

How not to train sport horses: Detrimental regimens and exercises.

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Take home messages

1. Racehorses should start to exercise as two-year olds.
2. Slowly introduce faster work during the first months of training.
3. A lot of high speed work is likely to be detrimental.
4. Doing zero fast work during training will not prepare the musculoskeletal system for racing.
5. Between 4 and 7 furlongs (800 – 1400 metres) of fast work per week is probably best.
6. Well maintained turf is probably the safest surface on which to train and race.
7. Warm up and cool down periods are important in all sports horses.
8. Further studies on the influence of different surfaces on injury rates in all sports horses are on-going.

Introduction

This paper summarises some of the recent research into training methods that have been shown to be detrimental to sports horses. The vast majority of this work has been performed in the racehorse but more recently work has been completed in dressage horses and is underway in show jumpers.

In order to provide an “evidence-based” set of recommendations this paper focussed on the most robust research in this field. In doing so the review is restricted to studies with large study populations and avoids references to small studies with insufficient power to detect statistically significant associations.

This paper addresses the following questions for racehorse training:

- When should full/pre-training commence?
- How much should a horse train per week?
- On what surfaces should a horse train?

In addition some aspects of dressage horse training relating to exercise regimens and training surfaces are investigated.

When should full/pre-training commence?

It has long been suggested, indeed some in the industry still hold the view, that starting race training at the age of two years is too early. With this in mind the RSPCA, in the UK, commissioned research to specifically test this (and other) hypotheses. Wood et al. (2001) in fact demonstrated that starting to train and race as a two-year old was beneficial to the long-term survival of the horse. Horses that started racing over the age of two were more likely to suffer a fatality during a race than

those that started racing at two years of age. This finding was supported by Parkin et al. (2004, 2005) who showed that horses that first raced at the age of two were less likely to sustain a catastrophic distal limb fracture or a lateral condylar fracture of the distal third metacarpus at any point in their subsequent career.

Both of these studies also demonstrated a significantly increased risk of fatality or catastrophic fracture during the first races or first year of a horse's racing career. The relationship between the risk of catastrophic fracture and first year of training was present regardless of the age at which the horses started training. This perhaps suggests that younger horses are more "fragile" and should therefore be slowly eased into training and racing.

How much should a horse train per week?

There is clearly a balance between cardiovascular fitness and skeletal adaptation/pathology that needs to be considered. Horses must have the required cardiovascular fitness to enable them to perform at their best during a race. However, over training can result in excessive strain on the musculoskeletal tissues that may result in an inability to train and race or even in a catastrophic breakdown.

Work from Hong Kong would suggest that getting this balance correct is especially crucial in the first few months of racing. Lam et al. (2007) demonstrated that horses that raced further in their first six months of training after import into Hong Kong were more likely to eventually retire due to a tendon injury. For example, a horse that raced a total of 10,000 metres, during the first six months in Hong Kong, was approximately three times more likely to eventually retire due to a tendon than a horse that raced a total of 4000 metres, during the first six months in Hong Kong.

Once the first year of training has been successfully negotiated it is still important to balance the needs of the cardiovascular system and the musculoskeletal tissues. A number of studies have been able to draw conclusions about the level of exercise required to avoid fracture or tendon injury.

For example, work from the UK has shown that horses that exceeded 220 furlongs (44 km) at canter (less than or equal to 14 m/s) **and** 30 furlongs (6 km) at gallop (greater than 14 m/s) in a 30-day period were at the highest risk of fracture of any bone (Verheyen et al. 2006a). This level of gallop distance exercise equates to approximately seven furlongs per week which compares closely with that reported in California (25 furlongs per 30 day period) by Estberg et al. (1998).

Together these, and other, studies provide good evidence of the association between increased amounts of high-speed exercise and the risk of musculoskeletal injury. These findings are consistent with the hypothesis that horses doing a lot of this type of exercise are also accumulating sub-clinical or clinical bone damage that may result in a catastrophic outcome.

There are some studies that have failed to identify significant associations between increased exercise distance and the risk of injury. In fact one of these studies actually demonstrated that horses with catastrophic musculoskeletal injury accumulated significantly less high speed exercise in the 30 day period before the injury date compared to uninjured controls (Cohen et al. 2000). Cases were also more likely to

have done zero high-speed exercise than controls before the injury date. This finding was also identified when risk factors for catastrophic distal limb fracture (Parkin et al. 2004) or lateral condylar fracture of the third metacarpus (Parkin et al. 2005) were investigated in the UK. The bones of the horses which were doing no high-speed exercise in these studies may not have been optimally adapted to the loads they would experience under racing conditions and were therefore more likely to fracture.

The final results produced for catastrophic distal limb fracture and lateral condylar fracture suggested that the risk was highest for horses doing zero fast work. For horses doing between 4 and 10 furlongs of fast work per week the risk was reduced and thereafter the level of risk did not alter (Parkin et al. 2004 & 2005). Very few high load cycles have been demonstrated as being sufficient to induce an osteogenic response in avian ulnar bones (Rubin and Lanyon 1984). Therefore relatively short distances of gallop work during training may be protective against fracture during racing. Biologically plausible findings such as these could contribute significantly to the formulation of training regimens designed to reduce the risk of injury.

On what surfaces should a horse train?

In many racing jurisdictions the majority of training occurs at the same location as racing and sometimes on the racetrack itself. However, in others such as the UK the vast majority of training occurs on private or public gallops away from racecourses. The former scenario makes it difficult to compare the effects of different surfaces as most, if not all, horses will be using the same surface. In the later scenario there are so many other factors that may contribute to differences in injury rates on different surfaces (e.g. training regimen, topography and population demographics) that identifying definitive associations with surface type have proved difficult. Nevertheless, some authors have reported significant differences in training injury risk. For example, dirt training surfaces have been associated with a higher incidence of dorsal metacarpal disease than wood fibre training surfaces in the USA (Moyer et al. 1991) and horses that spent more time exercising on Equitrack[®] were less likely to fracture in a study on a number of yards in the UK (Pickersgill 2000).

A further study conducted in the UK showed that horses that predominantly used a particular unnamed all weather surface, were eight times more likely to have sustained a pelvic or tibial stress fracture (Vereheyen et al. 2006b). In these analyses a horse was defined as predominantly using a particular surface if it had spent more than 70% of its time on that surface during the 30 or 60 days prior to fracture date. Horses that did not spend more than 70% of their time on one surface were defined as using a mix of training surfaces and were classed as the reference group, with which other surfaces were compared. The authors recognise that using a 70% cut-off was arbitrary and also that many other factors were not accounted for such as incline and maintenance of the training surface, indicating that further investigations measuring other training variables are required before definitive statements about the effect of training surfaces on injury and lameness can be made.

Work in other sports horses

In comparison to the amount of work performed in the Thoroughbred racehorses there is limited evidence from other disciplines. Some work has been completed in the dressage horse (described below) and work is currently on-going in show jumpers.

This work is being led by Lars Roepstorff at the University of Uppsala and initial results should be available during 2010.

Dressage horses

These findings come from a questionnaire study conducted by Murray et al. (*in press*). More than 12,000 registered members of British Dressage were asked to complete a questionnaire designed to identify training and training surface characteristics associated with injury or lameness.

The amount of time spent exercising on a horse walker was associated with lameness. Horses that did seven hours per week compared to one hour per week were almost twice as likely to have been lame. It is however important to remember that the most likely explanation of this finding was that horses that spent more time on the horse-walker were doing so because they were recovering from an episode of lameness. As such use of a horse-walker is a **result** of lameness rather than a **cause** of lameness.

In contrast lunging as part of a normal exercise regimen was associated with a reduced likelihood of lameness in the previous two years. Horses that were regularly lunged were 0.8 times less likely to have been lame in the previous two years, than horses that were not normally lunged. This association may be due to adaptation of the musculoskeletal system to different types of exercise and potentially improved proprioceptive conditioning. It is also possible that horses being lunged were fitter or maybe warmed up and cooled down more effectively than those that are not lunged, thus reducing their predisposition to lameness.

Horses that trained most often on outdoor arenas (whatever they were made of) were less likely to have been lame in the previous two years compared with horses that most often trained in indoor arenas. This may reflect various factors such as arena size, surface characteristics or arena maintenance that require further investigation.

Horses that most often used an arena with a sand-based surface were more likely to have been lame compared with horses that used other surfaces. However, for horses that trained on sand-based surfaces there was also a small but significant negative association between the number of times per week that horses trained on these surfaces and the likelihood of lameness. This finding probably illustrates the process of adaptation in bones, tendons, joints and muscles. In other words, keeping to a particular surface type (even those that may inherently be more risky such as sand-based surfaces), may be the better injury prevention strategy than continually changing training surface type. To maximise this beneficial effect the best option would be to continually train on the type of surface on which the horse would spend most of its time in competition.

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References

Cohen ND, Berry SM, Peloso JG, et al. Association of high-speed exercise with racing injury in Thoroughbreds. *J Am Vet Med Assoc* 2000;216(8):1273-8.

Estberg L, Gardner IA, Stover SM, et al. A case-crossover study of intensive racing and training schedules and risk of catastrophic musculoskeletal injury and lay-up in California Thoroughbred racehorses. *Prev Vet Med* 1998;33(1-4):159-70.

Lam KH, Parkin TDH, Riggs CMR, et al. Evaluation of detailed training data to identify risk factors for retirement because of tendon injuries in Thoroughbred racehorses *Am J Vet Res* 2007;68:1188-1197.

Moyer W, Spencer PA, Kallish M. Relative incidence of dorsal metacarpal disease in young Thoroughbred racehorses training on two different surfaces. *Equine Vet J*; 1991;23:166-8.

Murray RC, Walters JM, Snart H, et al. Identification of risk factors for lameness in dressage horses. *Vet J*. In press.

Parkin TDH, Clegg PD, French NP, et al. Horse level risk factors for fatal distal limb fracture in racing Thoroughbreds in the UK. *Equine Vet J* 2004;36(6):513-9.

Parkin TDH, Clegg PD, French NP, et al. Risk factors for fatal lateral condylar fracture of the third metacarpus/metatarsus in UK racing. *Equine Vet J* 2005;37(3):192-9.

Pickersgill CH, Reid SWJ, Marr CM: Musculoskeletal injuries and associated epidemiological risk factors among thoroughbred flat racehorses, *Proc British Equine Vet Assoc Congress, Birmingham 2000*;pp 208-9.

Rubin CT, Lanyon LE. Regulation of bone-formation by applied dynamic loads. *J Bone Joint Surg* 1984;66A(3):397-402.

Verheyen KLP, Price J, Lanyon L, et al. Exercise distance and speed affect the risk of fracture in racehorses. *Bone* 2006a;39(6):1322-30.

Verheyen KLP, Newton JR, Price JS, et al. A case-control study of factors associated with pelvic and tibial stress fractures in Thoroughbred racehorses in training in the UK. *Prev Vet Med* 2006b;74(1):21-35.

Wood JLN, Eastment J, Lakhani KH, et al. Modelling a retrospective study of death on racecourses. In: *Proceedings of the Society for Veterinary Epidemiology and Preventive Medicine*. Noordwijkerhout, the Netherlands. 2001; pp 115-26.