



LJMU Research Online

Abbott, W, Brownlee, TE, Harper, LD, Naughton, RJ, Richardson, A and Clifford, T

A season long investigation into the effects of injury, match selection and training load on mental wellbeing in professional under 23 soccer players: A team case study

<http://researchonline.ljmu.ac.uk/id/eprint/10515/>

Article

Citation (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

Abbott, W, Brownlee, TE, Harper, LD, Naughton, RJ, Richardson, A and Clifford, T (2019) A season long investigation into the effects of injury, match selection and training load on mental wellbeing in professional under 23 soccer players: A team case study. European Journal of Sport Science.

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact researchonline@ljmu.ac.uk

<http://researchonline.ljmu.ac.uk/>

1 **A season long investigation into the effects of injury, match selection and training load on**
2 **mental wellbeing in professional under 23 soccer players: a team case study**

3

4 Will Abbott^{1, 2}, Thomas E. Brownlee³, Liam D. Harper⁴, Robert J. Naughton⁴, Andy
5 Richardson⁵, and Tom Clifford^{5*}

6

7 **Affiliations:** ¹School of Sport and Service Management, Brighton University, UK; ²Brighton and
8 Hove Albion F.C, American Express Elite Performance Centre, Lancing, UK; ³Research Institute
9 for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, UK; ⁴School of
10 Human and Health Sciences, University of Huddersfield, UK. ⁵Institute of Cellular Medicine,
11 School of Biomedical Sciences, Newcastle UK.

12

13

14

15

16

17 **Address for correspondence:**

18 Tom Clifford

19 School of Biomedical Sciences

20 Newcastle University

21 Newcastle-upon-Tyne

22 NE1 7RU

23 UK

24 Tel: +44 0191 088 311

25 Email: tom.clifford@newcastle.ac.uk

26

27

28 **Key words:** Wellbeing; mental health; football; injuries; depression.

29 **Abstract**

30 This study examined the influence of injury, match selection and training load on mental wellbeing
31 (MW) in a squad of professional soccer players. Using a longitudinal design, twenty-five male
32 soccer players (age, 20 ± 1 years, height, 1.80 ± 5.79 m, body mass 76.33 ± 7.52 kg) from the
33 under 23 squad playing in the Premier League 2 division in the UK completed the Warwick-
34 Edinburgh Mental Well-being Scale (WEMWBS) each week of the 2017/2018 season (37 weeks
35 in total). Injury and non-selection for the match squad were the only significant predictors of MW
36 ($P < 0.05$). Injury had the biggest influence on MW that was lower when injured vs. not injured
37 (43.6 ± 5.0 vs. 49.9 ± 3.5 , respectively, $P = 0.001$, $ES = 1.48$), accounting for 40% of the variation
38 in MW. This increased to 50% when not being selected to play games was also considered. Weekly
39 training loads measured by GPS (total distance, sprint distance and total duration) and individual
40 player win rate did not influence MW ($P > 0.05$). These findings highlight the importance of
41 monitoring MW in professional soccer players and suggest that injured players and those rarely
42 selected for the match squad should be educated on the strategies available for managing their
43 mental health and wellbeing.

44
45
46
47
48
49
50

51 **Key words:** Wellbeing; mental health; football; injuries; depression.

52
53
54
55
56
57
58
59

60 **Introduction**

61 Recent studies have indicated that there is a high prevalence of mental health disorders amongst
62 professional soccer players (Gouttebarga et al., 2015a; 2015b; Junge & Feddermann-Demont,
63 2016; Junge & Prinz, 2018). For example, in a study of over 500 professional male soccer players
64 from Europe, 25-43% of players reported symptoms of anxiety and depression, 11-18% of distress,
65 and 47-74% of adverse eating behaviors (Gouttebarga et al., 2015a). In a similar study from the
66 same research group, in which the prevalence of adverse mental health disorders in 149
67 professional soccer players was assessed, 26% of respondents reported suffering from anxiety and
68 depression related symptoms (Gouttebarga et al., 2015b). Similarly, high rates of mental health
69 concerns, specifically anxiety disorders and depressive symptoms, have also been reported in
70 professional female soccer players (Junge & Prinz, 2018).

71 Although the number of studies examining mental health in elite soccer players is still limited;
72 especially in comparison to those assessing physical health (e.g., fitness levels and injury states)
73 (Rice et al., 2016), the aforementioned findings suggest that the prevalence of mental health
74 disorders might be greater in professional soccer than other sports (Gouttebarga et al., 2015b).
75 These findings suggest that the daily pressures associated with their sport could be negatively
76 affecting their mental health and wellbeing (e.g., ability to cope with stress, undertake daily tasks
77 and contribute to their community and relationships positively; WHO, 2001). This highlights the
78 need for a more concerted research effort to understand the causes and consequences of mental
79 health problems in professional soccer players (Gouttebarga & Aoki, 2014).

80 Drawing on research across all sports it appears that physical challenges such as training load and
81 injuries, and environmental factors such as low social support, major life events, match experience
82 and career transitions are the main risk factors for developing mental health problems in elite
83 athletes (Schinke et al., 2017; Rice et al., 2017; Junge & Prinz, 2018; Junge & Feddermann-
84 Demont, 2016; Gouttebarga et al., 2015a; 2015b). Of these, injury is often singled out as having
85 the greatest influence on an athlete's mental health and wellbeing (Pearson & Jones, 1992; Schinke
86 et al., 2017). Indeed, a number of studies have found that injured athletes experience a sequelae of
87 negative emotions associated with poor mental health, including frustration, depression, boredom,
88 low mood, low self-esteem, and anxiety (Pearson & Jones, 1992; Leddy et al., 1994; Appaneal et
89 al., 2009; Podlog et al., 2010).

90 Notwithstanding, there has been little attempt to examine the effect of injury or other potential risk
91 factors (e.g., high training loads and match selection) on mental health in professional male soccer
92 players (Gouttebarga et al., 2015a; 2015b Junge & Feddermann-Demont, 2016). Furthermore, the
93 studies to date have rarely considered the mental health of youth players, who might actually be at
94 a greater risk for developing mental health disorders than senior players (Junge & Feddermann-
95 Demont, 2016; Gouttebarga et al., 2015b; Schinke et al., 2017). Additionally, none of the studies
96 to date have employed a longitudinal design in which mental health was measured more than once
97 and where the players acted as their own control.

98 Consequently, the aim of the present study was to examine the influence of some common physical
99 and environmental stressors on mental wellbeing (MW) in a squad of professional under 23 soccer
100 players across a full season. We were specifically interested in the effects injury, training load,
101 match selection and match results had on MW throughout the season. While the effects of injury
102 have been investigated previously, no other studies have attempted to examine the effects of
103 training load and not being selected to play games on any aspect of mental health in professional
104 male soccer players. We hypothesized that injury, not being selected to play games and high
105 training loads would negatively affect the players MW.

106 **Methods**

107 *Participants*

108 Twenty-five professional male soccer players (see Table 1 for physical characteristics) competing
109 in the second tier of the under 23 championships in England took part in this study. Newcastle
110 University Ethics Review board granted ethical approval. All players provided written informed
111 consent for this study.

112 *Experimental procedure*

113 The players completed a questionnaire to assess MW on a weekly basis. The time of day (before
114 training ~09:30) and the day of the week this was completed on was kept consistent (Thursday)
115 throughout the study. This day of the week was selected because matches are typically scheduled
116 for a Monday evening, and therefore it was felt that the player's MW would be less influenced by
117 the preceding/upcoming match on this day. Nonetheless, we still analyzed the effect of match
118 result to see if this did in fact influence MW. The first questionnaire was completed on August

119 14th 2017 during pre-season and the last on April 23rd 2018 at the end of the season (37 weeks in
120 total). Figure 1 displays a longitudinal overview of the study timeline and the periodized training
121 program the players followed during the study.

122 An injury was defined as a period of being unable to complete at least 1 week of training (Appaneal
123 et al., 2009) and not being selected to play games was defined as being named in the match-day
124 squad of 16 players (11 outfield and 5 substitutions). This data was recorded by the Head of Sports
125 Science in conjunction with the medical team at the club. External load measures were calculated
126 from GPS units (OptimEye S5B, Version 7.18; Catapult Innovations, Melbourne, Australia) worn
127 during matches and training sessions (10-Hz GPS and 100-Hz accelerometer devices). Specific
128 data collected are displayed in Table 1, and include weekly training duration, weekly training
129 distance and weekly high-speed running distance. The mean number of satellites during data
130 collection was 16 ± 1 , and mean horizontal dilution of position was 0.8 ± 0.1 . Previous research
131 has suggested above 6 satellites are required for adequate data quality (Malone et al., 2017).
132 However following conversations with the manufacturer, data was excluded if the number of
133 satellites decreased below 12. If horizontal dilution of position was >1 , data was excluded (Malone
134 et al., 2017). Catapult Sprint software was used for data analysis (Catapult Sprint 5.1.5, Catapult
135 Innovations, Melbourne, Australia).

136 *Mental wellbeing measure*

137 Mental wellbeing was assessed using the Warwick-Edinburgh Mental Well-being Scale
138 (WEMWBS). The WEMWBS is a valid and reliable measure of MW in the general population,
139 including young adults, and sensitive to change in response to interventions at the individual and
140 group level (Stewart-Brown et al., 2009; Maheswaran et al., 2012). It has also been used to evaluate
141 MW in several European populations, including the UK, and thus population norms were available
142 for comparison (Tennant et al., 2007; Stewart-Brown et al., 2009; Haver et al., 2015). The
143 WEMWBS has also been shown to be highly inversely correlated with psychiatric scales of
144 depression (Bianca, 2012; Zadow et al., 2017). Finally, it is short and freely available and therefore
145 easily accessible for sports clubs who may wish to use it with their athletes.

146 The WEMWBS consist of 14 positive statements about an individual's thoughts and feelings. In
147 the present study, we asked the players to score the questionnaire based on their thoughts and
148 feelings in the preceding 7 days. Each item is scored on a 1 – 5 Likert scale (1 = none of the time,

149 5 = all of the time); the minimum and maximum scores that can be obtained are 14 and 70,
150 respectively. A copy of the WEMWBS used in the present study is provided in the supplementary
151 material.

152 It is important to highlight that we chose to look specifically at MW as opposed to the psychiatric
153 scales favored by other studies, and this was for several reasons. Firstly, because MW, which is
154 concerned with feelings, functioning and life satisfaction, is closely associated with both physical
155 and mental health (Huppert et al., 2009; Stranges et al., 2014). Secondly, psychiatric scales used
156 to assess depression, anxiety and other adverse mental disorders tend to be negatively worded and,
157 when discussing mental health, it has been shown that individuals prefer to answer positively
158 framed questions (Bianca, 2012). Because the players were required to answer questions weekly,
159 we therefore felt that compliance would be higher with a MW questionnaire that contained
160 positively worded questions. Lastly, many psychiatric scales are hidden behind paywalls. We
161 wanted to test the utility of a freely available scale so that our study could be easily implemented
162 and replicated in the elite sporting environment.

163 *Data analysis*

164 All data analysis was performed with SPSS for Windows (SPSS version 24.0) and statistical
165 significance was set to $P < 0.05$ a priori. Normality was checked and considered normally
166 distributed if the Shapiro-Wilk test was $P > 0.05$. Individual win rates (win percentage from the
167 number of games selected for), match selection rate (percentage of matches selected for), time out
168 with injury (injury percentage from time at the club) and training load (weekly sum of duration,
169 distance and high-speed running distance) were calculated for each player and used as independent
170 predictors of average weekly MW (see Table 2). The effects of each variable on MW (dependent
171 variable) was analyzed using stepwise multivariate regression. Differences in average MW scores
172 for injured vs. not injured, selected vs. not selected were also analyzed using multiple paired
173 samples T-tests. Differences in MW for preceding match result (win, lose or draw; only including
174 matches selected for) was calculated with a one-way analysis of variance. To estimate the
175 magnitude of change in MW, Cohen's d effect sizes (ES) were calculated with the magnitude of
176 effects considered either small (0.20–0.49), medium (0.50–0.79) or large (>0.80).

177

178 **Results**

179 Table 1 displays the descriptive statistics for the player's physical characteristics, independent
180 predictor variables and average WEMWBS scores.

181 Average MW, as assessed with the WEMWBS, was significantly lower when injured vs. not-
182 injured (43.6 ± 5.0 vs. 49.9 ± 3.5 ; $P = 0.001$; $ES = 1.48$; Figure 2) but was unaffected by the
183 preceding match result (win: 50.0 ± 4.0 , draw: 50.5 ± 5.0 , loss: 49.1 ± 4.8 ; $P = 1.000$; ES all ≤ 0.28).
184 There were no differences in MW scores when selected vs. not selected (48.9 ± 3.4 , vs. 46.9 ± 5.9 ;
185 $P = 0.134$; $ES = 0.43$).

186 The number of days missed to injury and not being selected for the games were the only variables
187 found to be significant predictors of MW in the multivariate regression model (Table 2). The length
188 of time spent injured throughout the season had a significant negative effect on MW, and accounted
189 for the biggest variance in MW (40%). When considered together, the length of time spent injured
190 and not being selected to play games accounted for 50% of the variation in MW scores (Table 2).
191 Multicollinearity between the predictor variables was considered acceptable as Variation Inflation
192 Factors were below 1.5 (Kutner et al., 2005).

193 The coefficient of variation for week to week changes in total distance (m), weekly total duration
194 (min) and weekly total high speed running distance throughout the data collection period of this
195 study was 12, 10 and 32%, respectively. As shown in Table 2, the players individual training loads
196 did not significantly influence their MW scores.

197
198 **Discussion**

199 The main findings of this study were that time out injured and not being selected to play games
200 significantly affected MW in a squad of under 23 professional soccer players during the course of
201 a season. Time out injured had the strongest influence on MW; the average WEMWBS when
202 injured was much lower than the average score in the general population (43.6 vs. 50.1 ; Health
203 Survey for England, 2016), and just below the suggested cut-off for depression (44.5 ; Bianca,
204 2012) and marginally above the lowest 15th quartile for MW (42 ; Stranges et al., 2014). The ≥ 3
205 point change in MW when injured is also considered to be a clinically meaningful decrease
206 (Maheswaran et al., 2012). This is the first study to longitudinally track MW in a squad of

207 professional soccer players of any age group, and provides new information on the factors that
208 affect MW.

209 As this is the first study to assess the effects of injury on MW in professional male soccer players
210 there are no other studies available for direct comparisons. However, given the close relationship
211 between WEBWMS and clinical depression scales (Stranges et al., 2018) we can make some
212 tentative comparisons to studies assessing the effects of injury on depression symptoms in
213 professional soccer players. Similar to our findings, Junge & Fedderman-demont, (2016) observed
214 that players from the top leagues in Switzerland reported higher levels of anxiety and depression
215 when they were injured (Junge & Fedderman-demont, 2016). Interestingly, male under-21 players
216 had significantly higher depression scores than the senior players. However, in two studies from
217 Gouttebauge et al., (2015a, 2015b) neither depression nor anxiety symptoms were associated with
218 severe injury, despite the fact that depression rates were significantly higher than in other sports
219 (25–44%). The discrepancy in findings between these studies could be due to the different study
220 designs. Junge & Fedderman-demont, (2016) compared depression and anxiety symptoms in
221 players currently injured or not in a cross sectional design, whereas the studies of Gouttebauge et
222 al., (2015a, 2015b) assessed whether the number of previous injuries influenced the players *current*
223 mental state. It is possible that the latter studies failed to detect any association between injury and
224 mental health because the data was not collected when the players were actively suffering from an
225 injury. Assessing mental health while injured might be more sensitive for detecting mental health
226 problems and should be encouraged in future studies.

227 Examining the possible ways in which injury could have affected the players MW was beyond the
228 scope of the present study. However, if MW is considered in relation to an individual's flourishing,
229 that is, whether they are functioning effectively, be it physically, emotionally or socially (Huppert,
230 2009), then anything that disrupts this state will likely affect MW. When injured, their day-to-day
231 functioning (e.g., ability carry out tasks), and identity as a soccer player, is disturbed, as they are
232 not able to train or compete. This change of circumstance has been reported to evoke a wide array
233 of emotional responses such as boredom, frustration and anger, all of which could affect MW
234 (Pearson & Jones, 1992). It has also been suggested by Podlog et al., (2007), in a return from sport
235 injury context, that MW is related to competence, autonomy and social connectedness (e.g., self-
236 determination theory). In this scenario, the loss of autonomy (little control over rate of recovery)

237 competence (inability to perform) and connectedness (isolation from teammates and coaches)
238 could significantly affect MW, and this could help to explain the findings of the present study. To
239 counter this, Podlog et al., (2010) recommend that interventions designed to promote feelings of
240 autonomy, connectedness and competence (e.g., performance on physical tests) should be
241 encouraged during the rehabilitation process. The present study's findings further highlight the
242 need to monitor the mental health of injured soccer players so that the relevant interventions and
243 support can be provided to ensure health and performance are not negatively affected.

244 It is important to note, however, that we cannot discern a cause and effect relationship between
245 injury and lowered MW, only an association between the two. Thus, we cannot rule out that
246 lowered MW is actually a risk factor for injuries and this could help to, at least in part, explain our
247 findings. Although we are not aware of any research assessing MW on injury risk, a recent study
248 by Watson et al., (2017) found that lowered mood increased injury risk in youth female soccer
249 players, suggesting a potential relationship between emotional responses and injury risk in athletic
250 populations. The relationship between MW and injury risk clearly needs further exploration.

251 Neither training load nor match result influenced the players MW; however, in our regression
252 model, not being selected for the match squad had a moderate negative influence on players MW.
253 Whilst this is the first study to assess the effects of match selection on MW, a recent study
254 examined the influence of match selection on anxiety and depression symptoms in professional
255 female soccer players (Junge & Prinz, 2018). In contrast to our findings, they found that not being
256 selected to play games did not significantly influence depression or anxiety with no differences in
257 symptoms between players who played *almost always* to *rarely* or *never*. The discrepancy in
258 findings between the present and the aforementioned study could be due to several reasons; player
259 differences (male under 23 players in England vs. senior female players in Germany), mental
260 health scales used (WEMWBS vs. anxiety and depression scales) and method of collection
261 (longitudinal throughout the season vs. cross sectional at a single time point).

262 As to why not being selected to play games might affect MW, we speculate that not being able to
263 play can result in significant psychological distress for the athlete and, similar to injury, this is
264 possibly due to a loss of autonomy, connectedness and competence, as suggested by Podlog et al.,
265 (2007, 2010). Such psychological distress could be even more pertinent at the under 23 level than
266 the senior level, as their career trajectory is still uncertain. If a player is not playing, either due to

267 injury or due to not being selected, then they are unable to impress coaches and support staff who
268 ultimately decide whether they receive a senior contract with the club or are promoted to the senior
269 squad. It has been shown that youth players who are released from soccer clubs in the UK often
270 suffer from high levels of psychological distress compared to their retained counterparts
271 (Blakelock et al., 2016). It would be reasonable to assume that the looming threat of being released
272 from their contract, or not making it to senior level, is heightened when they are not playing. Or it
273 could simply be the fact that younger players have yet to develop appropriate coping strategies to
274 help them deal with such psychological stress. Future research should examine the psychological
275 distress associated with not being selected in soccer players to better understand how their mental
276 health can be managed.

277 This study has several limitations that need to be acknowledged. Firstly, the sample size was low
278 ($n = 25$) and the population studied relatively homogenous. Thus, these findings might not be
279 representative of senior level soccer players, female players, or those from other countries, as
280 cultural differences in mental health have been observed (Schinke et al., 2017). As such, we
281 caution that these findings may only be relevant to young professional soccer players in the UK.
282 Future studies on MW in soccer players should include players from several different teams and
283 countries. Secondly, there are several other variables that could have affected MW other than those
284 examined in the present study. Our primary outcome measures were injury and not being selected
285 to play games; however, adverse life events and social support could also affect MW (Goutterborge
286 et al., 2015a) and should be included in future studies. It is important to highlight, though, that
287 Arnold and Fletcher, (2012) identified over 640 different psychological stressors for elite athletes
288 and clearly not all of these can be accounted for in studies of this nature. Another potential
289 limitation is that we did not collect a baseline value to calculate standardized individual changes
290 in MW values. This was partly because it is very difficult to collect a true baseline that is not
291 influenced by training load and performance to some degree, unless we were to collect the baseline
292 value right at the outset of the season, which we were unable to do in this study. Also, some players
293 started the season injured, and therefore getting a baseline MW score would not have been as
294 simple as assessing MW at the start of the season. Nonetheless, this should be considered in future
295 research. Lastly, future studies might experiment with different days the questionnaire is
296 completed. We opted for match day + 3, at which point we expected recovery to be sufficient
297 enough to not significantly interfere with the MW scores. If we had collected these scores on match

298 day, for example, we might have got different results; therefore, future studies might wish to
299 measure MW across a weekly cycle to see if this influences these values. The key strength here, is
300 that we kept the day the survey was completed consistent. Another strength of the present study is
301 the longitudinal design. This is the first study to track MW over a full season, with all previous
302 studies collecting mental health data either retrospectively (Goutterborge et al., 2015a, 2015b) or
303 with a cross sectional design (Junge & Fedderman-demont, 2016). The present study is also the
304 first to use each player as their own control. We believe our design strengthens the validity and
305 reliability of the findings, as the player's scores were not subjected to recall bias or reliant on a
306 single measure. Lastly, this is the first study to demonstrate that the freely available WEMWBS is
307 a simple and easy to administer questionnaire to monitor changes in MW in soccer players and
308 might serve as a useful tool for sports medicine professionals. It is important to note, however, that
309 WEMWBS is yet to be validated as a measure of MW specifically in soccer players and this should
310 be explored in future work.

311 **Conclusion**

312 In conclusion, this study demonstrates that injury and not being selected to play games can
313 significantly influence MW in under 23 soccer players. These findings add to the scant literature
314 available on mental health in professional soccer players, further highlighting the need to better
315 understand the causes and consequences of psychological distress in this population. From a
316 practical perspective, these findings indicate that soccer players should be educated on strategies
317 to better manage their mental health when injured and not selected. Of the available strategies for
318 coping with common stressors, a recent position stand on the topic (Schinke et al., 2017) suggested
319 that mindfulness based interventions incorporating resilience training might be effective for
320 managing sub-clinical mental health concerns in athletes. Lastly, these findings demonstrate that
321 the WEMWBS is a simple and cost-effective way to detect and monitor for potential mental health
322 disturbances in a squad of professional male soccer players.

323

324 **Acknowledgements**

325 The authors wish to thank all of the players who took part in this study.

326

327 **Reference list**

- 328 Appaneal, R. N., Levine, B. R., Perna, F. M., & Roh, J. L. (2009). Measuring postinjury depression
329 among male and female competitive athletes. *Journal of Sport and Exercise Psychology*, *31*(1),
330 60-76.
- 331 Arnold, R., & Fletcher, D. (2012). A research synthesis and taxonomic classification of the
332 organizational stressors encountered by sport performers. *Journal of Sport Exercise and*
333 *Psychology*, *34*, 397–429.
- 334 Bianca D. Performance of the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) as a
335 screening tool for depression in UK and Italy. University of Bologna, Bologna, Italy. Retrieved
336 from:[http://www2.warwick.ac.uk/fac/med/research/platform/wemwbs/development/papers/donat](http://www2.warwick.ac.uk/fac/med/research/platform/wemwbs/development/papers/donatella_bianco-thesis.pdf)
337 [ella_bianco-thesis.pdf](http://www2.warwick.ac.uk/fac/med/research/platform/wemwbs/development/papers/donatella_bianco-thesis.pdf).
- 338 Blakelock, D. J., Chen, M. A., & Prescott, T. (2016). Psychological distress in elite adolescent
339 soccer players following deselection. *Journal of Clinical Sport Psychology*, *10*(1), 59-77.
- 340 Fuller E, Mindell J, Prior G (eds) (2017) Health Survey for England 2016, London: NHS Digital.
- 341 Gouttebauge, V., & Aoki, H. (2014). Lifespan perspective of professional footballers' health. *Asian*
342 *Journal of Sports Medicine*, *5*(4).
- 343 Gouttebauge, V., Aoki, H., & Kerkhoffs, G. (2015a). Symptoms of common mental disorders and
344 adverse health behaviours in male professional soccer players. *Journal of Human Kinetics*, *49*(1),
345 277-286.
- 346 Gouttebauge, V., Frings-Dresen, M. H. W., & Sluiter, J. K. (2015b). Mental and psychosocial
347 health among current and former professional footballers. *Occupational Medicine*, *65*(3), 190-196.
- 348 Haver, A., Akerjordet, K., Caputi, P., Furunes, T., & Magee, C. (2015). Measuring mental well-
349 being: a validation of the short Warwick–Edinburgh mental well-being scale in Norwegian and
350 Swedish. *Scandinavian Journal of Public Health*, *43*(7), 721-727.
- 351 Huppert, F. A. (2009). Psychological well-being: Evidence regarding its causes and
352 consequences. *Applied Psychology: Health and Well-Being*, *1*(2), 137-164.
- 353 Junge, A., & Feddermann-Demont, N. (2016). Prevalence of depression and anxiety in top-level
354 male and female football players. *BMJ Open Sport & Exercise Medicine*, *2*(1), e000087.
- 355 Junge, A., & Prinz, B. (2018). Depression and anxiety symptoms in 17 teams of female football
356 players including 10 German first league teams. *Br J Sports Med*, bjsports-2017.
357 <http://dx.doi.org/10.1136/bjsports-2017-098033>.
- 358 Kutner, M. H., Nachtsheim, C. J., Neter, J., & Li, W. (2005). *Applied linear statistical*
359 *models* (Vol. 103). Boston: McGraw-Hill Irwin.
- 360 Leddy, M. H., Lambert, M. J., & Ogles, B. M. (1994). Psychological consequences of athletic
361 injury among high-level competitors. *Research Quarterly for Exercise and Sport*, *65*(4), 347-354.

362 Maheswaran, H., Weich, S., Powell, J., & Stewart-Brown, S. (2012). Evaluating the
363 responsiveness of the Warwick Edinburgh Mental Well-Being Scale (WEMWBS): Group and
364 individual level analysis. *Health and Quality of Life Outcomes*, 10(1), 156.

365 Malone, J. J., Lovell, R., Varley, M. C., & Coutts, A. J. (2017). Unpacking the black box:
366 applications and considerations for using GPS devices in sport. *International journal of sports*
367 *physiology and performance*, 12(Suppl 2), S2-18.

368 Pearson, L., & Jones, G. (1992). Emotional effects of sports injuries: Implications for ph Leddy,
369 M. H., Lambert, M. J., & Ogles, B. M. (1994). Psychological consequences of athletic injury
370 among high-level competitors. *Research Quarterly for Exercise & Sport*, 65, 347–354.
371 *Physiotherapy*, 78(10), 762-770.

372 Podlog, L., & Eklund, R. C. (2007). The psychosocial aspects of a return to sport following serious
373 injury: a review of the literature from a self-determination perspective. *Psychology of Sport and*
374 *Exercise*, 8(4), 535-566.

375 Podlog, L., & Eklund, R. C. (2007a). The psychosocial aspects of a return to sport following
376 serious injury: A review of the literature. *Psychology of Sport and Exercise*, 535–566.

377 Podlog, L., Lochbaum, M., & Stevens, T. (2010). Need satisfaction, well-being, and perceived
378 return-to-sport outcomes among injured athletes. *Journal of Applied Sport Psychology*, 22(2), 167-
379 182.

380 Prinz, B., Dvořák, J., & Junge, A. (2016). Symptoms and risk factors of depression during and
381 after the football career of elite female players. *BMJ Open Sport & Exercise Medicine*, 2(1),
382 e000124.

383 Rice, S. M., Purcell, R., De Silva, S., Mawren, D., McGorry, P. D., & Parker, A. G. (2016). The
384 mental health of elite athletes: a narrative systematic review. *Sports Medicine*, 46(9), 1333-1353.

385 Schinke, R. J., Stambulova, N. B., Si, G., & Moore, Z. (2017). International society of sport
386 psychology position stand: Athletes' mental health, performance, and development. *International*
387 *Journal of Sport and Exercise Psychology*, 1-18.

388 Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal
389 construct validity of the Warwick-Edinburgh mental well-being scale (WEMWBS): a Rasch
390 analysis using data from the Scottish health education population survey. *Health and Quality of*
391 *Life Outcomes*, 7(1), 15.

392 Stranges, S., Samaraweera, P. C., Taggart, F., Kandala, N. B., & Stewart-Brown, S. (2014). Major
393 health-related behaviours and mental well-being in the general population: the Health Survey for
394 England. *BMJ Open*, 4(9), e005878.

395 Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., ... & Stewart-Brown, S.
396 (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK
397 validation. *Health and Quality of life Outcomes*, 5(1), 63.

398 Watson, A., Brickson, S., Brooks, A., & Dunn, W. (2017). Subjective well-being and training load
399 predict in-season injury and illness risk in female youth soccer players. *Br J Sports Med*, 51(3),
400 194-199.

401 World Health Organisation (2001). *The world health report—Mental health: New*
402 *understanding, new hope*. Geneva: World Health Organisation.

403
404 Zadow, C., Houghton, S., Hunter, S. C., Rosenberg, M., & Wood, L. (2017). Associations Between
405 Positive Mental Wellbeing and Depressive Symptoms in Australian Adolescents. *The Educational*
406 *and Developmental Psychologist*, 34(2), 95-105.

407

408 **Figure 1** – Longitudinal design of the data collection period, including a detailed overview of the
409 players training cycles throughout season. WEMWBS, Warwick-Edinburgh Mental Wellbeing
410 Scale; Cond, conditioning; St, strength; Spd, speed; Bas, basic; CD, change of direction; Pro,
411 production; Mech, mechanics; Accel, acceleration; Pow, power; Med, medium; Dist, distance; H,
412 high intensity; M, medium intensity; L, low intensity; End, endurance; HIIT, high intensity
413 interval training; PBC, pitch-based conditioning.

414

415 **Figure 2** – Average WEMWBS score when injured vs. not injured ($n = 18$) and selected vs. not-
416 selected for the match squad ($n = 25$). *Represents difference in WEMWBS scores; $P < 0.05$.
417 Boxplots show median, 25–75th percentiles, and minimum to maximum scores.

418

419

420

421

422

423

424

425

426

427

428

429

430

431

432
433
434
435
436
437

Table 1 – Descriptive statistics for players age, height, mass, WEBWBS scores, training load (total duration, total distance, total sprint distance) and the % of time spent out injured, % of matches they were selected for, and % of matches won.

| Variable | Mean ± SD |
|---|------------------|
| Age (years) | 20 ± 1 |
| Height (m) | 1.80 ± 5.79 |
| Mass (kg) | 76.33 ± 7.52 |
| Weekly WEMWBS score (14 - 70) | 48.0 ± 3.9 |
| Time out with injury (%) | 24.3 ± 23.6 |
| Weekly training duration (minutes)* | 272.7 ± 28.0 |
| Weekly training distance (m)* | 21249.5 ± 2565.6 |
| Weekly high-speed running distance (m)*# | 600.6 ± 193.9 |
| Player match selection (%)** | 60.1 ± 27.9 |
| Player win percentage (%)** | 56.1 ± 17.6 |

438 *Includes matches, if selected. **Only for matches in which the players were available for selection.
439 #high-speed running distance is the distance travelled at ≥60% of maximum speed (km·h⁻¹).
440

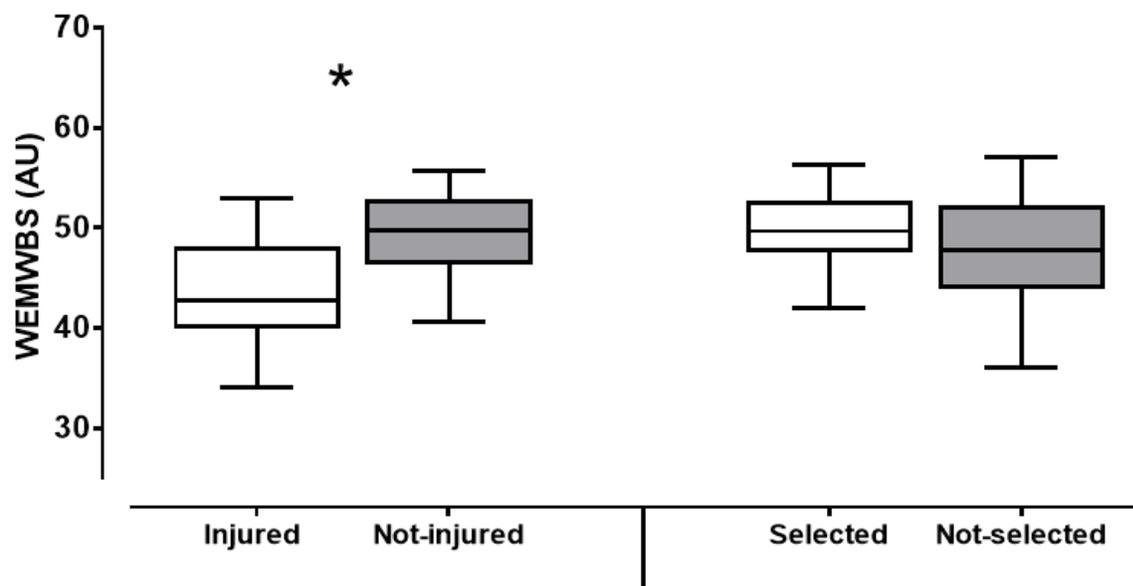
441
442
443
444
445
446
447
448

449 **Table 2** – Results from stepwise multiple regression analysis of the independent predictors on
450 the dependent variable, mental wellbeing.

| Predictor | B | SE (B) | β |
|----------------------------|-------|--------|---------|
| Step 1 | | | |
| Days missed to injury | -.105 | .27 | -.632* |
| Step 2 | | | |
| Days missed to injury | -.091 | .26 | -.545* |
| Not selected to play games | .53 | .24 | .336* |

451 Step 1 $R^2 = .399$, Step 2 $R^2 = .505$, $\Delta R^2 = .106$. * $P < .05$.

452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472



473
474
475
476
477
478
479

