Vital connections

Understand your horse's tendons and ligaments so you can keep them in fine working order with Gillian Higgins of Horses Inside Out

Ligaments

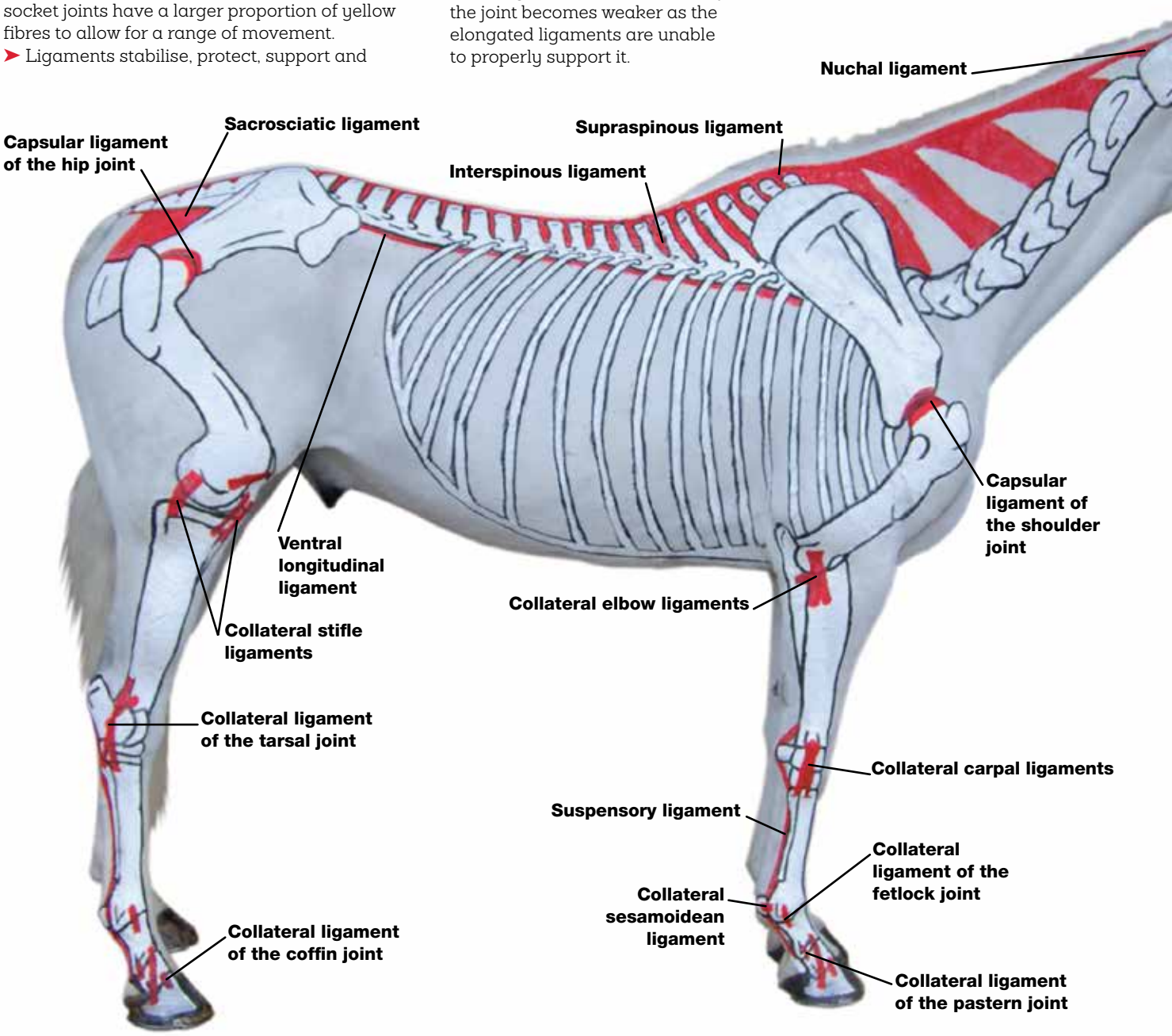
Fibrous bands of tough connective tissue that connect bone to bone, ligaments control range of movement and are found throughout the body including the spine, pelvis, hip, stifle and limbs.

Connective tissue is composed mainly of cells, fibre and collagen, a fibrous protein – white fibres are relatively inelastic, yellow fibres have the ability to stretch. Most ligaments are mainly white fibres, though capsular ligaments in ball and socket joints have a larger proportion of yellow fibres to allow for a range of movement.

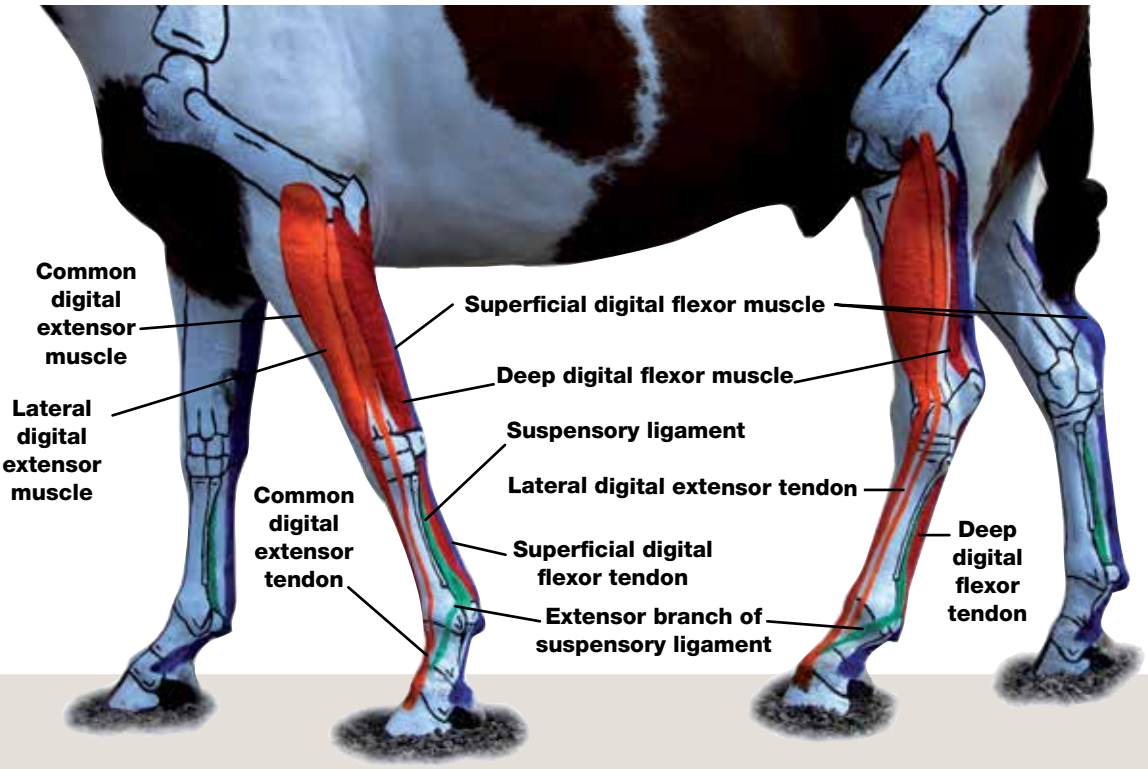
➤ Ligaments stabilise, protect, support and prevent joints from over-extending, over-flexing or over-rotating.

➤ Ligaments are formed from strands of collagen that criss cross and overlap. This makes them stronger and less elastic than tendons. Like tendons they are susceptible to injury and when they do become strained, their limited blood supply makes them slow to heal.

➤ If they are overstretched or injured, the joint becomes weaker as the elongated ligaments are unable to properly support it.



Text and most photos extracted from 'Horse Anatomy for Performance' by Gillian Higgins – see p89 for an offer on this book. Photos: Gillian Higgins, Bob Atkins (p68, top)



Tendons

Tendons are fibrous cords of connective tissue that connect muscle to bone.

➤ Tendons are formed when the muscle bulk tapers into dense, longitudinally arranged, parallel bundles of collagen, which have high tensile strength allowing them to withstand enormous loads.

➤ The collagenous fibres within tendons are arranged in a slightly zig-zag or crimped pattern, which allows them to stretch and recoil by approximately 4%. Beyond this stretch limit damage will occur.

➤ New collagen is produced from cells called fibroblasts, which are interspersed between the collagen fibres.

➤ Old collagen is constantly being replaced by new fibres. The entire tendon is replaced every six months.

➤ Where a tendon crosses a joint, it is protected by a synovial sheath and supported by an annular ligament.

➤ As there are no capillaries within tendons, poor blood supply makes them slow to heal.

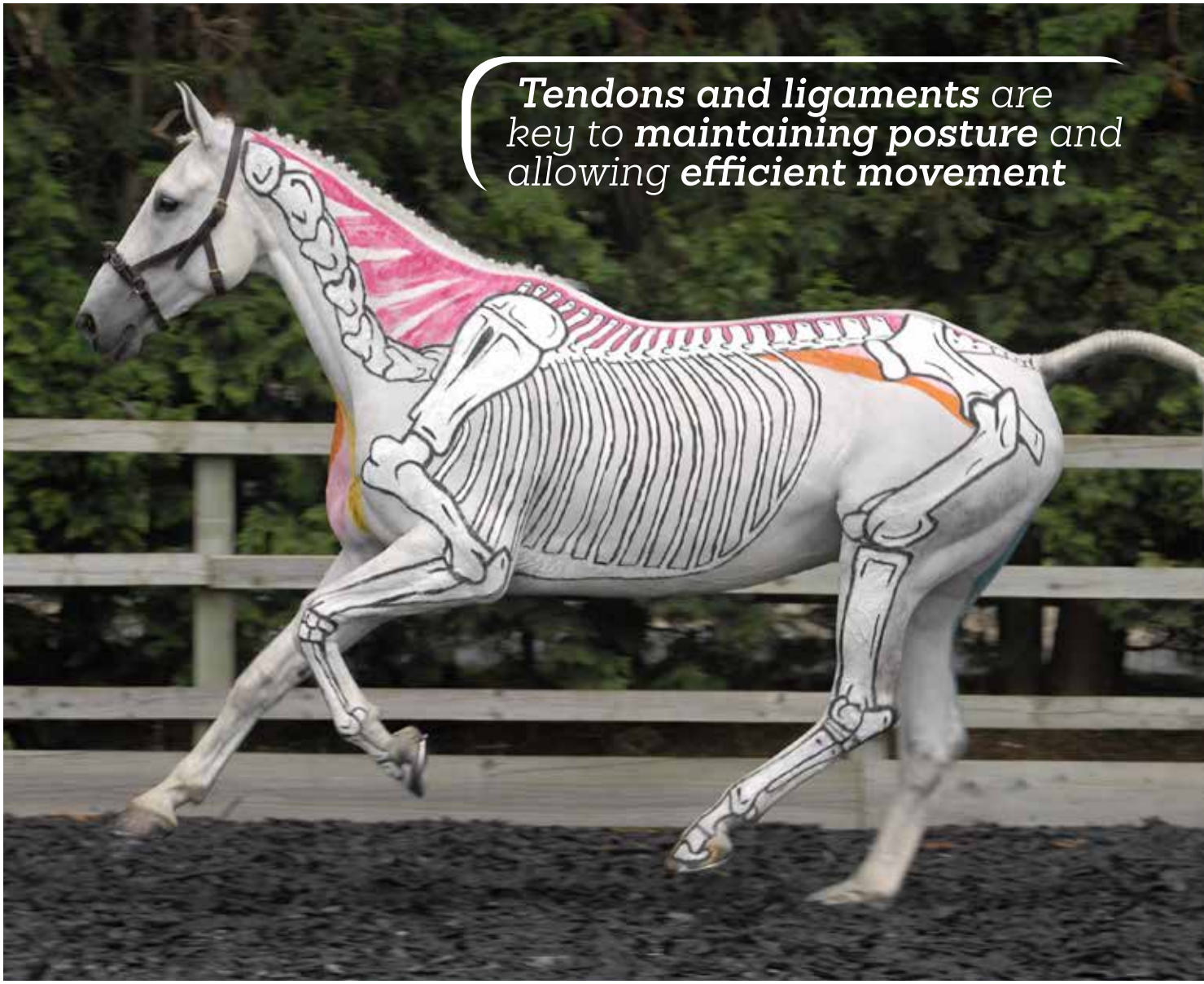
Go-faster fibres

The horse has no muscles below the knee or hock. This makes the limbs lighter and enables the horse to move faster and more efficiently. As movement in the joints from the elbow and stifle down is only in the forwards and backwards plane, the tendons in the lower leg are either extensors or flexors.

Healthy tendons are well-defined and feel firm. Tendons in younger horses appear to be more robust than those in more mature horses.

The digital extensor muscles and tendons come into play during the latter part of the swing phase of the stride (below left). They help position the hoof ready for impact and weight bearing.

The digital flexor muscles and tendons operate whenever the horse picks up and flexes his fetlock and pastern joints for example when jumping and during the first part of the swing phase in walk (below right). By using elastic recoil during the faster paces, tendons save energy and create movement without the parent muscle having to work as hard (see page 56).

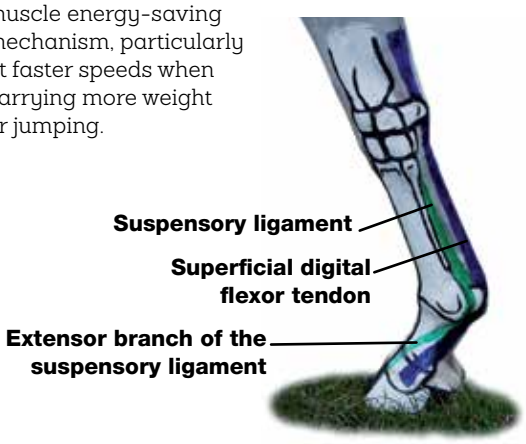


Tendons and ligaments** are key to **maintaining posture** and allowing **efficient movement

Energy-saving mechanism

The role of the suspensory ligament, which runs down the back of the lower leg, is to support and stabilise the fetlock. Although it is made up predominately of collagen fibres there are some residual muscle fibres. These, together with its higher proportion of yellow fibres, give the ligament its ability to stretch.

Due to their high elastic fibre content, the suspensory ligament and the superficial digital flexor tendon (SDFT) work closely together as a muscle energy-saving mechanism, particularly at faster speeds when carrying more weight or jumping.



Stretch...

Most weight is taken on the trailing forelimb as this lands first and is perpendicular to the ground. When landing from a fence, the suspensory ligament and the SDFT stretch to absorb upwards of 2½ times the horse's weight. As the body rolls over the planted limb, the fetlock joint extends, putting enormous strain on the fetlock suspension system. At this moment there is hyper-extension of the fetlock and carpal joints (see red circles).

...and recoil

Just like a taut elastic band, when pressure is released from the suspensory ligament and the SDFT, they spring back to their original length. This helps to pull the fetlock joint back towards a flexed position. As the forelimbs snap up they are almost instantaneously replaced by the hind feet.

Stretch...

Release...

Recoil

The suspensory ligament and the superficial digital flexor tendon play the same stretch and recoil role in the hind leg.

Typical injuries

Tendon and ligament strains, sprains and tears are common in performance horses' lower legs.

➤ Horses who gallop or jump are most at risk of tendon injury. Over-extension, particularly on a regular basis, can cause strain to the flexor tendons. Severe damage or rupture of the suspensory ligament may occur suddenly or over time. With dressage horses, the hind suspensory ligaments are particularly vulnerable to repetitive strain injuries, the most common training-related injury, which result in progressive degeneration.

➤ Factors which may lead to damage are: overworking a tired horse, direct trauma, damage to the parent muscle, poor conformation such as long sloping pasterns, poor hoof balance, carrying too much weight, rough, deep or hard ground and excessive fast work too early in training before the horse is conditioned.

➤ Injuries are most common in flexor tendons, check ligaments and the suspensory ligament.

➤ Inflammatory changes associated with the tearing of collagen fibres produce heat, swelling, pain and reduced function – although not all need to be present. In the case of mild strain there is little or no heat, pain or swelling.

➤ If injury is gradual rather than acute, it is known as tendonitis. The term for inflammation of the suspensory ligament is desmitis.

➤ If tendon or ligament damage is suspected, the vet must be called immediately. Swift action influences long-term recovery.

➤ Prompt application of cold therapy and pressure bandaging is essential to control inflammation. Application of ice to the limb will constrict ruptured blood vessels and slow bleeding and bruising.

The healing process

Tendon and ligament injuries may take 12–18 months to heal. The healing process follows three stages which cannot be hurried:

1 Damaged tissue is removed by phagocytes (white blood cells). Collagen has a poor blood supply so the process is slow, particularly in the mid-cannon bone area.

2 Fibroblasts migrate to the area to produce new collagen.

3 Scar, or granulation tissue is then remodelled.

Repaired scar tissue is not as elastic as original collagen due to its haphazard non-parallel organisation. This is an important factor when assessing the prognosis for a return to competition. New techniques incorporating stem cell therapy are now emerging to promote regrowth of healthily organised tendon rather than scar tissue.

*Prompt action to **control inflammation** can greatly assist in **recovering from injury***

Keep them sound

➤ As their elastic limit is doubled when warm, tendons are less prone to injury if warmed up gradually. Cold tendons are less pliable and more susceptible to damage.

➤ Excessive heat generated by protective leg gear when riding at speed can weaken the collagen fibres. If not removed immediately after exercise, retained heat can increase tendon temperatures to 46-47°C. Tendons are more susceptible to injury when they have a high core temperature.

To maintain optimum tendon health:

➤ Use well-ventilated boots that allow efficient, convection cooling of the legs during exercise.

➤ Remove boots and actively cool the legs as soon as it is safe to do so after fast work.

➤ Avoid using bandages for a prolonged period of time or if the horse is engaged in fast work. Bandages increase the heat within the structures more than boots, increasing the time it takes to cool the legs.

➤ Ensure protective and support bandages are firm but not tight, and include the fetlock.

➤ Feel legs daily for signs of heat or swelling.

Gillian Higgins, founder of Horses inside Out, is a sports and remedial therapist for horses and humans, anatomist and BHS Senior Coach who runs demos, courses and conferences in the UK and worldwide.