

A narrative review of the risk factors and psychological consequences of injury in horseracing stable staff

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29 Introduction

30 Stable staff, also known as racing grooms, have a multifaceted role within the horseracing
31 industry, acting as care givers, skilled athletes and equine experts (NARS, 2019; Racing
32 Welfare, 2012) which often results in a role with inherent high emotional, physical and mental
33 demands, and subsequently high injury rates amongst staff (Cassidy, 2002; Racing Welfare,
34 2012). British horseracing employs over 6,700 racing staff, across 550 licenced race yards
35 responsible for the care and training of 23,599 horses in the United Kingdom (BHA, 2019). The
36 role of stable staff has become a recent focus for the British Horseracing Authority (BHA), with
37 plans for the publication of a “People Strategy” to follow the recently released Horse Welfare
38 Strategy (BHA, 2020). In previous years, the social demand for strict welfare standards in horse
39 racing has led to a culture of ‘putting the horse first’ (Butler *et al.*, 2019). These priorities have
40 resulted in an industry which maintains that it has some of the highest welfare standards in the
41 equestrian sector, that has continuously worked to promote the application of scientific
42 evidence-based training and welfare principles and to upskill staff to maintain those standards
43 (BHA, 2020; Butler *et al.*, 2019; Jukes *et al.*, 2020). However, the ‘horse first’ culture may
44 have inadvertently reinforced a workforce who deprioritise their own health and wellbeing to
45 care for the horse, which has been previously reported in other animal care sectors (Figley and
46 Roop, 2006). Employees who ignore their own health needs may experience higher levels of
47 physical and mental stress, which can increase risk of occupational injury and may impact the
48 efficiency of the workforce (de Castro and Fujishiro, 2010; Dembe *et al.*, 2005; Singh and
49 Conroy, 2017).

50
51 Compared to other occupational fields, racing staff have been shown to have a very high injury
52 incident rate, with over 50% of yards reporting accidents (Filby *et al.*, 2012; Filby and Jackson,
53 2016; Racing Welfare, 2012). Core stable staff (track riders, racing grooms) were involved in
54 82% of all reported accidents (Filby *et al.*, 2012). Very few studies have formally investigated
55 injury in stable staff (Filby *et al.*, 2012; Filby and Jackson, 2016; Speed and Anderson, 2008),
56 with most focusing on the jockey due to the impact that injury would have on a jockey’s race
57 performance and earning potential. Whilst jockey injury is typically associated with falls during
58 training and racing and is well documented (Hitchens *et al.*, 2019; Turner *et al.*, 2002; Turner
59 *et al.*, 2012), a different profile of injury is evident in stable staff, with 46-48% injuries
60 occurring at ground level. Stable staff also experience an increased risk of injury in the lower
61 extremities (legs, feet) and back compared to jockeys (30% vs. 23% and 16% vs. 9%,
62 respectively) (Cowley *et al.*, 2007). The greater manual labour and contact hours with the horse
63 in comparison to jockeys may explain the differences in injury profile, reflecting the
64 multifaceted nature of stable staff, and may suggest additional occupational risks that are not
65 seen in jockeys (Filby *et al.*, 2012; Racing Welfare, 2012) despite both working in high risk
66 occupations (Speed and Anderson, 2008). Significant research exists in equestrian sport about
67 the role the horse plays in injury risk in both ridden and handling roles (see Asa *et al.*, 2019 for
68 full review), however there is a limited understanding of the additional risk factors for injury
69 associated with occupational stressors for staff working in the racing sector.

70
71 Recent horseracing sector-based research noted the disregard for personal injury in stable staff
72 (McConn-Palfreyman *et al.*, 2019) and a culture of presenteeism, turning up to work when
73 injured or unwell, which could suggest an injury minimalization culture forming within racing
74 (Cassidy, 2002; Cohen *et al.*, 2019; Sauers *et al.*, 2016; Sear, 2018). Previous research and
75 anecdotal reports have highlighted that whilst staff experience high levels of injury, the
76 likelihood of reporting injuries, seeking time off or treatment, or resting during recovery is low
77 (Filby *et al.*, 2012; Filby and Jackson, 2016; Racing Welfare, 2012; Sear, 2018). This culture
78 may promote an industry that continue to work whilst injured, stated by Filby *et al.*, (2012) as

79 “the walking wounded”, reducing not only the efficacy of the workforce, but influencing long
80 term physical and mental health of stable staff. The unique nature of the role of stable staff,
81 along with the culture considerations of horseracing as a competitive sport and industry, poses
82 a novel situation within which to consider the psychological implications of injury.

83
84 The purpose of this narrative review was to investigate the unique occupational and
85 psychosociocultural stressors within the horseracing industry that may increase the risk of
86 injury to stable staff, and to apply current injury theory to determine whether stable staff are at
87 heightened risk for mismanagement of injury. Specifically, this review will report the proposed
88 occupational and psychosociocultural risk factors for injury in horseracing stable staff; propose
89 psychological responses to injury with unique considerations of this population and explore
90 whether an injury minimalization culture may be influencing stable staff health and wellbeing.
91 The result of such a review could have important implications for increasing staff education
92 around injury management, and the design and training of interventions for employers and
93 employees to optimise psychological recovery from injury in stable staff.

94

95 **Methods**

96 *Search Method*

97 A literature search concerning occupational injury was conducted using online database search
98 engines, including Science Direct, PubMed, Psycinfo via Ovid, Google Scholar, and the
99 University of the West of England Library with no restrictions placed on country or publication
100 date. Search strategies focused on the initial inclusion of titles and/or abstracts containing the
101 key words: injury, psychological responses, occupational, sport and/or athlete, equestrian,
102 horseracing, jockey, risk of injury, rehabilitation, or injury minimisation. This initial search
103 was followed by crosschecking reference and citation lists (backwards search) and locating
104 newer articles that included the originally cited paper (forward search) (Darlow and Wen,
105 2016). In addition, industry reports obtained through personal communication with Racing
106 Welfare (UK) were included to supplement the research, including: *Racing Welfare’s Change
107 of Pace (2012) Report*, Filby and Jackson (2016) “*Thoroughbred Breeding Associations Expert
108 Report on Accidents*”, Speed and Anderson (2008) “*The health and welfare of Thoroughbred
109 Horse Trainers and Stable Employees*”, Racing’s Occupational Health Services Annual Reports
110 (2018, 2019), and an unpublished MBA thesis entitled “*Occupational Stressors for Racehorse
111 Trainers*”. These were primarily used to supplement the literature found, and to provide injury
112 statistics within the horseracing sector. The search was performed by the first author between
113 September 2019 and March 2020.

114

115 *Study Inclusion Criteria*

116 Inclusion and exclusion criteria were developed to identify key areas of interest, informed by
117 previously published research (Green *et al.*, 2006). The inclusion criteria included: the article
118 was required to be written in the English language, the article focused on the study of
119 musculoskeletal injury and was available as full text. To maximise the search range available,
120 due to a paucity of published research on horseracing-related injury, inclusion criteria included
121 research from 2000 – May 2020. Commissioned horseracing industry reports were included in
122 the criteria for review, as these reports act as key sources of industry data and reporting, and
123 are often utilised in the industry to support change. Studies were excluded if they did not focus
124 on either risk factors or responses to injury or if they discussed life-altering injuries, such as
125 paralysis, as that was beyond the scope of this review. Editorial pieces and methodological
126 validation studies were also excluded from this review.

127

128 *Information Extraction*

129 Information concerning risk factors for injury, predictors of work or sports-based injuries,
130 psychological responses to injury, adherence to rehabilitation, and injury culture (either work
131 or sport) was extracted from the articles. Information gathered for each study primarily
132 concerned the purpose of the study reviewed, the study design and execution, study findings
133 including participant demographics, and the conclusion drawn by the authors (Green *et al.*,
134 2006). The research was synthesised into a comprehensive review of injury predictors and
135 factors influencing responses to injury that may pose unique discussion and application to those
136 working within horseracing.

137

138 **Discussion**

139 The purpose of the current study was to review the occupational and psychosociocultural risk
140 factors for injury in horseracing stable staff, and to apply current injury theory to determine
141 whether stable staff are at heightened risk for mismanagement of injury. The following **themes**
142 emerged from the review as predictors of injury appropriate to working in the horseracing
143 industry: working hours, job security, job control, life stressors, mental health and drug misuse.
144 Additionally, in response to injury, the following **themes** were identified for consideration
145 specific to the racing sector: positive and negative responses to injury, the role of social support,
146 rehabilitation adherence, and injury minimalization.

147

148 **Predictors of staff injury in horseracing**

149 *Occupational risk factors*

150 **Organisational structure and working conditions have previously been reported as causal**
151 **factors for injury risk in occupational settings** (Singh and Conroy, 2017). **A number of**
152 **predictors of injury in the horseracing sector were** identified during the review process,
153 including the following occupational specific predictors: working hours, job security and job
154 control. Working in racing is **considered dangerous**; the unpredictability of the horse, manual
155 labour and long hours can result in increased risk of injury to those working within the sport
156 (Speed and Anderson, 2008). Dembe *et al.*, (2005) proposed that increased working hours
157 increased the risk of injury in employees by 84%, whilst for those working specifically in the
158 nursing profession, it is reported that working over 40hrs per week increased the risk of work-
159 based illnesses, sick days and back pain (de Castro and Fujishiro, 2010). Disruption of circadian
160 rhythms, greater levels of fatigue and lack of recovery time **were found to increase the risk of**
161 **injury observed in wider employment sectors, as well as staff working unsociable hours, where**
162 **typically there were less staff per shift than comparable shifts during the day** (de Castro and
163 **Fujishiro, 2010; Dembe *et al.*, 2005). **Similar patterns of unsociable and long hours are seen in****
164 **the racing industry, with trainers reporting long work hours as one of their main sources of**
165 **stress** (Sear, 2018). **In addition, over 85% of stable staff surveyed in Australia reported working**
166 **more than 40 hours per week averaging 46hrs per week in full time roles** (Speed and Andersen,
167 **2008). The National Association of Racing Staff (NARS) state that no employee should work**
168 **more than 48 hours per week on average over a 7-day period in the UK** (NARS, 2019), however
169 **limited data are available** to confirm the actual average weekly hours. Whilst occupational
170 health research often reveals that longer working hours results in increased stress responses and
171 injury concern, the wider literature would suggest a more nuanced relationship, based on
172 interactional models of stress (Angrave and Charlwood, 2015). The Person-Environment (P-E)
173 Fit theory assumes that “*organisational behaviour rests on the...fit between the person and the*
174 *environment and that stress occurs when there is an incompatibility between the two*” (Angrave
175 and Charlwood, 2015; Friedland and Price, 2003; Kristoff, 1996; Sear, 2018, pp. 16). P-E Fit
176 theory has proposed that when a person is working more or less hours than they would like,
177 stress occurs due to the mismatch between actual and preferred work hours, which decreases
178 job satisfaction and wellbeing (Angrave and Charlwood, 2015; Kristoff-Brown *et al.*, 2005).

179 This would therefore suggest that if there is a mismatch between preferred hours for racing staff
180 and expected hours based on the demands of the role, stress levels would increase in this
181 population, which could affect injury incidence.

182
183 Reports of increased pressure due to a “relentless” fixture list (Juckes *et al.*, 2020; Sear, 2018;
184 Speed and Anderson, 2008) and lack of work-life balance are emerging in the racing sector,
185 resulting in staff who have less time to unwind, relax and recover after work (Juckes *et al.*,
186 2020; Sear, 2018). Fixture numbers have increased by 6% to a current figure of 1,511 planned
187 race days for 2019 across Flat and NH seasons, compared to 1,429 in 2014 (BHA, 2019). The
188 inability to recover can lead to accumulation fatigue, or burnout, impacting coping mechanisms
189 and leading to poor decision making, which may result in a higher risk of occupational injury
190 (de Castro and Fujishiro, 2010; Dembe *et al.*, 2005). Despite the memorandum of agreement
191 between the National Trainers Federation (NTF) and The National Association of Racing Staff
192 (NARS) stating that staff returning from racing after midnight will not be required to start work
193 before 9.30am the following day, trainers often state that this is difficult to facilitate (Sear,
194 2018). Racing stable staff identified this as a major issue for them on a day to day basis,
195 resulting in a consistent and prolonged lack of sleep (Racing Welfare, 2012). The unseen impact
196 of a demanding fixture list on sleep and working patterns of stable staff has yet to be
197 investigated but could result in high injury rates amongst stable staff. Issues of poor horse
198 welfare can also arise when staff are not fully engaged in their daily tasks, a potential
199 consequence of physical and mental fatigue from the current fixture schedule (Butler *et al.*,
200 2019). Although a multi-billion-pound industry, the infrastructure of UK racing at ground level
201 varies. Staffing in race yards is often hierarchical, with the greatest number of employees
202 working as racing grooms, followed by ‘head’ roles (head lad/lass, head travelling groom),
203 assistant trainers and finally trainers in fewer numbers (BHA, 2019; NARS, 2019). However,
204 for yards run as small rural enterprises, with less available staff at ground level (BHA, 2019),
205 staff sickness, injury or changes to work efficiency due to such problems pose a significant
206 threat to the running of these establishments. Injury could not only affect an individual working
207 in racing but undermine the daily functioning of a training yard, and quickly impact standards
208 of horse welfare. It is therefore imperative that further research is undertaken to determine how
209 fixture lists, and working hours and sleep may affect injury rates in stable staff.

210
211 Job security may influence injury risk, with employees in temporary, casual or part-time roles
212 between 1.8 and 3.26 times more likely to experience injury compared to those in permanent
213 positions (Sakurai *et al.*, 2013). The racing industry is currently perceived to have a staffing
214 crisis by both its employees and the wider media, with reports of inadequate management
215 practices, low staff satisfaction and retention, and pay concerns highlighted by employees
216 (Public Perspectives 2018, 2016; Sear, 2018; Speed and Anderson, 2008). In 2018, 40% of
217 trainers reported issues with employment, and 21% of all permanent roles required annual
218 recruitment (Public Perspectives, 2018, 2016), creating instability in the workforce. In addition,
219 job satisfaction in stable staff has decreased since 2016 (80% in 2016 compared to 75% in
220 2018), and 50% of permanent vacancies in racing are considered hard-to-fill, compared to 33%
221 nationally (Public Perspectives, 2018, 2016). Instability in the workforce can lead to
222 misinformation regarding health and safety protocols, resulting in higher injury rates of staff
223 (Sakurai *et al.*, 2013), however this has yet to be investigated in racing. Recent research
224 identified that staff across roles within racing still perceive the industry is experiencing a
225 staffing crisis, highlighting relentless fixture lists, limited work-life balance and lack of
226 managerial skills in senior staff as ongoing issues (Juckes *et al.*, 2020). Attrition of staff in their
227 mid-twenties could fracture the cyclical nature of teaching and skills sharing which the racing
228 industry has historically been built on, as invaluable expertise leaves the sector and experienced

229 staff members **fail to pass** their knowledge on to the next generation of staff (Butler *et al.*, 2019).
230 This knowledge may include health and safety strategies, knowledge of horse care and
231 management practices, and preventative injury measures, all of which could perpetuate the
232 injury risk to stable staff, due to workplace instability (Butler *et al.*, 2019; Sakurai *et al.*, 2013).
233 This would therefore suggest that due to the current occupational climate of racing, there is a
234 higher risk of injury for stable staff resulting from an unstable workforce, low retention and
235 high employee turnover.

236
237 **Psychological and** mental health play significant roles **as** both an antecedent of injury, and **in**
238 responses to the injury event in sport and occupational health, as well as long term recovery
239 (Petrie and Falkstein, 1998). The psychosocial aspect of occupational health and injury risk is
240 becoming more prominently researched in wider contexts. The results conclude that increased
241 emotional demand, decreased job control and satisfaction, increased job demands, and role
242 conflict are all significant risk factors for work-based injury (Johannessen *et al.*, 2015; Sakurai
243 *et al.*, 2013). **Occupational research** proposes that jobs with increased demand and limited job
244 control can be classified as high strain roles (de Castro and Fujishiro, 2010). These **highly**
245 **demanding** roles increase physiological arousal that cannot be **managed effectively** due to
246 limited job control, therefore resulting in internal mental fatigue and physical exhaustion
247 (Karasek and Theorell, 1990; Van Yperen and Hagedoorn, 2003). This is referred to as the Job-
248 Demand-Control Theory (JDC) and is widely considered one of the most accepted models of
249 occupational stress and injury (Karasek and Theorell, 1990; Sear, 2018). Job control is defined
250 as the feeling of autonomy in the workplace, through control over work shift patterns, hours,
251 and responsibility for management and timing of daily tasks and is often limited in high risk
252 roles due to health and safety (Van Yperen and Hagedoorn, 2003). Racing grooms are required
253 to work long hours, with increasing weekend shift work due to the expansion of the fixture list
254 and anecdotal reports of struggling to access doctor's appointments or co-ordinate calendars for
255 off-work activities due to ever changing schedules (Racing Welfare, 2012; Sear, 2018; Speed
256 and Anderson, 2008). In addition, staff are required to demonstrate stringent management
257 practices to ensure high standards of **horse care and consequently** welfare. **The rigour of these**
258 **management practices can result in perceived loss of job control, which was recently reported**
259 **by stable staff in an industry study (McConn-Palfreyman *et al.*, 2019). Lower job control,**
260 **combined with a highly demanding role, can result in racing grooms being classified as a high**
261 **strain job role.** Employees in high strain occupations may also lack the ability to recover if
262 annual leave or days off are limited, or if off-work situations are directly linked to job role, i.e.
263 provision of employee housing, as observed in the racing industry (Racing Welfare, 2012; Van
264 Yperen and Hagedoorn, 2003). The inability to recover can lead to accumulation fatigue,
265 reduced coping mechanisms and subsequent injury from poor decisions (Landolt *et al.*, 2017).

266 267 *Psychosociocultural risk factors*

268 Whilst work-related stress is a significant contributor to injury, there are other reported factors
269 that can increase injury risk, including stressful life events, social isolation, anxiety and drug
270 misuse (Singh and Connoy, 2017; Trimpop *et al.*, 2000b). A number of psychosociocultural
271 predictors were identified during the review process: life stressors, mental health and drug
272 misuse. Andersen and Williams' (1988) early model of stress and athletic injury proposed that
273 life stressors were a significant risk factor for injury. Life stressors can be classified under two
274 areas: daily life stressors are mundane problems such as arguments at work, traffic or pressure
275 from deadlines and result in immediate psychological distress, whilst major life stressors such
276 as child abuse, unemployment, injury or death, are less common, but have prolonged
277 psychological responses (Selye, 1978; Singh and Connoy, 2017). Life stressors are proposed to
278 affect injury risk due to altered cognitive function, memory loss, reduced decision-making

279 capabilities, sleep disruptions and impaired relationships (Kim, 2008; Singh and Connoy,
280 2017).

281
282 In addition to the daily demands experienced by those working in the sector, horseracing may
283 pose unique stressors that could induce prolonged psychological distress, such as the high
284 fatality rates of horses under staff care due to injury or disease, or catastrophic injuries to peers
285 (Balendra *et al.*, 2008; Hitchens *et al.*, 2019; Hitchens *et al.*, 2013; Parkin *et al.*, 2006;
286 Pinchbeck *et al.*, 2004; Williams *et al.*, 2014). Within dyadic sports, where two athletes
287 compete as part of a double, pair or team, seeing a teammate injured can cause significant
288 psychological distress, known as vicarious trauma (O'Neill, 2008). Day and Schubert (2012)
289 identified that gymnastic athletes became psychologically distressed when witnessing vicarious
290 trauma, and all identified an increased awareness of their own frailty and susceptibility to
291 injury. In addition, O'Neill (2008) reported that sporting athletes increased their use of fear
292 words as descriptors in training following injury of a teammate. Witnessing another person's
293 trauma, or supporting them during a traumatic event, are recognised types of stress-induced
294 injury (Newell and MacNeil, 2010). In the racing industry, a 'team mate' may include other
295 stable staff, who may not identify as athletes *per se* but nevertheless experience physical and
296 cognitive demands akin to most sporting professionals, or the horse, who is culturally
297 considered the most important party in racing (Richardson *et al.*, 2019). Bennett and Rohlf
298 (2005) highlighted that animal caregivers were at great risk of stress induced injury, due to
299 increased time investments, empathic understanding of the animal, and the bond created in
300 caring for that animal. Research in wider equestrian sports suggests that equine injury can cause
301 significant psychological harm to the owner/rider, providing a bond is formed between horse
302 and human (Davies *et al.*, 2018; Davies and James, 2018). The emphasis of putting the horse
303 first in the racing sector (McConn-Palfreyman *et al.*, 2019; Racing Welfare, 2012; Sear, 2018),
304 and the time spent with the horses, mean bonds are often formed between stable staff and the
305 horses in their care. Numerous racehorses are lost during training or racing each year, with
306 many experiencing fatal injuries or cardiovascular episodes (Parkin *et al.*, 2006; Pinchbeck *et*
307 *al.*, 2004; Williams *et al.*, 2014) suggesting that equine injury could be seen as a repetitive life
308 stressor for racing staff.

309
310 Significant or repetitive life stressors can result in serious psychological distress (SPD), which
311 is a non-specific psychological disorder, including a plethora of psychiatric symptoms, that are
312 severe enough to cause occupational or social functioning impairments (Kim, 2008). SPD is
313 usually sequential to a traumatic life event and can cause increased susceptibility to pain and
314 decreased stress tolerance (Kim, 2008). Compromised cognitive processing may explain the
315 difference in physical interpretation of post-injury pain, disrupt the biomechanical efficiency
316 of a skill or task, alter motor patterns or training demands due to overcompensation
317 mechanisms, and decrease attention and visual acuity, which can all lead to an increased risk
318 of injury (Heil, 1993). In addition, research has highlighted that SPD sufferers are 36% more
319 likely to experience occupational injuries, and have a greater number of days off, compared to
320 non-sufferers (Kim, 2008). Due to the high incidence of injury to both staff and the horse within
321 the racing sector, stable staff may be at risk for developing SPD due to repeat exposure to
322 trauma, and combined with poor coping mechanisms may therefore be at a greater risk of
323 personal injury (Landolt *et al.*, 2017; Losty *et al.*, 2019; McConn-Palfreyman *et al.*, 2019;
324 Racing Welfare, 2012).

325
326 Recent research has highlighted an array of mental health concerns in athletes, including eating
327 disorders, burnout, depression, anxiety, suicidal ideation, gambling, hazardous driving,
328 unprotected sex and substance abuse (Hughes and Leavey, 2012; Putukian, 2016; Sundgot-

329 Borgen *et al.*, 2010). As many as one in two athletes experience psychological stress **during**
330 their career and this is no different in the racing sector (Losty *et al.*, 2019). Jockeys reported
331 exhaustive schedules, high risk occupations, unrealistic weight expectations, public scrutiny,
332 burnout and injury as risk factors for poor mental health, and 53% of jockeys surveyed in a
333 recent study demonstrated symptoms concurrent with at least one mental health issue (Losty *et*
334 *al.*, 2019). Whilst more research has been undertaken in jockeys due to the influence on their
335 performance, similar demands are experienced by stable staff, who also report long hours,
336 relentless schedules and high risk tasks as part of their daily role (Filby *et al.*, 2012; Filby and
337 Jackson, 2016; Jukes *et al.*, 2020; McConn-Palfreyman *et al.*, 2019; Racing Welfare, 2012).
338 These demands are **consistent** across jockeys and stable staff, suggesting that the risk factors
339 are associated with the industry rather than the specifics of a chosen role, and that stable staff
340 may be at risk of mental health concerns due to this. Figley and Roop (2006) also reported that
341 those working in animal care occupations may be vulnerable to depression due to self-
342 sacrificing behaviours often associated with putting the animal first, a common culture seen in
343 racing. Recently, a survey of wider stable staff highlighted 72% of training yard staff
344 experienced stress, anxiety or depression in the last 12 months, whilst less than 23% reported
345 on health concerns (McConn-Palfreyman *et al.*, 2019). Landolt *et al.* (2017) suggested that
346 occupational and life stressors are the biggest contributors to injury risk factors, and subsequent
347 negative mental health. Stable staff in training yards and stud establishments recently
348 highlighted concerns over pain maintenance and the disparity in physical and psychological
349 support available to staff in the industry compared to jockeys and other professions (McConn-
350 Palfreyman *et al.*, 2019). The recent data from racing suggest a mental health concern for staff
351 working within the racing sector and whilst this is being addressed by industry organisations
352 such as Racing Welfare and NARs, there is currently no reported link being considered to the
353 risk of injury in this population.

354
355 Chau *et al.* (2008) reported significant increases in injury risk **within the general population for**
356 **people** who smoked, took drugs and misused alcohol. Drugs and alcohol misuse are the less
357 publicised coping mechanisms for poor mental wellbeing and are frequently inter-related
358 conditions (Hayes, 2012). In the United States, prescription drug abuse doubled from 2002 to
359 2005, and tripled from 2005 to 2008, suggesting a serious endemic issue (Hayes, 2012). Prior
360 drug use is a concern due to the **implications for pain** severity and social isolation, which usually
361 correlates **with** drug misuse (Hayes, 2012). Pre-injury drug **use can influence** regulation of pain
362 when injured, with an increased experience of pain severity and a need for increased pain
363 management strategies in people who **routinely** abuse opioids (Campbell and Edwards, 2009).
364 Within stable staff, drug misuse has been previously reported (~9% of training yard staff, ~9%
365 **of** stud staff) (McConn-Palfreyman *et al.*, 2019; Racing Welfare, 2012), which could further
366 compound the risk of injury.

367

368 **Psychological responses to injury**

369 Injury alters a person's assumptions about the safety of their proximal environment and has far
370 reaching connotations on self, world and future viewpoints (Brewin and Holmes, 2003).
371 Following an injury, stable staff are likely to experience complex psychological responses to
372 injury, including changes in cognitive appraisal, emotional responses and behavioural changes,
373 similar to those seen in injured athletes (Wiese-Bjornstal *et al.*, 1998). Cognitive appraisal and
374 the subsequent emotional and behavioural responses of athletes have been extensively studied
375 in a range of sports, and studies have utilised qualitative and quantitative methodologies to
376 monitor short and long term responses to injury (Davies *et al.*, 2018; Davies and James, 2018;
377 Mitchell *et al.*, 2014; Rees *et al.*, 2010; Wiese-Bjornstal *et al.*, 1998). The cognitive appraisal
378 process suggests that injury triggers a cognitive evaluation, including the assessment of their

379 coping resources, injury severity and prognosis for recovery, the re-adjustment of goals and
380 subsequent sense of relief or loss dependent on whether goals are met (Wiese-Bjornstal *et al.*,
381 1998). The cognitive appraisal at the onset of injury can influence a person's emotional
382 responses; a positive appraisal of coping ability post-injury may lead to a positive emotional
383 response, whereas a sense of loss resulting from injury may lead to emotions such as grief, fear,
384 frustration or anger (Thatcher *et al.*, 2007; Tracey, 2003; Walker *et al.*, 2007). Initial grief
385 responses, similar to those reported in Kubler Ross's Grief Theory (1969), mimic loss, shock
386 and emptiness, often classified as devastation (Rees *et al.*, 2010). The loss of sport participation,
387 or unfavourable progression with rehabilitation, leads to restless behaviour, frustration or
388 anxiety about an athletes return to sport, whilst feeling cheated has been reported in many
389 athletes, where an injury has **resulted in** a loss in achievement, or required the readjustment of
390 goals (Mitchell *et al.*, 2014). For stable staff, this frustration or restlessness may result from an
391 inability to undertake daily working **tasks fully**, being unable to manage the horses in their care
392 due to physical limitations or slow recovery processes and pain, resulting in psychological
393 **distress**. **However** this has yet to be investigated.

394

395 **Following emotional responses, a person will likely experience behavioural changes in**
396 **response to the injury** (Wiese-Bjornstal *et al.*, 1998). Behavioural responses include adherence
397 to rehabilitation activities, use of psychological skills strategies, use or disengagement from
398 social support, risk taking behaviours and behavioural coping techniques (Wiese-Bjornstal *et*
399 *al.*, 1998). These responses will influence a person's ability to return to activity, such as sport
400 or work, successfully, and the quality and efficacy of their rehabilitation (Santi and Pietrantonio,
401 2013). Many sporting athletes fail to return to their pre-injury level of performance, and this is
402 often attributed to the lack of pre-emptive educational measures or interventions provided to
403 them to support coping resources and ability to review and reflect goals in a constructive
404 manner (Arvinen-Barrow and Walker, 2013). These interventions reduce the denial and distress
405 phases of the affective cycle of injury model, associated with the emotional response to injury
406 (O'Connor *et al.*, 2005). By reducing the denial phase at the onset of injury, athletes are more
407 likely to take an active role in their rehabilitation, refocusing goals to make use of their
408 rehabilitation to improve other constructs such as strength, endurance or confidence, and is
409 defined as determined coping, or more recently, sport injury related growth (SIRG) (O'Connor
410 *et al.*, 2005; Wadey *et al.*, 2019, 2012). This has recently been seen in jockeys, with the
411 continued growth and development of post injury resources and focus on improved
412 physiological and psychological recovery (Injured Jockeys Fund, 2019; Professional Jockeys
413 Association, 2020). Determined coping is seen earlier in athletes who undergo early education
414 interventions **focussing** on managing emotions, goal setting to enhance motivation and
415 resilience and the provision of social support (Santi and Pietrantonio, 2013). It is therefore
416 suggested that similar **educational** interventions should be offered to working stable staff in the
417 industry to facilitate psychological recovery, once psychological responses are understood.

418

419 *Maladaptive responses to injury*

420 Maladaptive psychological states, such as prior anxiety or depression, can also affect injury
421 recovery (Chin *et al.*, 2017) and may stem from underlying trait anxiety or have developed from
422 life stressors. Clinical depression can increase cortical activation in pain contexts, resulting in
423 an increased experience of pain severity, which could alter adherence to rehabilitation and
424 increase fear of movement (Campbell and Edwards, 2009; Haythornthwaite *et al.*, 1991).
425 Depression post injury has also been linked to increased absenteeism, decreased productivity
426 and increasing healthcare costs in wider sectors, likely as a result of poor injury recovery
427 (Keyes, 2002). Depression is a global public issue, affecting more than 264 million people
428 worldwide (World Health Organisation, 2019), and is not uncommon in athletes (Proctor *et al.*,

429 2010), and has been previously reported in jockey and stable staff populations (Losty *et al.*,
430 2019; McConn-Palfreyman *et al.*, 2019). Stress and anxiety can also affect pain at the onset
431 of injury; anxiety has a similar physiological response as pain, utilising similar hormone and
432 immunological functions, and is often classified as a potentiator of pain (Ozalp *et al.*, 2003).
433 Increased anxiety is correlated to an increased perception of pain due to a down-regulation of
434 immune function resulting from an increase in stress hormones which interfere with pain
435 modulation (Kiecolt-Glaser *et al.*, 1998). Increased pain at the onset of injury can result in
436 avoidance behaviours, social isolation and increased psychological distress (Eccleston, 2001).
437 Anxiety, independent from its impact on pain recognition, is also likely to alter someone's
438 recovery behaviours, with increased anxiety correlated to decreased adherence to rehabilitation,
439 usually linked to social isolation or fear of negative social evaluation, stemming from a lack of
440 confidence (Kiecolt-Glaser *et al.*, 1998; Reuter and Short, 2004).

441
442 Depression and anxiety can lead to increased substance abuse as a means of coping (Hayes,
443 2012), which can also negatively impair recovery from injury (Eccleston, 2001; Hanin, 2000;
444 Kiecolt-Glaser *et al.*, 1998; Petrie and Falkstein, 1998; Putukian, 2016). Substance use is
445 considered to modulate emotional reactions; for example alcohol has been shown to counter
446 manic symptoms whilst cocaine has been shown to modify depression, both aiming to increase
447 mood (Putukian, 2016). Alterations in mood or cognitive status of an individual has been shown
448 to affect adherence to rehabilitation, with increased anger resulting in withdrawal from
449 treatment programmes, and more positive mood profiles linked to better recovery (Eccleston,
450 2001; Kiecolt-Glaser *et al.*, 1998). False positive moods from drug use however may result in
451 'crashes'; extreme low moods as a result of withdrawal from substances and may then result in
452 increased self-destructive behaviours and negative self-appraisal (Eccleston, 2001).
453 Furthermore, decreased task attention has been reported to link to high risk situations, including
454 substance abuse, which could increase risk of re-injury during a rehabilitation session (Hanin,
455 2000). In addition to altering the psychological state of an individual during recovery, drug and
456 alcohol misuse also directly affects physiological state. Alcohol misuse can cause retardation
457 of healing, with delays in cell migration and collagen production, resulting in a suboptimal and
458 longer recovery (Kiecolt-Glaser *et al.*, 1998). In military professionals, alcohol is considered
459 the most common coping method post injury, often stemming from pre- or post-injury
460 depression (Hayes, 2012). Substance abuse has been reported in the racing sector as a method
461 of coping, and "a strong predilection for somewhat eccentric socialising" has been seen (Racing
462 Welfare, 2012, pp. 17), however the research is still inconclusive about the extent of substance
463 misuse in the sector, and may be subjective to population bias or self-report measures (McConn-
464 Palfreyman *et al.*, 2019; Racing Welfare, 2012). Populations with higher levels of anxiety,
465 depression or drug and alcohol problems prior to or resulting from injury may experience
466 increased negative appraisals of injury, and delayed recovery. Further research is needed to
467 evaluate whether these risk factors are currently influencing injury risk and recovery in racing
468 stable staff.

469 470 *Social support and Rehabilitation*

471 Within the racing industry, 44% of employees signalled that their employer was "not supportive
472 at all" in response to their injury rehabilitation, which could affect rehabilitation success and
473 recovery in stable staff (McConn-Palfreyman *et al.*, 2019, pp. 39). Trauma within the workplace
474 can create a distrust in senior staff, who are entrusted with care of employees and a sense of
475 betrayal may be formulated here which can further affect communication between staff and
476 employees (Brewin and Holmes, 2003). Social support, such as from employers, friends, family
477 or colleagues, is particularly important in maintaining adherence to rehabilitation. Social
478 support is one of the most frequently cited psychosocial resources (Rees and Hardy, 2000;

479 Thoits, 1995) but definitions are often varied. As a construct, social support has been linked to
480 the size of a network or community, social integration of an individual, the quality and quantity
481 of relationships formed, and social resources (Rees and Hardy, 2000). Disengagement from a
482 community after injury can lead to feelings of isolation, which is negatively associated with
483 adherence to rehabilitation (Harris, 2003; Rees *et al.*, 2010). Social support is considered a key
484 factor in coping with injury, and can be considered positive, negative or neutral. Udry *et al.*,
485 (1997) suggested more athletes reported negative social support than positive, with 54% of
486 unhelpful supporters being family members in Lehman *et al.*,’s (1986) research.
487 Comparatively, in military personnel, home based social support (including family members)
488 has been shown to be a protective factor for veterans at risk of suicide (DeBeer *et al.*, 2014). In
489 racing, there may be dual roles regarding social support, as racing is considered a family
490 business whereby partners, siblings or parent/child relationships may work together thus
491 creating tension if acting as both a co-worker and a social support mechanism (McConn-
492 Palfreyman *et al.*, 2019; Sear, 2018; Speed and Anderson, 2008). Involvement of family may
493 be perceived differently depending on the emotional responses of the **individual**. **Research**
494 suggests anger can weaken the recognition and effectiveness of social support by pushing away
495 those closest to the injured person (Wilks *et al.*, 2019), whilst quality of relationships with
496 family could play a role in perception of support (Rees and Hardy, 2000). Research suggests
497 that post trauma, negative social support, such as criticism or indifference to the wellbeing of
498 that person, has a greater impact on successful recovery outcomes than lack of support (Brewin
499 and Holmes, 2003). It is likely that friendship groups in racing will be formulated based on
500 work relationships, due to an increased time spent at work, and housing often given to staff as
501 part of a benefits package when working in the sector (NARS, 2019). This may result in a lack
502 of **availability of** wider social groups to discuss injury without fear of social evaluation or
503 appearing weak which could further isolate staff working in this sector.

504
505 Previous research in sport has suggested that expertise in the area, or shared injury experiences,
506 was influential in support preferences (Bianco, 2001) to support an injured athlete. Hogan *et al.*
507 (2002) suggest that mutual interventions with athletes in similar injury situations is more
508 effective than individual sessions, and equestrian-specific support systems have been identified
509 as more positive networks of support (Davies *et al.*, 2018). The need to promote social
510 engagement within rehabilitation plans to promote psychological growth is evident and
511 interestingly, stronger support systems at work could also reduce injury incidence (Trimpop *et*
512 *al.*, 2000a). The current staffing climate within the racing industry may not be conducive to the
513 social development of a team on a race yard due to fluctuating employee numbers and retention
514 issues, which could alter team dynamics and influence injury risk and likelihood of successful
515 recovery. McConn-Palfreyman *et al.* (2019) reported that **both** training and stud stable staff
516 wanted psychological support to mirror that currently available for jockeys, which currently
517 includes individual and group psychological support for injury recovery further highlighting
518 the need for intervention in this population. Athletes in higher risk sports, such as horse racing,
519 are also more likely to respond better to management interventions, making this population an
520 appropriate sport to investigate the benefits of reactive and pro-active coping strategies
521 (Gledhill *et al.*, 2018). Although racing staff may not view themselves as athletes, their
522 engagement in high risk activities and physiological demands of their job role would suggest
523 that they too would also respond better to management interventions.

524
525 Whilst there is typically a concern for practices related to a lack of, or low rehabilitation
526 adherence in sporting research, due perhaps to lack of intervention, pain perception, social
527 isolation and negative cognitive appraisals, there is an equally distressing concern for someone
528 demonstrating over-adherence behaviours (Podlog *et al.*, 2013). **Overadherence** to

529 rehabilitation can be defined as exceeding recommended medical guidelines, and research in
530 sport and military sectors has seen injured people acting directly against recommendations,
531 returning to sport prior to full recovery and a perception that it is socially expected to ignore,
532 suppress or hide pain when injured (Hall, 2011; Podlog *et al.*, 2013). This again echoes a
533 sociocultural element to injury recovery, proposing that social viewpoints on injury as a
534 weakness may lead to an increased likelihood of “*being pushed beyond tolerable stress [or*
535 *pain] levels”* (Hall, 2011, pg. 14). **Overadherence** is more likely in athletes with increased
536 athletic identity, or who are motivated by their perception of others and desire to make an
537 impression, which can be linked more to males than females in military culture (Cohen *et al.*,
538 2019). This often leads to risk taking behaviours, such as continued engagement in sport against
539 advice, denial of injury severity, and avoiding reporting injuries at all (Podlog *et al.*, 2013).
540 Increased likelihood of over adherence behaviours has been linked to particular personality
541 types, including those with high neuroticism tendencies, and increased trait anxiety. Recent
542 research in wider equestrian disciplines suggests high levels of neuroticism in younger riders,
543 a trait characterised by emotional instability, difficulty coping and negative affect, suggesting
544 riders may be at risk of over adherence practices (Wolframm *et al.*, 2015). Horse riders have
545 previously been reported to return to sport earlier than medically recommended following a
546 serious injury, despite reports of pain and limited function (Perlo and Davies, 2017). Assuming
547 riders and racing staff share similar characteristics of the “*horse*” identity discussed by
548 Dashper (2016), it is important to investigate whether **overadherence** is a problem within
549 injured stable staff. Further research should seek to determine the relationship between
550 psychological responses to injury and rehabilitation adherence in racing stable staff allowing
551 for more appropriate physical and psychological interventions to take place.

552

553 *Under-reporting and Injury Denial*

554 A culture of **under-reporting** or injury denial has been seen in jockeys, who hide or downplay
555 injury or injury severity to avoid being signed off by the Chief Medical Officer so they can
556 continue to ride (Hitchens *et al.*, 2013; Turner *et al.*, 2002; Waller *et al.*, 2000; Whitlock, 1999).
557 Athletes who experience denial may refuse or disengage with necessary rehabilitation (Harris,
558 2003), often resulting in emotional instability, leading to stronger emotional reactions and
559 increased difficulty in coping with stress (Samuel *et al.*, 2015). Within a recent industry report,
560 37% of racing industry staff reported injuries in the last 12 months but only 38% took any time
561 off related to that injury (McConn-Palfreyman *et al.*, 2019). Injury reporting and access to
562 treatment/rehabilitation is considered a concern in the racing industry, with anecdotal reports
563 of staff unwilling to take sick leave or continuing to work despite chronic pain or injury
564 (McConn-Palfreyman *et al.*, 2019; Racing Welfare, 2012; Sear, 2018; Speed and Anderson,
565 2008). Staff often cite a love of the job, moral or ethical obligations (for example to animal
566 welfare), or concerns for job security as reasons for not taking adequate time off (Johns, 2011;
567 McConn-Palfreyman *et al.*, 2019).

568

569 Presenteeism is not an uncommon occurrence in other lifestyle occupations, for example, 49-
570 58% of musculoskeletal injuries go unreported in the military (Sauers *et al.*, 2016), whilst
571 dancers report continuation of training despite severe musculoskeletal injury (Turner and
572 Wainwright, 2003). Referred to as an injury minimalization culture, military personnel report
573 the inconvenience of seeking medical treatment, fear of impact on their careers, knowing how
574 to treat themselves, and the cultural perspective to “suck it up” and ‘work through it’ mentalities
575 in the military as being key reasons not to report injury (Cohen *et al.*, 2019; Sauers *et al.*, 2016,
576 pp. 1077). The racing industry could also be suggested to have an injury minimalization culture;
577 discussions with staff highlights a need to appear fearless and brave, to hide injury and carry
578 on, similar to those themes reported in military culture (Racing Welfare, 2012; Sear, 2018). It

579 could therefore be expected that similar experiences may be reported as reasons for
580 presenteeism within the racing staff. This cultural norm may not specifically be fostered from
581 working within the racing industry. In professions where caring for others, particularly animals,
582 is a requirement, employees often report a worry that no one can replace their standards of care
583 leading to guilt for taking time off, and as such they must continue to work despite physical
584 injury or psychological distress (Figley and Roop, 2006). This can also be considered true for
585 the wider equestrian sector, and racing staff may have learnt this cultural norm from previous
586 experience with horses before entering racing, where the habitus was reinforced. Dashper
587 (2014) suggests guilt is experienced by horse riders when they put decisions about their own
588 career progression ahead of the horse, which could be seen here when injured staff are
589 prioritising their own needs and career ahead of daily management and care of the horses in
590 training. The love of the horse is often reported as a reason to maintain engagement within the
591 industry (McConn-Palfreyman *et al.*, 2019), and as such these factors may increase the risk of
592 underreporting or presenteeism post-injury in stable staff.

593
594 Employees within the racing industry are also reported to suppress and regulate emotional
595 displays to meet the organisation's expectations of the role (Sear, 2018), which Cassidy (2002)
596 suggested creates an organisational culture where the employees act, think and feel in
597 accordance to expectations, and new staff entering are taught to adhere to these cultural norms.
598 This culture, often referred to as institutional habitus (Bourdieu, 1984), may increase the
599 incidence of denial within staff regarding injury risk due to not wanting to appear weak or go
600 against the cultural norm, or for fear of losing their job (McConn-Palfreyman *et al.*, 2019;
601 Racing Welfare, 2012). Institutional habitus, particularly related to injury expectations, has
602 previously been reported in military personnel, boxing, dancers and veterinary professionals
603 (Day and Schubert, 2012; Turner and Wainwright, 2003; Vassallo *et al.*, 2019; Wainwright *et*
604 *al.*, 2005). Hall (2011) concluded that military culture had three psychological traits; secrecy,
605 stoicism and denial. These three traits created an institutional habitus that promoted successful
606 performance but often led to a delay in reporting injury, and members who were likely to push
607 beyond the boundaries of tolerable stress and pain to maintain those traits (Hall, 2011). In
608 dance, the institutional habitus formed by a dance company's ethos and social relationships
609 dictates a need to appear strong for the company, and to expect tolerance of pain as part of their
610 social contract (Turner and Wainwright, 2003). The cultural expectations of the habitus
611 override any prior cultural, religious or ethnic diversity, and the member is now belonging
612 solely to the habitus they joined (Hall, 2011). *For dancers, the historical and cultural norms of*
613 *hiding pain and injury are so ingrained that researchers and practitioners have questioned*
614 *whether pragmatic strategies for pain management and injury recovery are getting through to*
615 *athletes suggesting a need to focus on organisational culture as well as practical management*
616 *strategies within the racing industry.*

617
618 Within the racing industry, there is currently a staff shortage, which can lead to issues with
619 being covered if off sick or injured (Filby, 1987; Public Perspectives, 2018; 2016; Sear, 2018).
620 Different to the psychological belief that an employee is irreplaceable discussed previously
621 (Figley and Roop, 2006), the current working conditioning within racing highlights a physical
622 lack of staff who can cover shifts. This was recently highlighted as a concern for trainers in
623 Sear's (2018) study, whereby finding staff cover was reported as a main source of stress for
624 those working in industry. Injured employees or players has been previously highlighted as a
625 significant source of stress for managerial or coaching staff, who are in positions of
626 responsibility to 'fill the gaps left by injury' within a team, much the same as a trainer (Sear,
627 2018; Thelwell *et al.*, 2008). If this stress is made known, directly or indirectly, to a team of
628 subordinates, that team may alter their behaviours, and subsequently hide injuries or pain, in

629 order to reduce stress on their manager, particularly where good relationships have been
630 developed. In addition, within the racing sector, the requirements to maintain high standards of
631 care of the horses is vital for the success of training yards, thus making it more likely for
632 employees to continue working despite the need for rest or recovery. Employees or athletes
633 may also reduce reporting behaviours to avoid guilt for letting the team down, which has been
634 seen in injured athletes (Bianco, 2001; Mosewich *et al.*, 2013; Podlog and Eklund, 2007). Guilt
635 is defined as a feeling of responsibility and is often related to one's view of oneself and others'
636 expectations, such as expectations for injury management developed from an institutional
637 habitus (McNamee, 2002). It is considered as one of the more threatening emotions in response
638 to injury as guilt can result in separation from the social support that is essential to facilitate
639 recovery (Harris, 2003). The close working relationships within the racing industry, as well as
640 the current staffing crisis (Juckes *et al.*, 2020) and cultural focus of 'horse first' (BHA, 2020)
641 may increase the likelihood of staff experiencing guilt for taking time off, and thus continue to
642 work whilst injured.

643
644 Within other physically demanding occupations, when psychological or physical ability is a
645 barrier to completing the job, opportunities are often available to move into non-physical roles,
646 either in management or office work (Putukian, 2016; Singh and Connoy, 2017). In sport,
647 opportunities for coaching or teaching roles are often preferred, or career progression takes a
648 downwards trajectory towards less elite clubs (Hughes and Leavey, 2012). However, racing
649 staff suggested that a transition to a non-riding role was the inferior choice, felt like a weakness,
650 and considered it "*too painful to know you could never ride again*" (Racing Welfare, 2012, pp.
651 48) and due to the unpredictable nature of racehorses in training, limited opportunities exist to
652 gradually decrease aspirations (McConn-Palfreyman *et al.*, 2019). The accessibility of alternate
653 career paths may make it easier to accept post-injury limitations, and therefore increase the
654 likelihood of reporting an injury at its onset (Reuter and Short, 2004). The lack of accessibility
655 or desire to come away from the ridden aspect of racing may increase fear of injury in racing
656 staff, increasing the likelihood that injuries are unreported. Fear of the unknown is considered
657 a significant factor in fear of reinjury, which can negatively affect rehabilitation outcomes and
658 post injury recovery due to under or over adherence practices (Vassallo *et al.*, 2019). This could
659 therefore suggest that industries where career pathways are outlined clearly and multiple
660 opportunities exist for continuation at lower intensities, employees may be more likely to report
661 injury and adhere to prescribed injury rehabilitation strategies as wider opportunities exist for
662 them should they wish or need to leave the job. Stud staff recently highlighted issues with the
663 quality and availability of training for career progression, suggesting a gap in provision,
664 although this has since been addressed by the [British and Irish racing industries](#) (McConn-
665 Palfreyman *et al.*, 2019). A lack of visible alternative opportunities could increase the fear of
666 injury in this population, and therefore decrease the likelihood of reporting injury to managerial
667 staff. This would therefore suggest that failure to be active within a preferred role in their chosen
668 occupation may result in stable staff experiencing high levels of psychological distress as a
669 result of direct injury due to having a lack of a contingency plan for their career.

670

671 **Limitations and Future Research**

672 The use of a narrative approach poses several limitations commonly seen in narrative literature
673 reviews. There is an increased risk of selection bias compared to systematic reviews, as the
674 researcher is subjectively choosing articles to include within the review (Ferrari, 2015; Green
675 *et al.*, 2006). The risk of selection bias was mitigated in this [review](#) by utilising predetermined
676 inclusion and exclusion criteria when selecting studies, as recommended by Pare and Kitsoiu
677 (2017). In addition, care should be taken regarding the interpretation and analysis of the

678 literature, as conclusions have been formulated on the best available evidence in the field, and
679 may be open to subjective interpretation (Ferrari, 2015; Minichiello *et al.*, 2018).

680
681 This review has identified numerous gaps within the literature that the industry should seek to
682 address and theorised how racing staff may be influenced by psychology of injury based on
683 wider fields. However, these theories have not yet been confirmed through research. Future
684 studies should consider investigations into horseracing specific risk factors for stable staff, to
685 identify occupational and psychosocial risk factors that increase the risk of injury in this
686 population, with the aim to increase preventative strategies and educational opportunities
687 through yard management and racing organisations. In addition, exploration of the
688 psychological effects of injury in racing staff should also be undertaken, to support the
689 development and growth of Racing Occupational Health services and to determine how to
690 support staff who are experiencing injury and promote health and wellbeing of staff.

691 692 **Conclusion**

693 Multiple risk factors have been identified that may affect injury incidence within racing stable
694 staff. Risk factors include physical horse-related risk, organisational structure, job control and
695 working conditions, and the cultural norms of injury underreporting that could limit staff
696 seeking correct medical care and rehabilitation. There are serious physical and psychological
697 consequences for injury mismanagement, including increased risk of more serious injuries,
698 prolonged healing and chronic pain as well as decreased performance, loss of workdays and
699 long-term disability or impairment, usually resulting in forced retirement however these have
700 yet to be investigated within racing staff. Occupational health of stable staff is a key priority
701 for the racing industry, and further research into the prevalence, antecedents and psychological
702 responses to injury is recommended to ensure thorough understanding of the impact of injury
703 in racing staff. It is critical to identify if mismanagement of injury exists within the racing sector
704 and if so, to devise strategies to support employers and employees to minimise the negative
705 impact of this on human and potentially equine welfare.

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