length, position and attachment of the neck has a direct biomechanical effect on the horse's back
- *appearance*:

- measured from the axis (head/neck connection) and the middle of the front of the shoulder
- neck should be relatively long, in proportion with the body
- neck length should be 1/2 to 1/3 of the horse's total length
- measure neck from poll to withers
- 
-
- neck length is approximately the same as the hind leg length
- 

- the topline of the neck should be twice as long as the underline

- this allows for:
- a more sloping shoulder
- the withers to be well set back
- viewed from the top, the neck should be triangular

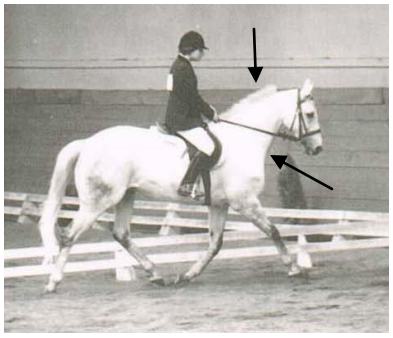
- the neck should be well muscled
- more of the muscling should be on the top and in the centre

- amount of muscling should match the use of the horse
- a long, more slender neck would be found in a racehorse
- a short, heavily muscled neck would be found in a draft horse or western horse
- a long length of neck with moderate muscling would be found in a dressage horse
- a moderate length of neck with heavier muscling would be found in a show jumper

- the neck will meet the head at a well defined throatlatch

- proportionately, the measure from the poll to the jugular groove should be equal to the measure from the poll down 2/3 of the horse's face
- neck size as defined by throatlatch circumference compared to circumference at base of neck is an indicator of strength

- the jugular groove should be well defined
- the trachea should be well defined
- the base of the neck will attach onto the body high up on the chest
- the underline of the neck should be straight
- the shape of the topline will be determined by the use of the horse
- a racehorse or hunter would have a flatter topline
- the horizontal neck is flexible, well weighted and balanced
- it is aligned with the forward movement of the body
- it is advantageous in almost every discipline
- a dressage horse will have a more arched topline

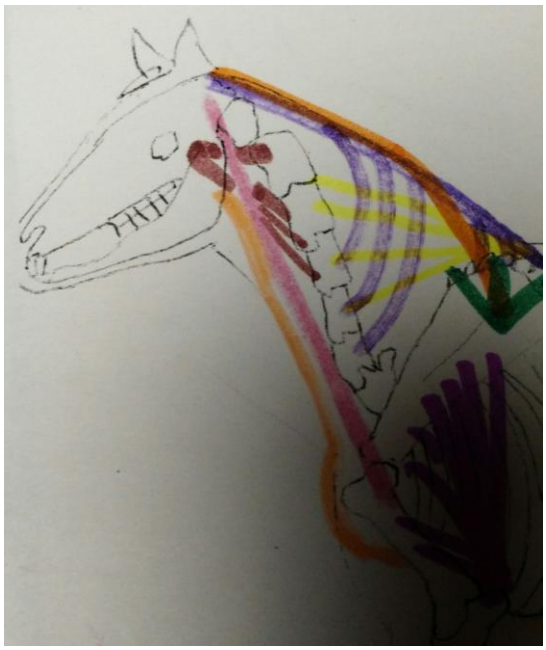


- the arched neck is aka *'turned over neck'*

- the crest is convex
- the neck is well muscled
- it has proportionate development of muscles
- this make a more efficient lever for manoeuvring
- it improves the swing of the shoulder
- it helps elevate the shoulder and body
- it activates the back, aiding in engagement

-
- the jumper also needs good muscling in his neck for the same reasons
- the crest is convex
- the neck is well muscled
- it has proportionate development of muscles
- this make a more efficient lever for manoeuvring
- it improves the swing of the shoulder
- it helps elevate the shoulder and body
- it activates the back, aiding in engagement
- *anatomy*:
- the neck is built around the spinal column, which starts at the poll and then loops down to join the torso at the base of the neck
- the cervical vertebrae allows motion:
- side to side
- up and down
- extending forward
- the rest of the neck is primarily muscles and ligaments
- the brachiocephalic and trapezius muscles pull the forearms up and forward when the horse is jumping

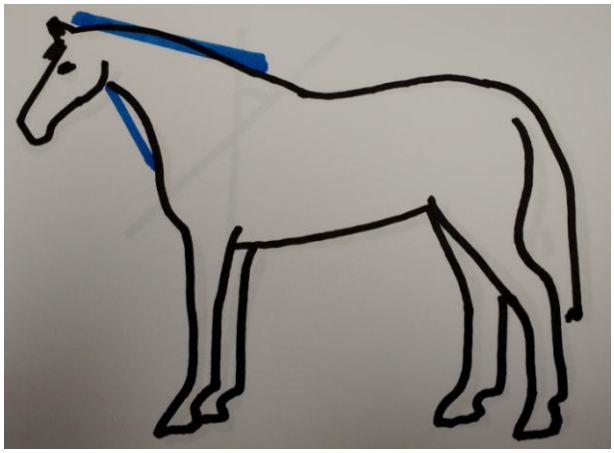
- the serratus ventralis and rhomboid are important in lifting and extending the foreleg
- the sternocephalic and brachiocephalic muscles help to flex the neck and extend the legs
- the scalenis muscle helps the horse to telescope the neck, lightening the forehand



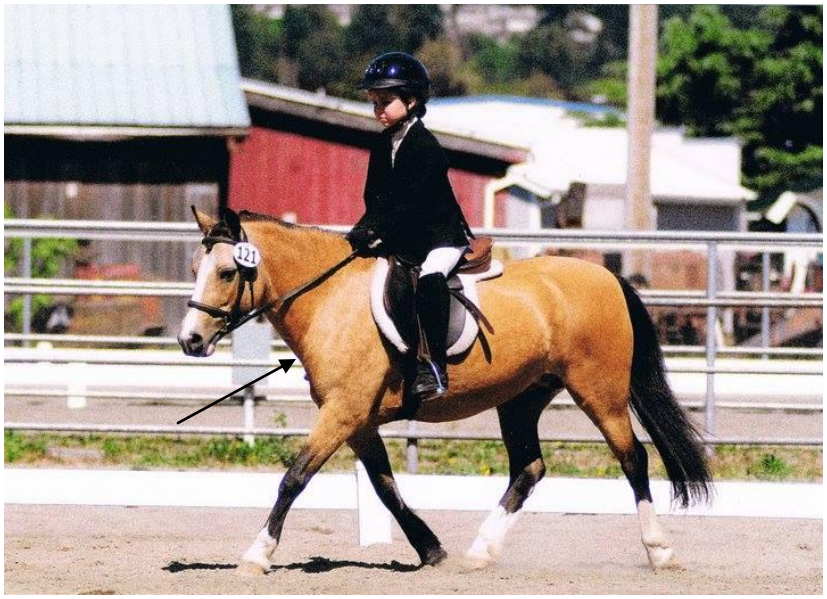
- *purpose*:
- horses use the head and neck as a counterweight for balance
- the racehorse can use its head and neck as a piston to increase and maintain speed
- the neck has an influence on the horse's ability to raise the back
- the neck influences the swing of the shoulder
- the neck has a high degree of flexibility
- the length of the neck will determine the horse's function
- length of neck is needed for dressage
- muscularity of neck is needed for show jumping
- the height of the attachment of the base of the neck to the body will help to determine lightness
- *action*:
- a long neck is directly correlated to a long stride
- the long muscles in the neck aid in bringing the foreleg forward
- long necks are associated with high scores for movement in conformation examinations (Holmstrom & Philipsson, 1993)

- the resultant high movement scores are associated with good overall orthopaedic health (n=195) (Holmstrom & Philipsson, 1993)
- a neck that at the base ties in higher to the body is correlated to:
- higher action in the front

-
- increased collection
- increased elevation



- there is a correlation between the length of the bottom of the neck and front end soundness
- for every 10 cm increase in measure of bottom line of neck, the odds of having an effusion to the front fetlock increased by a factor of 5.1
- this is due to a longer measure indicating a lower tie in to the body which results in less lightness which in turn influences soundness
- a neck that ties into a well set back wither will help to:
- raise the back
- improve the stride
- *faults:*
- *ewe neck*
- the spinal column dips lower than normal where it meets the body
- this results in the appearance of a dip in front of the withers
- limited athletically
- minimal flexion at the poll
- creates a high head position
- horse often goes in an inverted frame
- this results in a horse that is hard to get on the bit
- *do not* confuse an underweight horse with a high wither with a horse that has a ewe neck; look at the base of the neck, not the top
- *cresty neck aka studdy neck*
- typically seen in stallions, or geldings who were castrated at a later age, ponies and draft horses
- causes more weight on the forehand
- can be caused by overeating
- thick upper neck
- broken crest aka *lop neck*
- this neck has been weakened
- can often be seen on horses and ponies that have gained and lost an enormous amount of weight
- short neck
- less than 1/3 of the length of the horse
- horse will be prone to stumbling
- it will be heavy on the forehand
- it will hinder balance
- it will reduce agility
- associated with steeper shoulder angle

- there is a correlation between stride length at gallop and neck length, so a horse with a short neck will have a shorter stride at gallop
- short, thick, low set neck aka *bull neck*
- associated with
- short stride
- horse going heavy on the forehand
- can get out of balance when being ridden
- good for pulling in harness
- associated with a straighter shoulder
- low-set neck
- base of neck ties in low to chest
- associated with a heavier forehand and a straighter shoulder
- 
- overly long neck
- hinders balance
- horse fatigues more quickly
- horse carries greater weight on his front end
- may be prone to developing *wobbler's syndrome* aka Cervical Vertebral Stenotic Myopathy
- muscles are more difficult to develop
- the horse needs wide withers to help support a longer neck
- can create an 's' cure in the neck rather than an arch when the horse is on the bit
- this can cause the horse to fall in more and be harder to balance

- swan neck
- set at a high upward angle
- often associated with a dip in front of the withers
- hard to get on the bit
- knife neck
- long skinny neck
- poor muscle development top and bottom
- usually associated with a straight crest
- often rider induced, or seen in aged or young, green, immature horses

withers

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - withers (0:29)

The withers of the horse are very extensive compared to those of most other species

- *anatomy*:
- the withers arise from the upper part of the spinal column (the spinous processes, which in the case of some tall horses, can be 18" long) and the top of the scapulas
- the withers are composed of the 7th to 10th dorsal vertebrae
- the highest part of the withers is formed by the 2nd and 3rd spinous processes
- the nuchal ligament and a series of other ligaments and muscles are attached to the summits of the scapula to form the withers
- *appearance*:
- the withers should be well defined
- 

- the withers should be of good height, but not so much that they interfere with the saddle
- the withers should be the highest point of the back
- not too sharp
- the withers should be set back
- this ensures the rider is not directly over the front legs, allowing for a smoother ride, less jarring
- there should be a long length to the withers
- the withers should be well covered with muscles
- *purpose*:
- the withers are important attachments for tendons and ligaments that extend the head, and neck, also involving the shoulder and back
- the withers are the insertion point for the muscles that attach to the ribs to help the horse breath
- the withers act as an anchor for the tendons and ligaments to:
- extend the head
- help raise the head
- help raise the back
- help attach the muscles of the scapula to the body
- a prominent wither will help to keep a saddle in place
- *action:*
- there is a direct correlation between well conformed withers and good movement (a long stride)
- this is a strong correlation between well conformed withers and the horse's ability to raise its back
- *conformation faults*:
- *mutton withers*
- flat, low, thick, heavy withers
- short spines projecting off the 8th to 12th vertebrae
- can make it hard for the saddle to stay in position
- also hard to fit a harness
- can result in a horse that:
- is less mobile in the shoulder
- has less range of motion
- has a shorter stride
- has a harder time lifting the back
- negatively affects collection
- overly prominent withers
- 8th-12 thoracic vertebrae are long and angled back
- commonly seen in thoroughbreds, Saddlebreds, some Warmbloods

- this fault is purpose-bred into some horses as it has advantages:
- associated with a sloping shoulder
- easier to engage in collection
- easier to lengthen
- easier to round back for jumping
- easier to extend the shoulders to improve the stride length and speed
- acts as a lever for the muscles of the back and neck
- can put more stress on the croup
- will cause saddle fit issues
- often associated with slab-sidedness
- hollow behind withers
- this is a shelf behind the withers
- provides a less developed muscle bed for the saddle
- the saddle can bridge here and pinch the withers
- created by lack of muscular development
- associated with high withers
- caused by horses that trot fast with their head high (Standardbreds)
- fractured withers
- acquired; caused by trauma
- broken spinous processes
- appearance of withers can be low, uneven or unstable
- initially painful but many horses can return to regular work with adequate time off to allow bones to repair
- appearance of withers can be permanently flattened
- may interfere with horse's ability to raise and lower head and neck
- *loaded shoulder*
- low, thick withers
- limits movement
- trouble with saddle fit

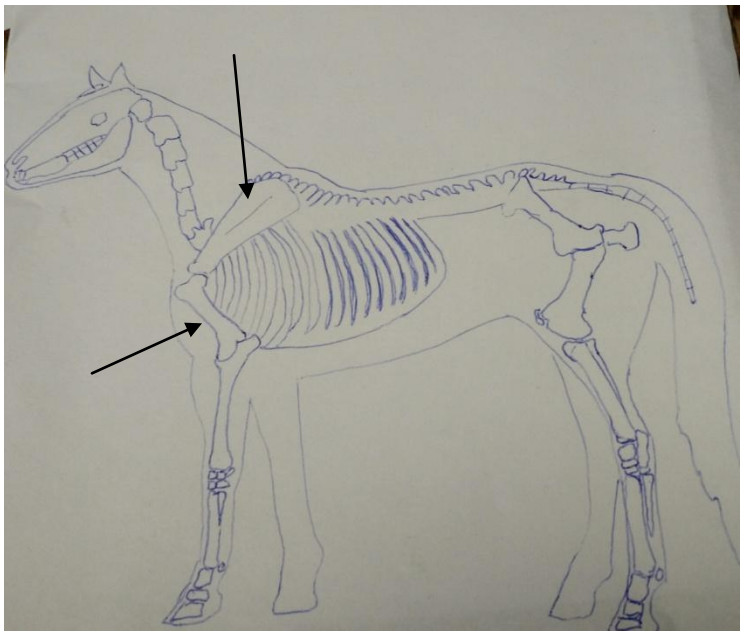
shoulder

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - Measuring the equine shoulder (0:59)

The shoulder is crucial to the soundness and athleticism of the horse

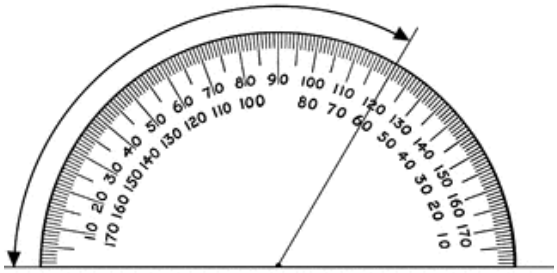
- it is closely related to the proportion of the neck and back
- *anatomy*:

- the shoulder is composed of the scapula and the humerus

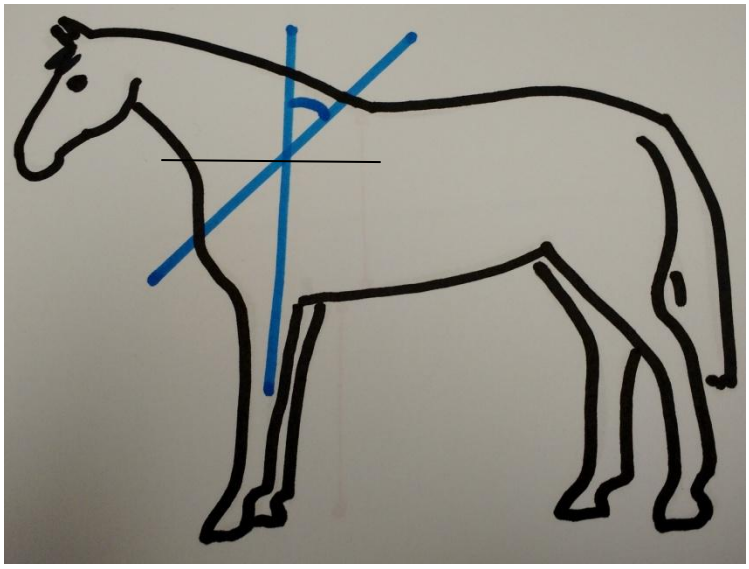


- it is covered with heavy muscling

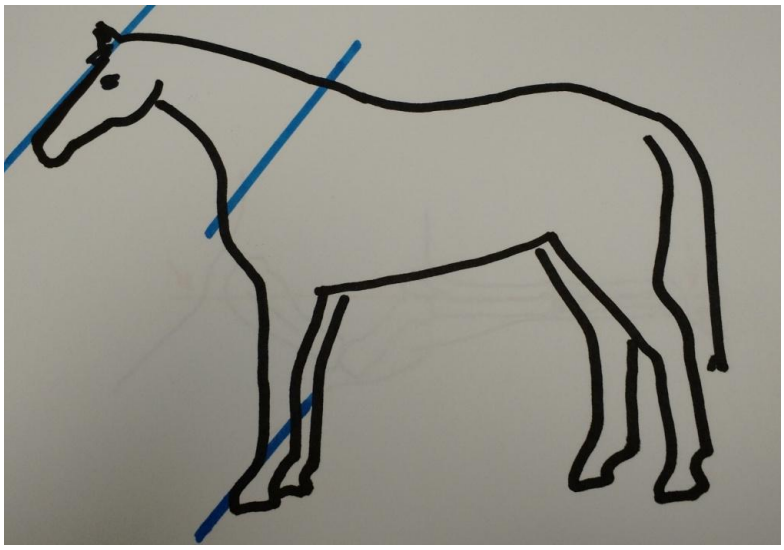
- the triceps are situated right behind the scapula
- they extend the elbow
- the horse rotates the scapula back under the saddle flap
- the fore legs push the horse off of the ground when jumping similar to how a pole vaulter uses a pole when jumping
- the shoulder is not attached to the horse's torso by bone
- the horse has no collar bone
- it forms a *synsarcosis*
- it is attached only by muscle

- the torso is suspended in a sling of muscles and ligaments between the left and right scapula
- the shoulder blade is aka the *scapula*
- the scapula is typically measured three ways:
- 1. *the **length** of the scapula*
- measured from the top of the withers to the point of the shoulder
- the longer the shoulder the more attachments of muscles available
- for every 10 cm increment in scapular length, the odds of sustaining a fracture of the carpus decreased by a factor of 1.97
- 
- 2. *the **slope** of the scapula*
- 
- measured from the top of the withers to the point of the shoulder
- compared to the line of the horizon
- slope can range from 40-60+ degrees
- the majority of horses are 45-55%

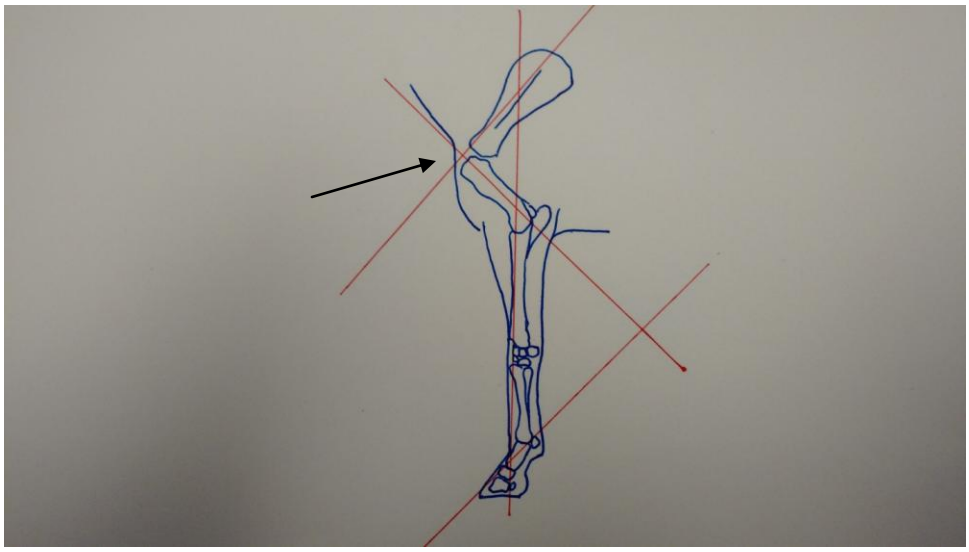
- 45 degrees is considered a *laid back shoulder*
- 48 degrees is typically considered ideal for the average horse in most references; however, recent research is challenging these measures
- 55 degrees was previously considered upright

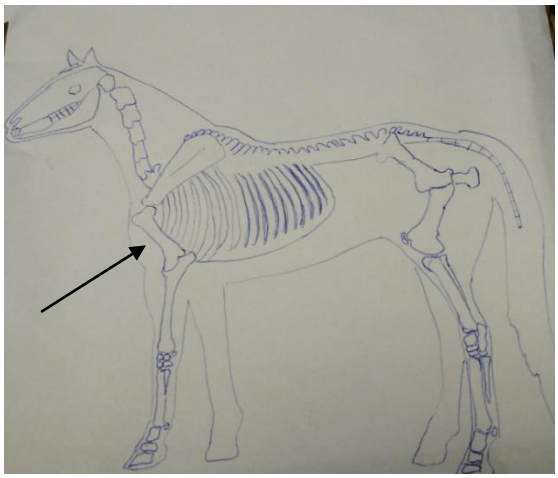


- the angle of the shoulder should match the angles of the
- pastern
- head in profile



3. *the angle at the point of the shoulder*
- measured at the junction of the scapula and the humerus

- 90 degrees is average
- less than 90 degrees = closed
- this results in an increased stride length
- there is more room for the horse to tuck its legs when jumping
- more than 90 degrees = open
- this results in an increased frequency and intensity of concussion
- this horse will have more knee action
- *this trait should not be considered in isolation as it is so closely influenced by the length of the scapula and humerus*
- 
- can range from 80-120 degrees in the outside parameters
- less desirable if there is an upright shoulder
- no other combination of traits can nullify the short -stridedness that results
- the humerus is stronger and shorter than the scapula
- it allows for many points of connection for muscles
- it serves as a leverage point for the muscles of the front leg that attach near the elbow
- the humerus should be 50-60% as long as the scapula
- the higher the number (between the above noted 50 and 60%, within reason) the more scope and the greater reach and arc for lateral movement
- too long is +60%
- the movement of the forearm becomes decreased as the shoulder muscles become stretched

- 

- the humerus becomes too horizontal if it's too long
- a horizontal humerus limits elbow movement
- this causes the horse to *'stand under himself'*
- this puts too much stress on the forelegs
-

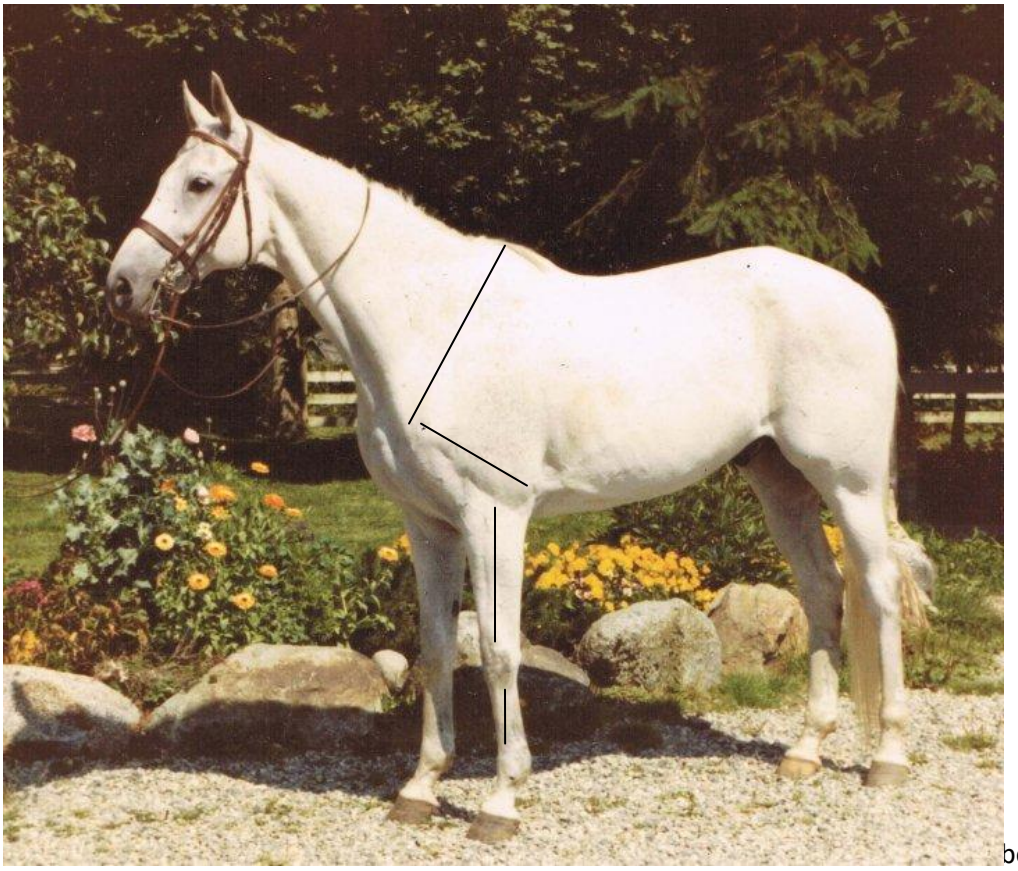
- 

- too short is less than 50%
- this also causes the humerus to become too horizontal
- the shoulder angle becomes less than 90 degrees
- the horse, viewed from the side, has the appearance of no chest
  his with legs out in front

- this can commonly be seen in Quarter Horses
- this decreases scope
- it creates a choppy stride that results in more concussion
- the horse has a decreased ability to do lateral work
- extremely short is less than 45%
- this creates very stiff and stilted movement
- the shoulder joint is a ball and socket joint
- its the only joint in the thoracic column capable of side to side movement
- the angle at the point of the shoulder is 85 degrees for the average horse
- 80% of horses are left handed and therefore the left shoulder is slightly further back in most horses with better muscle development on the top of the scapula
- *purpose*:
- the scapulas and muscles help to suspend the horse's torso in a sling
- this aids in reduction of concussion to the forelegs
- acts as shock absorber
- increases the area of attachment and length of muscle
- directly influences stride length, direction of movement and smoothness of gaits
- the horse can reach further and with a longer stride
- allows for lateral movement
- helps avoid concussion
- *appearance*:
- the shoulder should:
- approximately match the angle of the pastern and the profile

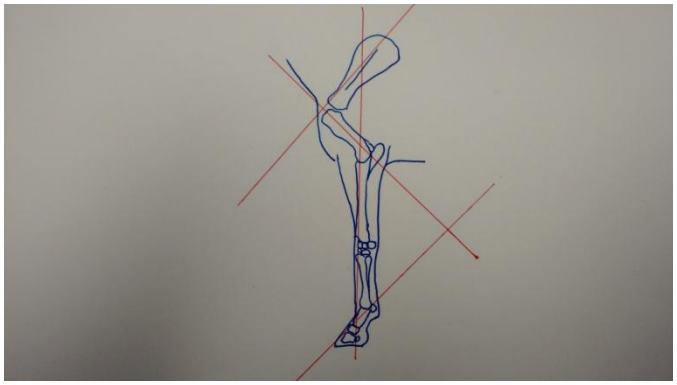
-
-
- be well developed
- be strong and appropriately muscled for the chosen discipline
- be long

- a long sloping scapula, short upright humerus, long radius/ulna, and short cannon are considered ideal
- this results in:
- longer stride
- freer stride
- greater range of motion
- less concussion on tendons, ligaments and bones
-



be

- sloping
- remember, there are two important angles regarding the shoulder:
- 1. the angle of the *length* of the scapula
- 2. the angle of the *joint* of the scapula and the humerus
- a sloping scapula will
- rotate further back
- allow the foreleg to reach farther forward
- allow the foreleg to reach farther upward
- this is very important for jumpers
- a straight scapula will

- restrict the range of motion
- restrict the length of stride
- encourage higher knee action
- produce more concussion
- result in a rougher gait
- slope can be measured by drawing a line from the top of the withers to the point of the shoulder blade
- a plumb line is then dropped to the ground
- the angle of the shoulder blade determines the length of stride and the range of motion of the joint
- 
- slope of the shoulder for an average horse is 48 degrees according to most reference books
- more recent studies have noted the following angles:
- thoroughbred race horses 55-70 degrees
- elite show jumpers 64-77 degrees with an average of 73 degrees
- less than 45 degrees = shorter stride
- this is often accompanied by a longer back
- 90 degrees at the point of the shoulder is the intermediate optimum
- less than 90 is considered *closed*
- more than 90 is considered *open*
- 105 degrees at the shoulder joint angle for elite jumpers

Action:

- a long, sloping scapula allows the scapula to provide:
- greater shoulder rotation
- greater forearm rotation
- this results in a:
- greater length of stride
- lower, more rounded action

- shoulders can tilt to allow for lateral movement
- different combinations of limb lengths and angles produce different movement
    - sloping shoulder + open shoulder angle + long humerus = dressage horse
    - sloping shoulder + closed shoulder angle + long humerus = an all around horse
    - upright shoulder + open shoulder angle + long humerus = jumping
    - upright shoulder + closed shoulder angle + short humerus = choppy gait
- elite dressage horses and show jumping had more sloping scapulas than other horses
- *Faults*:
- too much muscle overweighing forehand
    - reduces freedom of movement
- steep shoulder
    - reduces stride
    - increases impact on ground
    - steep shoulder = withers further forward resulting in shorter neck and longer back
    - higher knee action
- short scapula
    - results in shorter attachments for muscles
        - this results in a shorter stride
        - hastens muscle fatigue
        - greater risk of injury to forelegs
        - often associated with an open shoulder joint, set low
            - this horse cannot fold its knees up over fences
            - this horse will be able to accelerate more easily
- excessively sloping shoulder
    - angle of 40 degrees +
    - functional
    - not prone to lameness
    - creates issues with saddle fit
        - impingement of scapula
    - more desirable to fit with a harness
- very upright 60 degrees
    - does not create unsoundness
    - less elasticity
    - more concussive stride
    - stress
- a neck that ties in low usually results in a straighter shoulder=shorter stride
- shoulder angle influences the look of a horse's neck

Chest

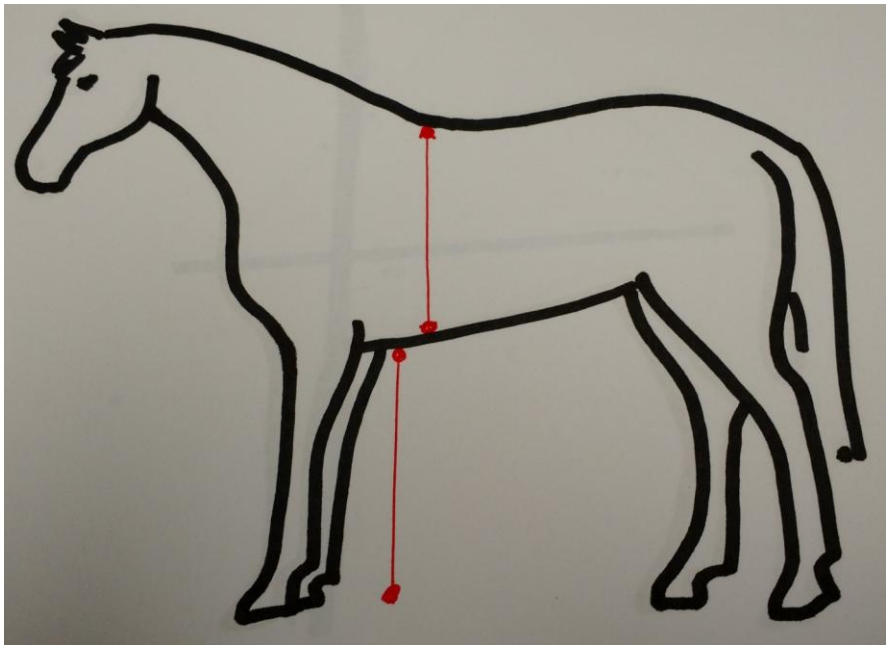
- *purpose*:
- the chest houses important internal organs such as the heart and lungs
- the shape of the chest plays a key role in front leg movement
- the forelegs emerge from the base of the chest
- there is a direct correlation between chest size and foreleg conformation and alignment
- the muscling of the under part of the chest is important in powering movement
- *appearance*:
- wide and full

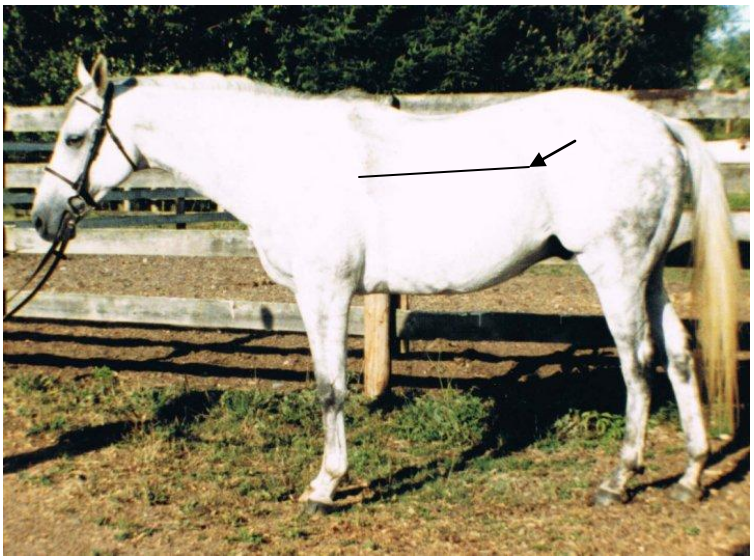
- width of the chest should be measured from point of shoulder to point of shoulder

- this should leave a gap of about one hand's breadth between the forelegs for an average sized horse
- allows for more room for muscular attachments
- viewed from the front, the chest should be wider at the bottom than at the top
- deep aka *barrel chest*
- well muscled
- an inverted 'V' should be apparent at the base of the chest (between the forelegs) in the pectoral muscles
- allows horse to be handy
- should appear vertical from the side and tie into the neck high
- the chest should be well defined and NOT blend into the neck
- base of the neck should attach to the body high enough for the chest to be distinctly visible below
- *faults*:
- too wide
- movement becomes waddling and unathletic
- may paddle
- can develop a rolling gait
- this wastes energy
- this decreases speed and agility
- too narrow
- not enough room between shoulders, providing less room for heart and lungs
- legs emerge from the body too close together
- interference can be an issue
- may be base wide
- this can interfere with balance and ability of horse to bear enough weight
- a narrow horse is an advantage when speed is a consideration
- a horse can be narrow because of:
- immaturity
- inadequate nutrition
- poor body condition
- lack of consistent work
- many of these faults can be improved with:
- time
- good nutrition
- conditioning
- prominent sternum aka *pigeon breasted*
- long shoulder that drops from a low point of shoulder causing the humerus to be almost horizontal, with the elbow set far to the rear

- often goes with a poorly balanced horse whose forefeet are set back too far under him
- often associated with a flat chest
- decreases efficiency of stride
- decreases swing of the shoulders
- hastens fatigue
- can cause a rolling gait
- this can be wholly or partially caused by:
- poor shoeing
- caudal heel pain

Heartgirth and thorax

- *heartgirth = thoracic perimeter*
- the measurement around the horse's barrel, where the saddle and girth would sit
- should be close to 2 m (6') in a full sized horse to provide for adequate heart and lung room
- the measure of the horse from ground to elbow should be equal to the measure of the horse from the elbow to the withers
- a measurement can be taken when a foal is approximately a week old that will roughly approximate its adult height
- measure the foal from ground to elbow, and then double that
- 
- ribs

- most horses have 18 pairs of ribs
- can range from 17-19 pairs
- thoroughbreds and Arabians typically have more ribs
- this creates a shorter lumbar vertebrae area
- this results in a stronger coupling in the loin
- male horses should have a well developed sheath
- *appearance*:
- needs to have depth
- depth refers to the vertical distance from the lowest point of the back to the bottom of the abdomen
- this indicates strong abdominal muscles
- this is important for speed and strength
- allows the horse to engage
- allows the horse to carry weight
- ribs need to be *well sprung*
- *well sprung ribs* = rib cage is rounder
- greater thoracic width
- the measurement (viewed from the front) of the most prominent parts of the costal cartilages
- there is more space between the ribs
- offers more room for heart and lungs
- this is a good feature for endurance
- commonly seen in thoroughbreds and Arabians
- ribs should be long
- ribs need to be spaced well back
- 

- if the last rib is approximately one hand's breadth from the point of hip, the back is well supported
- this is referred to as *well ribbed up*
- the belly should be proportionate to the horse's size
- size of the belly can be affected by too much/too little feed and/or work, being in foal, having had multiple foals, and carrying a heavy worm-load
- muscle groups in the torso known as the ring of muscles or circle of muscles aid in creating each stride
- the rectus abdominus, in particular, helps:
- round the back
- flex the loins at the gallop
- *function*:
- ribs house and protect the internal organs
- ribs can flex up and down slightly to allow for breathing
- this is possible due to the costal cartilage and the flexibility of the rib bones
- *faults*:
- *shallow heartgirth*
- restricts heart and lung capacity possibly decreasing endurance
- *slab sided*
- ribcage is flatter, offering less room for the heart and lungs
- this horse is often a poor doer
- typically has less stamina
- associated with poorly developed abdominal muscles
- associated with weaker loins
- this horse will be less able to carry weight well as there is a reduced base of support
- the narrowness of the horse may make it difficult for the rider to put the leg on effectively
- a slab-sided horse will often have good lateral flexibility
- *shallow flank/herring gutted/tucked up/wasp waist*
- angular, narrow waist
- decreases room for digestive organs
- not to be confused with a horse that is underweight
- limited development of abdominal muscles
- can be the result of poor riding
- often associated with short rear ribs
- often associated with a poor doer and horse that is of a nervous temperament

Back

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - Back and loin (0:31)

The back is the key to performance in the sport horse

- the back transmits *nervous impulses* out to muscles and limbs via the spinal column, and transmits *power* to the front from the horse's muscular hindquarters
- it acts as a bridge between the forehand and the hindquarters
- it is like a suspension bridge with levers at either end
- front lever: neck nuchal ligament and neck muscles raise the back
- back lever: hind limbs and abdomen work the SI joint to raise the back
- it serves a similar job to a transmission in a vehicle
- it is one of the most important features involved in movement
- the back is sometimes referred to as the *'fifth leg'*
- a sore back is an occupational hazard for jumpers
- 
- *anatomy*:
- the vertebral column has very limited flexibility, much less than in most other animals
- the neck (cervical vertebrae) is highly flexible, but the back from the thoracic to the sacral vertebrae has limited flexibility
- the nuchal ligament helps with balance
- *appearance*:
- the back should be approximately 2/3 as long as the neck

- the function of a long back is to promote forward movement

- should be strong and well muscled
- should be:
- flat

- pliable
- loose
- supple
- the length of the back should match the type of work being done

- draft horses need a short back
- racing thoroughbreds and riding horses do better with a slightly longer back
- a longer back will result in an increase in lateral bending, particularly through the thoracic vertebrae (Johnston et al, 2002)
- *purpose*:
- the loin and back carry the weight of the rider and lift the forehand
- nervous impulses are transmitted via the spinal column
- power is carried forward from behind
- *faults*:
- rough and bony
- kissing spine
- impingement of the dorsal spinal processes
- usually an acquired problem
- this is thought to occur in 39% of horses
- long back
- measured from the peak of the withers to the croup, exceeds 1/3 the length of the body
- associated with:
- weak loins
- sway back
- disadvantages:
- a long back is harder for a horse to stiffen
- a back needs rigidity for the rapid development of speed
- a long back makes it harder to coil loins and engage the hindquarters
- this will negatively affect upper level dressage
- this will force horse to jump flatter with less bascule
- a long back is harder to muscle up
- more likely to fatigue
- the loins and hindquarters may not track directly behind the forefeet, and swing more, especially on turns
- this can result in cross firing and speedy cutting
- positives:
- a long back is more flexible, particularly in the thoracic vertebrae
- movement of the back will be flatter and quieter
- lead changes will be easier
- if coupled with a strong loin, then can contribute to:
- more scope

- greater amplitude of movement
- short back
- can be rigid
- hard to bend
- can be less smooth or springy
- advantage:
- may be more handy
- may enable more thrust and collection
- *sway back*
- span dips noticeably in centre
- inverted
- a weak back
- may be congenital, or may be the result of poor riding/allowing the horse to travel incorrectly
- extreme congenital sway back is referred to as *hyperlordosis*
- often associated with:
- long back
- weak back ligaments
- high croup
- narrow loins
- if the loins are narrow, the horse will drop its back due to weak ligaments
- sway back puts the rider behind the centre of gravity (COG)
- this interferes with balance
- the horse will be unable to elevate
- the horse will not be able to achieve rapid impulsion
- rapid impulsion requires a more rigid, better supported back
- a swayback makes it difficult to transmit power from the back to the front
- a swayback can cause saddle fit issues
- the swaybacked horse can be more susceptible to soft tissue-related back pain
- *roach back*
- upward deviation or curvature of the spine, particularly in thoracic and lumbar region
- may make the horse more susceptible to spinal arthritis or neurological complaints such as shivers
- can make it hard to fit a saddle
- can make it hard to coordinate and collect
- can make the horse more susceptible to spinal arthritis
- roach back can be:
- congenital

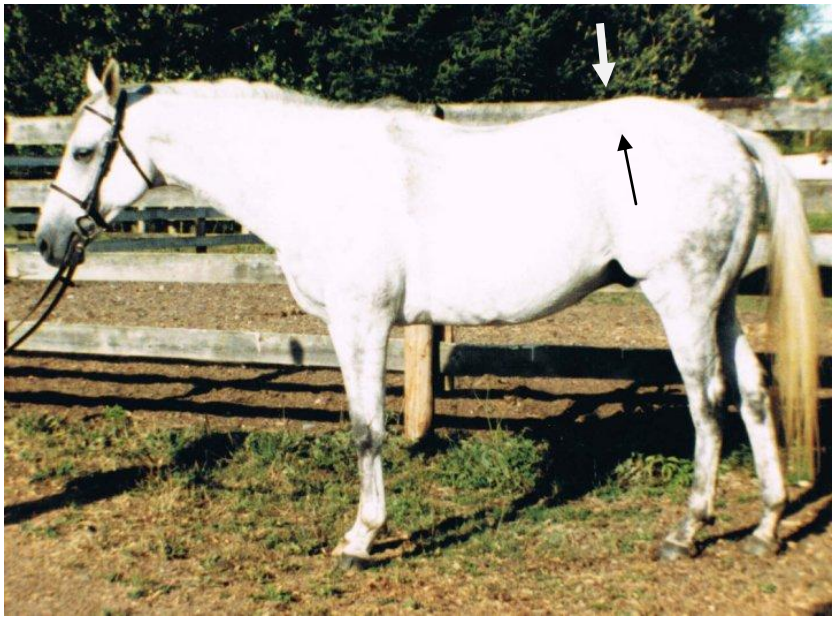
- caused by injury
- associated with short back
- due to malalignment
- associated with:
- a less developed loin muscle
- poor strength, breadth and substance
- horse will take shorter steps
- *cold backed* horses often are found to have an abnormality in the back behind the withers region when viewed from above/behind
- weak back
- a combination of poor muscling and poor skeletal support
- horses use the muscles in the lower abdomen for support instead
- eventually the horse tires, falls on the forehand, becomes strung out
- the horse passively tenses the nuchal ligaments in the topline, which can carry weight for a long time
- movement becomes:
- restricted
- unsteady
- sways
- hollow
- rocking
- this leads to pain
- this pain causes the horse to stiffen further
- horse tenses back muscles
- lactic acid build up causes pain and horse drops back
- cycle repeats
- *horses with back problems are often reluctant to lie down, so that will shorten their working life*

Loin

- *anatomy*:
- the loin is not supported by any bony structures, only the spine and muscles
- the loin is that area between the last rib and the point of the hip

- 

- the lumbosacral (LS) joint is located between the last lumbar vertebrae and the ilium
- ideally the LS joint is located directly above the hip bone

- 

- *purpose*:
- the loin connects the thorax with the hindquarters
- it is the pivot point of the horse's back

- this is where the horse's bascule arises from
- this allows power from the forelegs to be carried forward
- it aids in balance
- the loin helps to, in conjunction with the back, carry the weight of the rider and lift the forehand
- *appearance*:
- elastic
- well muscled
- strong
- short
- confusion arises when a horse is observed to have a long back
- if, in fact, the horse has a long loin, that is worse than a long back, as the loin is very poorly supported
- the measure to determine loin length should be:
- from last rib to hip bone
- ideally should be 1-1.5 hands width
- wide/broad
- the amount of subcutaneous fat will alter appearance
- *fault*:
- *hunters bump*, prominence of the tuber sacrale, part of the pelvis
- 1. due to injury caused by the horse either slipping or making a big effort with his hind end
- can result in tearing of ligaments and partial dislocation
- if caused by injury, can be problematic
- 2, due to long dorsal Ilium
- if not associated with an injury, then does not tend to be a problem
- weak loin
- associated with herring gutted/wasp-waisted
- lacks drive
- long loin
- associated with long back
- a long loin is weak, especially when combined with a long/weak back
- can be harder to track up
- can be harder to collect
- can have coordination and balance problems
- may be more prone to development of wobblers syndrome if combined with a long neck
- roach back
- upward deviation of the spine where back and loins join
- see pp. 55-56 for more information

- LS joint placed too far back
- should be situated directly above hip bone
- the further back the LS joint is located, the weaker the loin is
- long, weak loins are often associated with:
- flat croup and high quarters
- ability of horse to get hind legs under him is inhibited
- this negatively impacts ability to jump and go uphill
- ability of horse to distribute weight to hind end is inhibited
- horse unable to coil loins
- horse will move with a stiffer back and flattened LS joint
- horse may travel with hind legs trailing
- weak coupling aka *widow's peak*
- foremost part of croup has a hollow area
- cosmetically displeasing
- may have minimal effect on ability to collect if accompanied by ample
- muscling
- kissing spine

Hindquarters

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - pelvis and croup (0:35)

Hip and croup

- the horse is a *'rear engined'* animal
- all his power comes from the hind end and is transmitted forward via the loins and back
- there are three dimensions that are most important when considering the hindquarters:
- 1. length of croup from loin to tail

- 2. width of quarters, measured from stifle to stifle
- 3. depth from the top of the croup down to the hock
- we refer to this as *well let down*

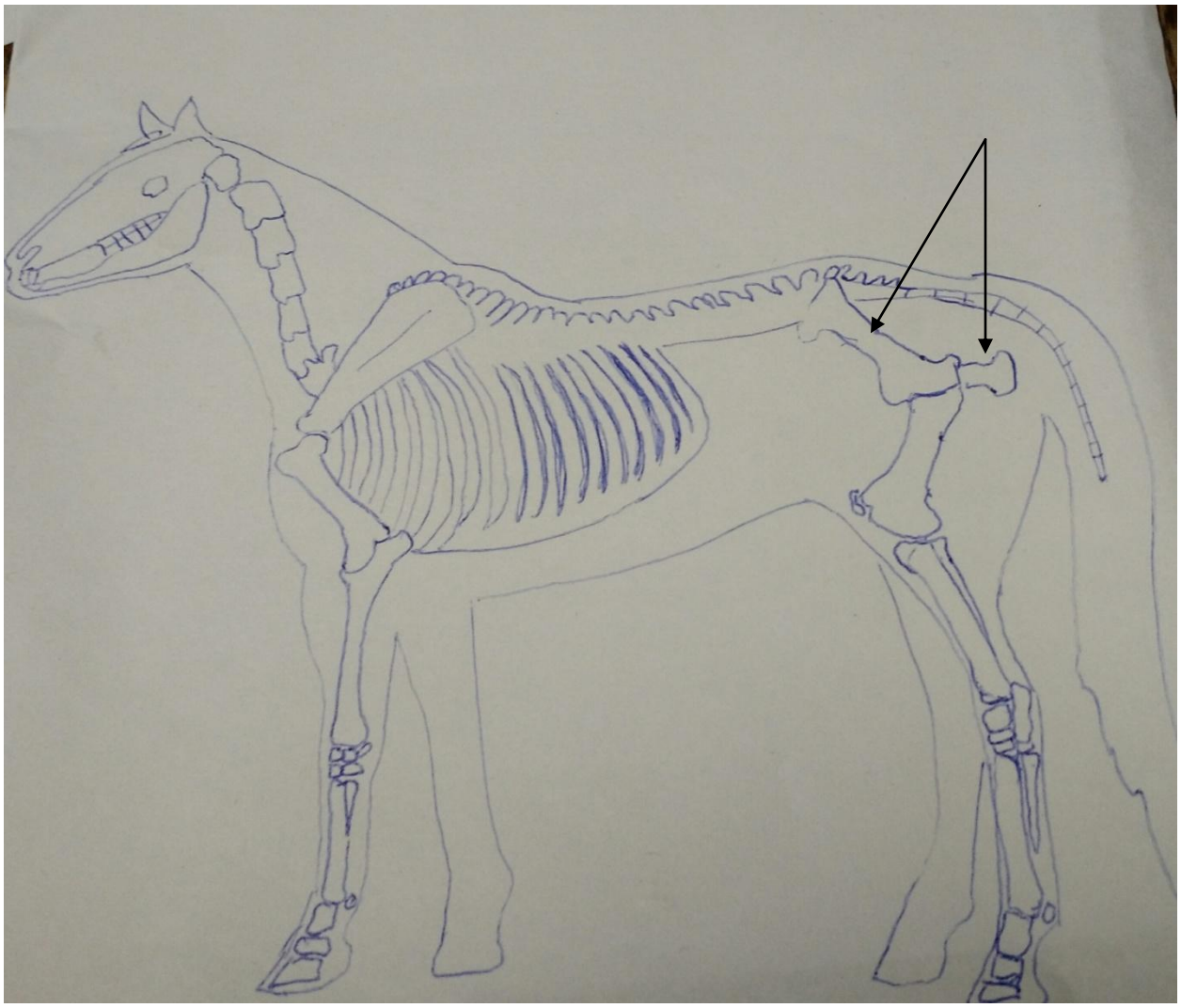
- other important measures include:
- 4. hip to point of buttock

- 5. hip to stifle

- 6. ischium to stifle

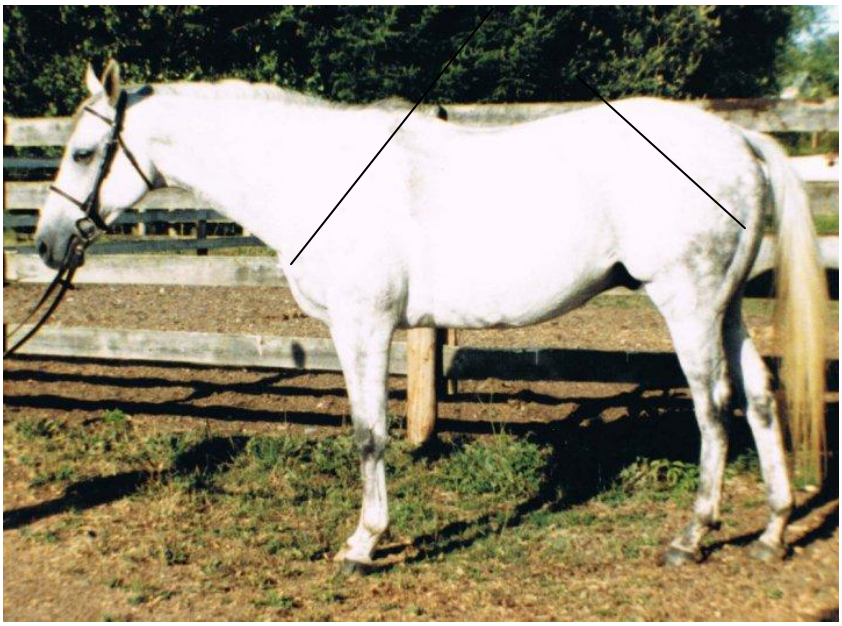
-
-
- 7. length of buttock (central buttock) to beginning of tendon/end of muscle
- 8. stifle to hock
- overall, the hindquarters should be:
- well muscled

- the quadriceps femoris are the most strained muscles when doing collected work
- wide viewed from behind
- long, measured from:
- hip bone to point of buttock
- hip bone to hock
- proportional
- well shaped
- the hip:
- typically when we refer to the hip we are discussing that part of the horse's hindquarter, viewed from the side, that measures from the hip bone back to the point of buttocks (this is the horse's pelvis, which consists of three bones fused into one, the ilium, and pubis and the ischeum)



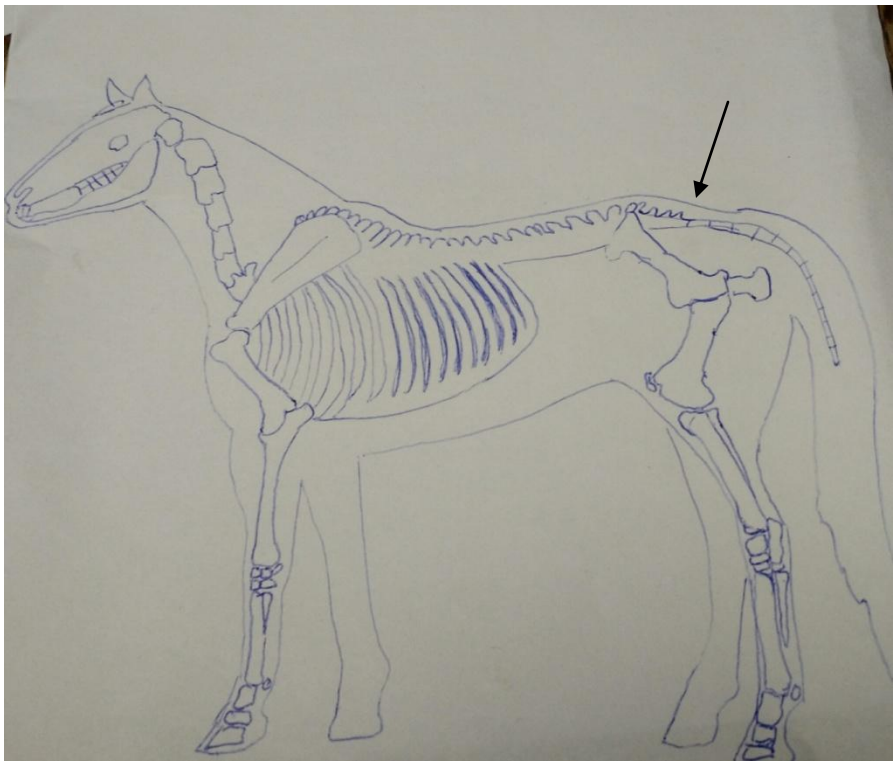
- there is a lot of rotation in the horse's pelvic angle when it is in motion
- depending on the discipline the horse will be used for, the location of the hip is better situated low for strength in an under saddle horse, according to Dr. Deb Bennett, while Dr. Danny Marks has observed that a higher hip bone is more commonly seen in elite jumper horses
- length of the hip is critical to the horse's athletic ability
- 
- the hip should be the same length to 2/3 as long as the horse's back
- the hip should be relatively wide and well muscled above (across the loins)
- the hipbone should be situated directly below the LS joint
- the further forward the hipbone is, the longer the bones of the hindquarter will be, which results in more strength

- the slope of the hip should roughly match that of the shoulder for balance

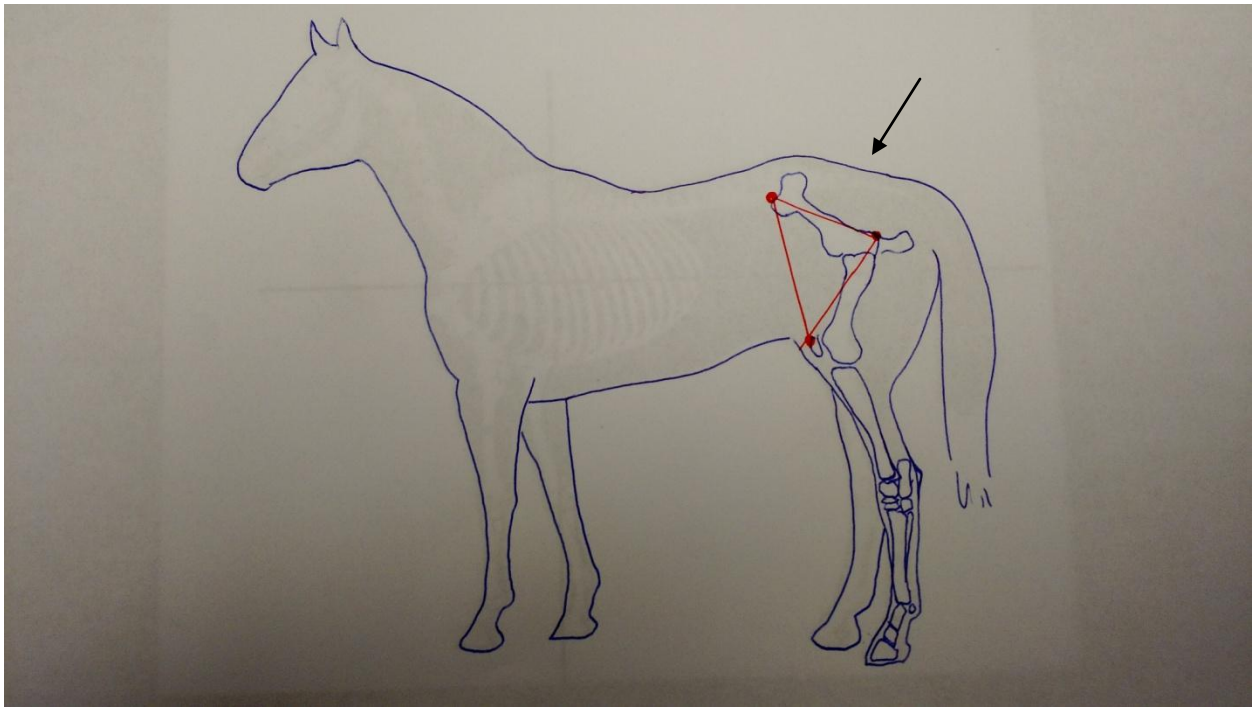


- too flat and the horse will have problems bringing the hind legs under him
- too steep (*goose rumped*) will result in a lack of power and lack range of motion
- the width of the hip is important
- wider is stronger
- if the hip is wide, the horse can get away with less muscling

- ideally, the square hind quarter viewed from behind is the strongest
- the croup:
- is located dorsally between the hip and the head of the tail
- helps to transmit energy of the hind end
- should be:
- long
- of uniform width
- muscular
- muscle length is associated with speed and endurance
- muscle width is associated with strength and power
- 
- even over top, on either side
- the slope of the croup strongly correlates to the function of the horse
- level croups are found in long distance/endurance horses

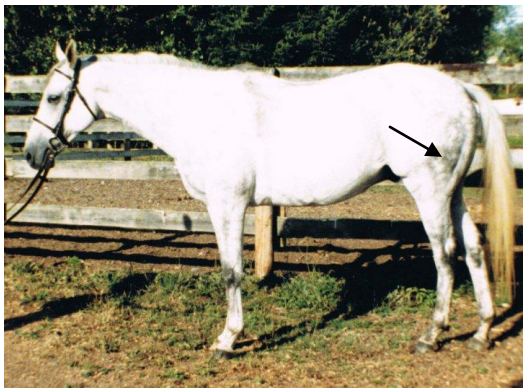


- a slightly sloping croup is found in a shorter distance speed horse
- a short, steep croup is often associated with a straight hind leg and can injure the hock
- a sloping croup allows for collection



- the croup should be well rounded when viewed from behind
- the point of the buttock

- this is where the ischium is located
    - the ischium equates to the human seat bone
    - the ischium acts like a pump handle
        - a longer ischium equates to a longer stride and vice versa
        - therefore, a longer ischium is seen in faster horses and those with a better ability to step in under themselves
    - the higher the ischium, the more scope the horse has
- muscles of the hindquarters
    - the gluteals start up in the croup
    - the hamstrings include the:
        - biceps femoris
        - semitendinosus
        - semimembranosus

- 
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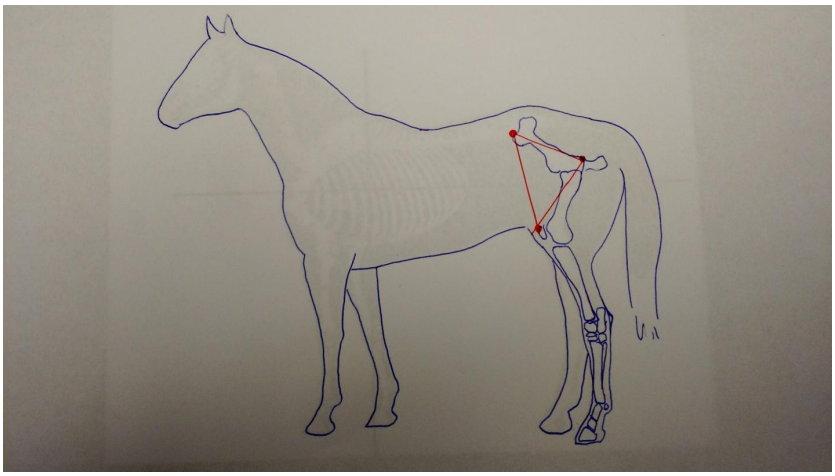
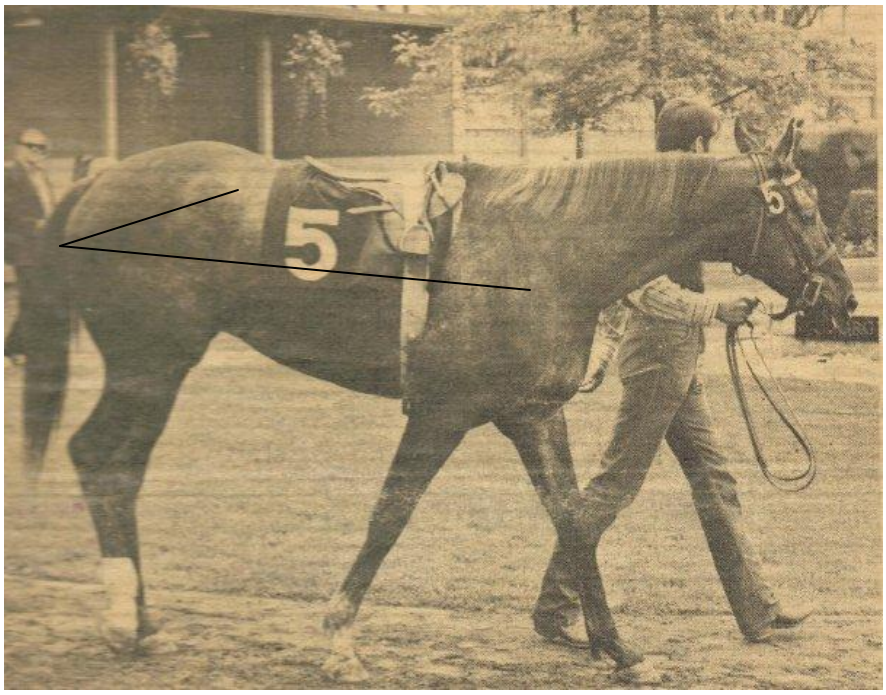
- these are the most important muscles for jumping
- they are the powerhouse of propulsion
- the horse should show good depth from the stifle through to the hamstrings

- 

- *appearance*:
- the shape of the hip and croup varies according to body type, which in turn determines suitability
- an equilateral triangle created between hip bone, hip joint and stifle is considered ideal



- a right angle triangle is usually seen in a dressage horse
- most helpful for dressage is the combination of:
- flatter pelvis
- ideal angle is 26 degrees (Holmstrom, 1994)
- long, forward sloping femur
- a long, forward sloping femur is most helpful for the horse to reach further under himself
- the hindquarters should be wide viewed from behind, with well developed hamstrings, quadriceps and rectus femorus muscles
- good width allows for breadth between stifles, hocks and fetlocks
- enables:
- power
- acceleration
- stable foot purchase
- helps to prevent interference
- the femur should be relatively short with the stifles pointing out slightly
- this allows for a good range of motion in the hind legs
- the stifles should be well developed
- a lower set stifle indicates a jumper with more scope
- viewed from above, the hindquarters should take a triangular appearance with the wider part of the triangle being the quarters, narrowing toward the head
- *anatomy*:
- the hindquarters should be 33% of the length of the horse
- most horses will be 29-33%
- thoroughbreds average 35%

- 

- the hip and croup house and help to transmit the major propulsive forces of the horse
- the pelvis and sacrum are the basis of the hindquarters
- they form the connection between the hind legs and the torso
- the pelvis acts as a fulcrum for the pelvic muscles which help to transmit the propulsive forces forward
- a long pelvis and wide hindquarter allows for larger hindquarter muscles which results in more power
- a long distance from hip bone to point of buttocks and from hip joint to stifle is good

- 

- a less sloping pelvis combined with a more sloping femur correlates to better movement
- there is a moderate positive correlation with dressage
- there is a significant positive correlation with show jumping
- a small angle pointing more forward than down will make the hock appear more straight

- elite show jumpers and dressage horses will typically possess this conformation trait
- the average angle between the femur and pelvis is 84-85 degrees
- 80-82 degrees is considered very good
- 89 degrees is considered not good
- the femur is the single most important conformation measure

- 

a long and forward sloping femur places hind leg under horse, improving power, balance and function of hind leg

- ideally the femur should be 85 degrees
- too much deviation from this can result in unsoundness
- the femur angle doesn't vary much between gaits
- it is exceptionally important in gait quality
- the femur and the tibia should be the same length

- 

- this provides more room for a longer thigh muscle
- a longer thigh muscle provides greater:
- speed
- power
- longer stride
- thigh muscle should also be:
- strong
- deep
- inner thighs should be:
- full
- the back of the thighs should touch
- square
- oblong or square viewed from behind
- the quadriceps groups of muscles, the vastus muscle, and those running from hip to stifle flex the hind leg
- the iliopsoas muscle runs from the underside of the lumbar vertebrae and the floor of the pelvis to the femur
- it draw the hind leg forward
- it flexes the loins (LS joint)
- a low stifle and long femur combination are desirable
- 

- low stifle and long femur enable:
- great scope
- speed and power once the horse starts moving
- a ground covering, efficient stride
- the exception is for a sprinting horse
- *purpose*:
- long hip and croup have longer muscles that increase the length of stride
- an almost flat croup promotes great speed
- a more sloping croup, as seen in a draft horse, allows a pulling horse to shift its weight
- level hip and croup = long, flowing stride
- sloping hip and croup = hind legs drive further under body
- produces power and speed
- *faults*:
- insufficient length of hindquarters
- minimizes length of muscles needed for powerful, rapid muscular contractions
- this reduces:
- speed over distances
- stamina
- sprinting power
- staying ability
- ability to engage
- associated with goose rump
- *goose rump*
- a flat, sloping profile from a high croup to a low tail
- can exhibit a muscular hindquarter
- pelvis is too far down and too short
- the point of buttocks is low
- this inhibits the stifle
- this makes the quarters less strong
- decreases stride length
- not much swing of hind legs
- not suitable for speed events
- more prone to hindquarter injuries
- associated with *cat hammed*
- often seen in drafts and draft horse crosses
- point of croup behind the point of hip
- creates a weak loin and coupling
- can cause sickle hocks
- tipped pelvis
- pelvis or rump is steep viewed from the side

- the lower part of the buttocks shorten the length of muscles from the point of the buttocks and gaskin
- this shortens the backward swing due to reduced extension and rotation of the hip joint
- can be strong if it is well muscled but is typically paired with a long back and loin
- a good range of hip can result in good galloping speeds
- narrow hips
- the pelvis is crowded
- may be improperly aligned
- the attachment to the hips affects the horse's strength and power
- may be partially dictated by muscling
- puts more strain on the leg joints
- limits size of muscles and number of muscle attachments
- contributes to speed
- horse is able to get legs under him
- *rafter hip*
- width at point of hip is greater than width at point of stifle when viewed from behind
- similar to that of a Holstein-Friesen cow
- lack of muscular development
- horse has less strength
- associated with poor muscling of the thighs and lower hips
- conditioning and training can help
- legs tend to be further apart at top and be narrower at the base
- associated with base narrow
- there is more stress on the joints
- a short, steep croup with a short pelvis is weak
- a very flat croup with place the hind leg out behind the horse, making engagement difficult
- *knocked down hip*
- one hip bone is lower
- typically due to:
- injury
- subluxation
- fracture
- gait symmetry will be affected
- interferes with power and thrust
- horse will be less capable of jumping high
- horse will go slower
- cannot do strenuous work

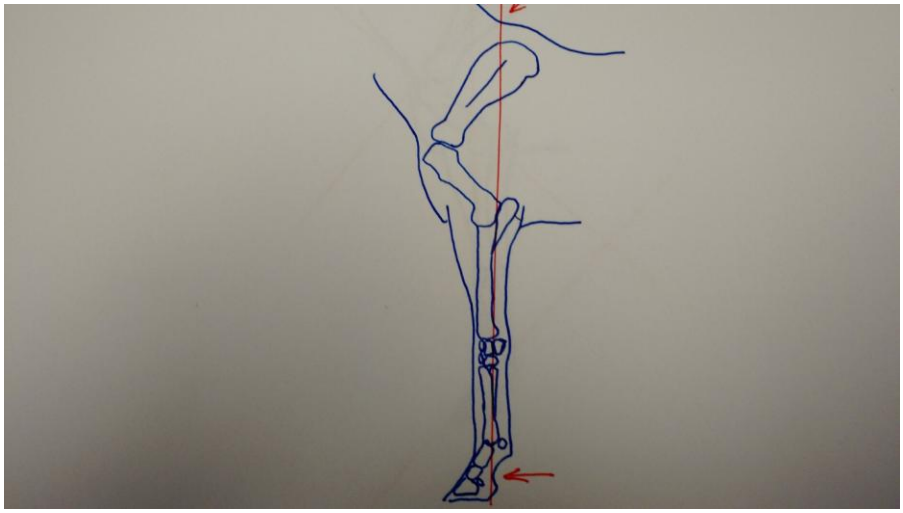
- horse will be more susceptible to muscle and ligament soreness
- high stifle and short hip
- a short hip has a short femur (thigh)
- this reduces the length of the quadriceps and thigh muscles
- a short femur creates a high stifle
- a high stifle indicates lack of scope
- this will create short, rapid strides
- this reduces elasticity of strides
- low stifle and long hip
- this is favourable except for in a sprinting horse

Legs

- *check out hhtp://vetmediastate.edu/limbanatomy/horse.html*
- *check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - line of concussion (0:58)*

- legs should hang straight under the four corners of the body

- the horse should have the appearance of 'a leg at each corner'

- however, a surprising result in a recent extensive study done on conformation, health and longevity has shown that there is less of a correlation between limb deviation (crooked legs) and future soundness than had previously been believed (Jonsson, 2013)
- as well, 80% of elite horses have been found to have slight outward deviation of the hind limbs
- straightness of the foreleg needs to be viewed from both:
- the front
- the side
- a plumb line should be able to be extended up and down along the thoracic column, through the middle of the fetlock, cannon knee and forearm
- ideally, this line should
- end in the heel at the bottom
- emerge in front of the withers
- 
- this is sometimes referred to the pillar of support
- the foreleg must carry 60%+ of the horse's weight
- as the horse moves faster and jumps, the forces increase on the leg and surrounding structures
- any forward or backward deviation of the leg will cause the limb to be compromised
- a well put together horse will be more capable of load bearing especially:
- when travelling at extreme speeds
- when tired
- when doing tight turns
- when coming down off a fence

- 

- straightness of the hind leg viewed from the rear
- from the side, in relation to a plumb line that hangs from the point of the hip, to the point of the hock, and down the back of the cannon bone

- 

- toes and stifles will turn out slightly to provide clearance of barrel when in motion
- it is acceptable if the hind feet stand close together as long as they cannons are straight
- this horse will carry his weight more over his centre of gravity
- this can help to increase engagement
- legs should be symmetrical, with the left leg being a mirror image of the right leg

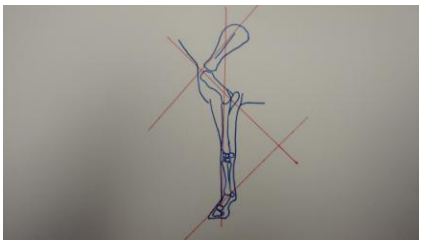
Foreleg

check out Michigan State University series https://www.youtube.com/user/MyHorseUniversity - front limb(0:54)

Purpose of forelegs

- *structural support*
- 60% of horse's weight is borne by the forelegs
- *movement*
- the forelegs reach out and move the horse forward as energy is transmitted forward from the hind legs
- the forelegs have a limited capacity to move laterally, allowing for lateral movements
- the forelegs fold up to enable a horse to clear a jump
- *absorb concussion* via
- the torso being suspended by a sling of muscles that is suspended off the shoulders
- sloping shoulder
- angle at the point of shoulder
- angle at the elbow
- the small bones and tendons of knee
- the fetlock joint
- expansion and absorption mechanism of the hoof

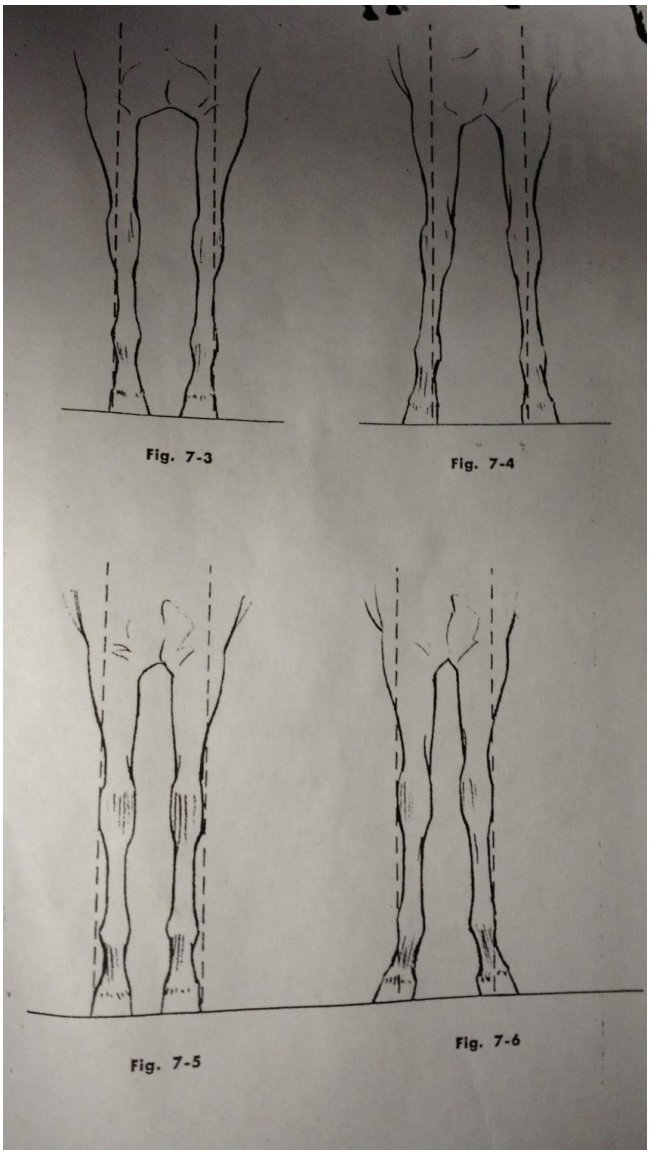
Most important aspects of forelimb conformation:

- angles, length, and proportion of bones
- 

- angles
- angles of scapula and pastern should match
- length
- proportion
- ideally, a foreleg should have
- long, sloping scapula
- short, upright humerus
- long, broad radius/ulna
- short, thick cannon
- medium pastern
- this results in
- longer stride
- less concussion
- a poor foreleg will have
- short scapula
- long humerus
- short radius/ulna
- long cannon
- short pastern
- this results in
- shorter, more jarring stride
- increased concussion
- increased risk of bone-related and soft tissue-related injuries
- straightness and trueness of limbs

Fore leg faults

- uneven loading of joints produces disproportionate strain more evidenced on the distal part of limbs (Jonsson, 2013)
- *base narrow*
- (viewed from the front)
- the legs are wider apart at the chest, where the legs emerge from the body, than they are at the feet
- inward deviation from a plumb line at the distal end of the limb
- puts more strain on one side of the leg
- may rope walk or sidewind
- may interfere



-
- *base wide*
- (viewed from the front)
- the legs are wider apart at the feet compared to at the chest
- outward deviation from a plumb line at the distal end of the limb
- puts more strain on one side of the leg
- can lead to ringbone
- often associated with narrow chest
- this goes along with poor muscle development
- toeing in aka *pigeon toed*
- (viewed from the front)
- causes horses to *wing out* aka *paddling*

- the leg swings out away from the opposing leg
- inefficient movement
- puts uneven strain on the legs
- may lead to unsoundnesses, including ringbone
- associated with higher effusions (swellings) in:
- fore and hind fetlocks
- coffin
- stifle
- hock
- hind limb tendons
- toeing out aka *splay footed*
- (viewed from the front)
- toes point out
- puts more strain on legs
- may lead to ringbone
- causes horse to interfere
- the leg swing inwards aka *winging in*
- *knock-kneed* (viewed from the front)
- inward deviation of the legs at the knees
- puts more rotation and strain on the knees and medial aspect of the cannon and medial splint bone
- associated with pigeon toes
- can make a horse susceptible to splints
- *bowed/bandy legs* (viewed from the front)
- outward deviation of the legs at the knees
- puts more strain on the knees and lateral aspect of the cannon and lateral splint bone
- *bench knees* aka *offset knees* (viewed from the front)
- bones of foreleg and cannon bones are not aligned
- parallel displacement of cannons
- puts more strain on the knees and medial aspect of the cannon and medial splint bone
- can make a horse susceptible to splints
- highest association with effusions (swelling) of
- knees
- fore and hind limb digital and flexor tendons
- *standing under* (viewed from the side)
- foreleg, which is the pillar of support, is set behind the plumb line
- associated with pigeon chest
- horse carries too much of his weight too far forward

- puts too much strain on:
- front of legs
- tendons
- ligaments
- causes the horse to move with a choppy stride
- potential for stumbling

- *before judging, ensure horse is standing up properly
- improper shoeing can also cause a horse to stand this way
- camped out in front (viewed from the side)
- pillar of support is set in front of plumb line
- legs are too far in front of horse
- causes the joints in the front legs to appear/be *hyperflexed* (bent backwards)
- can be exhibited due to hoof pain
- laminitis
- navicular syndrome
- neglected or poorly balanced and overlong feet
- this causes excess pressure on the:
- knees
- fetlocks
- hooves
- over at the knee aka *buck knee, knee sprung* (viewed from the side)
- knee is slightly buckled forward
- can cause uneven pressure on the legs
- can make a horse susceptible to stumbling if extreme

- a much less serious fault if minor
- back at the knee aka *calf knee* (viewed from the side)
- the knees appear *hyperflexed*
- can cause more pressure on the bones and joints of the knee
- can lead to carpal fractures
- can cause more pressure on the tendons and ligaments in the foreleg
- *a serious fault* that can quickly lead to unsoundnesses
- tied in below the knee (viewed from the side)
- the circumference of the cannon immediately below the knee measures less than the circumference of the cannon lower down the leg
- caused by a weak tie-in of the DDFT and SDFT
- can indicate some weakness and susceptibility to tendon issues
- often associated with a horse that is either back at the knee or over at the knee

Elbow

- site of one of the most important angles when determining quality of movement
- *anatomy*
- the elbow is the highest point of the leg not covered in muscle
- the part of the elbow that protrudes out the back is the *olecranon process*
- range of motion is 55-60 degrees
- *appearance*
- should be straight and square
- viewed from behind, the olecranon process should be vertical
- viewed from the side, the elbow should be in line with the withers
- the elbow should not be further back than the highest point of the withers
- *action*
- is more flexed at the beginning of swing phase retraction
- *faults*
- tied in/turned in elbow
- the elbow is placed too close to the body
- this can twist the leg
- this can result in toeing out
- can also result in toeing in
- often associated with a narrow chest
- movement is restricted, resulting in a shorter stride
- interference can be a problem, in particular *speedy cutting*
- can result in a lot of strain on the fetlocks and feet
- turned out elbow

- the horse is often base narrow
- can be pigeon toed
- this results in paddling

Forearm

- the bones of the forearm are the radius and the ulna
- all movement is on the sagittal plane
- there is very little pronation or supination
- these bones fuse together over time
- they connect the elbow to the knee
- forearm length is important in determining stride length
- a long forearm is especially important for jumpers
- a short forearm will produce a lot of knee action, as seen in Hackneys
- the length of the fore arm determines if the leg is set forward or back
- it is best if the leg is set forward
- *appearance*
- should be long in relation to length of cannon bone = *well let down*
- a short forearm decreases length of stride
- should be thick and wide
- in the study done on thoroughbreds, it was noted that the diameter of the forearm will typically double in size between the ages of 1 and 2
- well muscled without being bulky
- long muscling = greater contraction and lift of leg
- volume of muscling = power and support for lower leg
- the muscling on the forearm transmits energy to the flexor and extensor tendons in the lower leg
- the muscling will also help to absorb concussion and prevent strain in the tendons
- the amount of muscling on the forearm will determine how much muscling the horse has on the underside of the chest
- should be able to see an inverted 'V' on the underside of the chest
- the muscling should be prominent on arm but tie in flat and low on the knees
- there will be minimal fat on the forearm
- viewed from the side, should be in perfect line with the knee and cannon
- *faults*
- excessively short arm along with short muscles will produce a short stride
- this can lead to increased muscular effort
- increased muscular effort leads to muscle fatigue

- this can result in increased knee action
- increased knee action is not compatible with speed
- a long arm can result in excessive wear on the shoulder muscle

Knee

- the primary forward bending joint in the front leg
- *appearance*
- large, proportionately
- square viewed from the front
- flat viewed from the side
- *function*
- size affects function
- a large flat knee increases the area of support
- *anatomy*
- consists of 2 rows of bones
- proximal row (medial to lateral): radial intermediate, ulnar and accessory carpal bone
- distal row: 1st to 4th carpal bones (1st is typically small or absent)
- large flat knee increases the area of attachment for tendons, ligaments and muscles from the forearm
- *faults*
- small round knees
- unable to absorb concussion
- over at the knee aka *buck knee*, *knee sprung*
- radiometric angle smaller than 180 degrees carpal flexion
- back at the knee aka *calf knee*
- angle greater than 180 degrees = hyperextension
- can lead to knee fractures, and tendon and ligament strain
- often associated with tied in below the knee
- offset knees aka *bench knees*
- tied in below the knees
- knock knees aka *carpal valgus*
- viewed from front -180 degrees
- bowlegs aka *carpal varus*
- + 180 degrees for every 1 degree increase in carpal angle viewed from the front
- the odds of effusion of right front carpus, right carpal fracture, physeal enlargement and fracture of right front limb decreased
- for every 1 degree increase in radiometacarpal angle

- the risk of fracture of front proximal phalanx and physeal enlargement of front fetlock increased
- for every 10 % increase in right offset ratio the risk of effusion and problems in right fetlock increased
- offset knees
- leads to fetlock problems
- open knees
- indentations in the front of the knees
- weak and immature bone structure

Cannon bone

- *function*
- bears weight of horse
- integral part of the pillar of support
- length affects function
- short is stronger than long
- *appearance*
- horse should have good bone (over 20 cm or 8 inches in circumference)
- cannon bones have an *intermediate optimum*
- they shouldn't be too thick or too thin
- they shouldn't be too long or too short
- cannon bones should be straight when viewed from front and side
- joints should be evenly aligned above and below
- tendons should be well defined
- splint bones are situated medially and laterally of the cannon bone
- the splints are called metacarpal 2 and metacarpal 4
- splint bones are:
- vestigial bones
- incomplete
- 1/3 shorter than the cannon bones
- splint bones articulate with and help to support the carpal bones
- splint bones eventually fuse to the cannon bone (typically around age 8)
- *fault*
- *tied in below the knee*
- measure of circumference of cannon taken immediately below the knee is smaller than the same measure taken just above fetlock joint
- indicative of a weak tie-in of tendons and ligaments just under the knee
- often associated with:
- behind the knee

- toed out, small joints and weak pasterns

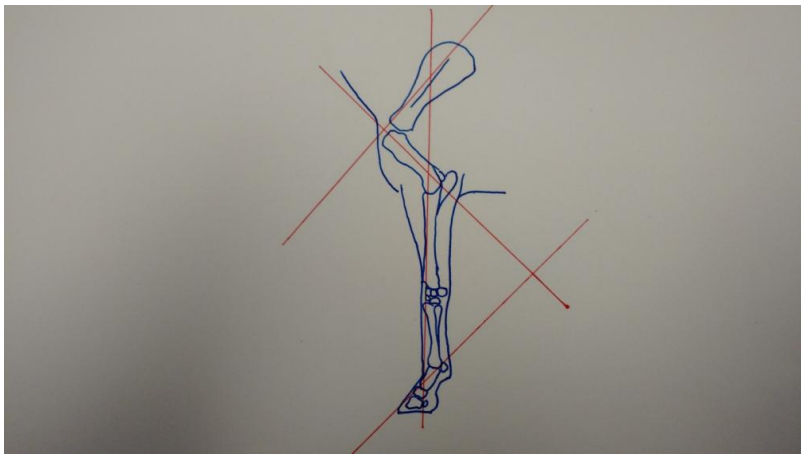
Fetlocks

- *function*
- provide springiness to gait
- disperse concussion
- *appearance*
- wide
- thick
- if fetlocks are thick antero-posteriorally, this places the tendons that run around the back of the tendons to close to the cannons, making them subject to strain
- strong
- clean and free of blemishes
- set well back on pasterns of medium length that are strong and sloping
- *action*
- free from stiffness
- most desirable is 48 degrees
- joints can operate up to about 56 degrees
- large fetlock angle = stiff pasterns
- this is the last favourable contributor to movement
- this contributes to superficial flexor tendon swelling
- more flexion in stance phase in hind fetlock correlates to better movement at trot
- *anatomy*
- elite show jumpers had smaller angles on front fetlocks than other horses
- *fault*
- fetlock problems can be the result of a longer neck bottom line
- this causes an increase in hind dorsal hoof angle (in hind fetlocks)
- compressive forces increase by 1.14X with every 1 degree
- fetlock lesions are the most common causes of riding horse cullings (Penell, 2005)

Pasterns

- *function*
- slope and length determine:
- smoothness
- spring
- stride length
- the pastern acts as a shock absorber for the leg
- therefore, there is a direct correlation between pastern conformation and soundness/unsoundness

- medium length to moderately long and sloping pasterns help to absorb concussion



- *appearance*
- the *intermediate optimum* is recommended for pasterns
- medium length
- medium slope
- there are serious disadvantages to pasterns that stray too far from medium length and slope
- slope of pastern should match the slope of the scapula
- *anatomy*
- front pasterns
- 45-50 degrees (can range up to 60 degrees; the average is 54 degrees)
- back pasterns
- 50-55 degrees
- *action*
- the longer and more sloping the pasterns, the smoother the ride
- dressage horses need length and slope for suspension
- long sloping pasterns are more susceptible to breakdown, in particular of soft tissues
- a shorter but well angled pastern will be stronger (in relation to less stress on soft tissue) but less able to absorb shock (in relation to more potential stress to bone)
- the shorter and more upright the pastern, the more jarring the ride
- short upright pasterns are more susceptible to breakdown, in particular to bone-related issues
- bone related issues related to short, upright pasterns may range beyond the immediate location and contribute to the development of
- navicular syndrome

- due to incongruity in angle between pastern and navicular bone, causing:
- bony spurs
- ringbone
- fetlock joint pain
- sesamoiditis
- bursal and soft tissue-related unsoundnesses such as windpuffs may appear first
- *fault*
- long upright pasterns
- lead to suspensory injuries
- short upright pasterns
- very strong
- absorb too much concussion
- can lead to proximal interphalangeal joint disease - a jumper problem
- upright pasterns
- will result in a rough ride
- too sloping and steep
- susceptible to injury in tendons, ligaments and fetlock joint
- steep pastern
- weak pasterns
- long pasterns
-

-

- often low jointed
- this is the worst pastern conformation
- excessively weak
- can lead to suspensory problems
- can lead to fracture in front limb
- for every 10 cm increment in pastern length the odds of sustaining a front leg fracture increased by 17.9 times
- broken angle
- a horse with a steep foot angle that does not match the angle of the pastern is said to have a *club foot*
- this can make the horse more susceptible to ringbone
- toed our pasterns
- viewed from front greater than 180 degrees
- toed in pasterns
- viewed from front greater than 180 degrees

Feet

Horses are perissodactyl unguligrade animals

- this means they bear weight on one hoof, on one weight-bearing digit

- the foot is the single most important aspect of conformation
- the foot is the single most common site of unsoundness
- *'No foot, no horse'*
- in a study done on orthopaedic health of the top SWB breeding stallions (from a sample of 133 with at least 20 offspring), it was noted that out of the top 20, three of the top five had also scored in the top 20 for hooves (Jonsson, 2013)
- *action*
- healthy hoof angles influence the position of the hoof on landing
- lower angles cause the horse to land toe first
- hoof angles influence tension in the deep digital flexor tendon (DDFT) affecting compression on navicular and rotary forces on coffin
- *function*
- bears weight of horse
- absorbs concussion
- provides traction
- hoof angles affect circulation
- low angles causes blood congestion in heels and pressure on navicular bone
- *appearance*

- good size
    - size of foot should correlate to size of horse
        - consider both height and weight of the horse
    - proportionate
    - big enough to distribute weight and absorb concussion
- healthy coronet band
    - viewed from the side, should follow a straight line, not curving down near the heels
    - avoid narrow hoof head
        - can make a horse susceptible to ringbone
- the wall should be smooth and free of:
    - major cracks
    - rings
        - slight grass rings are just indicative of a change in the horse's diet
        - these are acceptable
    - dips
    - indentations
- angle of wall should match angle of pastern when viewed from the side
    - 45-50 degrees is considered ideal for a front foot
    - the angle of both left and right feet should match
    - 50-55 degree is considered ideal for a hind foot
    - the angle of the slope of the hind foot tends to be wider than that of the front
        - warmbloods tend to have feet that are more upright than thoroughbreds
- shape
    - front feet are rounder as they bear more weight
        - overly round feet may make a horse more susceptible to:
            - sidebone
            - navicular syndrome
    - hind feet are longer and more pointed as they are used as rudders to help turn
    - size and shape of feet on the left should match that of feet on the right for both fore and hind feet
    - viewed from the front, angle of the medial walls and lateral walls should match
- sole should be concave
    - flat feet are very weak
- heel should be
    - broad
    - strong
    - deep
    - wide

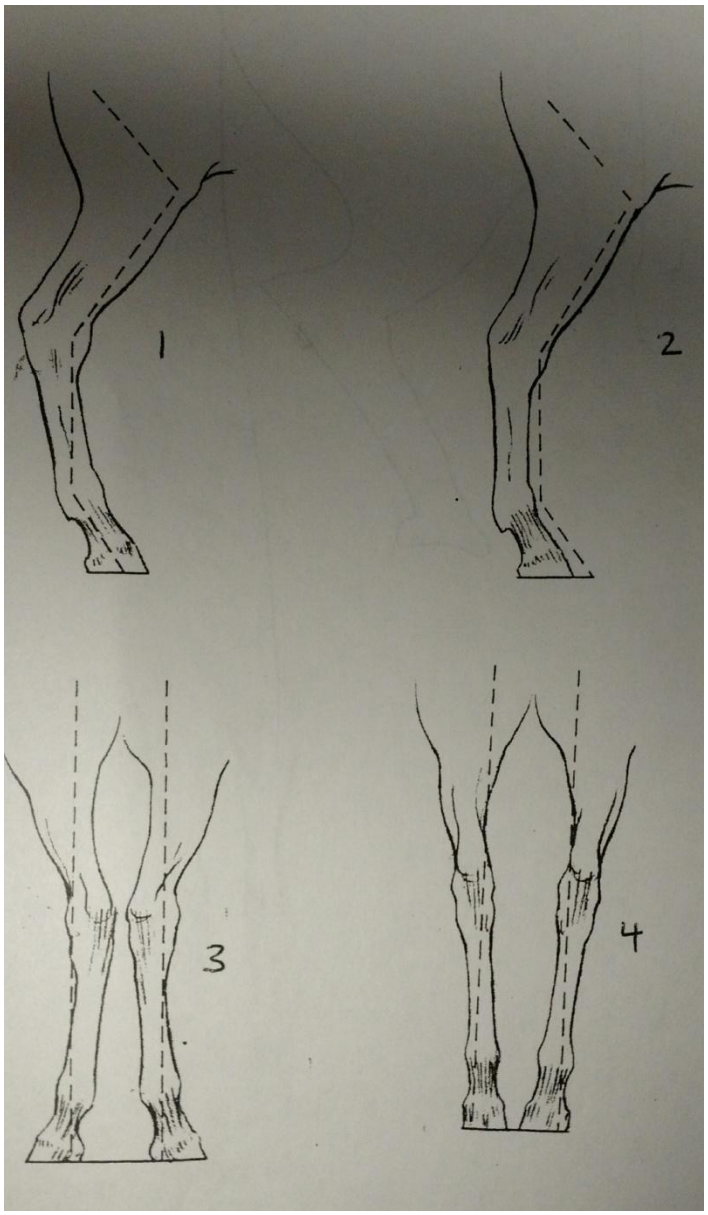
- no tendency to contraction
- a weak heel is considered to be the biggest fault in a poor foot
- a weak heel makes a horse susceptible to
- navicular syndrome
- injury to the wings of the pedal bone
- frog should be large and in contact with ground
- shallow, medium lacuna
- *faults*
- toe in (*pigeon toe*)
- toe out (*splay foot*) aka *coon foot*
- narrow *donkey foot*
- inadequate surface area
- horse will quickly become unsound
- *club foot*
- narrow hoof head
- flat feet
- no concavity of the sole
- weak feet
- pedal bone is too close to the ground
- provides inadequate protection
- tendency toward:
- bruises
- abscesses
- corns
- often associated with:
- large feet
- low heels
- very sloping feet
- mismatched feet
- small feet
- medio-lateral imbalance
- hoof angle over 61 degrees
- do not try to trim to normalize angle
- maximize sole thickness
- right front more often has low heel, long toe, thin wall, flat sole combination
- is most difficult
- responsible for overloading other structures
- low hoof angles contribute to caudal hoof (heel) pain
- low hoof angles cause the heel to bear more weight
- 39 degrees = 75% of weight on heels

- 47 degrees 63% of weight on heels
- 55 degrees = 43% of weight on heels
- DDFT strain decreased as toe angle increased from 55-78 degrees
- the lower the heel, the more strain on the tendon
- 10% increase in ratio of dorsal/palmar angle decreased odds of limb fracture
- for every degree increase in hind dorsal hoof angle risk of effusion and problems increased
- poor hoof wall quality
- associated with atrophied muscles in croup and hamstring
- associated with shorter longevity
- hoof wall cracks
- contracted heels
- sheared heels
- frog atrophy

Hind leg

- the hindquarters act as levers that move the horse
- a long hind leg from croup to hock is desirable
- this makes for a long stride
- this allows for speed
- the ideal hind leg will follow a plumb line dropped from the point of hip, through the point of hock and down the back of the cannon through the back of the fetlock joint

- this allows the horse to
- carry the weight of the hindquarters
- shift the weight of the forehand back over the hindquarters
- reach under himself with the hind legs
- a plumb line dropped down the centre of the cannon should run into the heel
- long, smooth, prominent muscling should be observable through the quarters down into the stifle and gaskin

- **hind leg faults**
- 

- *cow hocks* (viewed from the back)
    - crooked hocks
        - hocks point inward and the cannon bones are angled outward
        - puts stress on outside of hocks
        - can make a horse susceptible to
            - bog spavins
            - bone spavin
            - thoroughpins
        - results in inefficient movement
- *bowed hocks* aka *bandy legged* (viewed from the back)
    - opposite of cow hocks
        - hocks point outward and cannon bones are angled inward
    - both cow hocks and bowed hocks are weaker than straight hocks
        - there is more rotation in the joints during movement
        - this can lead to arthritic changes and bursal enlargements
        - results in inefficient movement
- too wide (viewed from back)
    - hind legs too far apart
    - associated with *rafter hip*
        - lacks power
        - results in short stride
- too narrow (viewed from back)
    - hind legs too close together
    - associated with narrow hips
        - also lacks power
        - can be less stable and balanced
        - very susceptible to interference
- *camped out* (viewed from the side)
    - hind legs set behind plumb line
        - makes it harder to engage
        - may be associated with back strain
- *sickle hocks* aka standing under (viewed from the side)
    - excess angulation of hocks
        - large hock angle
    - cannon is set too far under hock
        - causes strain on hocks
    - it is very difficult for this type of conformation to make it to elite levels as the horse does not have the strength to carry weight effectively
        - may lead to *curb* (inflammation of the plantar tarsal ligament)
            - can also lead to bog spavin and bone spavin

- associated with weak pasterns
- straight hocks aka *post legged* (viewed from the side)
- straight angles in the stifle and hock
- associated with speed
- commonly seen in show jumpers and dressage horses (okay if coupled with an angled femur)
- can make horse susceptible to:
- stifle issues
- suspensory strain
- bog spavin
- bone spavin
- effusions in hock
- effusions in stifle
- *base wide* (viewed from behind)
- from behind, legs deviate from a straight line as the feet stand wider than the rest of the hind leg
- horses have trouble using themselves
- horses have trouble pushing off from hind legs
- lacks power
- *base narrow* (viewed from behind)
- from behind, the legs deviate from a straight line as the feet stand closer than the rest of the hind leg

Stifle

The #2 joint for unsoundnesses in the hind leg

One of top three joints leading to the development of lesions responsible for the culling of riding horses (Jonsson, 2013)

- *appearance*
- needs to have a lot of muscling to support it
- the stifle should be the widest point of the horse, viewed from behind
- lower is better = more scope
- *anatomy*
- the patella is triangular with the base being proximal and the apex distal
- the angle behind the stifle ideally is 154 degrees with a small angle between the femur and tibia
- *faults*
- too straight

- can dislocate

Gaskin

- *appearance*
- long
- well muscled
- well defined
- broad
- wide
- deep
- degree of muscling in femorotibial area
- ties in low and flat to hock
- *anatomy*
- the tibia is weight-bearing
- the fibula is rudimentary
- *function*
- longer gaskin
- greater extension of hind leg
- maximum range of motion
- maximum area for attaching the driving muscles of the hindquarters
- long muscling provides greater contraction and lift of leg
- greater volume = power for impulsion
- *faults*
- short gaskin = shorter stride
- cat hammed/frog thighs
- long thin thighs and gaskins
- insufficient muscling
- poorly developed hindquarters
- not fast or strong
- horse will travel:
- with an ambling gait
- with a stiff torso and back, producing a rough ride
- can be caused by:
- confinement
- lack of exercise
- associated with:
- goose rump
- sickle hocks

Hock

The #1 joint for unsoundnesses in the hind leg

In the top three joints for developing lesions leading to the culling of riding horses (Jonsson, 2013)

The most important joint in the process of propulsion

- *appearance*
- needs to be large enough to provide room for muscle and tendon attachments
- wide
- deep
- needs to be in proportion to the size of the horse
- the front of the hock should be smooth
- well positioned
- well supported above and below
- not tied in
- the back of the hock should be square and well defined
- well marked point of hock
- matches the hock on the other leg in size and position
- hock angle should be 155.5 to 165.5 degrees
- ideal angle is 159 degrees (Holmstrom, 1990)
- this is optimal for vertical impulse of upward and forward movements (Gnagney et al, 2006)
- elite show jumpers and dressage horses have larger hock joint angles which gives the appearance of straighter hocks
- a smaller angle affects the horse's ability to bear weight and move elastically
- *anatomy*
- three rows of bones:
- proximal row
- talus
- calcaneus
- helps support the deep digital flexor tendon
- middle row
- central tarsal bone
- distal row
- medially to laterally, 1st to 4th tarsal bones
- 1st and 2nd usually fused
- 3rd rests on cannon bone
- *action*
- larger flexion of hocks during stance phase correlates to better trot movement

- greatly influenced by angle of tibia above and cannon bone below
- good horses flex the hock more and can do it faster
- *faults*
- typically cause due to smaller angles being more prone to injury
- smaller angles negatively influence ability to sustain degree of collection needed
- *sickle hocks*
- angle of less than 150 degrees
- more prone to *curb* (inflammation of the plantar tarsal ligament)
- more prone to over-reaching
- *post legged*
- angle over 170 degrees more prone to strain of flexor tendon sheath = thoroughpin and high suspensory strain

- *cow hocks*
- tarsal angle less than 180 degrees
- results in:
- loss of power
- inefficient movement
- interference
- susceptibility to:
- bog spavin
- bone spavin
- *valgus deformity*

- not a cause for concern
- *bowed hocks*
- tarsal angle more than 180 degrees
- horse twists the hock out
- horse tends to develop bursal enlargements such as thoroughpin and bog spavin
- associated with upright feet
- horse tends to drag toe and wear shoes out faster than normal
- *camped out*
- hard for the horse to engage
- weak behind
- *bone spavin*
- caused by sickle hocks, cow hocks and narrow thin hocks (Black, 1992)
- small, narrow hocks
- weak

Cannon bones aka *shannons*

The hind cannons are longer than the fore cannons

- long cannons
- higher action
- more flexion
- weaker

Pasterns

- more upright than front pasterns
- the worst conformation fault in the hind involves the low jointed, long pastern
- often associated with straight hock and stifle
- more commonly seen in draft horses
- results in excessive strain to hock
- stiff pasterns results in more swelling in the hocks

Hind feet

- the shape of the hind foot is different than the front foot
- the hind foot is used as a rudder and so creates a longer oval than seen in the round front foot
- the hind feet are less upright

- the hind feet should point out slightly to allow the stifles good clearance of the abdominal cavity

Try:

Horse Discover KY 4-H Horse Program (quiz ww2.ca.uky.edu External Anatomy) Cooperative Extension Service, University of Kentucky, College of Agriculture

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