UTS greyhounds safety and welfare research

Professor David Eager
University of Technology Sydney
Dubbo greyhounds racing track
Dubbo greyhound racing track

Track overview

Track specification at a glance

Bends: 51 m
Length of straight sections: 63 m
Inner track cross fall for bends apexes: 7.76% (4.44°)
Inner track cross fall on the straights: 3.79% (2.17°)
Track path has no transition between straight and bend
Track has a combination of straight and bend starts
# UTS Injury Category

<table>
<thead>
<tr>
<th>Rating</th>
<th>Incapacitation Period</th>
<th>Typical Injury Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor injuries-1 (MINa)</td>
<td>0 days</td>
<td>Mild skin abrasion/grazes</td>
</tr>
<tr>
<td>Minor injuries-2 (MINb)</td>
<td>1-10 days</td>
<td>Grade 1 muscle injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mild skin laceration</td>
</tr>
<tr>
<td>Medium injuries (MED)</td>
<td>11-21 days</td>
<td>Join/ligament sprain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin laceration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grade 2 muscle injury</td>
</tr>
<tr>
<td>Major injuries (MAJ)</td>
<td>Greater than 21 days</td>
<td>Grade 3 muscle injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bone fracture</td>
</tr>
<tr>
<td>Catastrophic (CATb)</td>
<td>Euthanised post-race</td>
<td>Euthanised post-race, unable to be retired or unable to race</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NB: does not include all data (deaths)</td>
</tr>
<tr>
<td>Catastrophic (CATa)</td>
<td>Deceased or euthanised on race day</td>
<td>Severe skull or spinal trauma Complex / Open / Join fracture</td>
</tr>
</tbody>
</table>
Injury levels

- **Level 1**: CATa + CATb
- **Level 2**: CATa + CATb + MAJ
- **Level 3**: CATa + CATb + MAJ + MED
- **Level 4**: CATa + CATb + MAJ + MED + MINa + MINb
Dubbo greyhound racing track

Interventions date

Hoop lure introduced on 29th June 2017 at Dubbo track
Level 1 normalised injuries in 2017

Number of injuries per 1000 starts

NSW Tracks

- Euthanized at track (CATa)
Level 1 normalised injuries in 2016

Number of injuries per 1000 starts

NSW Tracks

- Death: Euthanised post-race, unable to be retired or unable to race (CATb) #CATb may not include all data (deaths)

- Euthanized at track (CATa)
Level 2 normalised injuries in 2017

Number of injuries per 1000 starts

NSW Tracks

- Major Injuries (MAJ)
- Euthanised post-race, unable to be retired or unable to race (CATb) #CATb may not include all data (deaths)
- Euthanized at track (CATa)
Level 2 normalised injuries in 2016

Number of injuries per 1000 starts

- **Major Injuries (MAJ)**
- **Death: Euthanised post-race, unable to be retired or unable to race (CATb)** #CATb may not include all data (deaths)
- **Euthanized at track (CATa)**

NSW Tracks
Dubbo greyhound racing track
Level 1 injuries 2016 and 2017

David Eager, Hasti Hayati and Imam Hossain - April 2018
Dubbo greyhound racing track
Level 2 injuries 2017 and 2016

Normalised

David Eager, Hasti Hayati and Imam Hossain - April 2018
Dubbo greyhounds racing track
Injury locations 2016 and 2017

318 m
Number of starts 2016: 1456
Total injury 2016: 44
Number of starts 2017: 1165
Total injury 2017: 27

Back Straight
Dubbo Racing Track
Western turn
Eastern turn
Finish
Home Straight
Dubbo greyhounds racing track
Injury locations 2016 and 2017
Dubbo greyhounds racing track
Injury locations 2016 and 2017

516 m
Number of starts 2016: 618
Total injury 2016: 19
Number of starts 2017: 464
Total injury 2017: 7
Greyhounds stride analysis
Greyhounds stride pattern
Acceleration data acquisition

Sandy-loam track way (≈ 7.9% or 4.5° cross fall)

Greyhound

Jacket

Fore-legs

\( F_c \)

\( F_v \)
Greyhounds stride analysis
Straight running

![Diagram showing stride analysis of greyhounds in straight running.](image)

- Left foreleg: 46 ms
- Right foreleg: 40 ms
- Flight compressed: 54 ms
- Right hindleg: 48 ms
- Left hindleg: 44 ms
- Flight extended: 52 ms
Greyhounds stride analysis
Straight running

Distance (m)

0.0 0.8 2.22 2.93 5.36
Left foreleg Right foreleg Right hindleg Left hindleg Left foreleg

Flight compressed Flight extended
Track design investigation
Track design investigation
Greyhounds on the bends

Major forces acting on a greyhound on the straight side view

- Weight of greyhound
- Frictional force From the track / Shear strength of track
- Normal force from the ground

Reference frame

X
Y
Z

Forward acceleration $a_x$
Centripetal acceleration $a_y$
Resultant acceleration $a$

Acceleration of a greyhound on the bend top view
Track design investigation
Greyhounds on the bends

Forces acting on a greyhound on the bend front view

Greyhound’s weight
Greyhound’s centre of gravity
Centrifugal force
Friction from the ground ($\mu_s$)
/ ground’s shear strength
Normal force from the ground

Reference frame

Track cross fall ($\theta$) ≈ 7.9% (4.5°)

Greyhound’s lean ≈ 57°

Track width = 5m

Track bend 51m

David Eager, Hasti Hayati and Imam Hossain - April 2018
Track design investigation
What can be done for cross falls at the tracks

<table>
<thead>
<tr>
<th>Track bend (m)</th>
<th>Track cross falls (%)</th>
<th>Track cross falls (deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>78.1</td>
<td>38</td>
</tr>
<tr>
<td>50</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>55</td>
<td>62.5</td>
<td>32</td>
</tr>
<tr>
<td>60</td>
<td>57.7</td>
<td>30</td>
</tr>
<tr>
<td>65</td>
<td>53.2</td>
<td>28</td>
</tr>
<tr>
<td>70</td>
<td>46.6</td>
<td>25</td>
</tr>
</tbody>
</table>

Maximum leaning relative to the ground

Horizontal components of normal force and friction provide centripetal force

Optimum cross falls

No leaning relative to the ground

Horizontal component of normal force provides centripetal force

Optimum

High cross fall

Current

Low cross fall

Horizontal components of normal force provides centripetal force

Optimum cross falls
Track design investigation
What can be done for cross falls at the tracks

Track surface grades from surveyed data

Track surface grades existing

Track surface grades improved
Track design investigation
Continuity of a track path

First order

Second order
Track design investigation
Straight to bend path types in GRNSW tracks

No transition (N)

Part transition (P)

Dubbo 318 m start

Richmond 535m start

Track straight section

Track straight section

David Eager, Hasti Hayati and Imam Hossain - April 2018
Track design investigation
Case study Richmond 400 m starts immediate bend

David Eager, Hasti Hayati and Imam Hossain - April 2018
Most injury prone GRNSW tracks starts and corners
Most injury prone GRNSW tracks starts and corners in 2016

Worst five starts and corresponding corners

1. Grafton 480 m starts Back turn exit corner
2. Nowra 365 m starts Back turn exit corner
3. Grafton 305 m starts Home turn in corner
4. Casino 484 m starts Back turn in corner
5. Gosford 515 m starts Back turn in corner
Most injury prone GRNSW tracks starts and corners in 2016
Grafton 480 m starts Back turn exit corner

Number of starts: 847
Number of races: 111

David Eager, Hasti Hayati and Imam Hossain - April 2018
Most injury prone GRNSW tracks starts and corners in 2016

Nowra 365 m starts Back turn exit corner

Number of starts: 2396
Number of races: 311

Catastrophic
Major injury
Medium injury
Minor injury

David Eager, Hasti Hayati and Imam Hossain - April 2018
Most injury prone GRNSW tracks starts and corners in 2016

Grafton 305 m starts Home turn in corner

Number of starts: 1071
Number of races: 138

David Eager, Hasti Hayati and Imam Hossain - April 2018
Most injury prone GRNSW tracks starts and corners in 2016
Casino 484 m starts Back turn in corner

Number of starts: 1943
Number of races: 252

David Eager, Hasti Hayati and Imam Hossain - April 2018
Most injury prone GRNSW tracks starts and corners in 2016
Gosford 515 m starts Back turn in corner

Number of starts: 2130
Number of races: 277
UTS phase I recommendations
Average injury rate for Level 2 injuries 2016

Injuries per 1000 starts

- Straight starts: 7.67
- Bend starts: 8.74

12% difference
Q & A