

Conditioning and Retraining the Equine Athlete

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Basic Principles of Conditioning

Physiological conditioning of the equine athlete is often dictated by tradition, mostly practiced the same as it has been for the past century. Trainers have been slow to adapt new science and technology or to experiment with improved training techniques. Consequently, some horses never reach their peak performance level and musculoskeletal injuries in young race and performance horses during training are far too common. These injuries and/or sub-par levels of physical fitness have a significant negative effect on the economic outcome for race and performance horse trainers and owners.

Cardiovascular and musculoskeletal conditioning involves two basic principles. The **overload principle** is the basis for all conditioning responses. This means that the system must be overloaded in some manner (intensity, speed, time) in order to elicit a training response. Basically, when the system is overloaded it relays that fact to the rest of the body and passes on the message “hey, that hurts and we should get better prepared in case that happens again”. There must be a system overload in order to cause a conditioning effect. Another important concept of the overload principle is that in order to continue to have an improvement in fitness, we must continually increase the work load. Otherwise, the horse reaches a plateau of fitness relative to the current level of physical exertion and remains at that level. Gradually increasing the workload is the only way we can get a horse progressively more fit. Of course, if we overload the system too much or too quickly, serious breakdowns can occur before the horse has time to become fit.

How do we know if we are sufficiently overloading the system or more importantly, overloading it too much? Heart rate (HR) in response to a specific, repeatable exercise bout is the easiest way the average horseman can assess exercise stress. In a research setting, blood lactic acid concentration gives us a more accurate measure of relative fitness and exercise stress to a specific exercise

bout. However, with the use of widely available and affordable on-board heart rate monitors, any horse handler can immediately ascertain cardiovascular response to exercise. Table 1 shows approximate HR response to different types and intensity of exercise. Obviously, these would change slightly with various levels of fitness in the horse. In order to improve the horse’s anaerobic (without oxygen) system we must push the horse hard enough to get HR’s over 150 beats/minute. It is important, in the latter stages of training, to achieve some anaerobic training to assure that the horse has the capacity to continue to work during times of oxygen deficit such as at the end of a 1-mile race or at end of a long cross-country jumping course.

TABLE 1. Estimated Heart Rates (HR) at Different Exercise Intensities (Adapted from Gibbs, et al., 1995)

<u>Activity</u>	<u>HR (beats/min)</u>
At rest	36-40
Walking	60-80
Slow Trotting	80-90
Fast Trotting (200 m/min)	110-120
Fast Trotting (300 m/min)	130-140
Slow Cantering	100-120
Galloping (500 m/min)	180-200
Galloping (800-1000 m/min)	200-220

The other important principle of conditioning is **specificity of exercise**. This simply means that the horse needs to be conditioned for the type of athletic activity it will be performing later on. Most performance horses have to go through months of psychological training in order to get them ready for competition. A cutting horse, for example, does plenty of stops and turns in practice, similar to the activity they will be doing at the actual competition. So while they are learning to turn and stop with a cow, they are also getting more fit for the specific type of exercise they will be performing. However, we must be careful to accustom all horses to the type of exercise they will be asked for in

actual competition. Obviously, we would never ask a horse to run a race at a full gallop when all they had ever done at home is long trot. But, how many times are horses asked to run a mile and quarter when all we have ever run at home is a half-mile breeze? Or how many barrel horses are exercised everyday at a long-trot (“legging them up”) and then go to a jackpot barrel race or a practice session and make two or three hard runs at a full gallop. The horse basically should never be asked to perform at a level in competition that they had never had to perform at home. Is it any wonder why horses break down at the track? Many of them have never been asked for that level of physical exertion before in their life, until race day.

How long does this conditioning take? With the right kind of training, we can actually get significant cardiovascular conditioning in as little as 4 wk. However, it takes much longer than that to get the bones, tendons and ligaments conditioned. Normally it is recommended that we train the horse using 9 to 12 wk of slow, long distance type exercise before introducing any speed work. Once past this period, we can gradually start introducing speed work 1 to 2 times per wk in order to get the horses over the anaerobic threshold and to begin to get more bone density and strength. After 3 to 4 weeks of gradually introduced speed work, the horse can then be put on an interval training schedule, which involves a combination of distance work and speed work which will continue to build aerobic capacity and also build strength and speed.

Training of Young Horses

On many farms, young performance and race prospects are put in a back pasture somewhere on the farm and forgotten until they are approaching their 2 year-old year. At that time they are brought in and started into a training program. However, the high incidence of musculoskeletal injuries in young race and performance horses indicate that management practices of young horses need to be reevaluated. With the high prices currently being invested in yearling race and performance prospects, any management practices which may help improve the success rate of these young horses would be of economic benefit to horse owners and would improve the well-being of the horse. The chance of a long career in the show ring or on the track may be improved by implementing sound management practices on a routine basis.

Much of the training and conditioning of performance horses typically occurs toward the end of the skeletal maturation process. This is unfortunate as there is now research which shows the advantage of pre-conditioning young horses. If horses are conditioned during the early growth and development stage, bone remodeling and strengthening can occur during this growth stage. Since bone is a living tissue and does respond to mechanical loading by adapting

itself to those gradual increase in strain, it is very likely that young horses will benefit greatly from well-designed, gradual conditioning programs early in their weanling and yearling years. Research (Young et al., 1991) has shown that during training, bone rapidly remodels to decrease bone porosity and increase wall thickness and mineralization, to enhance the bone's ability to withstand stress during exercise.

One of the early reports of the beneficial effects of training on bone remodeling in young race horses showed that repetitive loading of the bone and the related strain contributes to bone remodeling and reshaping (Nunamaker et al., 1990). These authors further concluded that one of the contributing factors to the high incidence of bucked shins in Thoroughbred race horses is that young horses are repeatedly conditioned at slower speeds and higher speed work is introduced only once every 7 to 10 days. This practice models the bone for slower gallops but does not condition the bone for the speed work that is introduced occasionally in training or the actual full-speed race at the track. This dooms the young horse for possible failure when speed work is introduced all at once. Neilsen et al. (1997) found that bone remodeling does occur in young horse in race training and that bone density is at it's lowest point at about 50 to 60 days of training. This time frame coincides with the time when most race trainers start to introduce some speed work. Incidentally it also is the time when many bucked shins start to show up in young horses which are being asked for more speed. Exercise pre-conditioning of yearlings also has been investigated. There appears to be some advantage in bone density and strength in yearlings which have been pre-conditioned on a treadmill for 14 weeks prior to going into race training (Hiney et al., 2002). More recently, Rietbroek et al. (2007) reported a positive effect of training weanling horses in a show jumping environment in improving hind limb muscle development and stength.

The type of training and surfaces on which young horse are trained also contribute to bone development. Bruin (1993) reported that weanlings worked on a hard surface develop fewer bone abnormalities than those worked in deep sand. Anderson (1991) reported higher incidences of OCD lesions in weanlings which stood in dry lots with no forced exercise than weanlings which were forced exercised and fed a high protein, high energy ration.

There is no doubt that pre-conditioning of young horse will positively affect bone development and possibly contribute to longevity of the horse in subsequent training programs. Proper conditioning as well as a balanced feeding program early in the equine athlete will make a difference in the performance capability and longevity of our performance and race horses. Breeders, trainers and owners should be more aware of factors that will improve the ultimate

usability of horses. With the economics of producing and training outstanding athletic horses, and for the well-being of the horse, it is only logical that we do everything we can to get as much out of our performance horses for as long as we possibly can.

Nutrition

The importance of a good, balanced nutrition program for the performance horse or prospect should never be overlooked. Proper early development starts even before the foal is born. A complete, balanced nutrition program for the broodmare, especially during the last 90 days of gestation helps assure that the foal gets off to the right start. The broodmare's mineral intake is critical. Mares which are on pasture and are not supplemented with adequate high-quality, balanced concentrate should be provided with a free choice, loose mineral which contains approximately 10 to 12% Ca and P at a 1:1 ratio. Adequate protein intake for the broodmare, likewise, helps assure optimum skeletal development in foals during the later stages of gestation. Do not assume that winter pastures alone are going to provide all the nutrients needed for optimal foal growth in utero.

Once the foal is born, nutrition becomes even more important. Skeletal growth is comprised of 3 major components, protein, Ca and P. These nutrients must be provided in proper nutrient to calorie ratios to assure that needed nutrients are available for the level of energy the horses are consuming. The energy level in the ration basically determines how fast they are trying to grow. If the right level of protein and mineral is not available as compared to the level of energy in the diet, horses will get fat with a compromised skeletal structure (Gibbs et al., 1988). This of course can be disastrous as the horses become heavier and their skeleton is not equipped to handle the added weight, especially when the young horse enters a training program. Everything else being equal, protein intake will affect growth rate more than any other nutrient. Therefore, adequate attention needs to be paid to the daily amount and the quality of the protein intake. Young horses actually require specific amino acids, not intact proteins. Therefore, as horsemen, we should pay attention to amino acid balance, particularly lysine, threonine and methionine. Basically, if you are using a high quality protein source such as soybean meal to supply the daily protein needs, the horse will receive adequate levels of these and other essential amino acids. An 18 month-old growing horse needs about 1.8 lbs of crude protein per day to meet only their growth requirements (NRC, 2007). A faster growing yearling may need more protein and if they are in training at the time they need about 1.9 lbs per day. Ca and P also have to be provided in adequate levels and in proper ratios for optimum skeletal growth to occur. The basic requirements for an 18 month-old yearling for Ca and P are 37 g and 20 g respectively. Ca:P ratio in the

total ration (including hay) should be around a 1.5:1 ratio. Since grass hay normally contains about 0.4% Ca and 0.2% P, a concentrate designed to be fed with grass hay would obviously require a higher level of both Ca and P, with a closer Ca:P ratio. If feeding alfalfa hay which may contain Ca levels as high as 1.5 to 2.0%, Ca and P levels in the concentrate should be adjusted so that the ratio in the total ration does not exceed 2:1. Some trace minerals such as Cu, Zn and Mn are also involved in skeletal growth. So, a complete and balanced feeding program which provides recommended levels of all trace minerals is crucial.

Once horses begins a training program, bone remodeling starts to take place and protein, Ca and P levels in the diet have to be adjusted accordingly. According to Nielsen et al. (1997), bone remodeling takes place in the young race horse at about 50 to 60 days of training. It has been suggested that by increasing the level of nutrition in the diet prior to this remodeling phase, the number of injuries to the developing race horse may be reduced.

Nutritional status undoubtedly plays a major role in bone integrity during the early stages of training. Given the high prices currently being invested in young equine athletes, it is simply not advisable to skimp on the nutritional program. Not only will malnutrition compromise skeletal development, it could limit muscular development and repair. It may also compromise the immune system of the horse, which will further reduce the number of days the horse can stay in the training barn, due to illness.

Effects of Detraining and Retraining

In the previously fit horse, cardiovascular fitness appears to decline slowly during detraining or periods of relatively low activity. Kriz and Rose (1996) found that cardiovascular fitness did decline during the initial 4 to 6 weeks of rest. However, Erickson et al. (1987) reported that detraining for 6 mo did not significantly effect the response of previously fit horses to a sub-maximal exercise tolerance test on a high-speed treadmill. These researchers also reported that following the 6 mo of detraining, 10 wk of endurance training and 4 wk of sprint training caused only small, non-significant decreases in HR and blood lactates in response to the treadmill test. Apparently, highly fit horses that are layed off for a few weeks or possibly longer, lose relatively little of their cardiovascular fitness and gain full oxidative capacity after returning to only a few weeks of retraining.

During detraining, bone and musculoskeletal strength decrease at a slower rate than cardiovascular fitness, but also apparently is slower to recover after long periods of inactivity. Porr et al. (1998) reported that bone strength decreases significantly after 12 wk of rest. Firth et al. (1999) showed an increase in bone density within 17 wk

of retraining and Gillis et al. (1993) reported an increase in tendon dimensions within 16 wk of training.

Specific Programs for Retraining Horses

Retraining the horse after a lay-off must be tailored specifically to each horse. Each individual should be handled differently, based on the underlying reasons for the lay-off. Of course, basic health care programs (vaccinations, deworming, teeth care) and nutrition program should be evaluated thoroughly before the training period begins. Likewise the horse's body condition should be assessed and if possible, it should be stabilized at a body condition score of between a 5 and 6.

If a horse was simply was out of training for a year or more, with no injuries, they are treated essentially like a previously unfit horse. However, based on what we know about the effect of detraining and subsequent retraining, conditioning programs for horses which have been out of training for shorter periods of time, the reconditioning program can be varied somewhat from those used in initial training programs. The major difference is that it may require a much shorter time frame to attain peak cardiovascular fitness. However, if the lay-off was due to some injury, bone and hard tissue conditioning will need to be more gradual, assuring that we give the horse enough time to properly condition the injured limb. Even though it would take very little time to get back to previous level of cardiovascular fitness (as little as 4 wk), conditioning the skeletal tissue will come slower. Taking the time to allow all systems to reach previous fitness levels will pay dividends in the end. Trainers should resist the urge to push the horse too hard, too early just because they feel good and heart rates are recovering quickly.

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