



Original Article

Fédération Equestre Internationale (FEI) endurance events: Riding speeds as a risk factor for failure to qualify outcomes (2012–2015)

E.D. Bennet*, T.D.H. Parkin

School of Veterinary Medicine, University of Glasgow, Glasgow G61 1QH, UK

ARTICLE INFO

Article history:

Accepted 18 April 2018

Keywords:

Equine endurance
Failure to qualify
Lameness
Metabolic problems
Riding speed

ABSTRACT

This study examined the association between riding speed and elimination in Fédération Equestre Internationale (FEI) endurance events. A total of 35,061 horse starts from 1st July 2012 to 31st December 2015 were included in a multivariable logistic regression model containing 25 different risk factors. Riding speeds in individual stages ('loops') were included as individual risk factors in studying the progress of horses through loops 1–3 of each endurance ride. The possibility of real-time, 'mid-ride' predictive modelling was explored by modelling both riding speeds and sudden changes in speed between loops as potential risk factors. Faster riding speeds, especially during loops 1 and 2, were associated with deleterious outcomes. Furthermore, sudden drops in riding speed during loop 3 were associated with an increased likelihood of elimination.

© 2018 Elsevier Ltd. All rights reserved.

Introduction

Endurance riding has enjoyed rising popularity in recent years, but one potential consequence of this has been increased competitiveness. Fédération Equestre Internationale (FEI) results over recent decades show that riding speeds are rising worldwide (Coombs and Fisher, 2012; Nagy et al., 2012). Riding speeds may be associated with an increased risk of deleterious outcomes for horses, but this hypothesis has yet to be fully explored in an epidemiological study. Previously, only very specific data, such as 'average riding speed of the ride winner', has been included in published studies; this is perhaps useful to indicate the pace of the runners, but it is not representative of every horse, particularly those that were eliminated. In the absence of studies focussed on detailed average speed data, the previous focus in the literature has been given to more general epidemiological studies (Nagy et al., 2010; Fielding et al., 2011; Nagy et al., 2014a, 2014b), examination of training regimens (Bolwell et al., 2015) and predictive modelling using data gathered at veterinary inspections (Younes et al., 2015).

This paper presents the results of a large scale study of global endurance rides with the inclusion of individual riding speeds. The aim of this study was to use a multivariable model to assess associations between riding speeds and related risk factors, and deleterious outcomes affecting endurance horses. It was hypothesised

that specific combination of horse, rider, and ride-level factors would be dominant in terms of risk exposure, and that individual riding speed would be a significant risk factor. Furthermore, it was hypothesised that sudden drops in riding speed at different stages (loops) could be predictive of deleterious outcomes later in a ride.

Materials and methods

Since 2010, the FEI has built up a (publicly-accessible) database of information containing outcomes and details of horses and riders in each FEI level endurance ride. This paper reports part of an overarching project known as the Global Endurance Injuries Study (GEIS) which, as a direct collaboration between the FEI and the University of Glasgow, United Kingdom, granted access to the complete raw data set behind the endurance database. The data sample from the GEIS used in this study contained a comprehensive record of every horse start in every Concours de Raid d'Endurance International (CEI) event worldwide from 1st January 2010 to 31st December 2015. One of the recorded factors in the GEIS was the individual riding speed for each loop of a ride in which a horse participated.

The FEI endurance rules state that rides must be split into three to six loops, with horses being subject to veterinary examination before the start of the ride and at the end of each loop. To successfully complete a ride and record a result outcome (coded as R), horses must pass a final veterinary inspection. Other potential ride outcomes described by the rules are: (1) Retired (RET): riders have the option to retire from a ride after successfully passing a veterinary inspection; (2) disqualified (DSQ): a breach of rules occurred; (3) eliminated (EL): the horse did not complete a loop; (4) finished, not ranked (FNR): the horse completed the ride but took longer to finish than the specified time limit; (5) withdrawn (WD): the horse did not turn up for the event, or otherwise did not start the ride; (6) failure to qualify (FTQ): the horse failed to pass a veterinary inspection; FTQ outcomes must be accompanied by a reason for the outcome, such as 'irregular gait' (GA), 'minor injury' (MI) or 'metabolic' (ME).

Outcomes were sorted into 'results', 'retired', 'FTQ LA', 'FTQ ME' and 'other'. The category 'other' included outcomes DSQ, FNR and WD, none of which were

* Corresponding author.

E-mail address: Euan.Bennet@glasgow.ac.uk (E.D. Bennet).

considered to be deleterious. Two negative outcomes were assessed: (1) FTQ LA, for which the cases were only those horses that failed to qualify because of lameness, i.e. irregular gait (GA in the FEI description); and (2) FTQ ME, for which the cases were only those horses that failed to qualify because of metabolic problems.

Data selection

For result outcomes, the GEIS speed data were complete. For horse starts that did not successfully complete their ride, some or all of their average speed data were not recorded in the database. Reasons for absent speed data were: (1) in the early years of the database (until mid-2012), eliminated horses did not have their riding speeds recorded in the GEIS for any loop, even loops that were completed successfully; and (2) if a horse was removed from the field during a loop or otherwise was unable to complete a loop, then it did not have a time recorded for that loop. Of the 46,950 horse starts from 1st July 2012 to 31st December 2015, 45,047 (96.0% of horse starts in the cohort) had loop 1 speed recorded, 40,994 (87.3%) had loop 2 speed recorded and 35,061 (74.7%) had loop 3 speed recorded. The majority of the incomplete data in loop 3 related to horses eliminated during loops 1 and 2.

The final dataset selected for analysis included all 35,061 horse starts from 1st July 2012 to 31st December 2015 for which the average speed data was recorded for all three loops. This cohort selection ensured that, for every horse start included, the data relating to every risk factor studied was complete (since every ride included at least three loops). Loop speeds were categorised by quartiles of the data, defined as 'fast' (top quartile), 'medium' (middle two quartiles) or 'slow' (lowest quartile). Twenty-five potential risk factors were considered in the multivariable models (Table 1). The FEI classifies nine geographic regions as described in Table 1 and reference therein. Appropriate mandatory rest periods (MRPs) were calculated for each applicable horse start, based on the distance completed in the previous ride, according to the 2015 rules.

Multivariable logistic regression models were constructed using a bespoke code in MATLAB 2016b (MathWorks) to study potential risk factors associated with deleterious outcomes (FTQ LA, and FTQ ME). Risk factors rejected at the univariable and multivariable stage were tested for confounding in the final model. The goodness-of-fit of each model was tested using the Hosmer–Lemeshow test with 10 degrees of freedom. Biologically plausible combinations of risk factors were tested for second-order interactions in the final model. The final model was tested for clustering by including horse starts as a random element. In the cohort of horse starts studied, 13,863 unique horses accounted for 35,061 horse starts. The median number of horse starts per individual horse was two. The standard deviation of the random effect (ρ) associated with individual horses was $\rho < 0.001$.

Results

Table 2 shows the number of records, average riding speeds and average loop distances for each of loops 1–6, for each of the three most popular ride distance categories (80, 120 and 160 km).

Failure to qualify due to lameness outcomes

Table 3 shows the significant ($P < 0.05$) results of the multivariable model for FTQ LA outcomes. At ride level, associations were found between region group VII (North Africa/Middle East) and decreased odds of FTQ LA (Odds ratio, OR 0.53) compared to region group I (Western/Southern Europe). Compared to rides of distance 80 km, horses starting in rides of 90 km were less likely to be categorised as FTQ LA (OR 0.63), while horses in rides of 160 km had an increased likelihood of being categorised as FTQ LA (OR 1.92). Field sizes of 29–59 horses were associated with an increased odds ratio (OR 1.18) compared to fields with fewer than 15 horses, but no statistically significant associations were found for other field sizes.

At horse level, horses >11 years of age had an increased odds (OR 1.1) of being categorised as FTQ LA compared to horses <7 years of age. Compared to horses with a previous ride distance of 80 km, horses which previously completed ≥ 90 km were at increased likelihood of being categorised as FTQ LA (OR 1.29 for previous ride distance 90–110 km, OR 1.22 for previous ride distance of 120 km or greater). Horses with a previous ride outcome of FTQ LA had an increased odds of another FTQ LA (OR 1.14), but a decreased odds of FTQ ME (OR 0.75), compared to horses which completed their previous ride successfully. Compared to horses who returned to competition more than 30 days after their mandatory rest period had expired, horses with less than 1 day over MRP were at increased odds of FTQ LA (OR 1.32). An

Table 1
Risk factors used in the multivariable models.

Risk factor	Categorisation	Notes
Year	Categorical	2012–2015
Region group ^a	I–IX (Roman numerals)	Each group is a geographical area as defined by the Fédération Equestre Internationale, approximately corresponding to: I: Western/Southern Europe; II: Northern/Eastern Europe; III: Russia/Western Asia; IV: North America; V: Central America; VI: South America; VII: North Africa/Middle East; VIII: Oceania/Asia; IX: Sub-Saharan Africa
Ride distance	Categorical	Event distances are 80 to 160 km
Field size	Quartiles	No limits in regulations
Horse sex	Binary	Only difference found between 'stallion' and 'not stallion'
Horse age	Quartiles	Horse age on day of ride
Rider sex	Binary	
Rider age	Quartiles	Rider age on day of ride
Horse experience of rides > 120 km	Binary	Had the horse ridden >120 km in one event before?
Distance of previous ride	Categorical	Categories correspond to Fédération Equestre Internationale rules for rest periods
Outcome of previous ride	Categorical	Either 'result', FTQ LA, FTQ ME, or 'other'
Days since previous ride	Categorical	Relative to mandatory rest period applicable according to the 2015 rules
Horse previous FTQ LA	Categorical	Previous FTQ LA outcomes in career
Horse previous FTQ ME	Categorical	Previous FTQ ME outcomes in career
Rider previous FTQ LA	Categorical	Previous FTQ LA outcomes in career
Rider previous FTQ ME	Categorical	Previous FTQ ME outcomes in career
Rides in last 60 days	Categorical	Horse number of CEI rides in last 60 days
Rides in last 120 days	Categorical	Horse number of CEI rides in last 120 days
Rides in last 240 days	Categorical	Horse number of CEI rides in last 240 days
Rides in last 365 days	Categorical	Horse number of CEI rides in last 365 days
Loop 1 speed	Quartiles	Horse individual riding speed in loop 1
Loop 2 speed	Quartiles	Horse individual riding speed in loop 2
Loop 3 speed	Quartiles	Horse individual riding speed in loop 3
Sudden change in speed, loops 1–2	Categorical	Riding speed (fast, medium, or slow) in loop 1 and loop 2
Sudden change in speed, loops 1–3	Categorical	Riding speed (fast, medium, or slow) in loop 1, loop 2 and loop 3

FTQ LA, failure to qualify due to lameness; FTQ ME, failure to qualify due to metabolic problems; CEI, Concours de Raid d'Endurance International.

^a See: <https://data.fei.org/NFPages/NF/Search> (accessed 27 July 2017).

Download English Version:

<https://daneshyari.com/en/article/8504859>

Download Persian Version:

<https://daneshyari.com/article/8504859>

[Daneshyari.com](https://daneshyari.com)