

1 Resilience, Wellbeing, Depression Symptoms and Concussion Levels in Equestrian Athletes

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17 Abstract

18 Purpose: To conduct the first cross sectional survey on depression, resilience, wellbeing and
19 concussion levels of equestrian athletes, and to assess whether past concussion rates were
20 associated with depression, resilience, and wellbeing.

21 Design, Methodology, Approach: 511 participants from Canada, Republic of Ireland, United
22 Kingdom, Australia and United States of America took part in an international cross-sectional,
23 online survey evaluating concussion history, depression symptoms, resilience, and wellbeing.

24 Findings: 27.1% of athletes met clinically relevant symptoms of Major Depressive Disorder
25 (MDD). Significant differences were shown in wellbeing and resilience scores between
26 countries. Significant relationships were observed between reported history of concussion and
27 both high depression scores and low wellbeing scores.

28 Practical Implications: Findings highlight the need for mental health promotion and support in
29 equestrian sport.

30 Social Implications: Results support previous research suggesting a need for enhanced mental
31 health support for equestrians. There is reason to believe that mental illness could still be present
32 in riders with normal levels of resilience and wellbeing.

33 Originality/Value: This study examined an understudied athlete group: equestrian athletes and
34 presents important findings with implications for the physical and mental health of this
35 population.

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37 **1. Introduction**

38 Throughout history, athletes have been perceived as exemplars of human strength and
39 mental resilience (Uphill, Sly & Swain, 2016). Unfortunately, a more realistic understanding of
40 athletes and athleticism has seldom been examined until the recent surge of interest in athlete
41 mental health (Shinke et al., 2018; Breslin et al., 2019). Growing evidence demonstrates
42 widespread mental illness and challenges in athlete populations, and serious consideration is now
43 being given to promoting a positive mental health culture in sport (Breslin et al., 2019).

44 *Equestrian athlete* refers to all athletes participating in the sub-disciplines of equestrian
45 sport. In equestrian sport athletes uniquely depend on a partnership with a horse for success
46 (Meyers et al., 1999). Equestrian sport culture, like many others, has only recently begun to
47 appreciate the mental health challenges associated with the sport (Butler-Coyne et al., 2019).
48 This research seeks to develop current awareness of mental health in equestrian athletes and
49 inform efforts to promote positive mental health for this athlete population.

50 Mental health is a multifaceted construct (Uphill et al., 2016). Specifically, Keyes' (2002)
51 model of mental health comprises mental illness and mental health (i.e., social, psychological,
52 and emotional wellbeing) as two distinct, but correlated continuums. Optimal mental health is
53 characterised by the coexistence of high mental health, and low mental illness (i.e., flourishing).
54 It is also possible to have both high mental health and high mental illness (i.e., flourish with
55 mental illness), or both low mental health and low mental illness (i.e., languishing), or high
56 mental illness and low mental health (i.e., languishing with mental illness). Thus, Keyes' (2002)
57 model highlights the need to both promote mental health and reduce mental illness. Adopting
58 this perspective in a recent *mental health in sport* consensus statement, Breslin et al. (2019)
59 described a sport sensitive definition of mental health as; "mental health is not merely the

60 absence of illness, but a state of wellbeing in which those involved in competitive sport realize
61 their purpose and potential, can cope with competitive sport demands and normal life stressors,
62 can work productively and fruitfully, can act autonomously according to their personal values,
63 are able to make a contribution to their community and feel they can seek support when
64 required” (p.4). Hence, supporting athlete mental health is crucial considering growing evidence
65 that athletes can struggle with mental illness (Wolanin et al., 2015).

66 Wellbeing is an individual’s experience of social connectedness, personal competence
67 and functioning, and overall satisfaction with their life (Silva et al., 2019). One should consider
68 the potential negative impact of sport on wellbeing alongside the positive. Butler-Coyne et al.
69 (2019) found that participation in equestrian sport negatively impacted equestrian athletes’
70 wellbeing in several ways. Maintaining a ‘sport-life’ balance was particularly challenging due to
71 high time demands for training and associated financial pressures. The risky nature of the sport
72 influenced wellbeing via the perceived risk to the rider, and secondly through the psychological
73 impact of horse injury and occasional mortality (Butler-Coyne et al., 2019). A perceived
74 ‘wellbeing imbalance’ in the equestrian athlete may contribute to higher perceived pressure,
75 negative thoughts and emotions, and inhibited performance (Butler-Coyne et al., 2019, p.7).
76 Participants also perceived that involvement in equestrian sport enhanced their emotional
77 resilience, through navigating the challenges of competitive equestrian sport and having to
78 embrace adaptability in the face of these demands (Butler-Coyne et al., 2019). Resilience is the
79 capacity to adapt successfully despite adversity and is considered a crucial element of an
80 equestrian athlete’s ability to persevere through the inherent risks and adversities in their sport
81 (Lungano et al., 2019). Similar themes have been reported amongst jockeys. Despite significant
82 rewards associated with professional horse racing, such as status and mastery, jockeys’ wellbeing

83 was negatively impacted by the extreme amounts of time and physical and cognitive demands of
84 the sport (Landolt et al., 2017). This reflect both a positive and negative impact on wellbeing
85 from participation in equestrian sport.

86 Major Depression Disorder (MDD) is experienced by about 16% of the world's
87 population (Biesheuvel-Leliefeld, 2015). Individuals with MDD can spend as much as 21% of
88 their lives in a depressive state characterised by low mood, feelings of hopelessness, low energy,
89 and negative thoughts (Biesheuvel-Leliefeld, 2015). Higher-than-average rates of MDD and
90 depression symptoms in elite athlete groups have been reported compared to the general
91 population (Beable et al., 2017).

92 Sport related concussion is defined as “a traumatic brain injury induced by biomechanical
93 forces” (McCroory et al., 2017, p.839). Concussion can be followed by a variety of symptoms
94 such as: headache, dizziness, feeling foggy, memory problems, nausea, or throwing up (Kerr et
95 al., 2012). Equestrian athletes may experience comparable or higher concussion rates to those in
96 American Football, Hockey, and Rugby (Srinivasan et al., 2014; Kuhl et al., 2014). Research by
97 O'Connor et al. (2018) reports that 32.4% amateur and 19.6% professional jockeys suspect they
98 have had a concussion, and one in two jockeys would return to riding on the same day, even if
99 they suspected a concussion.

100 Kerr et al. (2014) found that athletes with one or more concussions could be 2.4 times
101 more likely to experience symptoms of MDD than athletes with no history of concussion. In a
102 systematic review of potential long-term effect of sport-related concussion, researchers
103 highlighted that although most athletes do not seem to suffer long-term consequences as a result
104 of their concussion history, a small percentage do seem to be at risk of depressive symptoms
105 and/or cognitive decline (Manley et al., 2017). Given the documented link between concussion

106 and MDD rates in sport (McCrory et al., 2017; Didehbani et al., 2017; Rice et al., 2018), research
107 is needed to establish evidence of this risk-factor for equestrian athletes. Dams-O'Connor et al.
108 (2014) assert that self-report screening for concussion is the best method of estimating
109 concussion incidence and prevalence, as it is common for concussions to result in mild
110 symptoms and/or not be reported to medical professionals. This could be especially common in
111 equestrian sport due to a culture of getting back on the horse quickly after a fall (O'Conner et al.,
112 2020), which may discourage riders from acknowledging and reporting symptoms.

113 Hence, the present study was a response to the limited research on mental health in
114 equestrian sport. The main purpose was to assess levels of depression symptoms, wellbeing and
115 trait resilience in equestrian athletes, both elite and non-elite, across five countries to develop a
116 coherent and evidence-based view of the state of mental health in equestrian sport. Additionally,
117 this study examined the relationship between self-reported concussion history and mental health
118 outcomes.

119 **2. Materials and Methods**

120 **2.1 Design and Participants**

121 540 participants took part. Data for 29 were removed as they were under 18. Statistical
122 analysis was calculated on 511 participants (mean age = 39.42: SD = 14.08: female= 93.6%,
123 male = 6.2%). Participant demographics are outlined in Table 1. All equestrian athletes from any
124 category of equestrian sport were eligible to participate from Canada, Australia, United Kingdom
125 (England, Scotland, Wales, Northern Ireland), Republic of Ireland and the United States of
126 America. These five countries were chosen based on (1) a high level of equestrian sport
127 participation, and (2) author connections in the equestrian industry which facilitated spreading

128 knowledge of the study to equestrian athletes within those countries. Participants completed an
129 online, anonymous, cross-sectional survey, which took approximately 10 minutes to complete
130 via Survey Monkey (Survey Monkey Inc.)

131 **2.2 Procedures**

132 Ethical approval was granted by Ulster University. Recruitment was achieved through
133 equestrian sport organisations in U.K., Ireland, and Canada, as well as through Facebook,
134 Twitter, and via professional riders in Australia, the USA, Ireland and Canada who promoted the
135 survey link to their equestrian contacts. Participants were informed that they were participating
136 in a study investigating mental health levels and the impact of concussion in equestrian athletes.
137 Informed consent was obtained from all participants.

138 **2.3 Measures**

139 Depression, wellbeing, resilience, and concussion were assessed.

140 *2.3.1 Depression*

141 The Patient Health Questionnaire (PHQ-8) (Kroenke et al., 2009) uses 8 questions (e.g., ‘Over
142 the past two weeks how often have you been bothered by any of the following problems: Little
143 interest or pleasure in doing things’) Responses were measured on a 4-point scale (0-*not at all*, to
144 3-*nearly every day*). Consistent with scoring methodology indicating an 88% sensitivity and 88%
145 specificity for classification of Major Depressive Disorder (MDD) (Kroenke et al., 2009;
146 Razykov et al., 2012), scores of ≥ 10 were used to classify the athletes with a clinically relevant
147 diagnosis of MDD. The PHQ-8 has sound psychometric properties in clinical and non-clinical
148 samples (Wu et al., 2019).

149 2.3.2 Wellbeing

150 The Mental Health Continuum Short Form (MHC-SF) (Lamers et al., 2011) is based on Keyes'
151 (2002) two-continuum model, and evaluates emotional, psychological and social wellbeing
152 through 14 questions e.g., How often over the past month did you feel that your life has a sense
153 of direction or meaning to it?). Responses were measured on a 6-point Likert scale (0-never to 5-
154 ever day), with all 14 questions being summed for a total score. This score can range from 0-70,
155 with higher scores indicating higher wellbeing. The MHC-SF has good internal consistency
156 (Cronbach α =>0.80, Lamers et al., 2011), and is valid for use with clinical and non-clinical
157 populations (Ferentinos et al., 2019).

158 2.3.3 Resilience

159 The Brief Resilience Scale (BRS) (Smith et al., 2008) assesses the 'bounce-back-ability' to
160 recover from health-related stress through six questions (e.g., I tend to bounce back quickly after
161 hard times). Responses were made on a 5-point Likert scale (1-strongly disagree to 5- strongly
162 agree). Scores range from 0-5, with 0-2.99 showing low resilience, 3.00 to 4.30 normal
163 resilience and 4.31-5.0 high resilience. The BRS has internal consistency (Cronbach α = 0.80-
164 0.91) (Smith et al., 2008) and has demonstrated validity and reliability across cultures (de
165 Holanda Coelho et al., 2016).

166 2.3.4 Concussion

167 Incidence of concussion was assessed using adapted questions from the General Health Survey
168 administered to retired American Football players (Kerr et al., 2012). Questions were adapted to
169 better simulate equestrian sport characteristics. Participants were provided with a concussion

170 definition. A self-report style of assessment was chosen intentionally to obtain the most accurate
171 estimation of concussion rates possible (Dams-O'Connor et al., 2014).

172 *2.3.5 Statistical Analysis*

173 Mean average scores and standard deviations as a measure of distribution or spread of
174 scores from the mean were calculated for the PHQ-8, BRS, MHC-SF and concussion scores as a
175 whole sample and by country. Separate one-way Analysis of Variance (ANOVA) with five
176 levels (country) was calculated to determine statistical differences in mean scores between
177 countries. Tukey's HSD Post-Hoc tests established which countries showed significant
178 differences. Concussion scores were analyzed in three groups: (1) no concussions, (2) 1-5
179 concussions, (3) 6 or more concussions. Mean average scores and standard deviations of the
180 PHQ-8, BRS and MHC-SF were calculated for the three concussion groups. Separate one-way
181 Analysis of Variance (ANOVA) were calculated to determine statistical differences in mean
182 scores between concussion groups. Statistical significance was set at $p \leq .05$. Partial Eta Squared
183 (η_p^2) values determined the strength of effects. All statistical analysis was calculated using the
184 Statistical Package for Social Sciences (SPSS) Version 24.

185 **3. Results**

186 The sample demographic scores for age, gender, years of experience in equestrian sport,
187 country of origin and equestrian discipline are described in Table 1. Participant mean scores
188 across measures are reported in Table 2. The mean depression scores was in the 'mild' range
189 (Kroenke et al., 2009). However, 27.1% of the sample reached the ≥ 10 cut off score for
190 experiencing major depressive disorder (MDD). The mean score for participants above the cut

191 off for MDD was $M = 13.89$. The mean score for participants below the cut off for MDD was M
192 $= 4.64$.

193 The mean wellbeing score was categorized as moderate by the MHC-SF scoring system (Lamers
194 et al., 2011). Further, the mean resilience score is categorised as “normal resilience” by the BRS
195 scoring system (Smith et al., 2008).

196 The mental health outcomes data consisting of the PHQ-8, MHC-SF and BRS were
197 analysed by country. There was no significant difference in PHQ-8 scores between countries.
198 However, there were significant differences in MHC-SF scores between countries $F(5, 495) =$
199 $5.265, p < .001$, with a small-to-moderate effect size ($\eta_p^2 = 0.05$, Field, 2013). Tukey post-hoc
200 test clarified this result, with Australia significantly higher than the UK ($p = .001$), Canada
201 significantly higher than the UK ($p = .012$), the USA significantly higher than the UK ($p = .026$)
202 and Australia significantly higher than the Republic of Ireland ($p = .008$). There were significant
203 differences in BRS scores between countries, $F(5, 501) = 2.87, p = .01, \eta_p^2 = 0.03$. Tukey post hoc
204 test clarified this result, with Australia scoring significantly higher than the Republic of Ireland
205 ($p = .007$).

206 PHQ_8 scores were negatively correlated with BRS scores $F(24,508) = 7.435, p < .001$
207 with a medium effect size of $\eta_p^2 = .26$. PHQ_8 scores were negatively correlated with MHC-SF
208 scores $F(61, 464) = 7.524, p < .001$ with a large effect size of $\eta_p^2 = .49$.

209 81.8% of the sample reported experiencing one or more concussions, 71.2% reported
210 between 1 and 5, and 10.8% reported six or more. 50% of respondents returning to riding on the
211 same day as a suspected concussion occurred. The mental health scores consisting of the PHQ-8,
212 MHC-SF and BRS were analyzed based on concussion history across three groups. Group one

213 had experienced no concussion, while Group two had experienced one to five concussions.
214 Group three had experienced six or more concussions.

215 There was a significant difference in PHQ-8 scores across three concussion groups, $F(2,$
216 $519) = 8.03$ $p < .001$. Tukey post hoc test determined that there was a significant difference
217 between all three groups. Between group one and two $p = .02$, between group one and three $p <$
218 $.001$, and between group two and three $p = .03$.

219 There was a significant difference in MHC-SF scores across three concussion groups, F
220 $(2, 486) = 5.05$ $p < .001$. Tukey post hoc test clarified a significant difference between the first
221 and third group, $p < .001$.

222 There was no significant difference in BRS scores across the three concussion groups.

223 **Discussion**

224 We report depression, resilience, wellbeing, and concussion levels in equestrian athletes
225 from five countries. Results suggest a relationship between the experience of concussion, with
226 both depression and wellbeing scores. 27.1% of the sample classified as having scores at the
227 level of major depressive disorder. This result supports previous studies assessing depression
228 levels in equestrian athletes, specifically jockeys, which have found depression symptoms as
229 high as 57% (Losty et al., 2018) and 35% (King et al., 2020). According to the current data,
230 equestrian athletes, therefore, experience symptoms of depression at a rate slightly above that
231 estimated in the general population, as has been found in other athlete groups (Beable et al.,
232 2017). These findings indicate a need to help equestrian athletes to prevent, manage, and treat
233 depression.

234 Despite the possible mental health concerns demonstrated by high depression scores, the
235 mean MHC-SF score indicated “moderate” wellbeing and the mean BRS score indicated
236 “normal” levels of resilience according to established norms, which resonates with the views by
237 Butler-Coyne et al., (2019) of the coexistence of the rewards of equestrianism on wellbeing,
238 while the demands, stresses and risk of equestrian sport were high. These findings, and those of
239 the current study, highlight the relevance of Keyes’ (2002) two-continuum model of mental
240 health and support the idea that equestrians may concurrently struggle with negative mental
241 illness and experience positive mental health as a result of their sport.

242 One of the novel contributions of the current survey to our understanding of equestrian
243 athlete mental health and wellbeing was the international composition of the sample from five
244 countries. However, it is important to highlight, effect size for the differences in scores between
245 countries were small-to-moderate (i.e., 0.03 and 0.05 respectively). Australian participants
246 scored highest in resilience and wellbeing and reported the lowest depression scores overall.
247 Future research should explore why Australian equestrians seem to experience stronger overall
248 mental health in comparison to other countries, we speculate that this maybe due to established
249 mental health awareness programmes, but empirical evidence is required to support the
250 legitimacy of this view.

251 **4.1 Clinical Implications**

252 When designing interventions for equestrians it will be important to consider the interrelated
253 continuums of mental health and mental illness in the equestrian athlete (Keyes, 2002). The
254 growing body of research on equestrian athletes reflects a complex reality where equestrianism

255 both helps and hinders wellbeing and may simultaneously contribute to mental illness (Butler-
256 Coyne et al., 2019; Lungano et al., 2019; McGuane et al., 2018)

257 **4.2 Concussion in Equestrian Sport**

258 This study contributes evidence to the position that concussions are a common and
259 significant risk factor to the physical and mental health of equestrian athletes. O'Connor et al.
260 (2018) found that 14.81% of injuries sustained by jockeys in point to point racing between 2007
261 and 2015 were concussions (45.09% were soft tissue and 38.55% were fractures). In the current
262 study, 82% of participants had experienced at least one concussion, compared to 38.8% of 797
263 former collegiate athletes in a study of self-reported concussion history and mental health (Kerr
264 et al., 2014). The high frequency of concussion in equestrian sport is concerning, especially as
265 the results of this study support previous findings which have linked increased concussion rates
266 with an increased risk of depression (Didehbani et al., 2017; Rice et al., 2018). This high
267 incidence of concussion may be influenced by the large proportion of amateur/leisure riders in
268 our sample. O'Connor et al. (2018) reported that amateur jockeys experience more falls and
269 injuries than professional jockeys. It is reasonable that a similar effect may exist in other
270 subdisciplines within equestrian sport.

271 Previous research has suggested that concussion negatively impacts athlete wellbeing due
272 to an experience of increased anxiety and stress for the athlete post-concussion (McGannon et
273 al., 2013). Research has also reported that loss of identity, pressure to heal quickly, and a lack of
274 perceived social support all negatively impact athlete wellbeing post concussion (Caron et al.,
275 2020).

276 Overall, the concerning links between concussion history and depression, and wellbeing
277 warrant further investigation into reducing concussion levels in equestrian sport and should
278 encourage equestrian sport organizations to implement and/or increase the availability and scope
279 of concussion education in order to encourage safe practice (e.g., helmet use) while riding and
280 handling horses.

281 **4.3 Limitations**

282 Despite the novel contributions of this study, including the assessment of a theoretically
283 informed mental health model (Keyes, 2002) using validated psychometric measures, and
284 recruitment of a large international sample of equestrian athletes, there were limitations. The
285 cross-sectional research design limits the ability to draw causal inferences. The self-reporting,
286 rather than direct medical diagnosis of depression and concussion by a medical professional
287 requires a degree of caution. The self-report concussion measure leaves much interpretation to
288 the participant, which may have impacted the results. Although five countries were sampled,
289 gender, sport type and response rates may have been influenced by respondents' interest,
290 perceptions, and experience of mental health and concussion. Varying sample sizes from
291 different countries may limit the conclusions drawn from comparisons between these groups. A
292 predominantly female sample may contribute bias to the results and indicates a lack of male
293 participation. Lastly, a lack of information of the timeframe of concussions experienced prevents
294 a deeper understanding of any possible relationships between concussion, depression, and
295 wellbeing.

296 **4. Conclusion**

297 Our study found that 27.10 % of a large international equestrian athlete sample reached
298 clinically defined cut-offs for MDD (American Psychiatric Association, 2013), despite the
299 sample demonstrating average/normal wellbeing and resilience. Results are similar to those
300 found in other athlete populations (Beable et al., 2017) and consistent with Keyes' (2002) model
301 of mental health. Results suggest that, despite presenting with moderate levels of mental health
302 (i.e., wellbeing, resilience) equestrian athletes concomitantly experience levels of depression
303 symptoms, that are slightly higher than the general population (Beable et al., 2017), and are at
304 the higher range of mental illness as reported in previous studies. There is potential for
305 improvement in equestrian athlete mental health and reduction of ill-being. Therefore, future
306 research should consider the interaction of mental health factors (i.e., social, psychological and
307 emotional) and how all three could be enhanced through evidence-based mental health
308 interventions (e.g., mindfulness, awareness raising). Our findings also indicated that athletes who
309 have experienced one or more concussions, have higher depression scores and lower wellbeing
310 scores than those athletes who have experienced no concussion. Further research with controlled
311 experimental designs is needed to determine potential causal links and underlying mechanisms
312 between concussion and mental health outcomes. Finally, we recommend that equestrian
313 sporting bodies urgently need health and safety provisions to reduce concussion prevalence in
314 equestrian athletes, such a delaying the return to riding after suspected concussion. Ultimately,
315 this research joins a growing body of evidence (e.g., Beable et al., 2017; McGuane et al., 2018;
316 Losty et al., 2018; Butler-Coyne et al., 2019; King et al., 2020) outlining ethical considerations
317 and risk factors for mental health in equestrian sports, wherein athletes could benefit from
318 evidence-based mental health awareness and self management interventions, specifically those

319 targeting depression, and provisions to provide additional rider safety for the prevention of
320 concussion.

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