Concussion awareness fails to translate into safe behaviour in amateur rugby.

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Abstract

A concussion is a form of traumatic brain injury and is prevalent in high-contact sports like rugby league and rugby union. Despite growing awareness of the risks of concussion, a gap persists between knowledge and the behaviours surrounding reporting and management. This study captured the knowledge and awareness of concussion among amateur rugby players using an online questionnaire-based survey. One hundred and four participants completed the questionnaire. The majority (83%) played rugby union. The findings revealed a good understanding of concussion, with most participants identifying symptoms and recognising concussion as an injury. However, 26% would continue playing despite suspecting a concussion, and 14% were uncertain about reporting it. Male players were more likely to exhibit risky behaviours, including continuing to play (30%) and returning to play prematurely (45%) after concussion, compared to females (12% and 19%, respectively). These gender differences suggest that females demonstrate better knowledge of concussion and safer behaviours. Participants consistently used non-medical terminology to describe concussions, potentially trivialising the injury, which may contribute to low reporting rates. Coaches were the primary point of contact for reporting concussions (68%), emphasising their critical role in player safety. Notably, only 4% of players would report a concussion to a doctor, reflecting limited access to medical care at the amateur level. This study highlights a disconnect between knowledge of concussion, attitudes and reporting behaviours, aligning with prior research in rugby. It emphasises the urgent need for improved education on concussion, adherence to protocols, and better support systems, particularly for amateur male players.

Background

Rugby league and rugby union (rugby) are contact sports which involve repeated physical contact, often resulting in injury (1,2). One of the most common injuries experienced in rugby is concussion. A concussion is a traumatically induced brain injury through direct or indirect contact with the head and can alter brain function, leading to a range of neurological and physiological symptoms (3-5). Numerous neurological studies demonstrate that mild to severe concussion is followed by metabolic and physiological events, which produce neurological deficits, cognitive impairments, and somatic symptoms (3-5). These symptoms can impair neurological and physiological function for several days to weeks, depending upon the severity of the injury.

Impaired neurological function in the weeks and months following a concussion has been found to affect the body in numerous ways. Previous research indicates that rugby union players who returned to play following a diagnosed concussion were 60% more likely to sustain a subsequent injury during that season than those who had not sustained a concussion (6). This finding suggests that the initial concussion may have impaired athletes' postural and neuromuscular control, increasing their vulnerability to subsequent injuries. Neurological impairment (e.g., reduced executive functioning and processing speed) has also been found in retired rugby players, sometimes decades after sustaining concussions (7,8). Some have suggested that repeated and poorly managed concussions in sports such as rugby contribute to the development of neurodegenerative diseases such as dementia, Alzheimer's, and Chronic Traumatic Encephalopathy (9,10).

Whilst the risks and prevalence of concussion are widely reported in both the literature and media, more research is needed on attitudes, knowledge, and misconceptions about concussions, as much of the existing literature focuses primarily on incidence and reporting, with limited exploration of these critical areas. The current literature indicates that knowledge of concussion is not translated into positive attitudes or improved reporting rates. Kearney et al. (11) reported that 30% of participants who were youth rugby players (11-17 years old) had inappropriate attitudes towards concussion, with only 11% following the Rugby Football Unions

(RFU) Graduated Return to Play protocol (12) after sustaining a concussion. Among 422 surveyed men's and women's Super League players, 20% admitted to withholding concussion-related symptoms from medical staff during the 2020/21 season. The main reasons given for underreporting were *"didn't want to be ruled out of a match"* (35%) and *"didn't want to let the team down"* (24%). Controversially, 89% of these players held sufficient knowledge about concussions, suggesting that they understood the risks but chose to ignore them due to internal and external pressures (13).

Similar findings were found in a study of members of USA Rugby, which found that for individuals who reported having experienced at least one concussion, only 50.8% reported it during the game or practice, with just 57.6% reporting a concussion to a medical provider, and 61% of respondents did not engage in recommended return to play protocols after the most recent rugby-related concussion (14). Studies have also found sex differences in knowledge of concussion and reporting behaviours, with males tending to display more negative concussion-reporting attitudes than females, such as lower reporting rates and a greater disregard for return-to-play guidelines (15,16). These findings are consistent globally, with reports of unsafe attitudes towards concussion demonstrated in studies with rugby players from Ireland (17), South Africa (18), and New Zealand (19).

These studies reveal a consistently poor attitude toward concussion in rugby globally, regardless of age, gender, nationality, or level of competition, despite participants often demonstrating a good standard of concussion knowledge. However, increasing literature linking repeated concussions to both short and long-term brain damage has increased media attention and concern from governing bodies to change these negative attitudes and misconceptions towards concussion in rugby via education programs such as HEADCASE by the Rugby Football Union (RFU) (12,20). HEADCASE was introduced in 2013 to educate those who play or coach rugby on the risks, symptoms and recommended protocols associated with concussion in rugby. An updated version was published in April 2024 to align with the Concussion Guidelines for Grassroots Sport published in 2023 (21).

Aims

This study aims to determine the attitudes, knowledge, and misconceptions of amateur rugby union and rugby league players towards concussion and to compare potential sex differences in both knowledge and disclosure behaviour.

Methods

This study was approved by the Lancaster University Research Ethics Committee (ethics number: FHM-2024-4201-RECR-5).

Recruitment

Participants were approached via their respective school, sixth form, university, local rugby league or union team. All participants approached were from within the North West of England. For schools and sixth forms, an email of invitation explaining the purpose of this study was sent to the headteacher and head of the Physical Education department. For universities, an email of invitation was sent to the head coaches or chair of the rugby league and union clubs. For local rugby league and union teams, the chair of the club would be contacted via email directly by the research team. It was made clear that participation in this study was entirely voluntary and that participant data would be completely anonymous. All participants completed a consent form online. Upon completion, answers to the online questionnaires were collated before being processed for analysis. Participants were included in this study if, at the time of participation, they played rugby league and/or rugby union. Participants could be of any gender and any age from 11 years old. This age was chosen as participants would have been eligible to participate in rugby with elements of contact for at least three seasons (contact in rugby union starts at under 9's and 6's in rugby league in England) (22,23).

Development of questionnaire

This questionnaire was developed in conjunction with a patient and public involvement engagement group made up of rugby players, coaches, teachers, and researchers of various genders, ages, and levels of competition to assess the

knowledge of and attitudes towards concussion. The development of the questionnaire involved discussions regarding common misconceptions held towards concussions adapted from previous studies that had asked similar questions (24,25) and feedback on potential questions to ensure they were suitable for individuals of all ages and levels of educational ability.

Data collection

Participants were invited to complete the questionnaire via an online link, which was distributed by relevant gatekeepers in their rugby team(s). The questionnaire consisted of 27 questions, including multiple-choice questions [11], short text boxes [6] which assessed participants' knowledge and attitudes towards concussion, and a true/false section [10] which was designed to assess a range of common misconceptions associated with concussive injuries, as highlighted by both Williams et al. (24) and Kearney et al. (25). All mandatory questions (denoted with an *) had to be answered for the data to be included in this questionnaire.

Thematic analysis

Thematic analysis was chosen as the method to analyse the questionnaire data. This study used inductive thematic analysis (27,28) to determine common themes throughout the data. Inductive thematic analysis was conducted whereby the data would be the starting point for engaging with meaning, allowing themes to naturally surface without pre-existing frameworks imposed. This method was chosen as it was appropriate for investigating a diverse range of beliefs and experiences of concussion. Questionnaire responses were read, re-read and coded individually into codes that the researchers deemed appropriate. Once all coding had been conducted, the research team met to discuss the appropriateness of the codes and to ensure that all data were systematically reviewed, ensuring they were coded and placed into relevant themes with sufficient quotations to evidence each theme.

Results

In total, 145 responses were recorded. Out of the 145 responses, 31 were not fully complete, and 10 participants recorded that they did not partake in rugby union and/or rugby league. These were removed from the study, leaving a total of 104 completed questionnaire responses.

Table 1. Participant characteristics

	Total	Male	Female
Rugby Union	87 (83%)	65 (82%)	22 (88%)
Rugby League	8 (8%)	7 (9%)	1 (4%)
Both	9 (9%)	7 (9%)	2 (8%)
Total	104	79 (76%)	25 (24%)

Most participants were male (76%), and the majority played rugby union (83%), with a minority playing rugby league (8%) or both rugby union and league (9%). These trends were consistent when split based on gender, with 82% and 88% of males and females playing rugby union.

Knowledge and Understanding of Concussion

Almost all participants reportedly knew what a concussion was, with 99% responding 'yes' to the question "Do you know what a concussion is?" and 97% reported that they believe concussion is an injury. 51% of participants claimed that they had previously sustained a concussion. A minority (11%) indicated they were unsure as to whether they had experienced a concussion, and 38% answered 'no', suggesting they had never experienced a concussion.

Brain and head injury were common descriptors of a concussion, with most participants describing concussion as a *"minor head injury"* or *"type of brain injury,"* whereas others described concussion as *"severe," "debilitating head injury",* or *"traumatic brain injury,"* showing a range in severity and perception of how severe a concussion may be.

Some participants inferred how a concussion may be caused, describing the mechanism as an *'impact', 'brain hitting the skull',* and *'head movement.'* The majority of participants were vague about the mechanism of concussion and assigned non-medical terminology such as *"the brain is hit," "hit on the head," "a knock"* or *"blow to the head."* Others expressed the mechanism with a clear understanding of the biomechanics of a concussion. This was evidenced by responses such as *"a type of traumatic brain injury caused by a jolt to the head or body that causes the head and brain to move rapidly back and forth."* There was a repeated focus on how the brain may *"shake," "rattle,"* or *"move"* within the skull and how a concussion occurs when the brain makes contact with the skull itself: *"Your brain hits your skull after a traumatic injury causing your brain to move back and forth."*

Short term symptoms

84% of participants stated they were aware of the short-term symptoms of concussion. Only 16% reported to not know of any short-term symptoms of concussion. Participants were asked to report any short-term symptoms of concussion that they were aware of in a follow-up question.

There was a focus on common short-term symptoms that caused feelings of physical discomfort such as dizziness, nausea and sickness, with some participants reporting "*feeling sick and nauseous*" and sometimes feeling the need to "*vomit*" or "*be sick*." Feelings of confusion and disorientation were highlighted through quotes such as "*not remembering what happened, confusion, feeling a bit out of it*," or a "*drunken feeling*."

A large proportion of participants reported how concussion may impair memory and primarily short-term memory, with answers such as "*loss of memory*" and "*short-term memory loss*" being common. The phrase "*feeling forgetful*" or "*forgetting where I was*" was also common. Fewer participants reported how concussion may impair other cognitive processes such as speech, sight or attention, with infrequent reference to "*slurred speech*," "*seeing stars*," "*blurred vision*," "*sensitivity to light*", and "*difficulty focusing*" being the extent of the references to these cognitive

symptoms. There was a reference to balance and coordination, with several participants reporting "*balance issues*" such as "*stumbling*" or feeling "*unbalanced*." Only a handful of participants noted that concussion may cause a "*loss of consciousness*" or "*blacking out*." A few participants reported a physical pain response to concussion, usually located on or around the head, with "*throbbing pain*" or "*bumps on head*", inferring potential swelling post-concussive impact.

Long term symptoms

70% of participants responded 'yes' when asked if they were aware of long-term risks commonly linked with concussion. Several neurodegenerative diseases such as CTE, Dementia, Alzheimer's and Motor Neurone Disease (MND) were identified by participants. These have all been associated with concussions, specifically repeated concussions over time, and are prominent in retired rugby players from both rugby union and rugby league. This shows a good level of awareness of the potential long-term risks associated with concussion. Several participants also quoted "*other neurodegenerative diseases*" as an umbrella term for the long-term risks associated with concussion, including some not commonly linked to concussion, such as Parkinson's Disease.

Participants reported several long-term symptoms they believed to be linked to concussion, including generic terms like "*brain damage*" and "*memory loss*" or "*being forgetful*," to more emotional responses such as "*bad temper and paranoia*", "*anxiety*," and "*personality changes*." Others mentioned other symptoms such as "*shaking,*" "*eyesight damage*," "*prolonged confusion*", and "*loss of bodily functions*." In reference to brain damage, one participant suggested concussion may cause a "*build-up of scarring on the brain*", demonstrating a good level of knowledge and understanding of the association between concussion and the damage it may cause the brain.

True-false statements of common misconceptions about concussion

As shown in Table 2., there was a consensus on the true-false statements regarding common misconceptions about concussion, with the vast majority choosing the same answers for each statement, even when split by gender.

Table 2. True-false concussion statements

	Male		Female		Total		Correct Answer
	True	False	True	False	True	False	
People who have had a concussion are more likely to have another concussion	52 (66%)	27 (34%)	17 (68%)	8 (32%)	69 (66%)	35 (34%)	True
There is a risk of death if a second concussion occurs before the first has healed	53 (67%)	26 (33%)	21 (84%)	4 (6%)	74 (71%)	30 (29%)	True
Symptoms of concussion always occur immediately	5 (6%)	74 (94%)	0	25 (100%)	5 (5%)	99 (95%)	False
Symptoms of concussion can last for several weeks	76 (96%)	3 (34%)	25 (100%)	0	101 (97%)	3 (3%)	True
You must be unconscious to have a concussion	2 (3%)	77 (97%)	1 (4%)	24 (96%)	3 (3%)	101 (97%)	False
Concussion affects sporting performance	77 (97%)	2 (3%)	25 (100%)	0	102 (98%)	2 (2%)	True
Concussion affects academic or work performance	72 (91%)	7 (9%)	23 (92%)	2 (8%)	95 (91%)	9 (9%)	True
Concussions only occur in contact sports	14 (18%)	65 (82%)	1 (4%)	24 (96%)	15 (14%)	89 (86%)	False
Concussions only occur if there is contact to the head	40 (51%)	39 (49%)	11 (44%)	14 (56%)	51 (49%)	53 (51%)	False
Most concussions go unreported by athletes	66 (84%)	13 (16%)	21 (84%)	4 (16%)	87 (84%)	17 (16%)	True

Attitudes towards concussion

60% of participants suggested that they would not continue to play rugby following a concussion, demonstrating a good attitude towards the injury. However, 26% answered that they would continue to play sports following a concussion, and 14% were unsure as to whether they would continue playing sports following a concussion. When asked how long they would wait until they returned to play, participants demonstrated a good awareness of the concussion guidelines in place for rugby union and rugby league, with 61% of females and 45% of males reporting they would wait between 3-4 weeks to more than one-month post-concussion before returning to play.

Some participants specifically referred to the guidelines in place within rugby: "*We follow RFU protocol which is minimum 21 days"* and "*1-week total rest + 1-week relative rest + GRTP* (graduated return to play) *protocol*." Others met the guidelines but did not specify them by name: "*21 days rest - training, 28 days rest – contact,*" "*1 week for non-contact and at least two weeks for contact. If symptoms are still present at 2 weeks, then it is 4 weeks total."* Another participant used a grading system to base their return to play time on: "*4 weeks for a mild concussion, 6 for a more serious concussion.*" However, 45% of males reported that they would return to play within either a few hours, 1-2 days, 1-2 weeks or 2-3 weeks post-concussion, indicating they would return to play before the recommended guidelines suggest. In comparison, just 19% of females would return within these periods.

Some participants expressed that their return to play was dependent upon symptoms rather than sticking to a guideline. Quotes to evidence this include, "*I think the amount of time you take off from playing depends on how bad the concussion is. I feel like a few weeks to a few months would be a good break*," and "*When you stop feeling symptoms or something going on in their head like pains or disorientation*." Some participants report that return to play post-concussion should be assessed on a "*case by case basis*," again emphasising a move away from the concussion guidelines provided within rugby.

Most participants (39% males, 35% females) suggested that they would wait 1-2 weeks post-concussion before returning to work or education. One participant

responded with "*at least 1-week total rest and no symptoms*", suggesting they would wait until symptoms had subsided before returning to work or education.

Some participants insinuated that their return to work or education was dependent upon the severity of the concussion. One participant responded, "*Depends on severity, mild probably a week – medium to severe probably 2 weeks plus*", highlighting that no concussion is the same and that each one should be dealt with based on its severity. Continuing this theme, another participant reported, "*I think depending upon the type of work you do and severity of the concussion, waiting a few weeks would be ok*." Others relied on externals to prescribe their recovery time "*However long the doctor says*" or "*within a few days after having a medical assessment*," demonstrating the need for a medical evaluation before deciding on when best to return to work or education. Some participants simply suggested they "*wait until they feel better*" or "*until they feel able to complete their work*," placing no timeframe upon when to return to work or education.

93% of participants responded 'yes' to suggest they would tell somebody if they suffered what they thought to be a concussion. Only 4% responded 'no', and 3% responded with "don't know.". All participants who reported that they would not report a concussion were male. Participants were then asked to state who they were most likely to tell if they had received a concussion and also who they would report a concussion to if they thought a player in their team had a concussion. Participants could choose from a choice of a 'referee', 'coach', 'doctor', 'physiotherapist', 'parent/guardian', 'teammate', 'partner', 'friend', or 'other'. The results are presented in Table 3.

Table 3. Reporting behaviour following a concussion

"Who would you tell if you had a concussion?"			
	Male	Female	Total
Referee	3	0	3
Coach	31	13	44
Doctor	2	2	4
Physiotherapist	2	1	3

Parent/guardian	16	3	19
Teammate	11	1	12
Partner	4	2	6
Friend	9	3	12
Other	1	0	1
“Who would you tell if you thought a player in your team had a concussion?”			
Referee	10	1	11
Coach	49	22	71
Doctor	1	0	1
Physiotherapist	2	1	3
Parent/guardian	2	0	2
Teammate	9	0	9
Partner	0	0	0
Friend	5	1	6
Other	1	0	1

The majority of participants (42%) would report a concussion to the coach. Similarly, most participants (68%) reported that they would tell a coach if they thought a player on their team had suffered a concussion. Almost all females (88%) reported that they would tell a coach, with only 3 participants reporting that they would tell other individuals (referee, physiotherapist, friend). A higher proportion of participants (11%) would report to a referee if they thought a player in their team had suffered a concussion than if they had suffered a concussion themselves (3%).

Discussion

This study provides a good insight into both the knowledge of concussion and attitudes towards concussion within amateur rugby union and rugby league players. This study indicates that participants possess a good level of concussion knowledge, with most able to describe the injury and identify both short- and long-term symptoms. Despite 97% of participants recognising concussion as an injury, 26% would continue playing after suspecting one, with 14% uncertain about reporting it.

When asked to describe what a concussion is, there was a significant use of non-medical and lament terminology. This may help to reduce the gravity and significance of concussion, potentially due to a lack of understanding of the potential severity or purposefully making a concussion feel less like a serious injury. The use of casual terminology may further an environment of poor concussion reporting rates, as demonstrated in this study.

Males were more likely than females to play on, highlighting differing attitudes toward concussion. Additionally, 45% of male participants were willing to return to play within a few hours to three weeks post-concussion, often earlier than the recommended 21-day guideline. In contrast, only 19% of females reported the same, reflecting findings in the literature that females tend to exhibit better concussion knowledge and safer disclosure behaviours than males (15,26). These data highlight a disconnect between understanding the dangers of concussion and acting on that knowledge, aligning with previous research showing low reporting rates in rugby players (11,13,14,17-19,27). Studies by Tadmor et al. (13) and Longworth et al. (33) highlight this issue, with Tadmor et al. reporting that 20% of professional rugby league players would not report a concussion and Longworth et al. finding that 17% of elite rugby league players in Australia chose not to report likely concussive episodes. This disparity further emphasises the need for improved concussion education and adherence to guidelines, particularly among male players.

Many participants place significant trust in coaches, with 68% reporting an incidence of concussion to their coach. This highlights the pressure on amateur coaches, many of whom are volunteers with potentially insufficient concussion knowledge or medical training, highlighting the need for greater education and support from governing bodies to support those individuals to be able to make informed decisions when concerning player welfare. Previous research has found that rugby coaches display a good knowledge of concussion and often hold safer attitudes and reporting intentions towards concussion than players. Fraas et al. (27) found that coaches demonstrated accurate concussion knowledge and a strong understanding of symptoms. Coaches displayed greater awareness, safer attitudes, and stronger reporting intentions than players, as reported by Salmon et al. (16).

Just 4% of participants would report to a doctor, and only 3% would report to a physiotherapist if they thought that they had experienced a concussion. Even fewer participants (1%) would report to a doctor, and only 3% would report to a physiotherapist if they thought a player in their team had suffered a concussion. Similar findings from a survey by Miller et al. (14) were shown with just 13.7% of rugby players in the USA indicating they would report a concussion to a doctor. This may be due to amateur-level rugby league and union players having limited access to immediate medical care. This further emphasises the level of care and responsibility amateur coaches have for their players.

Limitations

Responses to this questionnaire were predominantly from males and those who play rugby union, lacking an insight into those playing rugby league or from female rugby players. However, the responses still provide a useful adjunct to the literature on concussion within amateur sport, an area which lacks both research, funding and effective concussion protocols.

Conclusion

This study highlights that there remains a disparity in concussion knowledge, disclosure behaviours, and adherence to the recommended return-to-play guidelines. More work is needed to educate amateur rugby players on the dangers of not reporting a concussion, and a greater effort is needed to produce more positive concussion disclosure behaviours, as currently, too many concussions go unreported by amateur rugby players, placing themselves at risk of further injury.

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Conflict of Interest

The authors have no conflict of interest to note

Author contribution statement

ED and HJ conceived the study. ED collected data. All authors were involved in data analysis or interpretation. ED drafted the manuscript. Critical revisions involved ED and HJ, and the final manuscript was approved by all authors.

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