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Horse–rider interaction

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Introduction

Unlike humans, horses have no selective pressure for load carrying ability as it is not an action they would naturally undertake and incurs a proportionate increase in metabolic cost [1]. Despite this, domesticated horses are regularly required to carry the additional mass of a rider whilst undertaking complex or high speed movement.

Load carrying

Applying a load to horses does not affect stride length or frequency [2] but increases stance and decreases swing time and is directly related to increased vertical limb force and associated stress and strain in limb structures. As stance time is increased, despite increased ground reaction force (GRF) impulse, the increase in peak vertical force is minimised. Mechanisms to reduce forces are of particular interest in racehorses due to the high peak GRF they experience and associated risks of stress fractures or tendon injuries. The location of the load is important, influencing the risk of overloading limbs or loading weaker lumbar regions increasing the risk of spinal injuries.

Rider position

If rider stability is defined as synchronised movement with the horse, stability is greatest during sitting trot and canter when compared to walk, rising trot or the 2-point seat [3,4]. In conjunction with reduced stability, peak force under the saddle is lower in the 2-point seat despite no significant change in mean force [2]. This suggests that peak forces are reduced through elimination of ‘bouncing’ on the horse’s back, reducing the risk of pressure points or overloading spinal structures and indicating an isolation of the rider’s centre of mass (COM) displacement from that of the horse as found in race jockeys [5].

Rider experience

Links between rider experience and falls in racing [6] suggests changes occur with rider experience across disciplines [7,8]. Less experienced riders exhibit a lag phase [9] likely to reduce rider balance, increasing peak forces and the risk of spinal injuries, especially if the rider lands while the back is extended. Experienced riders exhibit a more flexed ankle suggesting a damping effect [10,11] reducing impact when landing on the back.

Energetics

The importance of displacement synchrony in race jockeys was highlighted [5] identifying the ability of jockeys to mechanically isolate their COM from that of the horse, reducing energy cost and race times. This is supported by De Cocq et al. [11] who concluded an extreme modern jockey technique is optimal to minimise peak vertical force and mechanical work of the horse.

Racing jockeys

A study investigating differences between novice and elite jockey technique on a simulator indicates that within jockey position remains consistent, while between jockey positions show greater variation. The displacement of the feet is of comparable magnitude to that of the horse while the pelvis of the jockey exhibits a significantly smaller displacement as a result of mechanical isolation. Experienced jockeys maintain a more consistent pelvic position, thus reducing the peak forces applied to the back.

Discussion

While it is agreed that experience, balance and fitness are all important attributes for jockeys. It is not yet known whether the ability to isolate their COM to maintain a consistent position is what determines a ‘good’ jockey. Neither has it yet been established whether the use of a whip alters rider movement or whether jockeys are able to overcompensate for the horses’ movement and thus provide a driving effect.

References