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Risk factors for race-day fatality, distal limb fracture and epistaxis in Thoroughbreds racing on all-weather surfaces in Great Britain (2000 to 2013)

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ABSTRACT

The incidence of race-day injuries in Great Britain (GB) is higher on all-weather (AW) surfaces than on turf. However, to date no studies have focused on identifying risk factors for injury specific to AW racing. Therefore, the objective of the current study was to determine risk factors for fatality, distal limb fracture (DLF) and episodes of epistaxis in flat racing Thoroughbreds racing on AW surfaces in GB. Data included all flat racing starts on AW surfaces (n = 258,193) and race-day veterinary events recorded between 2000 and 2013. Information on additional course-level variables was gathered during face-to-face interviews with racecourse clerks. Horse-, race- and course-level risk factors for each outcome were assessed using mixed-effects multivariable logistic regression including horse as a random effect. A classification tree method was used to identify potential interaction terms for inclusion in the models. During the study period, there were 233 fatalities resulting in a fatality incidence of 0.90 per 1000 starts; 245 DLF with a resultant DLF incidence of 0.95 per 1000 starts and 410 episodes of epistaxis resulting in an epistaxis incidence of 1.59 per 1000 starts. Risk factors varied for each outcome, although some factors were similar across models including the going, racing intensity, horse age, age at first race start, horse and trainer performance variables. Generally, older horses and those that had started racing at an older age were at higher risk of an adverse outcome, albeit with an interaction between the two variables in the fatality model. Faster going increased the odds of epistaxis and DLF but not fatality. Increasing race distance increased the odds of fatality but reduced the odds of epistaxis. Epistaxis was associated with type of AW surface (Fibresand versus Polytrack®), but DLF and fatality were not. This study provides further evidence of the association between the risk of race-day injuries and fatalities and current age, age at first start, race distance, going and horse performance. These findings provide the racing industry with information to develop strategies to reduce the occurrence of race-day events on AW surfaces.

1. Introduction

Worldwide, all-cause fatality, distal limb fractures (DLF) and exercise-induced epistaxis (i.e. blood at the nostrils) are some of the most common race-day veterinary events experienced by flat racing Thoroughbreds (Johnson et al., 1994; Williams et al., 2001; Parkin et al., 2004; Rosanowski et al., 2016). Previous studies have identified an incidence in flat racing of between 0.76 and 0.90 per 1000 starts for all-cause fatality (McKee, 1995; Wood et al., 2001; Rosanowski et al., 2016) and between 0.30 and 1.25 per 1000 starts for epistaxis (Williams et al., 2001; Rosanowski et al., 2016), while DLF was the most common reason for catastrophic musculoskeletal injury (Rosanowski et al., 2016). As well as the impact that injuries have on horse welfare and safety, it is widely recognised that any injury occurring on race-day negatively affects the public perception of the sport.

Abbreviations: AW, All-weather; BHA, British Horseracing Authority; DLF, Distal limb fracture; GB, Great Britain; IQR, Interquartile Range; LRT, Likelihood Ratio Test; ROC, Receiver Operating Characteristic

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Racing surface affects the dynamics of limb loading, hoof acceleration and ground reaction forces (Chateau et al., 2009; Setterbo et al., 2009). Consequently, surface has the potential to affect injury risk. A study of racetracks in Florida identified that horses racing on dirt had a lower risk of fatal musculoskeletal injury than those racing on turf (Hernandez et al., 2001). In contrast, a study in New York found that the risk of musculoskeletal injury was higher on dirt surfaces compared with racing on turf (Mohammed et al., 1991). Additionally, there was evidence that injuries on dirt surfaces tend to occur on surfaces that were rated as good (standard) or fast, based on the condition and speed of the surface. A recent five-year (2009–2013) cohort study of all flat racing starts in North America found that horses racing on a dirt surface were at the highest risk of fatality, compared with horses racing on turf or all-weather (AW) surfaces (Georgopoulos and Parkin, 2016). In this study, AW surfaces were associated with the lowest risk of fatality.

Differences in fatality risk on British racecourses have been identified between turf and AW surfaces. Compared to turf surfaces, the likelihood of fatality doubled for horses racing on AW surfaces (Henley et al., 2006), while the risk of epistaxis was 2.5 times higher for horses racing on slow AW surfaces when compared to turf (Newton et al., 2005). The incidence of distal limb injury (Williams et al., 2001) and veterinary events (Rosanowski et al., 2016) was higher in horses racing on AW surfaces compared with those racing on turf surfaces, although in these studies no multivariable analyses were conducted.

Racing on AW surfaces has occurred in Great Britain (GB) since the late 1980s. In 2013, there were four racecourses with AW surfaces, with three different synthetic surface types. Despite the apparently increased risk of fatality when racing on an AW surface (Henley et al., 2006), to date no studies have specifically focussed on risk factors for injury in horses starting in races held on these surfaces. The purpose of the present study was to identify horse-, race- and course-level risk factors for race-day fatality, DLF and epistaxis in flat racing Thoroughbreds racing on AW surfaces in GB. Identification of risk factors for these outcomes will enable the racing industry to implement strategies to reduce their occurrence.

2. Materials and methods

2.1. Study design

A retrospective cohort study was used to collect information regarding all veterinary events occurring on race-days and all race starts on AW surfaces in GB from 1st January 2000 to 31st December 2013. These data were provided by the British Horseracing Authority (BHA) and Weatherbys (www.weatherbys.co.uk) and have been described previously (Rosanowski et al., 2016). Briefly, the population included all Thoroughbreds racing in AW flat races in GB during the study period, with all horses declared to race in at least one race and subsequently entering the starting stalls prior to racing in an AW flat race included in the study. All race-day veterinary events were diagnosed and recorded by official racecourse veterinarians, with additional race start data provided by Weatherbys. The current study includes data from 258,193 starts from the five courses with AW surfaces that were operating in GB during the study period.

Additional information regarding changes in the AW surface, refurbishment of current or previous surfaces and surface maintenance, including seasonal variation, was collected via semi-structured face-to-face interviews with the Clerk of the Course (racecourse clerk), who is responsible for preparing and maintaining the racing surface. The Clerks from four of the five AW courses that were operational during the study period were contacted to participate in the study. A fifth course was operational between 2008 and 2009 and resumed AW racing in 2014 under different ownership and management. The new Clerk of this course did not respond to requests to participate in the study.

2.2. Explanatory variables

The unit of interest was a horse start, and one horse could have multiple starts during the study period. For each start, data were collated including horse, trainer, jockey, course and race information. Age variables were current age (in years: 2–7 +) and age at first flat racing start (in years: 2–4 +). In addition, a binary variable of first year racing in flat races (yes/no) was created. Sex was categorised in three categories: stallions and colts, geldings and rigs, and mares and fillies. For each start, a performance score was created (30 for a win, 20 for a second or third place, 10 for a run and 0 for failing to finish) (Reardon et al., 2012). Performance variables were calculated based on information from all starts prior to the current start, including the number of starts, the percentage of wins, placings (first, second or third) or failure to finish for each horse, trainer and jockey, for all flat starts and for AW starts only. An average score variable was calculated using the average of all performance scores for each horse, jockey or trainer prior to the current start. In addition, for each start, an average horse performance index was calculated as described by Compston et al. (2013). Firstly, horses were ranked from 1 to 10 based on the percentage of the field beaten in the race (in deciles). Secondly, races were ranked (1–10) based on the value of the race (purse). The deciles of purse were calculated for each year of the study period. These two ranks were then multiplied and averaged for previous starts. The percentage of flat racing starts attributable to racing on an AW surface was calculated for each horse. The number of days since last start, henceforth called racing intensity, was modelled as a categorical variable (first start, 1–7 days, 8–93 days and 94 days plus) based on previous research (Wood et al., 2001; Reardon et al., 2012). The number of starts per horse in the previous 15 or 30 days was calculated for each start.

The official track rating or condition, called going, was categorised in three levels: 1) fast and standard to fast, 2) standard and 3) standard to slow and slow. Based on the face-to-face interviews with Clerks of the Course, the variables surface type (Fibresand,[1] first generation Polytrack®[2] and second generation Polytrack®), time since last surface change (when a surface was replaced with a new surface type) and time since last refurbishment (when the current surface was added to or renewed) were created. More detailed maintenance records were not kept for most courses. All four courses for which racecourse clerks provided information undertook some refurbishment of the existing surface type over that time. At two of these courses the type of surface was changed during the study period. For the fifth course where no interview was conducted, racing was only held in 2008 and 2009 and all maintenance-related variables were set to missing.

2.3. Outcome variables

Three outcome variables were investigated: fatality, DLF and epistaxis (all coded as yes/no). All-cause fatality included events where horses were euthanased due to catastrophic injuries or died suddenly during or after a race (i.e. on race-day). An episode of epistaxis was defined as a veterinary-reported event where blood was observed at the nostrils. Whilst fatality or epistaxis constitute unambiguous outcomes, reports of DLF were primarily based on clinical examination and presumptive diagnosis by the on-course veterinarian, without further diagnostic investigations. Distal limb fracture was defined as fracture(s) of the carpal, tarsal, second, third or fourth metacarpal or metatarsal, proximal pastern, distal pastern and sesamoid or fractures in the fetlock area. The outcome of DLF could be fatal or non-fatal.

[1] http://www.mansfield-sand.co.uk/products/equestrian/fibresand/.
[2] http://www.martincollins.com/Surface-Range/Polytrack.