Intensive Exercise Schedules and Risk of Catastrophic Musculoskeletal Injury and Lay-Up in California Thoroughbred Racehorses

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The relative risk of catastrophic musculoskeletal injury and lay-up was significantly elevated in physically fit California Thoroughbred racehorses following 2-month rates of high-speed exercise distance accumulation exceeding 0.76 furlongs/day in 2-year-old horses, 0.85 furlongs/day in 3-year olds, 0.95 furlongs/day in 4-year olds, and 0.91 furlongs/day in horses greater than 4 years of age. Authors’ addresses: California Veterinary Diagnostic Laboratory System (Estberg and Johnson), Dept. of Medicine & Epidemiology (Gardner), and Dept. of Anatomy, Physiology & Cell Biology (Stover), School of Veterinary Medicine, University of California at Davis, Davis, CA 95616. © 1997 AAEP.

1. Introduction
Some catastrophic racehorse injuries may represent an acute manifestation of the failure of a chronic overuse-injury repair and adaptation process common in professional athletes.1,2 Because racehorses can reach and sustain running speeds capable of damaging musculoskeletal supporting structures, periods of demanding racing and training schedules may overwhelm the repair and adaptation process and result in catastrophic musculoskeletal injury (CMI).3,4 Additionally, if some cases of athletic injury can be attributed to persistent structural overburden, overuse injury-induced lay-ups may follow intensive or overly demanding exercise schedules.

The case-crossover study design proposed by Mclure provides a method to investigate the transient effect of temporary exposure episodes on acute outcomes.5 We hypothesized that intervals of excessive racing and training (the exposure) were followed by transiently elevated risk for CMI and 60-day periods of lay-up from racing. The objective was to use a case-crossover study design to investigate the relationship between intensive racing and training schedules and risk of either catastrophic musculoskeletal injury or lay-up from racing in California Thoroughbreds.

2. Materials and Methods
All Thoroughbred horses that died or were euthanized because of a CMI during a California racemeet in 1991 or 1992 were studied.6 Officially timed workout and racing histories were obtained from a computerized commercial racehorse database, and an exercise history at officially recognized racing speed was reconstructed for each horse. Two-month periods of excessive rates of distance accumu-
lation (exposure) were determined for each horse. The age-specific exposure threshold values were estimated as 75th percentile values from the pooled 2-month rates of racing-speed distance accumulation from the study subjects. It was hypothesized that each exposure (exceeding 0.76 furlongs/day in 2-year-old horses, 0.85 furlongs/day in 3-year olds, 0.95 furlongs/day in 4-year olds, and 0.91 furlongs/day in horses greater than 4 years of age) was followed by a 30-day high-risk period, and the remaining career days (excluding lay-up periods) were classified as baseline time at risk.

Horses were included in the current study if they had raced or worked consecutively for ≥30 days prior to either CMI or their last lay-up. A case-crossover study design was used to estimate relative risks (RR’s) with 95% confidence intervals (CI’s; statistical significance level ≤ 0.05) for CMI and lay-up within 30 days following exposure.5

3. Results

Of the 214 CMI cases, 84 (39%) suffered a CMI within 30 days following exposure (i.e., during a high-risk period). On average, 22% of the time at risk for injury for all cases fell within 30 days following exposure (was high risk), and the remaining 88% was baseline time at risk. The RR of CMI occurring within 30 days following exposure was 4.2 (95% CI = 3.0, 5.8).

Of 98 CMI cases with at least one lay-up period, 32 (33%) of the last lay-ups began within 30 days following exposure. On average, 22% of the time at risk for last lay-up was also high risk. The RR of lay-up occurring within 30 days following exposure was 4.8 (95% CI = 2.9, 8.1).

4. Discussion

Only those horses that had raced or worked consecutively for ≥30 days prior to CMI or lay-up were included in the current study. These criteria were used to exclude study subjects least likely to be at racing-level fitness at the time of injury or lay-up. An overly demanding racing and training program for an unfit racehorse is most likely quite different than that for a fit one.6 Additionally, although we did not know the reasons for lay-up in our study subjects, we hypothesized that some of these lay-up periods represented necessary periods of recovery from injury and that recovery lay-ups may tend to follow periods of intensive and demanding racing schedules.

Typically, 2-month racing-speed distance accumulation rates tended to vary by age (but not gender); therefore the threshold values were calculated separately for age groups of 2, 3, 4, and greater than 4 years. Results from the study reported here suggest that the risk of CMI and lay-up was significantly increased in fit racehorses following excessive 2-month rates of high-speed distance accumulation, and that this relationship may be dependent on a horse’s age.

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References and Footnotes


*The California Horse Racing Board and the California Veterinary Diagnostic Laboratory System established a postmortem program for all racehorses that die or are euthanized on one of the 14 racetracks under the jurisdiction of the Board.

*Bloodstock Research Information Services Inc., P.O. Box 4097, Lexington, KY 40544.