Risk factors for horse falls in the cross-country phase of British Eventing competitions: A comprehensive data analysis

Introduction

- Myerscough College - National Diploma
- Myerscough/UCLan – BSc(Hons) Equine Science (Physiology)
- UCLan (Myerscough funded) – PhD by Research

- Worked, groomed and ridden in eventing in UK

- Research presented at a variety of equine and sports conferences in the UK, Ireland, Denmark, Madrid…. and now Switzerland!

Previous Research

- Level of Event
- Horse Age
- Horse Sex
- Rider Sex
- Position Before Cross-Country
- Month of Event
- Year of Event
- Event

- Novice
- Intermediate
- Advanced

N = 2002

National level one-day events only. Format:

Dressage – Show-jumping – Cross-country
Although effect is small, strong support, large data set, 95% confidence intervals (dashed lines) are narrow.
Physiology or Psychology?
PhD Research

Why are riders in leading positions at an increased risk of a horse fall?

Mass data analysis to confirm/deny preliminary results
- Last 10 years of data
- N=850,000

What are the key risk factors for horse falls?

How do the variables interact with each other?

Methods from racing risk analysis (30, 60, 90 days)
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Mass Data Processing

Data processing
- Data is live on competition results but not on fall results, marriage changes name
- Some people use ‘0’ some people use blanks (which is missing data, and which is ‘0 faults’?)
- How to get the system to recognise which horse fell if the rider is on several horses during that day (horse name not included on fall report data)
- Human error on fall report forms, misspelt names etc
- Huge data set some computers/software programs not able to process it

Creating new variables
- How many times has the horse/rider competed in last 30,60,90 days?
- How many times has the horse/rider had a HF in career, 6 months, 1 year?
- How many times has the horse/rider had a UR in career, 6 months, 1 year?

Using a variety of statistical software packages, mainly ‘R’ and Microsoft Access for data processing, and STATA for analysis
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Mass Data Analysis

- Univariate analysis was completed on each individual factor against horse fall
- Almost everything came up as ‘significant’ due to large data set
- Variables sorted in to numerical order using the highest odds ratio and lowest significance combined

- Variables are then input in to a multivariable model in this order
- When a variable comes up as insignificant in the MV model it is removed
- This process narrows the significant factors down greatly (from 34 to 13!)
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>VARIABLE EXPLANATION</th>
<th>FINDING</th>
<th>RISK</th>
<th>RISK EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>My_sum_horse_falls</td>
<td>How many horse falls has the horse had in its career</td>
<td>For every horse fall</td>
<td>increases</td>
<td>If horse has had several horse falls in career it is likely it will have more</td>
</tr>
<tr>
<td>My_horse_starts_30_60</td>
<td>How many times has the horse competed in the last 30-60 days</td>
<td>For every competition</td>
<td>increases</td>
<td>The more the horse has competed in 30-60 days the more it is at risk of a HF</td>
</tr>
<tr>
<td>Ridersex</td>
<td>Gender of rider</td>
<td>Male riders</td>
<td>Increases</td>
<td>Male riders are more likely to have HFs</td>
</tr>
<tr>
<td>My_horse_starts_60_90</td>
<td>How many times has the horse competed in last 60-90 days</td>
<td>For every competition</td>
<td>Increases</td>
<td>The more the horse has competed in last 60-90 days the more it is at risk</td>
</tr>
<tr>
<td>My_horse_starts_0_30</td>
<td>How many times has the horse competed in the last 30 days</td>
<td>For every competition</td>
<td>Increases</td>
<td>The more the horse has competed in last 30 days the more it is at risk</td>
</tr>
<tr>
<td>Horsegrade</td>
<td>Horses grade</td>
<td>Higher grade</td>
<td>Increases</td>
<td>Horses of a higher grade are at an increased risk</td>
</tr>
<tr>
<td>Riderage</td>
<td>Age of the rider</td>
<td>For every additional year of age</td>
<td>Decreases</td>
<td>Young riders are more at risk than older riders</td>
</tr>
<tr>
<td>Dressagepen</td>
<td>Dressage penalties</td>
<td>For every additional penalty</td>
<td>Increases</td>
<td>A poor dressage test score predicts higher risk of a horse fall</td>
</tr>
<tr>
<td>Horseage</td>
<td>Age of the horse</td>
<td>For every additional year of age</td>
<td>Increases</td>
<td>Older horses are at a higher risk of HFs</td>
</tr>
<tr>
<td>Sjpen</td>
<td>Show jumping penalties</td>
<td>For every additional penalty</td>
<td>Increases</td>
<td>A poor show jumping round presents increased risk of a HF</td>
</tr>
<tr>
<td>My_days_since_last_start_jockey</td>
<td>How many days has it been since the rider last competed</td>
<td>For every additional day of rest</td>
<td>Decreases</td>
<td>More days of rest for the rider reduce the risk of a horse fall</td>
</tr>
<tr>
<td>My_jockey_starts_30_60</td>
<td>How many times has the rider competed in the last 30-60 days</td>
<td>varied</td>
<td>varied</td>
<td>Decreased risk initially, but at 5 or more it changes to increased risk</td>
</tr>
</tbody>
</table>
PhD Research

Why are riders in leading positions at an increased risk of a horse fall?

**In-field data collection**
- Follow a group of riders and their horses through the eventing season
- Monitor heart rate and heart rate variability of the horse and rider during cross-country
- Psychoanalysis of rider before and after cross-country
- GPS mapping of course
- GPS tracking of horse and rider during cross-country rounds (location, speed, altitude)

Are there changes in the horse/rider physiological, psychological or GPS data depending on what position they are in (or any other factors!)?
PhD Research
Why are riders in leading positions at an increased risk of a horse fall?

Psychological profiling of riders
- Personality profiling
- Sensation seeking scale

Is there a trend in personality profiles of riders as there is in participants of other high risk sports?

How do riders score on the sensation seeking scale? Is there a trend?
PhD Research
In-field data collection
PhD Research
In-field data collection
PhD Research
In-field data collection

<table>
<thead>
<tr>
<th></th>
<th>Horse</th>
<th>Rider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max HR</td>
<td>222 bpm</td>
<td>198 bpm</td>
</tr>
<tr>
<td>Min HR</td>
<td>42 bpm</td>
<td>64 bpm</td>
</tr>
<tr>
<td>Average HR</td>
<td>160 bpm</td>
<td>164 bpm</td>
</tr>
<tr>
<td>Max Speed</td>
<td>42.2 km/h (26.2mph)</td>
<td>164 bpm</td>
</tr>
<tr>
<td>Average Speed</td>
<td>17.6 km/h (11 mph)</td>
<td></td>
</tr>
</tbody>
</table>
PhD Research
In-field data collection

Notable events whilst testing
- 3 rider falls
- 1 horse fall
- Several ‘1st attempt at level’
- Regional final competitions
- Male and female riders, variety of age and experience
- BE90 to Intermediate level

Observations
- Who is present/spectating? Parents, spouse etc.
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Current phase of research

- Analysis of psychological data from competitions
- Analysis of HR/HRV data from competitions
- Psychoanalysis/personality profiling of riders

Multifactor analysis of quantitative data

PhD end date 31st December 2018