

## LOCOMOTION

### Movement Generation

- Movement of the horse is generated from the musculature in the body (torso) not the legs
- Forward momentum is generated from the hind end and transferred to the front end
- Legs modify the forward energy by characteristics of their swing
- However, the force of movement is generated by their body (hindquarters)
- Front legs determine direction
- Hind legs determine momentum
- To complete a step, each leg must perform 4 basic movements or “phases”
  - Impact – When the leg contacts the ground and absorbs the downward and forward forces of the moving horse
  - Stance – When the limb is on the ground and supporting weight
  - Thrust – When the limb ceases backward movement but still bearing weight
  - Flight – When the limb is moving forward through the air
- A stride involves completion of a single step (i.e. all four phases of movement) in all four limbs. A stride can have a suspension period, which is when none of the horse’s legs are in contact with the ground.

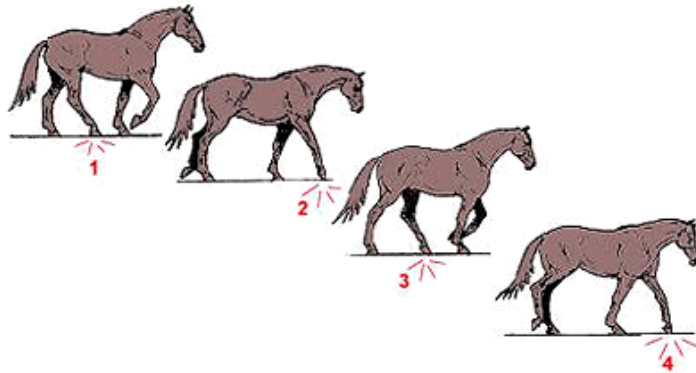
Stride	Full cycle of limb motion. The sequence and precise timing of limb movements within each stride defines the gait used.
Stride duration	Time required to complete one stride.
Stride frequency	Number of strides per unit time. Increases linearly with speed in the walk and trot up to the trot-canter transition.
Stride length	Distance traveling between successive imprints of the same hoof.
Swing phase	Limb is carried forward through the air
Velocity	Product of stride length and stride frequency

- A gait is a pattern of leg movements used to complete a stride.
- Gaits can be symmetrical, where the limb movements of the first half of the stride are repeated with the opposite limbs during the other half of the stride. Examples of symmetrical gaits are the walk, trot, pace and back.
- In asymmetrical gaits, the limb patterns on one half of the stride are not repeated on the other half of the stride. Examples are the canter, gallop and fox trot.
- Diagonal gaits are gaits in which the limbs on the opposing side move together as a pair or in sequence. Examples – trot, back.
- Lateral gaits are gaits in which the limbs on the same side move together in pairs or in sequence. Examples – walk, pace
- In some asymmetrical gaits, two legs may be paired during a stride while the other legs move independently. Examples – canter, gallop
- When two legs are paired in gait, but the other two are not, the legs that move independently are called the leading legs.
- The independent foreleg, the last leg to impact before the period of suspension, defines or gives the names to the lead.
- Because motion is initiated in the hind end, the lead is determined by the footfall pattern of the hind legs.
- Assuming a right lead, a horse can switch the left lead after the suspension period by impacting with the right hind leg.

**Natural Gaits - Those patterns of footfalls that is inborn in the majority of horses.**

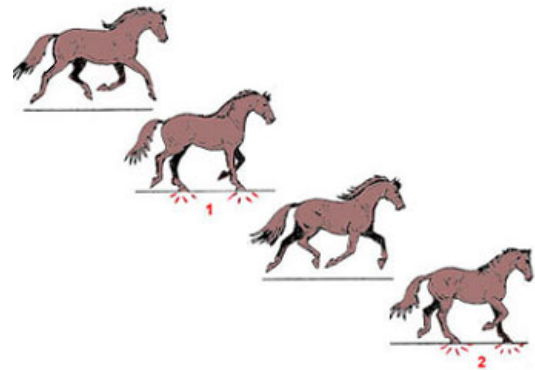
**Walk**

- Slowest of the gaits
- Four separate and distinct beats
- The walk is a symmetrical gait with an even cadence of footfalls in a 1-2-3-4 pattern.
- Any gait can start out on either the right or hind leg.
- Remember, during the impact phase of one foot, one or two other feet can be on the ground.
- There is no suspension period to this gait.
- At least 2 feet are always on the ground at the same time.



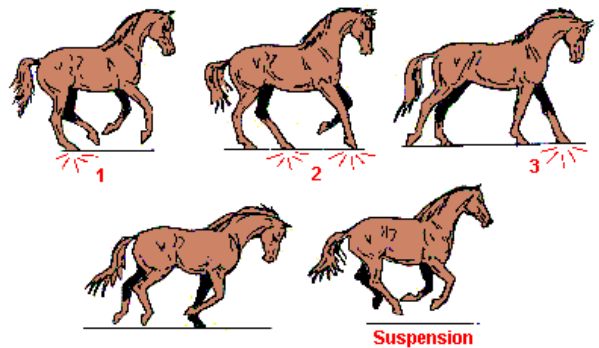
**Trot**

- Second slowest of the natural gaits
- 2 separate and distinct beats
- The trot has an even cadence of footfalls in a 1-2 pattern
- There is a suspension period between beats
- Diagonal forelegs and hind legs move together



**Canter, lope**

- Second fastest of the natural gaits
- 3 distinct beats
- The canter has an even cadence of footfalls, in a 1-2-3 pattern.
- Name of lead determined by unpaired foreleg



**Right Lead Canter – Sequence of beats**

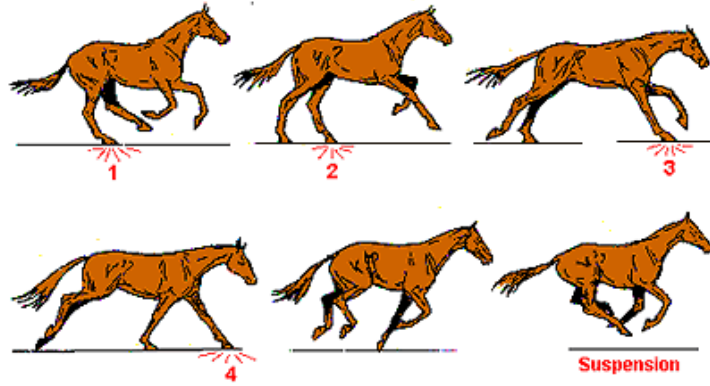
1. Near hind
2. Left diagonal consisting of near fore and off hind.
3. Off fore – right lead

**Left Lead Canter – Sequence of beats**

1. Off hind
2. Right diagonal consisting of off fore and near hind.
3. Near fore – left lead

## Gallop

- Fastest of natural gaits
- 4 separate beats
- Uneven cadence of footfalls, in a 1-2-3-4 pattern (There is a long beat between 1&2 and 3&4; & a short beat between 2&3).
- The non-lead diagonal legs lift off the ground & swing together.
- They hit the ground slightly apart, with the hind leg hitting slightly before the foreleg.
- There is a suspension period after the 4<sup>th</sup> beat
- All legs impact independently



Right Lead Gallop – Sequence of beats

1. Near hind
2. Off hind
3. Near fore
4. Off fore

Left Lead Gallop – Sequence of beats

1. Off hind
2. Near hind
3. Off fore
4. Near fore

## Back

- Slow and only gait performed while moving in reverse
- 2 separate beats
- Even cadence of footfalls in a 1-2 pattern
- The movement is diagonal with paired legs moving together. However the foreleg may be set down slightly before the hind leg.
- There is no suspension period.

**Artificial Gaits** – Those patterns of footfall that are not inborn in the majority of horses.

Most artificial gaits must be taught to the horse; however, some breeds have been selected for their tendency to perform alternative gaits from birth.

## Pace

- Lateral, symmetrical gait which is normally performed slightly faster than the trot
- Has 2 separate and distinct beats
- Even cadence of footfalls in a 1-2 pattern
- One of the racing gaits for the Standardbred
- Lateral foreleg and hind leg move together which creates a side-to-side rocking motion of the body.

(1) (2)

(1) (2)

## **Slow Gait**

- Slow gait or stepping pace is a modified pace performed with great animation.
- 4 separate and distinct beats
- Uneven cadence of footfalls in a 1-2-3-4 pattern
- Performed by American Saddlebred horses
- High leg action (animation) in front legs and hind legs
- Lateral feet leave the ground at the same time
- Front legs hesitate for a moment at the peak of their flight allowing them to strike the ground slightly after the lateral hind limb
- There is no suspension period
- Lateral movement

## **Rack**

- Modified walk performed at great speed
- 4 separate and distinct beats
- Even cadence of footfalls in a 1-2-3-4 pattern
- Performed by American Saddlebreds and Rocky Mountain horses
- Horse only has a single foot on the ground at some moments
- Action should be high and quick with both fore and hind legs
- Some horse breeds perform the rack naturally, although without the extreme animation displayed by gaited horses
- No suspension period
- Movement is lateral
- Action should be high and quick

## **Running walk**

- Fast smooth walk at a speed similar to the trot
- 4 separate and distinct beats
- Even cadence of footfalls in a 1-2-3-4 pattern
- Performed by the Tennessee Walking Horse
- Hind legs reach far under the body, with the hind foot overstepping the print of the lateral front foot
- Head performs an exaggerated nod in time to the striding of the hind legs
- Although the hind legs do not display much animation, the forelegs are lifted higher than in a flat-footed walk
- Smooth, gliding step
- No suspension phase

## **Fox Trot**

- Medium speed, broken trot
- 4 separate beats
- Uneven cadence of footfalls in a 1-2-3-4 pattern
- Performed by the Missouri Fox Trotting Horse
- Lacking a suspension period, the gait is smooth
- Diagonal foreleg and hind leg move together in the flight phase
- Hind foot moves slightly behind the motion of the diagonal forefoot, so that the forefoot strikes a moment before the paired hind foot
- Due to its unique broken-trot pattern, the fox trot is referred to as Walking in front & trotting behind
- No suspension period

## **Paso Fino**

- Modified walk with 4 separate and distinct beats
- Rapid and rhythmic
- Even cadence of footfalls in a 1-2-3-4 pattern
- Paso Fino horses perform the paso fino gaits
- Smooth, elegant and have dynamic energy
- Paso fino can perform the paso gait at 3 different speeds
  - Paso fino (collected)
  - Paso corto (medium)
  - Paso largo (extended)
- Lateral gait with no suspension period
- Moderately high leg action

## **Stride Attributes**

All of these gaits can be executed with the horse adopting various frames (collection or extension) and with different levels of animation (limb fold or reach)

## **Frame**

The horse moves forward by using its torso musculature to propel it from the hindquarters.

The musculature creates a ring around the horse's torso.

The "ring" of muscles includes the base of the neck, abdominal and hindquarters.

**Collection** is when a horse gathers himself so that he can quickly shift his balance in any direction. The horse's body appears compressed with the hind legs engaged and the strides shorter and higher. The horse reaches under (engages) himself with his hindquarters. He flexes at the poll and reaches from the root of the neck. He rounds his back, tucks his hindquarters and contracts his abdominal to create a bascule (round frame). The horse is round and working in a shortened frame (nose to tail length).

## **Extension**

The horse still moves in a bascule (round frame) when extended, but he is reaching with his legs and lengthens his frame. He moves with great impulsion from the hindquarters and extends his stride to its maximum distance. The horse's front legs move from the shoulder and swing far forward. The toe will extend past the nose of the horse in a fully extended horse.

## **Animation**

The difference in height of the legs in a stride. The horse is collected, has high head carriage, and flexes his knees and hocks.

**Fold** is a high vertical action. The movement is more vertical than forward. The forelegs may be brought up past the horizontal and the legs are folded tightly.

**Reach** is a high, but more horizontal action. The forelegs may be brought up past the horizontal. The front toe should reach out beyond the horse's nose.