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Original Research

Profile and Surface Conditions of New Zealand Thoroughbred Racetracks

Chris W. Rogers MAgriSci, PhD [a,*], Charlotte F. Bolwell PhD [a], Erica K. Gee BVSc, PhD [a], Michael L. Peterson PhD [b], C. Wayne McIlwraith BVSC, PhD, DSc [c]

[a] Massey Equine, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, New Zealand
[b] Department of Mechanical Engineering, University of Maine, Orono, ME
[c] Orthopedic Research Center, Colorado State University, Fort Collins, CO

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ABSTRACT

There are no published data on racetrack configuration or the surface conditions of racing in New Zealand. Data on the physical shape and dimensions of racetracks were obtained from Google Earth and an online database (www.nzracing.co.nz). An electronic extract of all race records (horse and track condition details) covering the 7-year period from 2005/2006 to 2011/2012 were obtained from New Zealand Thoroughbred Racing Inc. Track data were examined in relation with the following categories: oval track, egg shaped, and other. Track condition data were described as official penetrometer or going data. Physical descriptions were obtained of the 49 official racetracks used in the 2011/2012 season. There were 27 oval-shaped, 16 egg-shaped, and five other-shaped tracks with most racing occurring in a counter clockwise direction (39 of 49). The median racetrack circumference was 1,800 m (interquartlie range, 1,600–1,800 m). There was no significant effect of track shape on the physical dimensions of the turns (home straight or back straight turn) or of the estimated centrifugal force. There were few fast tracks (penetrometer, 2.0–2.5) reported (8 of 1,093 races) and an even distribution of races among good (393 of 1,093), dead (204 of 1,093), slow (261 of 1,093), and heavy (227 of 1,093) tracks. Tracks were significantly heavier in winter ($P = .001$). Change in going during a race meeting was limited, with a median of one-point change (interquartlie range, 1–2) on the going scale. The consistency of the racing direction, track circumferences, and turn dimensions in association with a consistent pattern of track going during a season implies a relatively consistent racing surface is available for horse racing in New Zealand.

1. Introduction

Musculoskeletal injury and race day fracture are complex multifactorial events [1], and a number of studies have identified racecourse-related risk factors, such as racetrack, racetrack surface, and geometry [2–5]. Within some racing jurisdictions, such as California, aggressive programs of change have been implemented to improve surface conditions with the transition from dirt to synthetic all weather racing surfaces, in an attempt to reduce the rate of musculoskeletal injury and fracture [6].

These changes and assumptions of the effect of racetrack surface largely ignore track shape, which may be a confounding factor. The radius of the turns and the level of banking alter the loading pattern of the distal limb [7]. However, within the literature, there are limited data on optimal racetrack shape and the interaction of track design (configuration) on race day injury, with much of the

* Corresponding author at: Chris W. Rogers, MAgriSci, PhD, Massey Equine, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Private Bag 11222, Palmerston North 11222, New Zealand.
E-mail address: c.w.rogers@massey.ac.nz (C.W. Rogers).

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published data focusing on harness racing as opposed to Thoroughbred flat racing [4,8].

Surface maintenance, irrespective of surface composition or type, is of importance in attenuating injury, and track going is largely modified by the moisture content of the surface and its subsequent ability to retain moisture [9,10]. In a wet temperate climate, such as New Zealand, it is management of excess moisture and its effect on racetrack surfaces that often becomes an issue.

Within New Zealand, most fast work (gallops during training and/or breezing) and racing are conducted on turf tracks [11,12] and most horses race counter clockwise [11]. It is believed that most tracks within New Zealand are of an oval shape and approximately 1 mile (1,600 m) in circumference. However, there are limited data published on the variation in track shape, dimensions, or racetrack surfaces within New Zealand [13].

Variations in racetrack design may exist because of local environmental and/or geographical constraints [14]. Within New Zealand, there is an opportunity for rationalization of racetracks and associated greater economies of scale, as there are a large number of racetracks in relation to the number of race meetings and race starters. Fewer racetracks may mean less variation in racing surface and environment and, hence, possibly less environmental contribution to race day injury. It is therefore important to quantify current racetrack design and variation in track surface for a comparison against other racing jurisdictions and to provide a reference point against which one could quantify the impact of any change.

This article reports on the track shape and variation in track surface during seven Thoroughbred flat racing seasons within New Zealand. These data provide a baseline for further investigation into track-based risk factors and association with injury within New Zealand flat racing.

2. Materials and Methods

A complete list of all racetracks that held at least one official race meeting in the 2011/2012 racing season were obtained from the official website of New Zealand Thoroughbred Racing Inc (www.nzracing.co.nz). Data on the physical shape and the physical dimensions of each racetrack were calculated by using known global Positioning Satellites coordinate data within Google Earth (earth.google.com). The data derived consisted of the circumference, radius of turns, length of straights, and changes in altitude throughout the track. Additional data on racing direction and track dimensions were obtained from the official New Zealand Thoroughbred Racing Inc website and used to validate data obtained via Google Earth. Track shape was described using common racing descriptors of oval (two straights and two turns of equal radius), egg (two straights and two turns, one of which was larger [by 10%]), or other. To describe the flattened arc of the turns, an aspect ratio for each turn was calculated. The aspect ratio was the ratio of the true radius of the turn divided by half the distance between the two straight sections of track (Fig. 1). Changes in elevation of the back straight and home straight were obtained from a profile plot of the tracks altitude. The estimated centrifugal force throughout the turn was

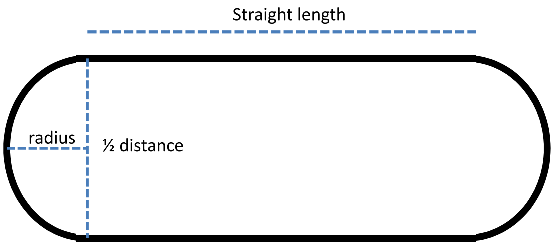

Fig. 1. Calculation of aspect ratio for racetrack turns.

calculated using the formula provided by Fredricson et al [8] and an average racehorse mass of 440 kg.

2.1. Racetrack Composition and Variation

Data on the official penetrometer and "going" for all races and race meetings in New Zealand in the 7-year period covering the 2005/2006 to 2011/2012 racing seasons were obtained. The initial penetrometer value reported for a race meeting was an average of 30 readings from around the track taken between 6 and 7 AM of the race meeting. During the period of data capture, there was a change in the official measurement of track surface conditions from penetrometer readings to a "going scale," based on that used in Australia, which uses both the penetrometer data and objective assessment of the track (Table 1). This new system came into effect on June 22, 2008. The number of tracks for which going data were available was greater than that reported for track dimensions as three tracks used during this 6-year period were no longer used for official race meetings in the 2011/2012 racing season.

2.2. Statistical Analysis

The data extracts were imported and sorted within a customized database (MS Access, Microsoft Corporation, Redmond, WA) before export for statistical analysis. Data were screened and described using simple descriptive statistics to identify coding errors and outliers. Graphical

Table 1
The official 11-scale "going" track grading system used in New Zealand

Scale	Rating	Penetrometer Band	Comment
1	Fast	0.5–1.9	A dry hard track
2	Good	2.0–2.2	A firm track
3	Good	2.3–2.5	Ideal track with some give
4	Dead	2.6–2.8	Track with give better side of Genuine Dead
5	Dead	2.9–3.2	Genuine Dead
6	Dead	3.3–3.5	Significant amount of give, worse side of Genuine Dead
7	Slow	3.6–3.8	A mildly rain-affected track, better side of Genuine Slow
8	Slow	3.9–4.2	Genuine Slow
9	Slow	4.3–4.5	Rain affected, worse side of Genuine Slow
10	Heavy	4.6–5.5	Genuine Heavy
11	Heavy	5.6+	Very soft and wet, heaviest category