Trot: the inside story

MEET THE EXPERT

GILLIAN HIGGINS is an authority in equine anatomy and biomechanics, a British Horse Society senior coach and a professional sports and remedial therapist. Gillian specialises in assessing posture and movement, devising exercises for improving performance and educating horse owners. She is known for her books, videos and anatomical painting on live horses, which she uses for teaching. Visit horsesinsideout.com.

Suspension in trot greatly increases the stretch of muscles, tendons and ligaments. In part two of our series with biomechanics specialist **Gillian Higgins**, she explains exactly how parts of the body are used

TROT IS A TWO-TIME symmetrical, rhythmical gait in which the horse springs from one diagonal pair to the other with the hindlegs at opposite phases of the stride at any one time. The moment of suspension causes an increase in the stretch of muscles, tendons and ligaments, which have to absorb the extra load as the fetlock sinks following impact. The subsequent recoil plays an important role in contributing to momentum.

TROT FOOTFALL: SIGHT AND SOUND

MOVEMENT

In trot, the horse's legs move in the following order:

- **Right hind and left fore together**
  - **Suspension**
- **Left hind and right fore together**
  - **Suspension**

SOUND

The trot has a two-time beat which should be evenly spaced:

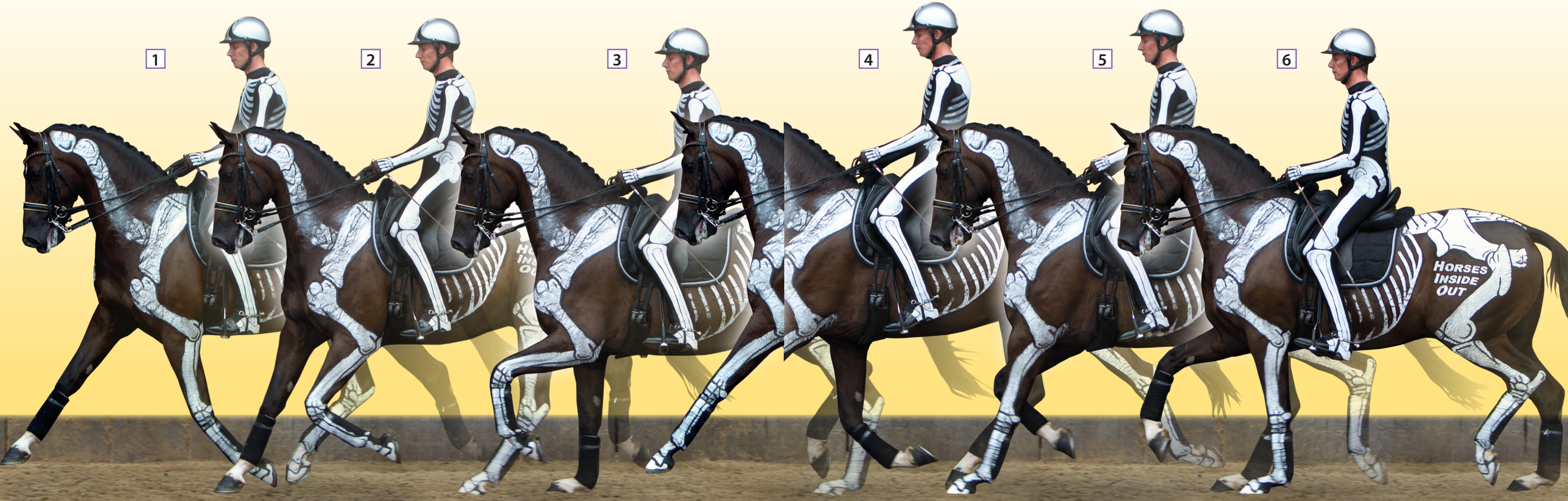
1 - 2 - 1 - 2

An uneven beat denotes lameness.

HOW THE BACK MOVES

- As the horse trots there is a small amount of passive flexion and extension through the thoracolumbar and lumbosacral regions.
- As he pushes up into the moment of suspension (images **1** and **4**, below) the abdominal contents, approximately 150kgs in a 500kg horse, push up against the underside of the back and cause it to flex.
- As this happens the longissimus dorsi muscles contract to counteract this upward pressure and limit back flexion.
- Conversely during stance (images **3** and **6**) the weight of the abdomen pulls down on the back, causing it to extend.
- At this point the abdominal muscles, particularly rectus abdominis, contract to counteract the extension.
- Adding the weight of the rider will reduce passive flexion and increase extension.

THE HORSE'S MOVEMENT IN TROT



Qualities of trot

As with any gait, good posture is required for a good trot. Qualities for a consistent, even, steady trot also include straightness, rhythm, regularity, cadence, mental and physical relaxation, harmony and impulsion. Steps should be light, balanced, steady and symmetrical, with the knees and hocks flexing to the same height.

The horse's head should be steady, with the hind- and forelimbs equally active. A supple back allows the horse to over-track as he steps through evenly. This is even more crucial for extended paces.

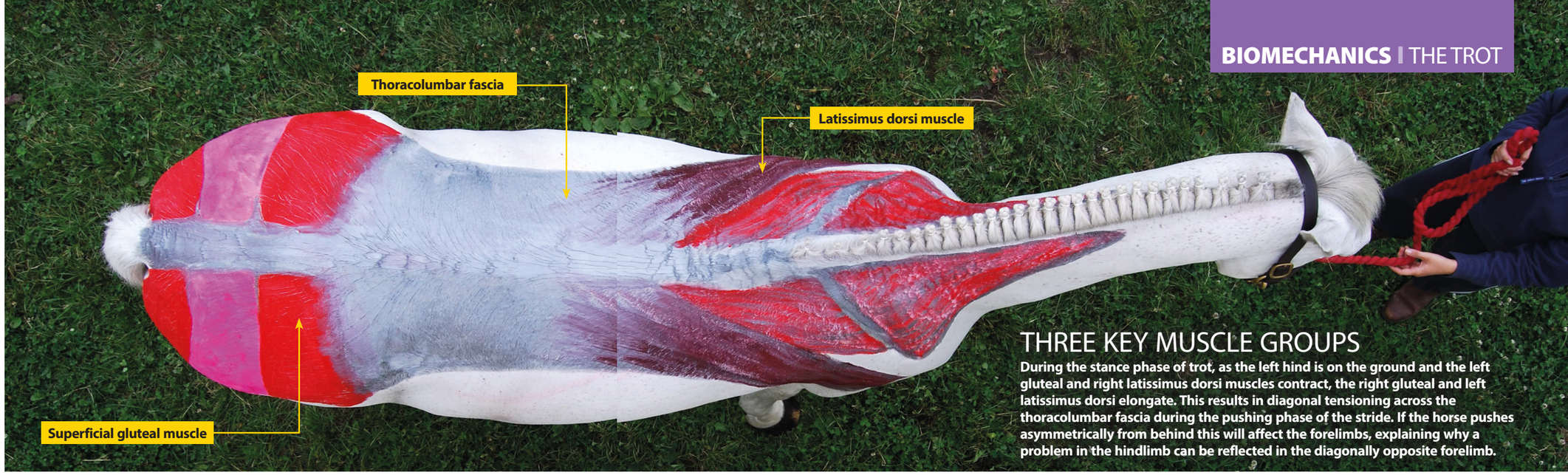
Trot is a particularly useful gait for:

- Improving rhythm
- Assessing symmetry
- Identifying lameness
- Improving muscular strength, expression and cadence
- Improving balance and core control.

Improving the trot

There are ways to help your horse improve his trot, including:

- Establishing a good even working trot before asking the horse for either lengthened steps or collection.
- Trying to ensure the horse doesn't run on the forehand by sitting up and controlling the speed with your rising.
- Ensuring that this gait is well established before making the transition from rising to sitting trot.
- Returning to trotting on a loose rein between bouts of hard work to let the muscles stretch, relax and recover.



THREE KEY MUSCLE GROUPS

During the stance phase of trot, as the left hind is on the ground and the left gluteal and right latissimus dorsi muscles contract, the right gluteal and left latissimus dorsi elongate. This results in diagonal tensioning across the thoracolumbar fascia during the pushing phase of the stride. If the horse pushes asymmetrically from behind this will affect the forelimbs, explaining why a problem in the hindlimb can be reflected in the diagonally opposite forelimb.

Collected trot cannot be achieved until the horse has sufficient muscular strength to maintain it

Types of trot

There are a range of trots which vary in power, tempo and stride length. These are all dependent on the strength of both the gluteal and hamstring muscles, which allow optimal engagement of the hindquarters, and on the strength of the forelimb protraction muscles, which are responsible for expression in the forelimbs.

Working trot

This is the most natural, efficient, achievable and sustainable type of trot for the horse. Working rhythmically and consistently with good posture, the nose should be slightly in front of the vertical. He should swing through the back with active rhythmical balanced steps. The horse should track up or over-track, have good hock action and impulsion derived from the hindquarters. Only when the muscles are sufficiently conditioned can work towards medium and collected trot begin.

Collected trot

This is an engaged trot with a compressed frame. Collected trot has several unique characteristics:

- Steps are shorter, more elevated and more energetic.
- Anatomically there is increased flexion of the hip, stifle, hock and fetlock, generating more power and thrust.
- Muscular strength and control are required as the haunches are lowered, and the hind end takes more weight.
- A strong core and muscular strength are required to maintain the shortened frame and lightened forehand.
- An arched and raised neck contributes to shoulder mobility and lightness.
- Collected trot is muscularly tiring and should be interspersed with a few steps of medium or working trot at regular intervals.

In extended trot, an elongated frame and longer stride length is seen

Medium trot

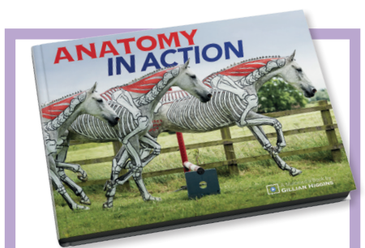
Medium trot is between working and extended trot, with impulsion coming from the hindquarters. It is a balanced pace with moderately lengthened strides, and is performed with the nose slightly in front of the vertical and the neck slightly elongated. The horse's steps should be even and rhythmical with the frame longer than in the working trot, but rounder than the extended trot.

Extended trot

Extended trot cannot be achieved until the horse is strong and the musculoskeletal system is mature. It requires an elongated frame, a strong core, muscular strength, power and elasticity. With this trot there is more spinal lateral flexion and rotation, a longer stride length, greater over-track and a longer moment of suspension.

Watch a video of the horse's skeleton moving in trot via Horses Inside Out academy. Membership is free. Visit horsesinsideout.com/academy.

The sequence of the footfalls in trot and pattern of the contraction of the spinal muscles working alternately on the left and right sides causes a small amount of spinal lateral flexion and rotation. This is reflected in pelvic movement.



Anatomy In Action **is Gillian's most adventurous project yet. It's a book plus detailed online biomechanics course in horse movement. There are 28-fold-out book pages along with 28 videos of the same movements with voice overs describing the biomechanics. It is available now at HorsesInsideOut.com/aia.**

- **Next issue: biomechanics of canter**