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

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## ABSTRACT

**Objectives:** To explore sport-related concussion (SRC) awareness, behaviours, and attitudes of medical team staff working in elite football in the United Kingdom. Including usage and awareness of the FA concussion guidelines, concussion education rates of players and coaching staff, and collection of baseline concussion assessments.

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

**Results:** 120 responses were gathered. High awareness rates of the FA guidelines were found (97%) with variable rates of player and coaching staff concussion education. Baseline concussion assessments were collected by 78%. Of those, 99% collected SCAT5 with low rates of other neuro-psychometric testing (17%). Confidence of pitch-side SRC recognition was high (93% feeling very confident or confident). Introduction of a 'concussion' substitute was seen as strongly positive for player welfare (85% strongly agreeing or agreeing).

**Conclusions:** Awareness of FA concussion guidelines, and collection of SCAT5 baseline testing was high. Player and coaching staff concussion education rates were low, as was the use of neuro-psychometric testing beyond the use of the SCAT5. There was strong support the introduction of a 'concussion' substitute being a positive thing for player welfare.

## ARTICLE HISTORY

Accepted 15 February 2021

## KEYWORDS

Soccer; assessment; strategy; doctor; physiotherapist; therapist

## Introduction

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

It is established that injuries have a significant influence on team performance in elite football (Hagglund et al. 2013). A study of injury rates in elite level European clubs between 2001 and 2008 quoted a concussion rate of 0.06 concussions/1000 hours of exposure, or one concussion per team every other season (Ekstrand et al. 2011). This remains the largest, most recently published dataset to date in elite European football (Prien et al. 2018; O'Leary et al. 2020). This figure is thought to underestimate the true incidence SRC with five confirmed concussive injuries diagnosed during the 2014 Brazil FIFA World Cup matches alone, equating

to 2.44 concussions/1000 player match hours (Nilsson et al. 2013; Junge and Dvořák 2015; Abraham et al. 2019). Due to the difference in player match hours vs. player exposure hours (matches and training) direct comparison between studies is difficult.

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

## Methodology

### Questionnaire development

An original questionnaire based on the 5th Consensus Statement on Concussion in Sport and the FA concussion guidelines (The

Football Association 2015; McCrory et al. 2017) was created (Appendix A). Areas explored included respondent demographics, and awareness and implementation of the FA guidelines. Confidence and personal experience around concussion recognition and pitch-side management were explored using a 5-point Likert Scale. Questionnaire usability, relevance, and content validity was checked by all the authors and by members of the Football Association medical team acting as external experts.

'Consultant level doctors' in the United Kingdom are deemed as those who have completed a training program in their chosen specialty. General practitioners (GPs) are not deemed as consultants. 'Referees and other officials' would be assumed to include the referee, two assistant referees, and a 4th official.

### Inclusion criteria

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

### Distribution approach

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

Ethical approval was granted by Queen Mary University of London ethical research committee, ethics code QMREC2018/48 030. Consent was gained using a pre-participation leaflet with confirmation of acceptance being required. Respondents could withdraw up until completion of the questionnaire. All information collected was anonymous and non-identifiable. The questionnaire was hosted on a secure website by Online Surveys (JISC, Bristol, United Kingdom).

### Statistical analysis

Analysis was conducted within Statistical Package for Social Sciences (SPSS; version 26, IBM Corp, NY, USA) with significance set at  $P \leq 0.05$ . Pearson  $\chi^2$  was used to assess difference in nominal data between groups. Differences in non-parametric Likert scale responses were assessed using the Mann-Whitney  $U$  tests ( $U$ ) for differences between two distinct groups including gender, or

Kruskal-Wallis test ( $H$ ) for differences between more than two distinct groups including profession. When analysing responses to coach or player education or baseline concussion assessment rates, answers of 'not sure' were grouped with 'no' responses, due to any uncertainty around the definite delivery of education and/or concussion assessment collection inferring deviation from the FA recommendations.

## Results

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

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

### Coach concussion education

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

Table 1. Respondent demographics.

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

coach education than those with four or less years of experience ( $N = 52$ ) ( $P = .009$ ).

### Player concussion education

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

### Baseline concussion assessments

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

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

- (1) ImPACT (Lovell *et al.* 2001) collected by 12 (13%) respondents. One respondent collected only ImPACT with 11 also collecting SCAT5. All 12 respondents worked in Men's football, with eight working in first team and four working in teams aged 17–23. Seven worked in Premier League and five in Championship clubs.
- (2) CogSport (Collie *et al.* 2003) collected by two (2%) respondents. Both also collected SCAT5. Teams collecting CogSport were one Premier League men's team and one international team.
- (3) CSx (2020) collected by one (1%) respondent working in a Men's first team in the Premier League who also collected SCAT5.
- (4) King-Devick Test (Oride *et al.* 1986) was collected by one (1%) respondent working in a Men's first team in the Championship who also collected SCAT5.

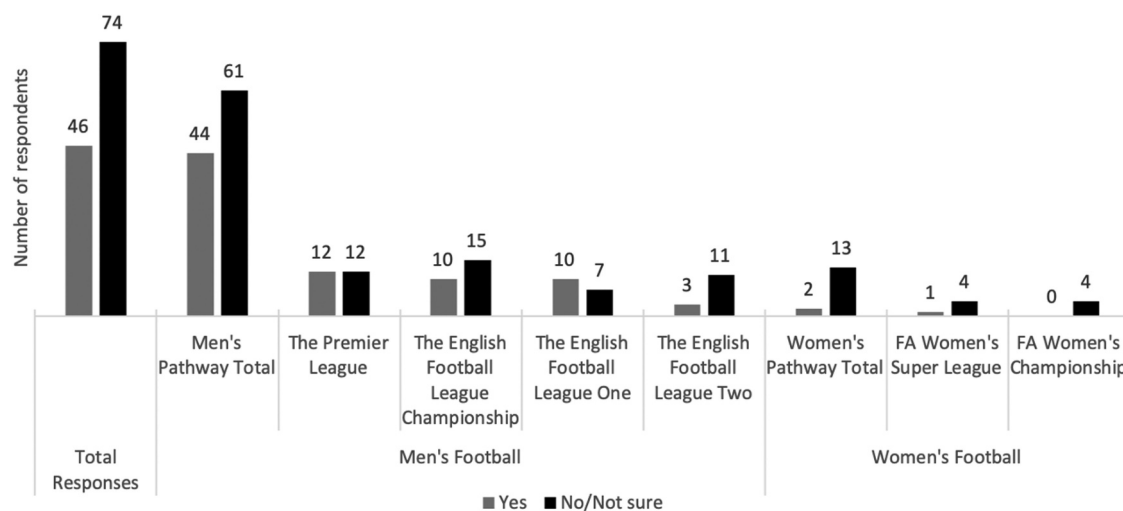


Figure 1. Response to 'does your club deliver concussion education sessions to the coaching staff at least once a season' by Men's and Women's football pathways and leagues.

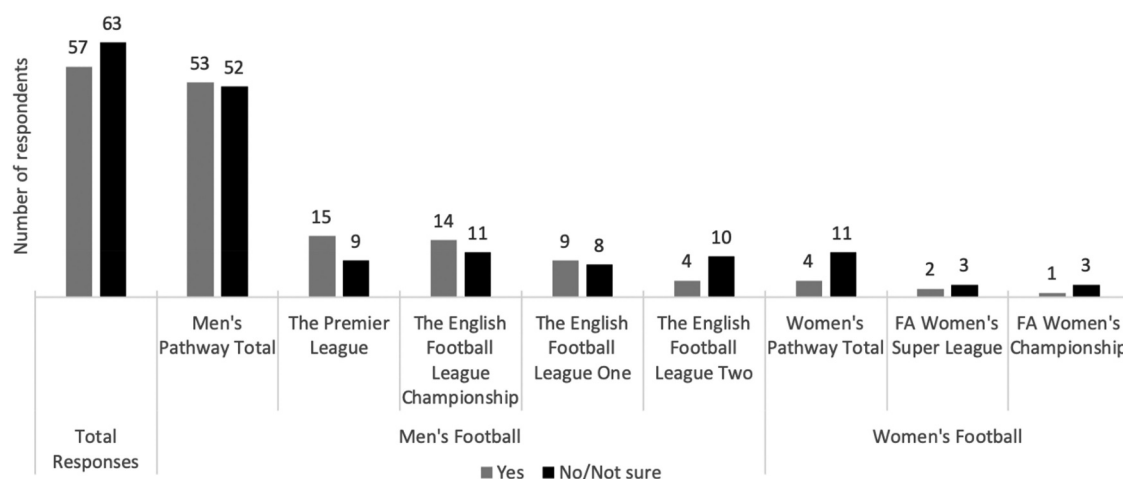


Figure 2. Response to 'does your club deliver concussion education sessions to players at least once a season' by Men's and Women's football pathways and leagues.

**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
Total	93 (78%)	23 (19%)	4 (3%)	120

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

### Pitch-side concussion assessment

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

Confidence in recognizing a concussion pitch-side was high with 33% ( $N = 39$ ) feeling *very confident*, 61% ( $N = 73$ ) feeling *confident*, and 7% ( $N = 8$ ) felt *neither confident nor unconfident*, with none feeling *unconfident* or *very unconfident* (Figure 3). There was no difference in confidence level between gender ( $P = .461$ ) or profession ( $P = .725$ ). Doctors who were consultant level were more confident in recognizing concussion pitch-side with 48% being *very confident* compared to 26% of non-consultant level doctors. Those with five or more years of experience working in football ( $N = 68$ ) were more confident in recognizing concussion pitch-side compared to those with four or less years of experience ( $N = 52$ ;  $P = .02$ ).

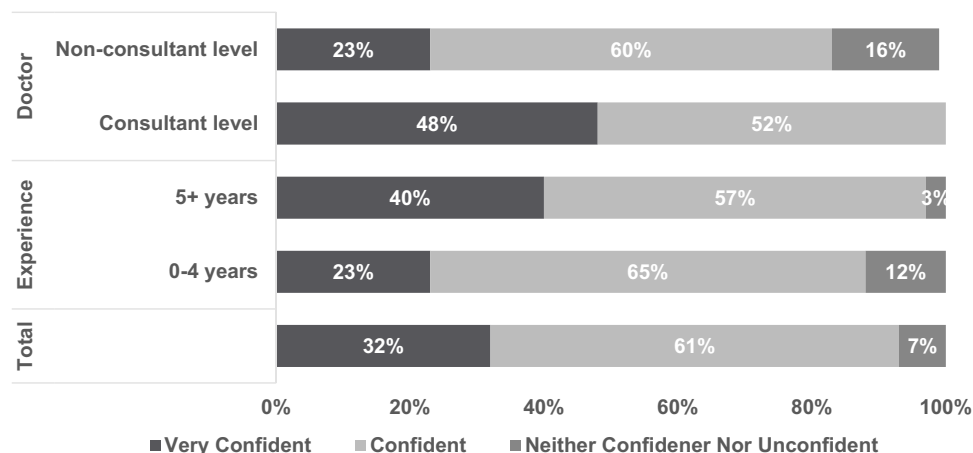
The Concussion Recognition Tool (CRT) (Echemendia *et al.*, 2017a) was regularly used by 48% ( $N = 58$ ), 26% ( $N = 31$ ) were aware but did not regularly use it, 23% ( $N = 27$ ) were aware but did not use it, and 3% ( $N = 4$ ) had not heard of it. More female respondents used it compared to male,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

### Assessment time for concussion pitch-side

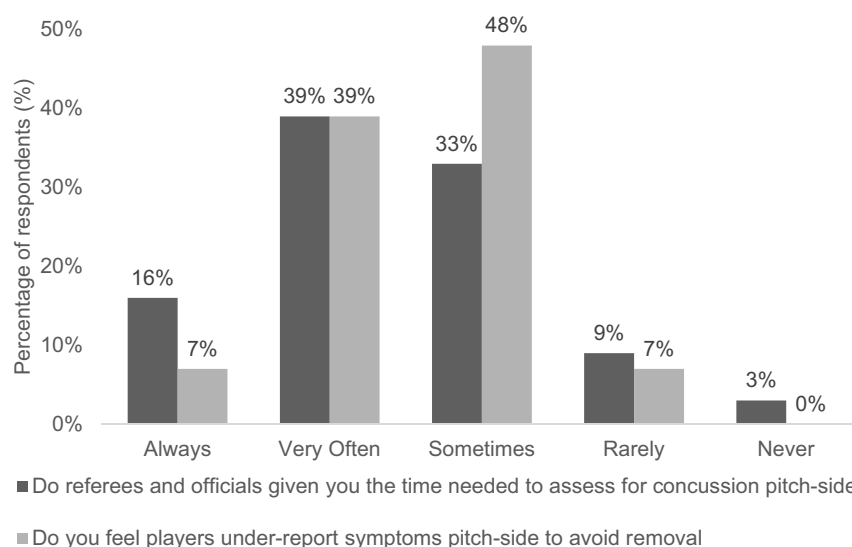
Respondents overall felt that *referees and other officials* gave them enough time to assess for concussion pitch-side (Figure 4). Only 12% felt they rarely or never had enough time, with similar figures seen in staff working in Men's (12%) and Women's football (13%).

### View on 'concussion' substitutions

It was felt that the potential introduction of a 'concussion substitution' would positively benefit player welfare with 67%

**Figure 3.** Confidence in recognising a concussion pitch-side, with subgroups 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.

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

### Player reporting of symptoms pitch-side

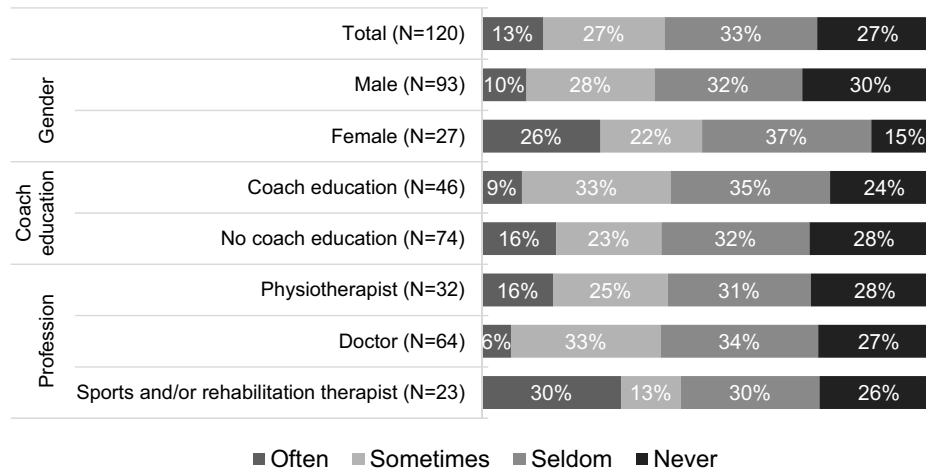
A significant difference in responses of whether it was felt players under-reported their symptoms pitch-side was seen by gender ( $P = .026$ ), with 53% ( $N = 49$ ) of male respondents feeling players *sometimes* underreported compared to 30% ( $N = 8$ ) of female respondents, and 33% ( $N = 31$ ) of male respondents feeling *very often* compared to 59% ( $N = 16$ ) of females. Of sports and/or rehabilitation therapists, 74% ( $N = 17$ ) thought players always or very often under reported symptoms, compared to 44% ( $N = 14$ ) of physiotherapists and 36% ( $N = 23$ ) of doctors ( $P = .057$ ). There was no difference in responses between those working in Men's or Women's football ( $P = .359$ ). No difference was seen between groups that educated players and those that did not ( $P = .51$ ). A significant difference in response between those collecting baseline neurological testing and those that either did not or were not sure ( $P = .26$ ), with 40% ( $N = 37$ ) felt players *always* or *often* underreported symptoms compared to 67% ( $N = 18$ ). Those with 4 years or less of experience working in football ( $N = 52$ ) significantly thought more players under-reported their symptoms compared to respondents with 5 or more years of experience ( $P = .024$ ).

### Influence on decision making from manager or coaching staff members

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

### Discussion

This pilot study aimed to assess the awareness, attitudes and behaviours of medical staff in Men's and Women's football in the United Kingdom. Awareness of concussion guidance is now much higher than in 2009, when 27.8% of English football doctors were aware of the 2008 Zurich Consensus Statement (Price et al. 2012). However, awareness of guidelines did not infer application of guidance, with the majority of English football team medical staff in 2009 not routinely following concussion guidelines (Price et al. 2012; Niederer et al. 2018). A disconnect between recommendations and implementation has been found in other areas of player care including injury prevention programs (Bahr et al. 2015; Bizzini and Dvorak 2015).



**Figure 5.** Perceived influence on decision making from manager or coaching staff members by percentage of respondents, including subgroups by gender, profession, and by those that delivered coach concussion education.

### Education and baseline assessments

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

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

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

### Pitchside management

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

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

Respondents overall felt referees and other officials gave them enough time to assess for concussion, with female respondents feeling referees and officials did not give them as much time compared to male respondents. SRC knowledge



in professional level football referees and other officials has not yet been investigated but increasing concussion awareness in other sports has increased confidence in calling injury stoppages and facilitating medical assessments (Kroshus et al. 2017). When making player removal decisions, varying levels of manager or coaching staff influence was felt with 40% of respondents *sometimes*, or *often* feeling pressure with less influence being felt in teams that educated their coaching staff. Future research exploring differences in perceived influence by gender and profession may support staff in making player removal decisions.

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

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

### Conflict of interest

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

suggested that pressure to influence player removal by coaching staff or players although low, was present and should be explored further. Some sports with higher concussion incidence utilize independent, unaffiliated medical personnel who can either over rule team medical staff (Rugby Union), or offer a second opinion (American Football; Patricios et al. 2018).

### Experience of medical team staff

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

### Limitations

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

The self-reported questionnaire nature of the study raises limitations within the data set including participation, response, and selection bias given that participation was voluntary and respondents who self-selected to participate may not be a true representation of those working in elite football. The percentage of medical staff working in elite football being members of one of the recruiting organisations is unknown. Respondents whose roles may cross several teams and age groups, could only select the team they worked with most commonly. Responses from several staff members from within the same club was possible and due to the anonymity of participants this would not be identified. Due to the high heterogeneity and small number of respondents within some of the groups it limits intergroup comparisons and the potential significance of statistical analysis. Age and experience of managers and coaching staff were not collected, whether this changes attitudes within the clubs could be explored in the future. Given the novelty of the

area of being explored there was no validated questionnaire available but questionnaire content and usability was piloted prior to distribution.

## Conclusion

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

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CR, DB, and WC hold or have held clinical roles at the Football Association within the youth pathway teams. DB, WC, and RC hold clinical roles in Premier League football clubs. CR holds a clinical role in a Women's Super League team.

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