Realistic foundations – SEES 2018 Factors affecting performance

Sarah Logie FWCF

When discussing performance we often jump to the conclusion that we are referring to high level athletics. In fact the definition of performance is ‘the action or process of carrying out a task or function’. A horses ‘task’ may vary dramatically from work in hand, to carrying a load, pulling, carrying a potentially unbalanced rider right through to working at the extremes of the equines capability – and no matter where on this scale the task falls the needs of the individual must be considered.

All equines have the same basic needs – (Fresh water, correct nutrition, shelter and company) but I would add to that list the ability to move without pain and to rest comfortably = ‘soundness’ i.e. to be free from injury, damage, defect or disease.

When we face an individual with a task that is perhaps not within their comfort zone then they enter the margins of compensation – or ‘coping’. The degree that they have to ‘cope’ is dependant of the task, the conformation of the animal and therefore their own biomechanics (the study of the action of external and internal forces on the living body, especially the skeletal system).

The equine conformation should be assessed in relation to the task the animal will be asked to perform and this should be worth considering at the point of purchase and vetting. It should also be considered whether or not that task will change later on – i.e. a horse bought as a safe hack may not adapt to being a showjumper in a few years just because the rider has changed their aspirations.

There are many papers and books discussing conformation but they can be condensed into ‘where shape and structure allow optimum performance with minimal wear and effort’. Straight legs in four corners will go a lot longer and further than a pretty head!

Horses that are able to move efficiently are less likely to suffer lameness as they use minimum energy (and have more in reserve), place less strain on the soft tissues, have minimal wear and concussion on the bones and joints and are able to rest properly, aiding good recovery. The more factors a horse has to compensate for (i.e. poor conformation for the task) the greater the risk of injury and lameness.

The feet and limbs of the horse are the foundation on which the rest of the animal relies and if elements are not right the horse is very adept at transferring load and strain onto other structures to cope – until it can compensate no longer.

When approaching a new horse regarding hoof care a number of considerations must be given. Firstly the individuals' **conformation**, the **task** the horse is expected to perform, the **environment** it lives in, and finally the **management** and ability of the rider.

When assessing the horse it is important to be aware that stance can give a false impression of conformation. Stance can be changed - conformation cannot. If we shoe for stance at the expense of the conformation we will again overload structures as the horse compensates – which is likely to worsen the stance! We must trim and/or shoe whilst recognising the limits of the horses' conformation as this will affect how shoes stay on and how sound the animal stays.

Foot conformation and horn quality should be assessed. In a poor conformed foot some structures may be weak, and require the load to be transferred to other stronger structures while they recover.

After the static assessment of conformation, stance and the feet then the horse should be assessed dynamically. Asymmetry, limb flight, interference, foot fall and limb loading are all factors that should be considered before trimming and/or shoeing and can sometimes be surprisingly different to what you might assume in the static animal. Those feet are on a moving animal and it has to be comfortable on them for 6-8 weeks or until they are seen again.

The task now influences the work carried out, does the task require added grip, what are the wear requirements which must be balanced against the weight of the shoe, what surface will the horse be on, what is the normal direction of travel (rapid turns or long straight lines?), are additional aids like studs or pins required and where should they be placed to give the desired effect without creating extra strain or jarring.

The environment the horse lives in will influence the shoeing, very wet ground, steep or rough ground, poor fences will all require slight alterations which may not be beneficial to the horse but are more desirable than broken feet and lost shoes. Combine this with the management, if the shoeing interval that is preferable for the horse is not affordable to the owner then it is unlikely to be maintained and ultimately

the horse will suffer, so a happy medium must be found which is favourable with the wallet, the day to day management and the riders' ability. This can be a bit of trial and error on the part of the farrier!!

What can we influence through farriery? In the growing animal we can improve (or worsen) angular and flexural limb deformities but the animals age is vital in the success of any treatment as depending on the site of deviation there are times of maximum growth and then times of grow plate closures after which that is the animals conformation and can only supported not improved.

As farriers we can affect the stance of the horse, how each foot lands and loads and how efficiently it breaks over and interacts with the ground/surface. Once having assessed the horse dynamically we should be striving for feet that land level, with even loading through the hoof and limb, then the ability for the horse to move forward with power (i.e. can push off its toe) but without excessive strain. So having taken all the other factors into consideration farriery is quite simple!!!

The horses stance can be a big clue about what pain or discomfort the horse is experiencing within its body, it may be as obvious as the 'laminitic stance' or more subtle like a horse that stands under itself due to a hoof imbalance which forces it to change how it can rest comfortably (Fig.1). Over time an adapted stance due to compensation will cause further problems and may not be instantly resolved by removing the initial cause; for example a horse with long toes and shod short behind will likely stand with its feet well forward under itself, if this has become habitual for the animal, trimming and correct shoeing will help but the soft tissue through the legs and back will also need work so that the body can 'relax' back to a normal stance. It will then require work to build up the correct supportive muscles to maintain the horse in that new posture.

Issues which create changes in stance will only be fully resolved when the root cause is identified and treated. If a horse has dental problems that cause it to change its head and neck carriage, it may then suffer back pain which can manifest itself as hind limb lameness. Farriery cannot sort dental problems! However if the feet are the start of a sore back or head carriage issue then the basics of good farriery have been ignored.

What should we look for when we are assessing the horses' feet? Good basic mechanics must be the first priority, the mass of the horse has to move over each of its feet and the strain placed upon the joints and soft tissue at the end of the limb are immense. There are various recognised trimming protocols which fundamentally agree, there should be a maximum of 50% of the area of the foot in front of the widest part (Centre of rotation/the centre of the coffin joint) and preferably up to 60% behind it (Fig.2). This can be altered with shoe placement without the need for dramatic trimming which weakens the foot.

A foot which has less weight bearing surface behind the widest point will be under excessive strain each time it loads and breaks over, as the deep digital flexor tendon will be passing over the navicular bone and inserting into the pedal bone at an acute angle – leading to heel pain and progressive lameness. Symmetry is recognised to be a positive thing as a load falling down the limb is equally supported by each joint and then the foot below it, so an asymmetrical foot is a sign of an imbalance and uneven loading.

When watching a horse the way each foot lands is important as this is the initial impact that must be absorbed by the hoof capsule then the internal structures and the joints. It should be even between the medial and lateral aspects and slightly heel first as this is where the majority of the shock absorbing structures in the foot are (Fig. 3). Uneven landing causes excessive concussion and crushing in some parts of the foot then secondary tearing and jarring in others, conditions such as corns and sheared/shunted heels are external signs that the hoof can no longer cope with un-level landing (Fig. 4).

Once the foot has come to the ground the body weight starts to move over it and causes it to be loaded. The joints in the lower limb all move in one plane and take even load well, they are strongly supported by ligaments and tendons which are all either collateral (on both sides) or central or wrap around the joints. This design is very strong but does not cope with repeated uneven loading, without strain ultimately occurring. The compression and strain caused by uneven loading will build up to cause damage to joints, their associated synovial structures, cartilage and supportive tissues.

A well balanced foot which lands and loads level will be a strong lever for the horse to move forward over, the energy stored in the loaded tendons will allow free (minimal effort) movement as the horse breaks

over (body weight moves forward and heels start to unload). The task which the horse is doing at this point may affect how the toe needs to react with the ground – for example a driving/pulling horse may need to dig its toes into the ground to get leverage so a round broad shoe will not help it but for a dressage horse which needs to move lightly over the top of a surface a broad light section means the foot ‘floats’ on top of the surface requiring less energy to lift it up and out of the ground.

A foot which has excessive percentage in front of the centre of rotation will incur increased soft tissue strain as the foot breaks over and it will take more energy for the limb to move forward.

The hoof capsule is malleable and will therefore deform and distort as a result of the load placed upon it. This can be seen externally in the form of crushing, folding, shunting, flaring or cracking. Internally this will result in inflammation, bruising, strain and breakage of connective tissue (laminal tearing). The basics of hoof proportions and good balance (even landing/loading) may be achieved and maintained with trimming but in some cases (although the unshod foot will compensate better than a poorly shod foot) addition help is required. When the trim cannot place the bearing surface in the optimum position under the load then we can use shoes to enhance and improve the base of the limb.

Shoes can be made or adapted to create any profile which can improve the landing and loading of the foot, and surface interaction can be influenced with various modern materials such as pour in pads. The material the shoe is made of (steel, aluminium, plastic or wood) will all have positive and negative effects so selection will depend on which will achieve the goal with minimum side effects i.e. is weight more important than wear? (Fig. 5) Every day shoeing should be considered remedial and simple hammer techniques or use of a welder or grinder can be used to improve the biomechanics that the horse has to live with every day until the next shoeing.

As farriers to be part of a horses ‘team’ is very rewarding and any changes we make can be maximised and maintained by a good soft tissue worker. Good observation and open communication within the team can be the best way to prevent and manage any potential problems the horse may deal with.

Figure 1. Laminitic stance is pain related, but a stood under stance can also indicate discomfort

Figure 2. Widest part of the foor indicates the center of rotation. (COR) Courtesy of J.Ferrie FWCF

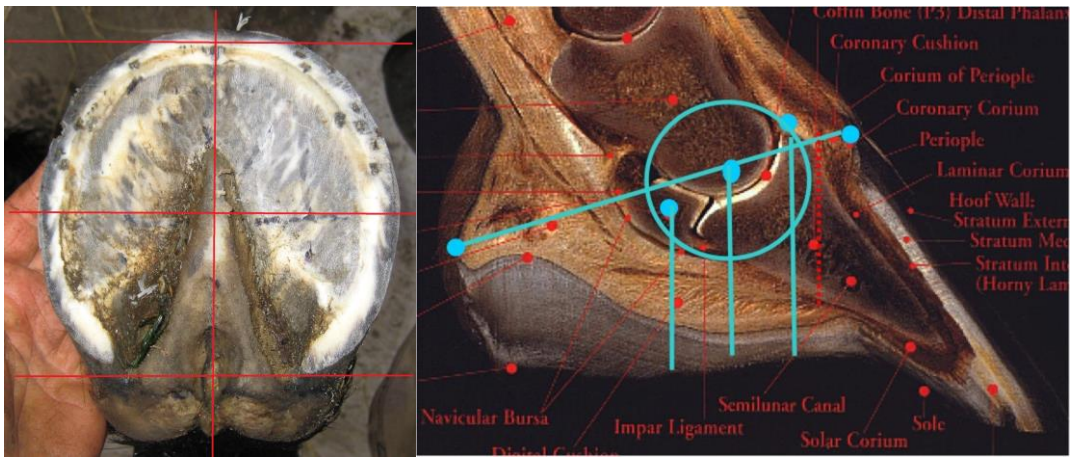

Figure 3. The shock absorbing structures of the foot should be loaded evenly for efficient energy dispersion.

Figure 4. Uneven landing causes excessive concussion in parts of the foot.

Figure 5. A selection of shoes – different materials, sections and styles will all have positives and negatives effects which must be considered carefully before application.