

**TITLE**

Sport-related concussion practices of medical team staff in elite football in the United Kingdom, a pilot study

**AUTHOR**

Rosenbloom, Craig; Broman, Dr Daniel; Chu, Wing; et al.

**JOURNAL**

Science and Medicine in Football

**DATE DEPOSITED**

1 February 2023

**This version available at**

<https://research.stmarys.ac.uk/id/eprint/5823/>

---

**COPYRIGHT AND REUSE**

Open Research Archive makes this work available, in accordance with publisher policies, for research purposes.

**VERSIONS**

The version presented here may differ from the published version. For citation purposes, please consult the published version for pagination, volume/issue and date of publication.

1 Title: Sport-related concussion practices of medical team staff in elite football in the United  
2 Kingdom, a pilot study

3

4 Authors:

5 1. Dr Craig Rosenbloom \* 1 2

6 2. Dr Daniel Broman 3 4

7 3. Dr. Wing Chu 5

8 4. Dr Robin Chatterjee 4 6 7

9 5. Dr Katrine Okholm Kryger 2 8 9

10

11 1) The Football Association, Technical Directorate, Burton-upon-Trent, DE13 9RN, United  
12 Kingdom

13 2) Queen Mary University of London, London, E1 4NS, United Kingdom

14 3) Isokinetic Medical Group, 11 Harley Street, London, W1G 9PF, United Kingdom

15 4) West Ham United Football Club, London Stadium, Queen Elizabeth Olympic Park,  
16 London, E20 2ST, United Kingdom

17 5) Imperial College Healthcare NHS Trust, St Mary's Hospital, London W2 1NY, United  
18 Kingdom

19 6) Institute of Sport, Exercise and Health, 170 Tottenham Court Rd, London W1T 7HA,  
20 United Kingdom

21 7) British Association of Sport and Exercise Medicine, 3 Jetstream Dr, Doncaster DN9  
22 3QS, United Kingdom

23 8) St Mary's University, London, TW1 4SX, United Kingdom

24 9) Department of Sports Science and Clinical Biomechanics, University of Southern  
25 Denmark, Odense, Denmark

26

27

28 Dr Craig Rosenbloom - ORCID 0000-0001-6166-209X

29 Dr Robin Chatterjee - ORCID 0000-0002-4858-3642

30 Dr Katrine Okholm Kryger - ORCID 0000-0003-0924-6181

31

32 \*Corresponding Author:

33 Dr Craig Rosenbloom

34 32 Woodland Road, Loughton, Essex, England, IG10 1HJ

35 +44 7743523309

- 36 Twitter: @craigdoctor
- 37 ORCID ID 0000-0001-6166-209X
- 38 [craig.rosenbloom@thefa.com](mailto:craig.rosenbloom@thefa.com)

39 **Title:** Sport-related concussion practices of medical team staff in elite football in the United  
40 Kingdom, a pilot study

41

42 **Objectives:** Explore sport-related concussion (SRC) awareness, behaviours and attitudes  
43 of medical team staff working in elite football in the United Kingdom. Including usage and  
44 awareness of the FA guidelines, concussion education rates of players and coaching staff,  
45 and collection of baseline concussion assessments. Additionally, pitch-side confidence in  
46 SRC recognition, associated perceived influence of players, coaching staff, referees and  
47 other officials on decisions, and attitude towards a “concussion” substitute were explored.

48 **Methods:** Cross-sectional questionnaire study distributed online by organisations including  
49 or representing medical staff working in elite football in the United Kingdom.

50 **Results:** 120 responses were gathered. High awareness rates of the FA guidelines were  
51 found (97%) with variable rates of player and coaching staff concussion education. Baseline  
52 concussion assessments were collected by 78%. Of those, 99% collected SCAT5 with low  
53 rates of other neuro-psychometric testing (17%). Confidence of pitch-side SRC recognition  
54 was high (93% feeling very confident or confident). A small number of respondents thought  
55 players never under-reported symptoms to avoid removal (6.6% selecting it rarely or never  
56 occurred). There is a perception of coaching staff trying to influence removal decisions with  
57 40% often or sometimes feeling influence. Introduction of a “concussion” substitute was  
58 seen as strongly positive for player welfare (85% strongly agreeing or agreeing).

59 **Conclusions:** High awareness rates of the FA concussion guidelines are not consistent  
60 with adherence to recommendations around baseline concussion assessment and  
61 concussion education. Confidence in SRC recognition was high but removal decisions could  
62 be subject to attempted influence by players and coaching staff.

63

64 **Keywords:** soccer, assessment, strategy, doctor, physiotherapist, therapist

65

66 **Word count:** 4141

67 **Introduction**

68 Sports-related concussion (SRC) can be defined as representing the immediate and  
69 transient symptoms of traumatic brain injury (McCrory *et al.*, 2017). Given the significant  
70 potential of immediate and long-term consequences of SRC it is gaining an increased  
71 spotlight (Harmon *et al.*, 2013; Gouttebarga *et al.*, 2017). A 2009 questionnaire study of club  
72 medical officers in the top 4 leagues in England found 27.8% had not heard of the 2008  
73 concussion Consensus Statement (McCrory *et al.*, 2009), and only 22% collected baseline  
74 concussion assessments (Price, Malliaras and Hudson, 2012). **To improve player welfare  
75 the Football Association (FA) produced guidelines in 2015 outlining  
76 recommendations around concussion practice (Football Association, 2015).**

77 It is established that injuries have a significant influence on team performance in elite football  
78 (Hagglund *et al.*, 2013). A study of injury rates in elite level European clubs between 2001-  
79 2008 quoted a concussion rate of 0.06 concussions/1000 hours of exposure, or one  
80 concussion per team every other season (Ekstrand, Hägglund and Waldén, 2011). **This  
81 remains the largest, most recently published dataset to date in elite European football  
82 (Prien *et al.*, 2018; O'Leary *et al.*, 2020). This figure is thought to underestimate the true  
83 incidence SRC with five confirmed concussive injuries diagnosed during the 2014  
84 Brazil FIFA World Cup matches alone, equating to 2.44 concussions/1000 player  
85 match hours (Nilsson *et al.*, 2013; Junge and Dvořák, 2015; Abraham *et al.*, 2019). **Due to  
86 the difference in player match hours vs. player exposure hours (matches and training)  
87 direct comparison between studies is difficult.****

88 The FA guidelines set a standard of care for management of **all players across all leagues**  
89 with suspected SRC, but are not mandated (Football Association, 2015). Medical staff who  
90 make player removal decisions can face pressure from both coaching staff, management,  
91 and the players themselves (Broglia *et al.*, 2010; Williams *et al.*, 2016). **Informed and  
92 educated players have been shown to willingly return-to-play with ongoing  
93 concussive symptoms, indicating that education alone is not the answer (Tsao, 2014).**  
94 Concussion specific education has been shown to improve attitudes of professional  
95 footballers and coaching staff towards concussion **in Italy (Broglia *et al.*, 2010), and The  
96 Netherlands (Gouttebarga *et al.*, 2019). Rates of education and adherence to FA  
97 guidelines within elite clubs in The United Kingdom is unknown.**

## 98 **Methodology**

### 99 ***Questionnaire Development***

100 An original questionnaire based on the 5th Consensus Statement on Concussion in Sport  
101 and the FA concussion guidelines (Football Association, 2015; McCrory *et al.*, 2017) **was**  
102 **created (Appendix A). Areas explored included respondent demographics, and**  
103 **awareness and implementation of the FA guidelines. Confidence and personal**  
104 **experience around concussion recognition and pitch-side management were**  
105 **explored using a 5-point Likert Scale.** Questionnaire usability, relevance, and **content**  
106 **validity** was checked by all the authors and by members of the Football Association medical  
107 team acting as external experts.

108 **“Consultant level doctors” in the United Kingdom are deemed as those who have**  
109 **completed a training program in their chosen specialty. General practitioners (GPs) are**  
110 **not deemed as consultants. “Referees and other officials” would be assumed to**  
111 **include the referee, two assistant referees, and a 4<sup>th</sup> official.**

### 113 ***Inclusion Criteria***

114 Respondent inclusion criteria included healthcare professionals working in elite football  
115 within the United Kingdom, who are involved in the recognition and/or management of SRC  
116 pitch-side. **This included staff working in Men’s and Women’s football in first team,**  
117 **academy settings, national teams, and in disability football.**

### 119 ***Distribution Approach***

120 Recruitment was via organisations whose membership included medical staff working in  
121 **elite football. This recruitment approach was chosen to increase participation, rather**  
122 **than only contacting the clubs’ designated medical officer. Organisation selection**  
123 **was agreed by all authors, and all those contacted agreed to participate and included:**  
124 The British Association of Sport and Exercise Medicine (BASEM), The Faculty of Sport and  
125 Exercise Medicine (FSEM), The Football Medicine and Performance Association (FMPA),  
126 and The Football Association Medical Society (FAMS). **Healthcare members of the**  
127 **organisations were sent at least one email with some also promoting recruitment via**  
128 **social media** (Twitter and LinkedIn). Involvement was without obligation with no financial  
129 benefit. **Recruitment opened beginning of January 2020 and closed end of February**  
130 **2020.** The nature of distribution prevented **an exact** response rate being calculable.

131 Ethical approval was granted by Queen Mary University of London ethical research  
132 committee, ethics code QMREC2018/48 030. Consent was gained using a pre-participation

133 leaflet with confirmation of acceptance being required. Respondents could withdraw up until  
134 completion of the questionnaire. All information collected was anonymous and non-  
135 identifiable. The questionnaire was hosted on a secure website by Online Surveys (JISC,  
136 Bristol, United Kingdom).

137

### 138 ***Statistical Analysis***

139 Analysis was conducted within Statistical Package for Social Sciences (SPSS; version 26,  
140 IBM Corp, NY, USA) with significance set at  $P \leq 0.05$ ., Pearson  $X^2$  was used to assess  
141 difference in nominal data between groups. Differences in non-parametric **Likert scale**  
142 **responses were assessed using Mann-Whitney U tests (U) for differences between**  
143 **two distinct groups including gender, or Kruskal-Wallis test (H) for differences**  
144 **between more than two distinct groups including profession. When analysing**  
145 **responses to coach or player education or baseline concussion assessment rates,**  
146 **answers of “not sure” were grouped with “no” responses, due to any uncertainty**  
147 **around the definite delivery of education and/or concussion assessment collection**  
148 **inferring deviation from the FA recommendations.**

149 **Results**

150 A total of 136 completed questionnaires were received. Five respondents were excluded  
151 for not working pitch-side, five for not working in the United Kingdom, and six for not  
152 working in football leaving 120 included responses - with demographics seen in Table 1.  
153 97% (N=116) of respondents indicated they were aware of the FA guidelines.

154

155 **\*\*\*\* Table 1 near here \*\*\*\***

156

157 A lower proportion of doctors were female (11%) compared to physiotherapists (31%) and  
158 sports and/or rehabilitation therapists (43%). Of the 64 doctors 33% (N=21) were  
159 consultants, and 67% (N=43) were non-consultant level.

160

161 ***Coach Concussion Education***

162 **Less than half of respondents indicated coach education occurred, (38%, N=46), 40%**  
163 **saying it did not (N=48), and 22% being not sure (N=26).** There was a lower rate of coach  
164 education in Women's football compared to Men's, 13% vs. 42% seen in Figure 1 (P=.033).  
165 The **mean** coach education rates in the top 4 male leagues (Premiership to League Two)  
166 was 44%. Respondents with five or more years of experience working in football (N=68) had  
167 significantly higher rates of coach education **than** those with four or less years of experience  
168 (N=52) (P=.009).

169

170 ***Player Concussion Education***

171 **Half indicated player education was delivered (48%, N=57), 38% said no (N=45), and**  
172 **15% (N=18) were not sure.** The rate of player education was significantly lower in Women's  
173 football compared to Men's seen in Figure 2, 27% vs 51% (P=.033). In Men's football,  
174 varying player education rates were seen across leagues with 63% (N=15) of Premier  
175 League teams, 56% (N=14) Championship, 53% (N=9) League One, and 29% (N=4)  
176 League Two teams (P=.442).

177

178 **\*\*\*\* Figure 1 near here \*\*\*\***

179

180

181 **\*\*\*\* Figure 2 near here \*\*\*\***

182

183 ***Baseline Concussion Assessments***



184

185 Collection of baseline concussion assessment was reported by 78% (N=93), whilst 22%  
186 (N=27) did not **or were not sure**. A breakdown of baseline concussion assessment by team  
187 structure demonstrated similar tendencies between Men's and Women's first teams (Table  
188 2).

189

190 **\*\*\*\* Table 2 near here \*\*\*\***

191

192

193 Of the 93 respondents collecting baseline assessments, 99% (N=92) collected SCAT5  
194 (Echemendia *et al.*, 2017b) with other assessment modalities collected including:

- 195 • ImPACT (Lovell *et al.*, 2001) collected by twelve (13%) respondents. One respondent  
196 collected only ImPACT with eleven also collecting SCAT5. All twelve respondents worked  
197 in Men's football, with eight working in first team and four working in teams aged 17-23.  
198 Seven worked in Premier League and five in Championship clubs.
- 199 • CogSport (Collie *et al.*, 2003) collected by two (2%) respondents. Both also collected  
200 SCAT5. Teams collecting CogSport were one Premier League men's team and one  
201 international team.
- 202 • CSx (CSx) collected by one (1%) respondent working in a Men's first team in the Premier  
203 League who also collected SCAT5.
- 204 • King-Devick Test (Oride *et al.*, 1986) was collected by one (1%) respondent working in a  
205 Men's first team in the Championship who also collected SCAT5.

206 Respondents with five or more years of experience working in football (N=68) had  
207 significantly higher rates of baseline concussion assessment collection than those with  
208 four or less years of experience (N=52; P=.01).

209

## 210 **Pitch-side Concussion Assessment**

211 **When asked who had the final say about removal of a player with a suspected**  
212 **concussion 96% (N=115) identified the medical team, 2% (N=2) said referee and 3%**  
213 **(N=3) manager/coach.**

214 **Confidence in recognizing a concussion pitch-side was high with 33% (N=39)**  
215 **feeling very confident, 61% (N=73) feeling confident, and 7% (N=8) felt neither**  
216 **confident nor unconfident, with none feeling unconfident or very unconfident**  
217 **(Figure 3). There was no difference in confidence level between gender (P=.461) or**  
218 **profession (P=.725). Doctors who were consultant level were more confident in**

219 recognising concussion pitch-side with 48% being very confident compared to 26%  
220 of non-consultant level doctors. Those with five or more years of experience  
221 working in football (N=68) were more confident in recognising concussion pitch-  
222 side compared to those with four or less years of experience (N=52; P=.02).

223 The Concussion Recognition Tool (CRT) (Echemendia et al., 2017a) was regularly used  
224 by 48% (N=58), 26% (N=31) were aware but did not regularly use it, 23% (N=27) were  
225 aware but did not use it, and 3% (N=4) had not heard of it. More female respondents used  
226 it compared to male, 63% vs. 44% (P=.084). More sports and/or rehabilitation therapists  
227 used it compared to doctors and physiotherapists, 61% vs 46-47%, (P=.45). Those that  
228 regularly used the CRT were more frequently very confident recognising concussion  
229 pitch-side compared to those who do not regularly use it, 40% vs 28% (P=.166).

230

231 \*\*\*\* Figure 3 near here \*\*\*\*

232

233 \*\*\*\* Figure 4 near here \*\*\*\*

234

### 235 ***Assessment Time for Concussion Pitch-Side***

236 Respondents overall felt that referees and other officials gave them enough time to  
237 assess for concussion pitch-side (Figure 4). Only 12% felt they rarely or never had  
238 enough time, with similar figures seen in staff working in Men's (12%) and Women's  
239 football (13%).

240

### 241 **View on "Concussion" Substitutions**

242 It was felt that the potential introduction of a "concussion substitution" would positively  
243 benefit player welfare with 67% (N=80) strongly agreeing, 18% (N=22) agreeing, 11%  
244 (N=13) neither agreeing nor disagreeing, 3% (N=4) disagreeing, and 1% (N=1) strongly  
245 disagreeing. All of the 13 respondents who felt they rarely or never had enough time **from**  
246 referees and other officials to assess for concussion pitch-side either agreed or strongly  
247 agreed. There was a significant difference between professions with sports and/or  
248 rehabilitation therapists and physiotherapists strongly agreeing that it would positively  
249 benefit player welfare compared to doctors, 78-81% vs 55% (P=.016).

250

### 251 ***Player Reporting of Symptoms Pitch-side***

252 A significant difference in responses of whether it was felt players under-reported their  
253 symptoms pitch-side was seen by gender (P=.026), with 53% (N=49) of male respondents

254 feeling players sometimes underreported compared to 30% (N=8) of female respondents,  
255 and 33% (N=31) of male respondents feeling very often compared to 59% (N=16) of  
256 females. Of sports and/or rehabilitation therapists, 74% (N=17) thought players always or  
257 very often under reported symptoms, compared to 44% (N=14) of physiotherapists and  
258 36% (N=23) of doctors (P=.057). There was no difference in responses between those  
259 working in Men's or Women's football (P=.359). No difference was seen between groups  
260 that educated players and those that did not (P=.51). A significant difference in response  
261 between those collecting baseline neurological testing and those that either did not or  
262 were not sure (P=.26), with 40% (N=37) felt players always or often underreported  
263 symptoms compared to 67% (N=18). Those with 4 years or less of experience working in  
264 football (N=52) significantly thought more players under-reported their symptoms  
265 compared to respondents with 5 or more years of experience (P=.024).

266

### 267 ***Influence on Decision Making from Manager or Coaching Staff Members***

268 When asked how often have you felt the manager or other member of the coaching staff  
269 try to influence your decision making with respect to removal of a player who you  
270 suspected might have a concussion; 13% (N=16) said often, 27% (N=32) sometimes,  
271 33% (N=40) seldom, and 27% (N=32) never as seen in Figure 5. Gender differences were  
272 seen with more female respondents felt coaching staff often try and influence their  
273 decision making compared to male respondents (26%; N=7 vs to 10%; N=9). Of male  
274 responders 30% (N=28) never felt attempted influence compared to 15% (N=4) of female  
275 responders (P=.071). A difference in profession was seen with 16% (N=5) of  
276 physiotherapists often feeling influenced, compared to 6% (N=4) of doctors, and 30%  
277 (N=7) sports and/or rehabilitation therapists but no significant difference was seen  
278 (P=.819). In teams that did not have concussion education for their coaches every  
279 season, 22% (N=6) often felt coaches influence them, compared to 11% (N=10) in those  
280 that did educated coaching staff (P=.928).

281

282 \*\*\*\* **Figure 5 near here** \*\*\*\*

283

### 284 **Discussion**

285 This **pilot** study aimed to assess the awareness, attitudes and behaviours of medical staff  
286 in Men's and Women's football in the United Kingdom. Awareness of concussion guidance  
287 is now much higher than in 2009, when 27.8% of English football doctors were aware of the  
288 2008 Zurich Consensus Statement (Price, Malliaras and Hudson, 2012). However,

289 awareness of guidelines did not infer application of guidance, with the majority of English  
290 football team medical staff in 2009 not routinely following concussion guidelines (Price,  
291 Malliaras and Hudson, 2012; Niederer *et al.*, 2018). **A disconnect between**  
292 **recommendations and implementation has been found in other areas of player care**  
293 **including injury prevention programs** (Bahr, Thorborg and Ekstrand, 2015; Bizzini and  
294 Dvorak, 2015).

295

### 296 ***Education and Baseline Assessments***

297 Concussion education levels of coaching staff and players were low. Club delivered  
298 education is not the only source of concussion knowledge therefore a low education level  
299 does not automatically indicate inadequate knowledge (Guilmette, Malia and McQuiggan,  
300 2007; O'Donoghue *et al.*, 2009). The education figures were similar to a study in Welsh elite  
301 and semi-professional rugby union from 2016, where 62% of players and 66% of coaches  
302 had not received concussion education (Mathema *et al.*, 2016). Player and coaching  
303 education rates were lower in Women's football than Men's, with **varying** rates of both  
304 player and coaching education being reported in teams **across the leagues. Given the**  
305 **increased concussion incidence in female athletes** (Harmon *et al.*, 2013) staff working  
306 in Women's football should be **especially** vigilant, but may be secondary to differences in  
307 staffing and resource levels between leagues and pathways. Concussion education in  
308 professional footballers has been shown to improve players attitudes towards concussive  
309 injuries (Gouttebauge *et al.*, 2019). Pre-season education in other sports increased the self-  
310 reported likelihood and confidence of athletes to report concussion symptoms in themselves  
311 and other teammates (Bramley *et al.*, 2012; Kurowski *et al.*, 2015; Cash, 2019). **The FA**  
312 **guidelines only specify that an "enhanced care setting" requires a concussion**  
313 **education program, with no mention of whose responsibility delivering the education**  
314 **is. Designating that responsibility a specific figure could increase accountability for**  
315 **delivering education.**

316 **Historically, club medical officers viewed baseline concussion assessments to be of**  
317 **low importance.** At the start of the 2009/2010 season, cognitive baseline assessment  
318 collection was 22% across the top four male leagues in English football (Price, Malliaras and  
319 Hudson, 2012). The landscape has changed significantly since then with 78% of  
320 respondents now indicating that their club collected baseline concussion assessments with  
321 similar numbers across Men's and Women's teams. This was consistent with 82% collection  
322 in an Italian club level football study (Broglio *et al.*, 2010).

323 The SCAT5 was by far the most collected baseline concussion assessment with other  
324 concussion assessment tests being used in much lower frequencies, and collected  
325 alongside SCAT5 except by one respondent. The use of computerised and/or formal  
326 neuropsychological evaluation is increasingly being recommended in consensus statements  
327 but it appears this has not yet been translated into practice (McCrory *et al.*, 2017; Patricios  
328 *et al.*, 2018) .

329

### 330 ***Pitchside Management***

331 Identification that the medical team had the final say on player removal was high, as was  
332 confidence of recognising SRC pitch-side (93% feeling confident or very confident) with  
333 high levels were seen in consultant level doctors. **The FA guidelines do not comment on  
334 who within the medical team has the final say on player removal, unlike in the NFL  
335 where the final decision is the responsibility of the team clinician (Patricios *et al.*,  
336 2018). This study has not explored whether behaviour changes in leagues who have  
337 access to pitch-side real time video replay, which has been shown to improve the  
338 identification and decision making around player removal** (Fuller, Kemp and Raftery,  
339 2016; Patricios *et al.*, 2018).

340 Use of the Concussion Recognition Tool (CRT) (Echemendia *et al.*, 2017a) was varied  
341 with 48% regularly using it. High usage was seen in female and sports and/or rehabilitation  
342 therapy respondents. Increased confidence in recognising concussion pitch-side was  
343 found in those that used the CRT regularly. The CRT is a diagnostic aid designed to assist  
344 non-medical personnel but these results indicated usage amongst medical staff was high  
345 and might improve SRC recognition confidence levels (Echemendia *et al.*, 2017a; McCrory  
346 *et al.*, 2017; Patricios *et al.*, 2018). Reason behind this are unknown, but exploration may  
347 give insight into how to better support pitch-side assessments.

348 Respondents overall felt **referees and other officials** gave them enough time to assess for  
349 concussion, with female respondents feeling **referees and officials** did not give them as  
350 much time compared to male respondents. SRC knowledge in professional level football  
351 **referees and other officials** has not yet been investigated but increasing concussion  
352 awareness in other sports has increased confidence in calling injury stoppages and  
353 facilitating medical assessments (Kroshus, Parsons and Hainline, 2017). When making  
354 player removal decisions, varying levels of manager or coaching staff influence was felt with  
355 40% of respondents *sometimes*, or *often* feeling pressure with less influence being felt in  
356 teams that educated their coaching staff. Future research exploring differences in perceived  
357 influence by gender and profession may support staff in making player removal decisions.

358 Pitch-side underreporting of symptoms has previously shown to be an issue in football with  
359 the latest although potentially outdated evidence from 2010 revealing that 62% of Italian  
360 players did not report concussion symptoms to anyone (Broglia *et al.*, 2010). Player under-  
361 reporting of symptoms has shown to be multi-factorial and can be influenced by not wanting  
362 to be removed from play, a lack of awareness of SRC symptoms and severity, the perceived  
363 importance of the match, the possibility of being prevented from playing future games, or  
364 the availability of substitutes (Broglia *et al.*, 2010; Williams *et al.*, 2016). More female  
365 respondents felt players underreported symptoms as well as sports and/or rehabilitation  
366 therapists, but it is unknown whether this correlates with an increased removal rate. Higher  
367 confidence in true symptom reporting pitch-side was seen in those who collected baseline  
368 neurological testing compared to who did not, supporting the argumentation for the use of  
369 baseline neurological testing.

370 The recent consensus statement highlighted football as not having a replacement policy,  
371 which potentially comprised clinicians concussion evaluation (McCorry *et al.*, 2017; Patricios  
372 *et al.*, 2018). Not having remaining substitutions heavily influenced players under-reporting  
373 of concussive symptoms (Williams *et al.*, 2016). The International Football Association  
374 Board (IFAB) recently agreed to trial substitutions in cases of concussion (The International  
375 Football Association Board, 2020). The possible introduction of such a substitution was felt  
376 to be a positive benefit for player welfare with 85% of respondents *strongly agreeing* or  
377 *agreeing*. All respondents who felt that **referees and other officials** rarely or never gave  
378 them enough time to assess for concussion pitch-side *agreed* or *strongly agreeing* it would  
379 improve player welfare.

380

### 381 **Conflict of interest**

382 It has been suggested that conflicts of interest between doctors, players, and coaching staff  
383 could present an obstacle to adherence to concussion guidelines (Partridge, 2014; Turner  
384 *et al.*, 2020). If pressure is applied to prevent or influence player removal decisions it could  
385 go against the professional responsibility that medical staff have for player welfare  
386 (Anderson and Gerrard, 2005). In an un-supportive environment, medical staff could find  
387 their professionalism being tested against obligations they felt towards employers who are  
388 concerned about success of the team, or players who will disregard their own wellbeing to  
389 continue to play (Polsky, 1998; Anderson and Jackson, 2013). **Clinical staff found to have  
390 failed to deliver a standard of reasonably expected care could find themselves open  
391 to negligence associated medicolegal risk (Turner *et al.*, 2020). Our results** suggested  
392 that pressure to influence player removal by coaching staff or players although low, was

393 present and should be explored further. **Some sports with higher concussion incidence**  
394 **utilize independent, unaffiliated medical personnel who can either over rule team**  
395 **medical staff (Rugby Union), or offer a second opinion (American Football; (Patricios**  
396 **et al., 2018).**

397

### 398 ***Experience of Medical Team Staff***

399 Respondents with five or more years of experience working in football had significantly  
400 higher rates of baseline concussion assessment collection and coaching staff concussion  
401 education compared to those with four or less years of experience. Higher rates of pitch-  
402 side concussion recognition confidence and lower perceived rates of player under-reporting  
403 of concussive symptoms pitch-side were also seen in the more experienced group. These  
404 results may suggest that experienced staff can positively influence club behaviour around  
405 education rates and protocols. Future research could explore this area in more detail.

406

407

### 408 ***Limitations***

409 Due to the recruitment method calculating **an exact** response rate was not possible.  
410 Estimating a response rate of those working in **men's 1<sup>st</sup> team football in the top four**  
411 **leagues in the men's pathway** (Premier League to League Two) using available staff  
412 profiles on club websites accepting the wide limitations of this method suggests a response  
413 rate of 18%. **There were 51 responses from those working in men's football in these**  
414 **leagues, from an estimated 280 staff** (20 Premier League teams: each having 2 doctors,  
415 3 physiotherapists/sports therapists. 24 Championship teams: 1.5 doctors, 2  
416 physiotherapists/sports therapists. 24 League One teams: 1 doctor and 1  
417 physiotherapists/sports therapists, 24 League Two teams: 1 doctor and 1  
418 physiotherapists/sports therapists). **A 10% estimated response rate from those working**  
419 **in 1<sup>st</sup> team football in the Women's Super League and Championship, 6 responses**  
420 **from an estimate 58.** (23 teams total; 1 doctor and 1.5 physiotherapists/sports therapists).  
421 **A response rate from those working in academy settings not calculated due to lack**  
422 **of available**

423

424 The self-reported questionnaire nature of the study raises limitations within the data set  
425 including participation, response, and selection bias given that **participation was voluntary**  
426 **and respondents who self-selected to participate may not be a true representation of**  
427 **those working in elite football. The percentage of medical staff working in elite**



428 **football being members of one of the recruiting organisations is unknown.**  
429 **Respondents whose roles may cross several teams and age groups, could only select**  
430 **the team they worked with most commonly.** Responses from several staff members from  
431 within the same club was possible and due to the anonymity of participants this would not  
432 be identified. Due to the high heterogeneity and small number of respondents within some  
433 of the groups it limits intergroup comparisons and the potential significance of statistical  
434 analysis. **Age and experience of managers and coaching staff were not collected,**  
435 **whether this changes attitudes within the clubs could be explored in the future.** Given  
436 the novelty of the area of being explored there was no validated questionnaire available but  
437 questionnaire content and usability was piloted prior to distribution.

438

### 439 **Conclusion**

440 Awareness of The FA concussion guidelines is high, with an increased collection rate of  
441 baseline concussion assessments compared to a similar previous study. Player and  
442 coaching staff concussion education rates were low, as was use of neuro-psychometric  
443 testing beyond the use of the SCAT5. **A disconnect is seen between awareness of**  
444 **guidelines and implementation of recommendations designed to improve player**  
445 **welfare, with further research being needed looking into how to reduce this gap.** Pitch-  
446 side concussion recognition confidence was high however some respondent groups felt  
447 more pressure from the players, coaching staff, or the **referee or other officials** when  
448 making removal decisions. There was strong support the introduction of a “concussion”  
449 substitute being a positive thing for player welfare.

450

451 Disclosure of interest: CR, DB, and WC hold or have held clinical roles at the Football Association  
452 within the youth pathway teams. DB, WC, and RC hold clinical roles in Premier League football clubs.  
453 CR holds a clinical role in a Women’s Super League team.

454



455 **Bibliography**

456

- 457 Abraham, K. J., Casey, J., Subotic, A., Tarzi, C., Zhu, A. and Cusimano, M. D. (2019) 'Medical  
458 assessment of potential concussion in elite football: video analysis of the 2016 UEFA European  
459 championship', *BMJ Open*, 9(5), pp. e024607. doi:10.1136/bmjopen-2018-024607
- 460 Anderson, L. and Jackson, S. (2013) 'Competing loyalties in sports medicine: Threats to medical  
461 professionalism in elite, commercial sport', *International Review for the Sociology of Sport*, 48(2),  
462 pp. 238-256. doi: 10.1177/1012690211435031
- 463 Anderson, L. C. and Gerrard, D. F. (2005) 'Ethical issues concerning New Zealand sports doctors',  
464 *Journal of Medical Ethics*, 31(2), pp. 88-92. doi: 10.1136/jme.2002.000836
- 465 Bahr, R., Thorborg, K. and Ekstrand, J. (2015) 'Evidence-based hamstring injury prevention is not  
466 adopted by the majority of Champions League or Norwegian Premier League football teams: the  
467 Nordic Hamstring survey', *British journal of sports medicine*, 49(22), pp. 1466-1471. doi:  
468 10.1136/bjsports-2015-094826
- 469 Bizzini, M. and Dvorak, J. (2015) 'FIFA 11+: an effective programme to prevent football injuries in  
470 various player groups worldwide—a narrative review', *British Journal of Sports Medicine*, 49(9), pp.  
471 577-579. doi: 10.1136/bjsports-2015-094765
- 472 Bramley, H., Patrick, K., Lehman, E. and Silvis, M. (2012) 'High school soccer players with  
473 concussion education are more likely to notify their coach of a suspected concussion', *Clinical  
474 pediatrics*, 51(4), pp. 332-336. doi: 10.1177/0009922811425233
- 475 Broglio, S. P., Vagnozzi, R., Sabin, M., Signoretti, S., Tavazzi, B. and Lazzarino, G. (2010)  
476 'Concussion occurrence and knowledge in italian football (soccer)', *J Sports Sci Med*, 9(3), pp.  
477 418-30.
- 478 Cash, D. E. (2019) Effects of preseason concussion education on self-reported likelihood and  
479 confidence in concussion reporting. ProQuest Dissertations Publishing.
- 480 Collie, A., Maruff, P., Makdissi, M., McCrory, P., McStephen, M. and Darby, D. (2003) 'CogSport:  
481 reliability and correlation with conventional cognitive tests used in postconcussion medical  
482 evaluations', *Clin J Sport Med*, 13(1), pp. 28-32. doi: 10.1097/00042752-200301000-00006
- 483 CSx, [Online] Accessed 30/4/2020, Available at: <http://csx.co.nz/>.
- 484 Echemendia, R. J., Meeuwisse, W., McCrory, P., Davis, G. A., Putukian, M., Leddy, J., Makdissi,  
485 M., Sullivan, S. J., Broglio, S. P., Raftery, M., Schneider, K., Kissick, J., McCrea, M., Dvorak, J.,  
486 Sills, A. K., Aubry, M., Engebretsen, L., Loosemore, M., Fuller, G., Kutcher, J., Ellenbogen, R.,  
487 Guskiewicz, K., Patricios, J. and Herring, S. (2017) 'The Concussion Recognition Tool 5th Edition  
488 (CRT5): Background and rationale', *Br J Sports Med*, 51(11), pp. 870-871. doi: 10.1136/bjsports-  
489 2017-097508
- 490 Echemendia, R. J., Meeuwisse, W., McCrory, P., Davis, G. A., Putukian, M., Leddy, J., Makdissi,  
491 M., Sullivan, S. J., Broglio, S. P., Raftery, M., Schneider, K., Kissick, J., McCrea, M., Dvořák, J.,  
492 Sills, A. K., Aubry, M., Engebretsen, L., Loosemore, M., Fuller, G., Kutcher, J., Ellenbogen, R.,  
493 Guskiewicz, K., Patricios, J. and Herring, S. (2017) 'The Sport Concussion Assessment Tool 5th  
494 Edition (SCAT5): Background and rationale', *British Journal of Sports Medicine*, 51(11), pp. 848-  
495 850. doi: 10.1136/bjsports-2017-097506
- 496 Ekstrand, J., Hägglund, M. and Waldén, M. (2011) 'Injury incidence and injury patterns in  
497 professional football: the UEFA injury study', *British Journal of Sports Medicine*, 45(7), pp. 553-  
498 558. doi: 10.1136/bjism.2009.060582
- 499 Fuller, G. W., Kemp, S. and Raftery, M. (2016) 'The accuracy and reproducibility of video  
500 assessment in the pitch-side management of concussion in elite rugby', *Journal of Science and  
501 Medicine in Sport*, 20. doi: 10.1016/j.jsams.2016.07.008
- 502 Gouttebauge, V., Aoki, H., Lambert, M., Stewart, W. and Kerkhoffs, G. (2017) 'A history of  
503 concussions is associated with symptoms of common mental disorders in former male professional  
504 athletes across a range of sports', *Phys Sportsmed*, 45(4), pp. 443-449. doi:  
505 10.1080/00913847.2017.1376572
- 506 Gouttebauge, V., Cowie, C., Goedhart, E., Kemp, S. P. T., Kerkhoffs, G. M. M. J., Patricios, J. and  
507 Stokes, K. A. (2019) 'Educational concussion module for professional footballers: from systematic  
508 development to feasibility and effect', *BMJ Open Sport Exercise Medicine*, 5(1), pp. e000490. doi:  
509 10.1136/bmjsem-2018-000490

510 Guilmette, T. J., Malia, L. A. and McQuiggan, M. D. (2007) 'Concussion understanding and  
511 management among New England high school football coaches', *Brain Injury*, 21(10), pp. 1039-  
512 1047. doi: 10.1080/02699050701633080

513 Hagglund, M., Walden, M., Magnusson, H., Kristenson, K., Bengtsson, H. and Ekstrand, J. (2013)  
514 'Injuries affect team performance negatively in professional football: an 11-year follow-up of the  
515 UEFA Champions League injury study', *Br J Sports Med*, 47(12), pp. 738-42. doi:  
516 10.1136/bjsports-2013-092215

517 Harmon, K. G., Drezner, J. A., Gammons, M., Guskiewicz, K. M., Halstead, M., Herring, S. A.,  
518 Kutcher, J. S., Pana, A., Putukian, M. and Roberts, W. O. (2013) 'American Medical Society for  
519 Sports Medicine position statement: concussion in sport', *British Journal of Sports Medicine*, 47(1),  
520 pp. 15-26. doi: 10.1136/bjsports-2012-091941

521 Junge, A. and Dvořák, J. (2015) 'Football injuries during the 2014 FIFA World Cup', *British Journal*  
522 *of Sports Medicine*, 49(9), pp. 599-602. doi: 10.1136/bjsports-2014-094469

523 Kroshus, E., Parsons, J. and Hainline, B. (2017) 'Calling Injury Timeouts for the Medical Evaluation  
524 of Concussion: Determinants of Collegiate Football Officials' Behavior', *J Athl Train*, 52(11), pp.  
525 1041-1047. doi: 10.4085/1062-6050-52.11.17

526 Kurowski, B. G., Pomerantz, W. J., Schaiper, C., Ho, M. and Gittelman, M. A. (2015) 'Impact of  
527 preseason concussion education on knowledge, attitudes, and behaviors of high school athletes', *J*  
528 *Trauma Acute Care Surg*, 79(3 Suppl 1), pp. S21-8. doi: 10.1097/TA.0000000000000675

529 Lovell, M., Collins, M., Podell, K., Powell, J. and Maroon, J. (2001) 'Immediate post-concussion  
530 assessment and cognitive testing', Pittsburgh, NeuroHealth Systems.

531 Mathema, P., Evans, D., Moore, I. S., Ranson, C. and Martin, R. (2016) 'Concussed or Not? An  
532 Assessment of Concussion Experience and Knowledge Within Elite and Semiprofessional Rugby  
533 Union', *Clin J Sport Med*, 26(4), pp. 320-5. doi: 10.1097/JSM.0000000000000256.

534 McCrory, P., Meeuwisse, W., Dvořák, J., Aubry, M., Bailes, J., Broglio, S., Cantu, R. C., Cassidy,  
535 D., Echemendia, R. J., Castellani, R. J., Davis, G. A., Ellenbogen, R., Emery, C., Engebretsen, L.,  
536 Feddermann-Demont, N., Giza, C. C., Guskiewicz, K. M., Herring, S., Iverson, G. L., Johnston, K.  
537 M., Kissick, J., Kutcher, J., Leddy, J. J., Maddocks, D., Makdissi, M., Manley, G. T., McCrea, M.,  
538 Meehan, W. P., Nagahiro, S., Patricios, J., Putukian, M., Schneider, K. J., Sills, A., Tator, C. H.,  
539 Turner, M. and Vos, P. E. (2017) 'Consensus statement on concussion in sport—the 5th  
540 international conference on concussion in sport held in Berlin, October 2016', *British Journal of*  
541 *Sports Medicine*, 51(11), pp. 838-847. doi: 10.1136/bjsports-2017-097699

542 McCrory, P., Meeuwisse, W., Johnston, K., Dvorak, J., Aubry, M., Molloy, M. and Cantu, R. (2009)  
543 'Consensus statement on Concussion in Sport—the 3rd International Conference on Concussion in  
544 Sport held in Zurich, November 2008', *South African Journal of sports medicine*, 21(2). doi:  
545 10.4085/1062-6050-44.4.434

546 Niederer, D., Engeroff, T., Lange, K., Vogt, L. and Banzer, W. (2018) 'Return-to-play after  
547 concussion: state of knowledge, frequency of use and application barriers of guidelines among  
548 decision-makers in rugby', *Brain Inj*, 32(9), pp. 1096-1102. doi: 10.1080/02699052.2018.1483032

549 Nilsson, M., Hagglund, M., Ekstrand, J. and Walden, M. (2013) 'Head and neck injuries in  
550 professional soccer', *Clin J Sport Med*, 23(4), pp. 255-60. doi: 10.1097/JSM.0b013e31827ee6f8

551 O'Donoghue, E. M., Onate, J. A., Van Lunen, B. and Peterson, C. L. (2009) 'Assessment of high  
552 school coaches' knowledge of sport-related concussions', *Athletic Training and Sports Health*  
553 *Care*, 1(3), pp. 120-132. doi: 10.3928/19425864-20090427-07

554 O'Leary, F., Acampora, N., Hand, F. and J, O. D. (2020) 'Association of artificial turf and  
555 concussion in competitive contact sports: a systematic review and meta-analysis', *BMJ Open Sport*  
556 *Exerc Med*, 6(1), pp. e000695. doi: 10.1136/bmjsem-2019-000695

557 Oride, M., Marutani, J. K., Rouse, M. W. and DeLAND, P. N. (1986) 'Reliability study of the Pierce  
558 and King-Devick saccade tests', *American journal of optometry and physiological optics*, 63(6), pp.  
559 419-424. doi: 10.1097/00006324-198606000-00005

560 Partridge, B. (2014) 'Dazed and Confused: Sports Medicine, Conflicts of Interest, and Concussion  
561 Management', *Journal of Bioethical Inquiry*, 11(1), pp. 65-74. doi: 10.1007/s11673-013-9491-2

562 Patricios, J. S., Ardern, C. L., Hislop, M. D., Aubry, M., Bloomfield, P., Broderick, C., Clifton, P.,  
563 Echemendia, R. J., Ellenbogen, R. G., Falvey, É. C., Fuller, G. W., Grand, J., Hack, D., Harcourt,  
564 P. R., Hughes, D., McGuirk, N., Meeuwisse, W., Miller, J., Parsons, J. T., Richiger, S., Sills, A.,  
565 Moran, K. B., Shute, J. and Raftery, M. (2018) 'Implementation of the 2017 Berlin Concussion in  
566 Sport Group Consensus Statement in contact and collision sports: a joint position statement from

567 11 national and international sports organisations', *British Journal of Sports Medicine*, 52(10), pp.  
568 635-641. doi: 10.1136/bjsports-2018-099079

569 Polsky, S. (1998) 'Winning medicine: professional sports team doctors' conflicts of interest', *J*  
570 *Contemp Health Law Policy*, 14(2), pp. 503-29.

571 Price, J., Malliaras, P. and Hudson, Z. (2012) 'Current practices in determining return to play  
572 following head injury in professional football in the UK', *Br J Sports Med*, 46(14), pp. 1000-3. doi:  
573 10.1136/bjsports-2011-090687

574 Prien, A., Grafe, A., Rössler, R., Junge, A. and Verhagen, E. (2018) 'Epidemiology of Head Injuries  
575 Focusing on Concussions in Team Contact Sports: A Systematic Review', *Sports Med*, 48(4), pp.  
576 953-969. doi: 10.1007/s40279-017-0854-4

577 The Football Association, (2015) 'The FA Concussion Guidelines [Online], Accessed 3/9/2020.  
578 Available at: [https://www.thefa.com/-/media/files/pdf/my-football/the-fa-concussion-guidelines-](https://www.thefa.com/-/media/files/pdf/my-football/the-fa-concussion-guidelines-2019.ashx?la=en)  
579 [2019.ashx?la=en](https://www.thefa.com/-/media/files/pdf/my-football/the-fa-concussion-guidelines-2019.ashx?la=en)

580 The International Football Association Board, I. (2020) The IFAB agrees to implement substitution  
581 trials to address concussion incidents. [Online] Accessed 7/6/2020. Available at:  
582 [https://www.theifab.com/news/the-ifab-agrees-to-implement-substitution-trials-to-address-](https://www.theifab.com/news/the-ifab-agrees-to-implement-substitution-trials-to-address-concussion-incident)  
583 [concussion-incident](https://www.theifab.com/news/the-ifab-agrees-to-implement-substitution-trials-to-address-concussion-incident)s

584 Tsao, J. (2014) 'The knowledge and decision making behaviors of NCAA Division I soccer coaches  
585 and athletes toward concussions', *Athletic Insight*, 6(2), pp. 93.

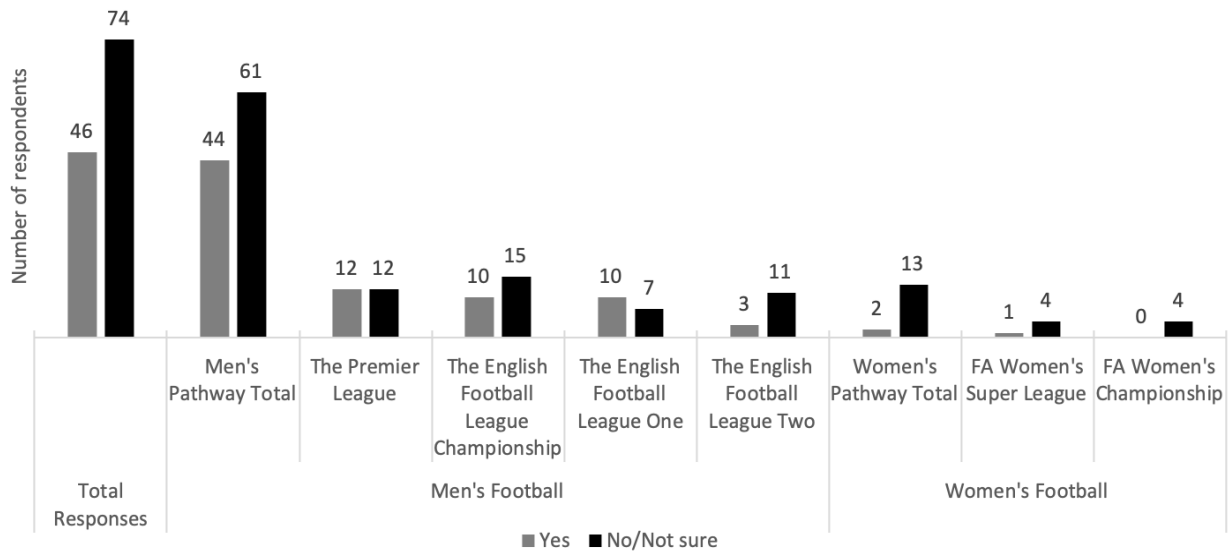
586 Turner, M., Maddocks, D., Hassan, M., Anderson, A. and McCrory, P. (2020) 'Consent, capacity  
587 and compliance in concussion management: cave ergo medicus (let the doctor beware)', *British*  
588 *Journal of Sports Medicine*, pp. bjsports-2020-102108. doi: 10.1136/bjsports-2020-102108

589 Williams, J. M., Langdon, J. L., McMillan, J. L. and Buckley, T. A. (2016) 'English professional  
590 football players concussion knowledge and attitude', *Journal of Sport and Health Science*, 5(2), pp.  
591 197-204. doi: 10.1016/j.jshs.2015.01.009

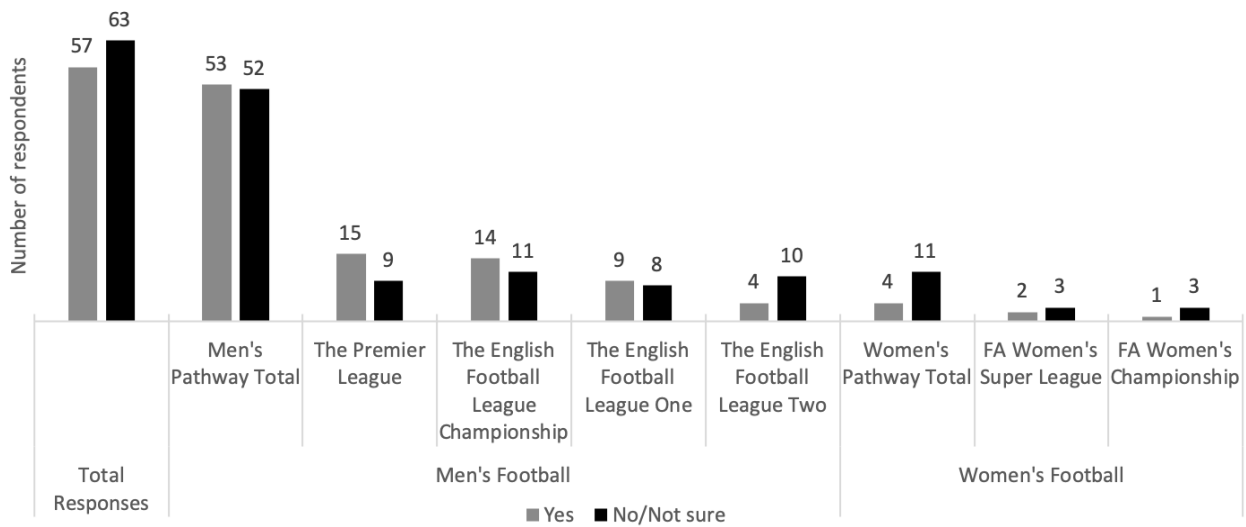
592  
593  
594

**Table 1: Respondent demographics**

		<b>N</b>	<b>Male N (%)</b>	<b>Female N (%)</b>
Total		120	93 (78%)	27 (22%)
Country	<b>England</b>	107	83 (78%)	24 (22%)
	<b>Wales</b>	2	1 (50%)	1 (50%)
	<b>Scotland</b>	8	7 (88%)	1 (12%)
	<b>Northern Ireland</b>	1	0	1 (100%)
	<b>Ireland</b>	2	2 (100%)	0
Men's/Women's	<b>Men's football</b>	105	84 (80%)	21 (20%)
	<b>Women's football</b>	15	9 (60%)	6 (40%)
Profession	<b>Physiotherapist</b>	32	22 (69%)	10 (31%)
	<b>Sports and/or rehabilitation therapist</b>	23	13 (57%)	10 (43%)
	<b>Sports scientist</b>	1	1 (100%)	0
	<b>Doctor</b>	64	57 (89%)	7 (11%)
	<b>Consultant level</b>	21	20 (95%)	1 (5%)
	<b>Non-consultant level</b>	43	37 (86%)	6 (14%)
Age	<b>Under 20 years</b>	1	1 (100%)	0
	<b>21-30 years</b>	38	24 (63%)	14 (37%)
	<b>31-40 years</b>	40	34 (85%)	6 (15%)
	<b>41-50 years</b>	18	15 (83%)	3 (17%)
	<b>51-60 years</b>	17	13 (76%)	4 (24%)
	<b>61-70 years</b>	4	4 (100%)	0
	<b>Over 71 years</b>	2	2 (100%)	0
Years of Experience	<b>0-2 years</b>	27	17 (63%)	10 (37%)
	<b>3-4 years</b>	25	18 (72%)	7 (28%)
	<b>5-6 years</b>	19	15 (79%)	4 (21%)
	<b>7-10 years</b>	11	10 (91%)	1 (9%)
	<b>11-14 years</b>	13	12 (92%)	1 (8%)
	<b>Over 15 years</b>	25	21 (84%)	4 (16%)



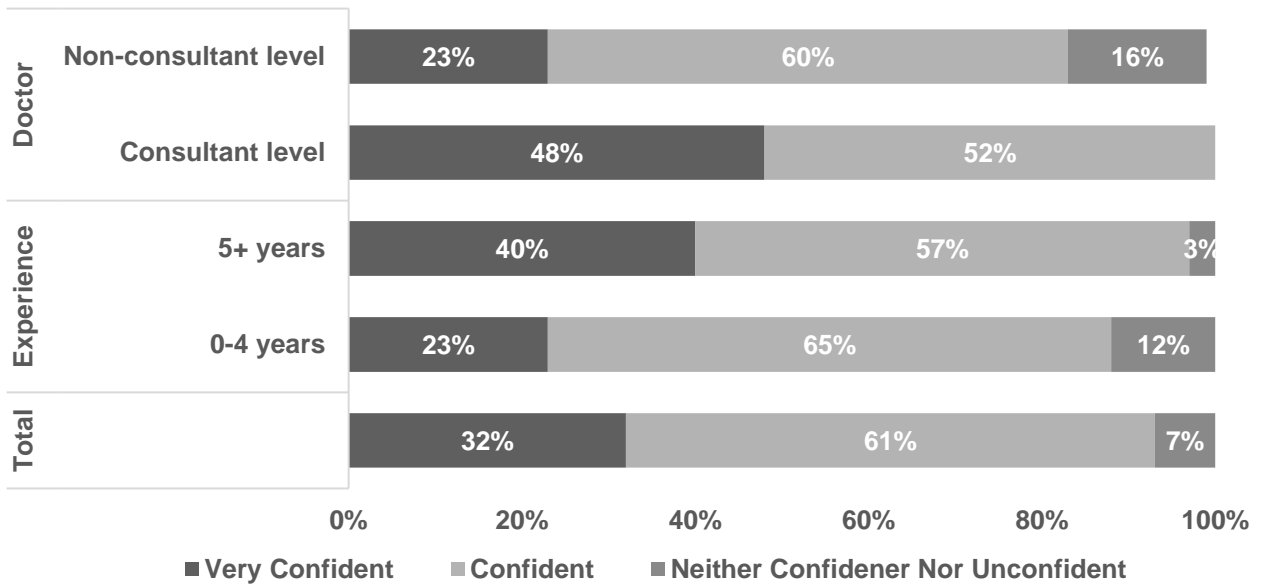
**Figure 1: Response to “does your club deliver concussion education sessions to the coaching staff at least once a season” by Men’s and Women’s football pathways and leagues**



**Figure 2: Response to “does your club deliver concussion education sessions to players at least once a season” by Men’s and Women’s football pathways and leagues**

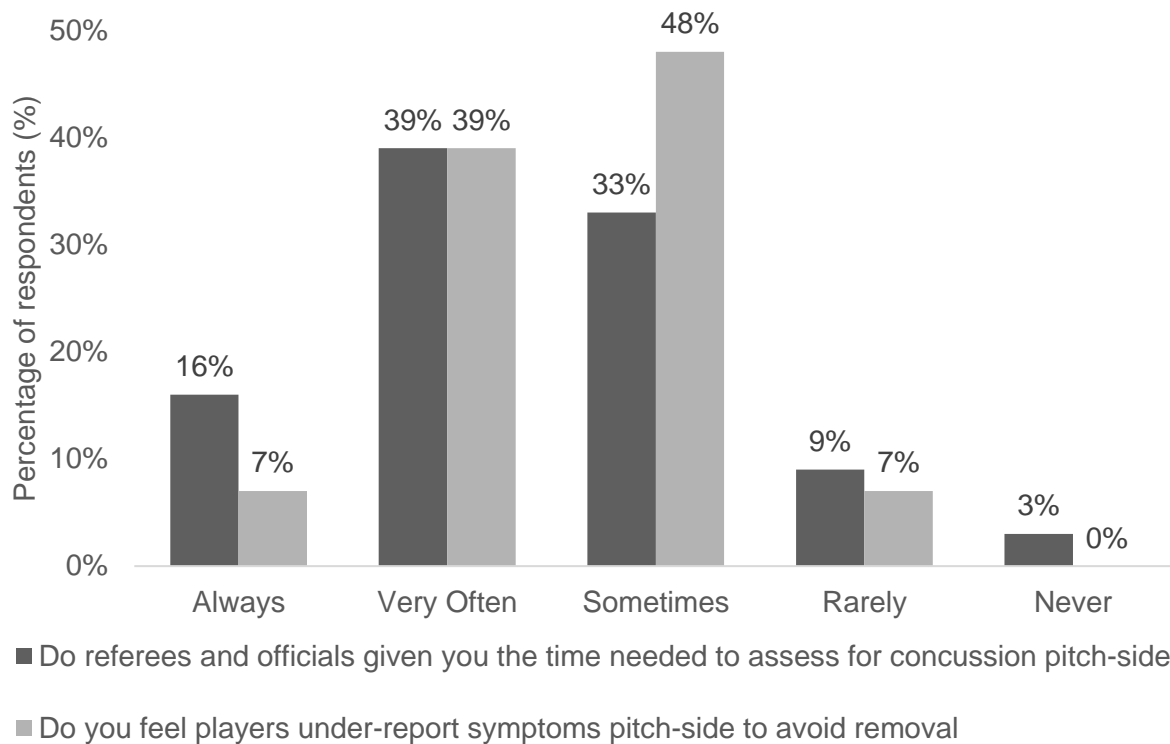
**Table 2 Number (%) of baseline concussion assessment collection by team level and age**

	Yes (%)	No (%)	Not sure (%)	Total
Men's first team	51 (77%)	12 (18%)	3 (5%)	66
Men's team aged 17-23	23 (85%)	3 (11%)	1 (4%)	27
Men's team aged 16 and under	4 (44%)	5 (56%)	0	9
The Premier League	20 (83%)	4 (17%)	0	24
The English Football League Championship	21 (84%)	3 (12%)	1 (4%)	25
The English Football League One	14 (82%)	3 (18%)	0	17
The English Football League Two	10 (71%)	3 (21%)	1 (7%)	14
The National League	4 (80%)	1 (20%)	0	5
Scottish Premier League	3 (100%)	0	0	3
Women's first team	6 (75%)	2 (25%)	0	8
Women's team aged 17-23	3 (100%)	0	0	3
Women's team aged 16 and under	3 (75%)	1 (25%)	0	4
FA Women's Super League	5 (100%)	0	0	5
FA Women's Championship	3 (75%)	1 (25%)	0	4
Disability men's football	1 (100%)	0	0	1
International team	2 (100%)	0	0	2
<b>Total</b>	<b>93 (78%)</b>	<b>23 (19%)</b>	<b>4 (3%)</b>	<b>120</b>

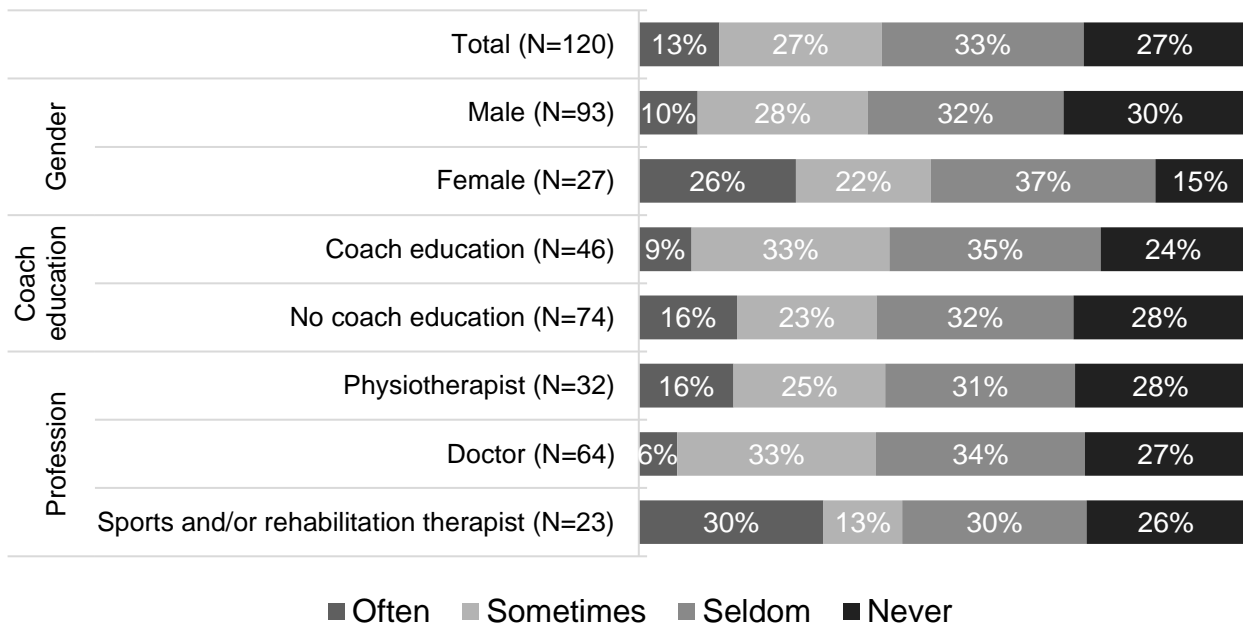


**Figure 3 Confidence in recognising a concussion pitch-side, with sub-groups by experience and doctor level**





**Figure 4 Percentage of respondents who felt referees and other officials gave them enough time to assess for concussion pitch-side, and whether they felt players under-reported their symptoms to avoid removal from play**



**Figure 5 Perceived influence on Decision Making from Manager or Coaching Staff Members by percentage of respondents, including sub-groups by gender, profession, and by those that delivered coach concussion education**