

## A RETROSPECTIVE CASE-CONTROL STUDY OF MUSCULOSKELETAL RACING INJURIES IN AUSTRALIAN THOROUGHBREDS

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*Une enquête rétrospective de type cas - témoins a été réalisée pour identifier et quantifier les facteurs de risque des lésions graves de l'appareil locomoteur chez des chevaux pur - sang courant sur quatre champs de course de Melbourne. Les courses ont eu lieu sur pistes en gazon durant toute l'année. Un cheval a été défini comme cas si il a fait l'objet d'un rapport vétérinaire concernant une lésion de l'appareil locomoteur, survenue entre août 1988 et Juillet 1995, l'ayant empêché de courir ou de s'entraîner pendant six mois après blessure. Un nombre équivalent de chevaux témoins a été sélectionné au hasard parmi la population de chevaux ayant couru sur les quatre pistes de l'étude pendant ces sept années.*

*L'analyse univariée des facteurs de risque potentiels, réalisée à l'aide de tests t de Student pour les variables quantitatives et de tests du Khi2 pour les variables qualitatives ( $p \leq 0.25$ ) a permis de déterminer les facteurs à inclure dans le modèle initial multivarié de régression logistique. Ce modèle a été ensuite affiné par l'élimination a posteriori des variables avec un degré de signification  $p > 0.10$ .*

*Le modèle final a mis en évidence que les pistes plus dures, un âge supérieur à quatre ans pour les chevaux et les distances de courses plus longues étaient des facteurs associés de façon significative à l'augmentation du risque d'apparition de lésions de l'appareil locomoteur. L'incidence des accidents pour les courses de plat était comparable à celles rapportées au Royaume-Uni mais plus faible qu'aux USA.*

### INTRODUCTION

The investigation of racetrack injuries has gained impetus in recent years as researchers attempt to improve horse welfare and jockey safety, and to reduce economic losses associated with horse injuries and fatalities. Epidemiological techniques have enhanced our ability to study the complex interaction between the variables that may contribute to the occurrence of racing injuries.

### MATERIALS AND METHODS

A retrospective case-control study design was used to investigate serious musculoskeletal injuries in Thoroughbreds racing on the flat. The population at risk was all horses racing at the four major racecourses in Melbourne, Australia, during the period August 1988 to July 1995. Flat races were conducted throughout the year on turf track surfaces. A case was defined as any horse that was recorded in the Steward's report by the racecourse veterinarian as having a musculoskeletal injury and that then failed to race for six months from the date of injury. An equal number of control animals was selected at random from horses which had raced during the period of study at the four tracks under investigation.

For each horse, data was collected to investigate the following variables as possible risk factors: age, sex, track, track condition, race class, field size, barrier position, change in distance from previous race, season, age at first start, year, total number of starts, days since first start, distance of race, weight carried, distance of previous race, days since previous race and average days rest between races.

Univariable analysis, using Student's t test for continuous variables and chi-squared tests for categorical variables, identified factors which had little or no association with disease. Variables significant at  $P \leq 0.25$  were included in the multiple logistic regression analysis. Determination of the final multivariable model was achieved through backward elimination, with variables remaining if the change in deviance from the full model was significant at  $P \leq 0.1$ . The same criteria were used to assess two-way interactions. The goodness-of-fit of the model was assessed by the Hosmer-Lemeshow statistic and influential covariate patterns were identified using regression diagnostics.

### RESULTS

During the period of study, there were 196 cases of serious musculoskeletal injury, representing an incidence rate of 0.29 per cent (2.9/1,000 starts). The incidence rate of musculoskeletal fatality (died or euthanised on course) was 0.06 per cent (0.6/1,000 starts).

Variables that were eligible for inclusion in the initial logistic regression model ( $P \leq 0.25$ ) included: field size, race distance, track condition, weight carried, previous race distance, total number of starts, age, age at first start, days since first start, average days rest, season and class of race.

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The final model indicated that race distance, track condition and age of the horse were significant risk factors for musculoskeletal breakdown (Table I). The Hosmer-Lemeshow statistic was 3.95 with 8 degrees of freedom (P=0.86), indicating a good fit to the observed data.

**Table I**  
**Factors identified by logistic regression as being associated with the risk of musculoskeletal breakdown in flat racing horses**

Variable	Coefficient	Standard error	Odds ratio (95% Confidence Interval)
Constant	-1.72	0.39	-
Track condition			
Dead, slow, heavy	0		1
Fast, good	0.58	0.22	1.8 (1.2, 2.8)
Race distance (km)	0.72	0.24	N/A
Age			
2 - 4 years old	0		1
>5 years old	0.5	0.24	1.7 (1.0, 2.6)

## DISCUSSION

The use of the multivariable approach to the investigation of racing injuries enabled the effect of each putative risk factor to be determined, whilst controlling for all others. In the current study of four Australian racecourses, the most significant risk factors for serious musculoskeletal injury in Thoroughbreds racing on the flat were the track condition, distance of the race and age of the horse. Turf track surfaces with lower water content (fast, good) were associated with a greater risk of injury than those with higher water content (dead, slow, heavy). Horses older than five years were 1.7 times more likely to sustain an injury than those four years or less. The finding that older racehorses were at greater risk of injury than younger horses is consistent with results from studies of racing injuries and fatalities in other countries. Increasing race distance was associated with a progressive increase in risk of breakdown. Longer race distances may represent an increased risk due to fatigue, or possibly because of the greater number of turns or track crossings that are encountered.

The incidence of fatalities in the present study (0.6 /1,000 starts) is comparable to figures reported in the United Kingdom (0.8/1,000 starts), but considerably lower than the United States (1.4 to 1.7/1,000 starts).

Epidemiological techniques have the potential to bring a more rigorous approach to the study of racetrack injuries and fatalities. Results from these investigations will enhance the current state of knowledge of risk factors for such injuries, enabling the implementation of reasoned intervention to decrease the incidence of racing injuries and fatalities.

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