

Knowledge, attitude, and practice of male professional and semi-professional footballers towards concussion: a look at two countries from the Caribbean Football Union

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ABSTRACT

Objective: This study sought to determine the knowledge, attitudes, and practices of male professional or semi-professional footballers towards concussion from two member countries of the Caribbean Football Union.

Methods: A cross-sectional survey was conducted targeting footballers from Jamaica's Premier League and Guyana's Elite League. The Rosenbaum Concussion Knowledge and Attitude Scale student version (RockAS-ST) was used to collect data on knowledge and attitude. Five questions were added to examine practice and one question examined athletes' agreement with a ban on ball heading for young children in the Caribbean region.

Results: The mean Concussion Knowledge Index (CKI) score for Jamaican footballers was 16.5 ± 3.4 [95% CI = 13.5, 14.6; range 8 - 25] and mean CKI for Guyanese footballers was 14.0 ± 2.9 [95% CI = 15.8; range 8 - 25]. There was a weak correlation between years playing and CKI score for Guyanese footballers ($r = 0.3$, $p < 0.01$). The mean Concussion Attitude Index (CAI) scores for Jamaican footballers was 56.8 ± 8.4 [95% CI 55.2, 58.5; Range 33 - 75] and for Guyanese footballers the mean was 58.2 ± 3.6 [95% CI 57.5, 59.0; Range 45 - 70]. There was no significant correlation between age or number of years playing in the league and CAI scores.

Conclusion: There is room for improvement of knowledge, attitudes and practices of footballers from both countries with respect to sport-related concussion. This gap could potentially be addressed by the development of culturally specific educational programs which integrate behaviour change theories.

KEYWORDS: Brain injury, head injury, traumatic injuries, soccer

INTRODUCTION

Football (soccer) is the most popular sport in world with the 2006 Fédération Internationale de Football Association FIFA Big Count reporting an estimate of 265 million players worldwide.¹ Approximately 43 million of these players are from North America, Central America and the Caribbean region combined.¹

Like other contact sports, concussion injuries in soccer are common.^{2,3,4} The increasing numbers of confirmed cases of chronic traumatic encephalopathy and neurodegenerative disorders among former professional players has created much concern.^{2,3,4} Added to this is emerging data showing that heading of the ball is a potential risk for traumatic brain injury, especially for children.^{5,6}

Sport-related concussion is a traumatic brain injury caused by a direct blow to the head, neck or body from engagement in sport or exercise related activity which results in an impulsive force being transmitted to the brain.⁷ It triggers a sequence of events that leads to possible axonal damage, impairments in blood flow and brain inflammation. Signs and symptoms may be immediate or delayed and loss of consciousness may or may not occur. Diagnostic imaging reveals no abnormality. Some cases resolve within days, whilst others take a long time.⁷ Diagnosis is based primarily on the presence of signs and symptoms that cannot be explained solely by drug, alcohol, medication use, other injuries or other comorbidities.⁷ Repeated injuries to the head can result in long-term brain injury referred to as chronic traumatic encephalopathy; a condition which manifests as dementia but can only be definitively diagnosed with a postmortem autopsy.⁸

The common mechanisms associated with sport-related concussion in youth, collegiate and professional soccer are head-to-head contact during a heading duel, head-to-body contact, head contact with the ground and head contact with goalposts.^{9,10-14} Video analysis of professional Norwegian and Icelandic soccer players showed that 58% of concussion cases occurred during a heading duel.¹³ Contact of the head with elbow, arm or hand of another player was the second most common cause of concussion in this group.¹³

A ten-year comparison of concussion incidence in America's Major League Soccer and English Premier League showed 20.22 concussions per 1000 athlete-exposures per year for America and 18.68 concussions per 1000 athlete-exposures per year for England.¹⁵ This may be an underestimation since several studies have

shown that sport-related concussions are underreported.¹⁶⁻²⁰ A prospective study of 959 elite Swedish footballers reported an incidence of 1.19 concussions per 1000 player hours.²¹ At the collegiate level, the rate of concussion per 1000 athletic experience for boys was found to be 0.24 during practice and 1.38 during competition. For girls, the rates were 0.25 per 100 athletic experiences during practice and 1.8 during competition.^{22,23} A retrospective study of university footballers showed that 46.2% of the soccer players had experienced symptoms of a concussion during the previous season, however, only 29.2% of the concussed players realised they had suffered a concussion.²⁴

Recognition of a concussion is the first step of successful management, however, this can be quite challenging as the game is fast-paced and often requires having multiple views to determine whether head contact occurred.^{7,25} Athletes therefore are essential in recognizing and reporting possible concussions to medical personnel, but the literature points to a knowledge gap.^{17-20, 26-28}

The Rosenbaum Concussion Knowledge and Attitude Scale (RoCKAS) is a valid tool for evaluating concussion knowledge and attitude among athletes.^{29,30} The instrument was developed in the United States of America with a version for high school students, one for coaches and one for athletic trainers.³¹ The student version (RoCKAS-ST) has been validated among collegiate and high school athletes and has been used, either in full or part, to evaluate concussion knowledge and attitude among professional, semi-professional, club and collegiate footballers across the globe.^{20,26,28,30} The instrument allows for the calculation of a Concussion Knowledge Index Score (CKI) and a Concussion Attitude Index Score (CAI), with higher scores indicating better knowledge or attitude respectively.^{29,30} Knowledge and attitude gaps have been reported by studies using this instrument to evaluate English Premier League players, semi-professional and amateur league Irish players, Gaelic footballers and Japanese collegiate footballers.^{20,26,28}

There are no focused public education campaigns regarding sport-related concussions in the Caribbean region and the sports medicine structure to support professional athletes and teams is not organized as that of North America and Europe. Literature related to recognition and treatment is constantly evolving and it is therefore essential for educational programmes to be established targeting all stakeholders, including athletes. These programmes must be tailored to the relevant audience and an understanding of the existing knowledge

can help inform programme development.

This study examined the knowledge and attitude of semi-professional/professional male footballers in Jamaica and Guyana in relation to concussion. Professional players were defined as salaried players contracted to clubs whilst semi-professional players were those who played for organized clubs and were paid inconsistently or not at all. The countries were selected to represent the two ends of the Caribbean Football Union, including a country with and without a FIFA World Cup qualification and a country with and without an active Sports Medicine Association.

METHODS

A cross-sectional survey was conducted following ethical approval from the Research Ethics Committee of the University of the West Indies, Mona Campus and the Ethics Committee Ministry of Health, Guyana.

Study Setting and Participants

Jamaica is located close to the United States of America. The country has a professional Premier Football League which has existed since 1973. This league is at the top of the competition structure in the country and consists of clubs with salaried players competing for the champion title. At a national level, Jamaica has had one FIFA World Cup qualification by its male team and two qualifications by the female team. It has an active Sports Medicine Association in existence since 1979.

Guyana is considered part of South America, however, for football, the country belongs to the Caribbean Football Union, which is a member of CONCACAF (Confederation of North, Central America and Caribbean Association Football). Guyana has a semi-professional, Elite League which started in 2015. This is also the top level of competition in the football structure for the country, however, at the time of the study, not all players were paid. The country has never qualified for a FIFA World Cup and does not have a Sports Medicine Association.

The targeted sample for the study was 184 Jamaican male Premier League soccer players and 129 male Elite League players from Guyana. Players 18 years and older who competed between 2018 and 2019 and consented to participation were included.

Instruments

The Rosenbaum Concussion Knowledge and Attitude Scale, student version (RoCKAS-ST) was used to evaluate

knowledge and attitude of players. This instrument has been validated for use among high school and college athletes, has been used in studies examining concussion knowledge among amateur, professional and semi-professional footballers across the globe and it is available in the public domain.^{20,26,28-30,31} The instrument consists of 55 questions divided into 5 sections: section 1 contains 19 questions of the true and false type, section 2 contains two case studies, section 3 requires an indication of the level of agreement with seven statements, section 4 contains three case studies and section 5 a list of symptoms for persons to select. A scoring key is provided with the instrument which allows for calculation of a Concussion Knowledge Index (CKI) score with a maximum possible score of 25 and a Concussion Attitude Index (CAI) score (range 15 to 75).

Distractors, which do not form part of the score, are included among the items. Two validation items are included, which if not properly answered requires discarding the data. An additional five questions were added by the researchers in relation to practice and a sixth question sought to determine the level of agreement with implementing a potential ban on ball heading in children. The instrument was pilot tested with five university footballers with no issues encountered in understanding and completing the instrument.

Recruitment and Data Collection

The researchers attended club training sessions and presented the information to the individual athletes. Those who expressed an interest were given consent forms to take home for further reading. Follow-ups were done at subsequent training sessions to answer any questions. Those who agreed to take part were given the instrument to complete. This was done either onsite at the football field or through a video conferencing session. In both situations, at least one of the researchers was present to provide clarification, if necessary.

Participants were encouraged to be truthful in their responses. All persons collecting data were briefed by the principal investigator on the use of the instrument and methodology prior to data collection.

Data Analysis

Data was analysed using the IBM SPSS Statistics (version 16). The CKI and CAI scores were derived from the questionnaire using the developer guidelines.²⁹ Anyone who failed the validation items on the scale was eliminated from the analysis. Descriptive statistics were

used to calculate mean and standard deviations. The Pearson's correlation coefficient was used to evaluate correlations between age and years of experience and CKI and CAI scores. Analysis of variance was done to see if there was a difference in the mean CKI and CAI scores and responses to the practice questions. All analyses were done at a significance level of 0.05.

RESULTS

Study Participants

A total of 198 footballers (92 from Guyana, 106 from Jamaica) completed the study. One athlete from Guyana and one from Jamaica failed the validation questions and their data was excluded. Data was therefore analysed for 196 footballers (91 from Guyana and 105 from Jamaica). The mean $\pm$ SD age of Guyanese players was 22.4 ± 3.4 years and for Jamaican players was 22.6 ± 3.5 years. The mean $\pm$ SD time playing at the Premier/Elite League was 3.7 ± 2.0 years and 3.2 ± 2.8 years for Guyana and Jamaica respectively. All participants included in the analysis completed all the items on the instrument.

Concussion Knowledge

The Jamaican footballers had a significantly higher mean CKI score than the Guyanese players ($p < 0.05$). For the Jamaican footballers, the mean $\pm$ SD CKI was 16.5 ± 3.4 (95% CI = 13.5, 14.6) and for Guyanese players the mean was 14.0 ± 2.9 (95% CI = 15.8). For both countries, the lowest individual CKI score within the sample was 8 and the highest was 25. The correlation between age and the CKI score was small and statistically insignificant ($p > 0.05$) for both groups (Guyana: $r = 0.2$, Jamaica: $r = 0.1$). The correlation between years playing and CKI score was small but significant for participants from Guyana ($r = 0.3$, $p < 0.01$) and insignificant for participants from Jamaica ($r = 0.1$, $p > 0.05$).

Table 1 shows the percentage of correct responses on the items that make up the CKI score. Less than 50% of the Guyanese footballers knew that a second concussion occurring before the first one is healed posed a risk of death. In both countries, over 50% knew that one did not have to be knocked out for a concussion diagnosis, but only a small percentage knew that a concussion could occur without a direct hit to the head (Jamaica = 38.5%, Guyana = 31.1%). Additionally, only a small percentage in both groups were knowledgeable of the fact that diagnostic imaging showed no brain damage (Jamaica = 21.1%, Guyana = 15.6%). For the case scenario, a large

percentage of participants in both countries recognized that people who had multiple concussions could have adverse long term health outcomes. The presence of headaches was accurately recognized as a concussion symptom by over 90% of participants in both countries but accuracy of identifying other symptoms of concussion was more variable.

Attitude Towards Concussion

The Guyanese footballers had a significantly higher ($p < 0.05$) mean CAI score (58.2 ± 3.6 ; 95% CI 57.5, 59.0) than the Jamaican footballers (56.8 ± 8.4 ; 95% CI 55.2, 58.5). The correlation between age and CAI score was small and statistically insignificant ($p > 0.05$) for both groups (Guyana: $r = 0.2$; Jamaica: $r = 0.1$). Correlation between years playing and CAI score was small and statistically insignificant ($p > 0.05$) for both groups (Guyana: $r = 0.1$; Jamaica: $r = 0.03$). The correlation between CAI and CKI scores was insignificant for participants from Guyana ($r = 0.1$, $p > 0.05$) but significant for participants from Jamaica ($r = 0.3$, $p < 0.05$).

Table 2 shows the response to items that comprise the CAI score. In both countries, footballers had some level of agreement regarding continuing to play while having a headache that resulted from a minor concussion (Guyana: 24.2%; Jamaica: 36.5%). Some persons also agreed that an athlete has a responsibility to return to a game even if it means playing while still experiencing symptoms of a concussion (Guyana: 5.5%; Jamaica: 12.2%).

Table 3 shows the response of the participants to the practice questions. None of the Guyanese footballers indicated that they would always report contact injuries in which they were involved that could cause a concussion, whilst 48.5% of the Jamaican players indicated they would always report these injuries. None of the Guyanese players indicated that they would always comply with a "sit out" due to suspected concussion, whilst 6.9% of Jamaican players said they would always comply. There was no significant association between knowledge and any of the practice items.

Ban on ball heading in children

A large percentage of the Guyanese footballers (86.82%) agreed with placing a ban on heading of the ball in young children (Table 4). A similar pattern was seen for the Jamaican players, with a 36.54% agreeing with a ban and 15.38% strongly agreeing.

Table 1: Percentage of correct responses on the items that make up the CKI Score

Items from the RoCKAS-ST Comprising the Concussion Knowledge Index (CKI)	% of players with Correct Responses	
	Jamaica (n = 105)	Guyana (n = 91)
There is a possible risk of death if a second concussion occurs before the first one has healed.	85.6	44.4
People who have had one concussion are more likely to have another concussion.	61.5	51.1
To be diagnosed with a concussion, you must be knocked out.	67.3	58.9
A concussion can only occur if there is a direct hit to the head.	38.5	31.1
Being knocked unconscious always causes permanent damage to the brain.	77.9	68.9
Symptoms of a concussion can last for several weeks.	83.7	63.3
Sometimes a second concussion can help a person remember things that were forgotten after the first concussion.	53.9	53.3
After a concussion occurs, brain imaging (e.g., CAT Scan, MRI, X-Ray, etc.) typically shows visible physical damage (e.g., bruise, blood clot) to the brain.	21.1	15.6
If you receive one concussion and you have never had a concussion before, you will become less intelligent.	88.5	68.9
After 10 days, symptoms of a concussion are usually completely gone.	44.2	68.9
After a concussion, people can forget who they are and not recognize others but be perfect in every other way.	32.7	15.6
Concussions can sometimes lead to emotional disruptions.	83.7	76.7
An athlete who gets knocked out after getting a concussion is experiencing a coma.	52.9	57.8
There is rarely a risk to long-term health and well-being from multiple concussions.	58.7	52.2
Scenario 1. While playing in a game, Player Q and Player X collide with each other and each suffers a concussion. Player Q has never had a concussion in the past. Player X has had 4 concussions in the past.		
It is likely that Player Q’s concussion will affect his long-term health and well-being.	53.9	72.2
It is likely that Player X’s concussion will affect his long-term health and well-being.	83.7	92.2
Scenario 2: Player F suffered a concussion in a game. She continued to play in the same game despite the fact that she continued to feel the effects of the concussion.		
Even though Player F is still experiencing the effects of the concussion, her performance will be the same as it would be had she not suffered a concussion.	78.9	46.7
Symptoms of Concussion Checklist		
Headaches	90.5	93.4
Sensitivity to light	62.9	52.8
Difficulty remembering	74.3	61.9
Drowsiness	61.0	51.7
Feeling in a fog	58.1	58.2
Feeling slowed down	72.4	53.9
Difficulty concentrating	81.0	39.6
Dizziness	89.5	63.7

Table 2: Response to key questions that make up the CAI score

		% of Players Responding (n = 91 Guyana, n = 105 Jamaica)				
Question		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would continue playing a sport while also having a headache that resulted from a minor concussion.	Guyana	6.6	69.2	0	24.2	0
	Jamaica	16.8	37.4	9.4	31.8	4.7
I feel that coaches need to be extremely cautious when determining whether an athlete should return to play.	Guyana	0	0	0	81.3	18.7
	Jamaica	1.9	2.8	4.7	43.9	46.7
I feel that concussions are less important than other injuries.	Guyana	12.1	86.8	0	1.1	0
	Jamaica	33.1	49.1	4.7	7.5	5.6
I feel that an athlete has a responsibility to return to a game even if it means playing while still experiencing symptoms of a concussion.	Guyana	11.0	81.3	2.20	5.5	0
	Jamaica	29.0	52.3	6.54	10.3	1.9
I feel that an athlete who is knocked unconscious should be taken to the emergency room.	Guyana	0	1.2	0	87.9	10.9
	Jamaica	0.9	4.7	1.87	44.9	47.7

Table 3: Footballers' response to practice questions

		% of Players Responding (n = 91 Guyana, n = 105 Jamaica)				
Question		All the time	Most of the time	Some of the time	Seldom	Never
During practice or games if you get a contact that could cause a concussion, do you report it as soon as possible?	Guyana	0	24.2	33.0	34.1	8.8
	Jamaica	48.5	30.1	19.4	1.0	1.0
If you are told that you have a concussion by a doctor and you are to be removed from play, do you sit out?	Guyana	0	49.5	47.5	3.3	0
	Jamaica	69.9	17.5	7.8	2.9	1.9
During practice or games if another player gets contact that could cause a concussion, do you report it as soon as possible?	Guyana	3.3	27.5	55.0	11.0	3.3
	Jamaica	54.5	27.2	14.6	2.0	1.9
If another player is told they have a concussion by a doctor and they are to be removed from play, do you encourage them to sit out?	Guyana	5.5	50.6	44.0	0	0
	Jamaica	66.0	20.4	10.7	2.9	0
If another player sits out a game/games because of a concussion, are you upset with them?	Guyana	0	0	1.10	12.1	86.8
	Jamaica	5.9	4.9	3.9	0	85.3

Table 4: Footballers level of agreement with placing a ban on ball heading by children

Percentage of Players					
Country	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Guyana	0	86.8	5.5	7.7	0
Jamaica	15.4	36.5	20.2	18.3	9.6

DISCUSSION

The primary focus of the study was to determine knowledge and attitudes towards concussion in two member countries of the Caribbean Football Union (Jamaica and Guyana). The islands were selected to represent the two ends of the Union. The overall findings indicate a need for improvement in knowledge for both countries. Attitudes were good, but scores reflected scope for further improvement.

For both groups, there was a knowledge gap on the RoCKAS-ST. The mean knowledge scores for the Jamaican footballers (CKI = 16.5 ± 3.4) were like that reported for the English players (CKI = 16.4 ± 2.9) but less than that of the Irish players (CKI = 18.2 ± 2.2).^{26,28} For the Guyanese footballers, mean knowledge scores (CKI = 14.0 ± 2.9) were lower than that of both the English and Irish players.^{26,28} The Jamaican footballers had a significantly higher knowledge score than the Guyanese footballers which may be due to a better sports medicine support structure. Jamaica has had a Sports Medicine Association in existence since 1979. The organisation not only provides coverage for sport events but also delivers educational seminars and workshops to medical professionals, athletes and coaches. Though there have never been any focused concussion campaigns in the country, short seminars have been conducted. Concussion publicity campaigns in the United States of America (USA) may have also impacted on the knowledge of the Jamaican athletes. Jamaica’s proximity to the USA results in significant travel between the two countries and many Jamaicans follow American mainstream media. Biedler and colleagues showed that concussion knowledge was significantly higher for collegiate athletes from a country with high publicity regarding concussions compared to those with lower publicity.¹⁹

There was no correlation between age and knowledge for either group of players. The years of playing was positively correlated for the Guyanese footballers but not for the Jamaicans. The lack of correlation between age and years playing was also reported for the Irish players.²⁵ It is possible that the persons who had been playing for a

longer time in Guyana may have had experience with having concussions and may have received education as part of their management. The lack of significant findings should be treated with some level of caution since the sample size was below that targeted.

The findings of our study were similar to others which showed many people being unaware that concussions can occur without a direct hit to the head, symptoms can last for longer than ten days and there may be negative long-term consequences with repeated concussions.^{20, 26-28} Deficits in symptom recognition in our study were similarly reported in the literature, with several persons not knowing that drowsiness, feeling in a fog and sensitivity to light were symptoms of a concussion.^{20, 26-28} These findings imply that players may sustain concussions but continue to play due to misconceptions about symptoms and impact of concussion. In the Caribbean, the lack of resources and access to sports medicine professionals may restrict persons from seeking medical clearance to return to play following a concussion. Those who believe a concussion is fully healed within ten days may therefore engage in practices that could put them at higher risk for a second concussion.

The Jamaican footballers had a poorer attitude towards concussion (mean CAI = 56.8 ± 8.4) than the Guyanese players (mean CAI = 58.2 ± 3.6). Their scores were also lower than that reported for players from England (mean CAI = 59.6 ± 8.5) and Ireland (mean CAI = 60.3 ± 6.9).^{26,28} There was no significant relationship between age and CAI scores or years playing and CAI scores for either group, however, the Jamaican footballers with a higher knowledge score had a significantly better attitude towards concussion. The findings of this study are similar to others, except for the Irish study where age was positively correlated with attitude.²⁶ Attitude is a difficult construct to evaluate using surveys and whilst the RoCKAS-ST has strong validity for the knowledge segment, that for the attitude component is lower.²⁹ A qualitative approach to exploring attitude may have provided deeper insights. One should therefore exercise some caution with interpretation of the relationships for

attitude.

The practices of the athletes in this study were like that reported in the literature, where many persons do not report concussions and they continue to play even if they have had a concussion or symptoms of a concussion.^{17,19,20} Not wanting to miss a game, not wanting to miss playing time, not wanting to let teammates down and not being aware that they had a concussion are the most common reasons cited in the literature for underreporting.¹⁸ Though we did not explore reasons in this study, the findings may have been similar.

The weak association between knowledge, attitudes and practices for this study is important when looking at the development of educational campaigns. The aim must be on behaviour change and not simply conveying information. Sports medicine professionals in the region should liaise with behaviour change experts to develop focused programs.

Despite the shift that is occurring internationally regarding a ban on heading in young children, several participants in this study disagreed with such a move for the Caribbean. This is mostly likely due to a lack of knowledge/awareness of the evolving science surrounding the possible risk of traumatic brain injuries with the sub-concussive impacts from heading. It could also be that they are knowledgeable but are in the camp that believes the scientific evidence is inadequate to support a ban.

Limitations

Whilst this study has provided important information, one should note that the targeted sample size was not obtained, so caution should be exercised in interpretation and extrapolation of findings to other Caribbean Islands. Even though persons were asked to answer honestly, it is possible that they could have looked up information whilst completing the questionnaire which could have affected the scores obtained.

CONCLUSION

The findings of this study show a concussion knowledge gap among footballers in both countries which must be addressed. Attitudes were good but there was room for improvement. Behaviour changes in practices of returning to play whilst still having signs and symptoms of a concussion is needed and football organizations in the

region should engage in discussions to drive policy regarding heading of the ball in young children in the Caribbean.

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Author contributions:

1. Sharmella Roopchand Martin – conception, design, data analysis and drafting of the manuscript.
2. Barrington Gayle – conception, design, data acquisition, data analysis and drafting of the manuscript.
3. Vanessa Wickham – conception, design, data acquisition, data analysis and drafting of the manuscript.
4. Saundria Codling – conception, design, data acquisition, data analysis and drafting of the manuscript.
5. Lori-Ann Miller – conception, design, data acquisition, data analysis and drafting of the manuscript.

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