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Research article

Concussion occurrence and knowledge in Italian football (soccer)

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Abstract

The purpose of the study was to investigate concussion history, knowledge, injury identification, and management strategies among athletes, coaches, and medical staff in Italian club level football (soccer) clubs. Surveys (N=727) were distributed among Italian football clubs. Athletes' surveys were designed to evaluate athlete knowledge of concussive signs and symptoms and injury reporting. Coaches' surveys explored the understanding of concussive signs and symptoms and management practices. Medical staff surveys explored the standard of care regarding concussions. A total of 342 surveys were returned, for a 47% response rate. Descriptive analyses indicated 10% of athletes sustaining a concussion in the past year and 62% of these injuries were not reported, primarily due to the athletes not thinking the injury was serious enough. Coaches consistently identified non-concussion related symptoms (98.7%), but were unable to identify symptoms associated with concussion (38.9%). Most understood that loss of consciousness is not the sole indicator of injury (82.6%). Medical staff reported a heavy reliance on the clinical exam (92%) and athlete symptom reports (92%) to make the concussion diagnosis and return to play decision, with little use of neurocognitive (16.7%) or balance (0.0%) testing. Italian football athletes appear to report concussions at a rate similar to American football players, with a slightly higher rate of unreported injuries. Most of these athletes were aware they were concussed, but did not feel the injury was serious enough to report. Although coaches served as the primary person to whom concussions were reported, the majority of coaches were unable to accurately identify concussion related symptoms. With little use for neurocognitive and postural control assessments, the medical personnel may be missing injuries or returning athletes to play too soon. Collectively, these findings suggest that athletes, coaches, and medical personnel would benefit from concussion based educational materials on the signs, symptoms, and evaluative techniques of concussion.

Key words: Mild traumatic brain injury, symptoms.

Introduction

Football, or soccer in the United States, is easily considered the world's most popular sport with over 240 million regular participants(Fédération Internationale de Football Association (FIFA), 2008). As with other sports however, those participating in football are at risk for injury, including concussions. Until recently, loss of consciousness (LOC) has been used as the primary identifier of a concussion, although it is now known that only 10% of all cases involve LOC (Guskiewicz et al., 2000; Lovell et al., 1999). Other symptoms, such as headache, occur much more frequently(~80% of the time) (Ellemberg et al., 2009), but are often not revealed to teammates or medical personnel. Indeed, over half (53%) of concussed athletes fail to report their concussion because they did not think the injury was serious enough (63%), they did not want to leave the game (41%), or they did not know it was a concussion (36%) (McCrea et al., 2004).

In light of these findings, there has been a marked increase in educating athletes, coaches, and medical staff on injury severity and the importance of injury recognition. For example, the Centers for Disease Control and Prevention (CDC) launched the 'Heads Up' campaign (Centers for Disease Control and Prevention, 2005) designed to inform coaches and athletes about the signs and symptoms of concussion and proper injury management. The need for this toolkit is highlighted by findings indicating nearly half (42%) of youth sports coaches believed LOC is the hallmark of concussion and 26% would permit an athlete exhibiting concussion symptoms to return to play (Valovich Mcleod et al., 2007). By contrast, medical personnel have continually adapted their approach to concussion management with evolving guidelines supporting the implementation of neurostatus and/or neurocognitive exams and balance assessments to compliment the clinical examination (Aubry et al., 2002; Guskiewicz et al., 2004; McCrory et al., 2005; 2009).

The majority of investigations evaluating concussion knowledge and treatment practices among athletes, coaches, and medical staff have been completed on sports that lack world wide appeal (eg American football). Thus, little is known about concussion knowledge and treatment practices in those associated with globally popular sports such as football. Furthermore, no investigation has simultaneously administered survey instrumentation to athletes, coaches and medical staff of the same team. Thus, the intent of this investigation was to evaluate the concussion knowledge and medical practice among athletes, coaches and medical staff in Italian football clubs.

Methods

In 2009, 727 surveys (650 athletes, 43 coach, 34 medical) were distributed to the medical staff of 10 juvenile teams of Italian football clubs. The surveys were then disseminated to athletes and coaches who were asked to complete the survey on their own time and return it to the medical

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Table 1. Reasons provided for reporting the concussion. Responses are not mutually exclusive as the athletes were asked to rank all that apply.

	1st Reason	2nd Reason	3rd Reason	4th Reason	5th Reason	6th Reason	Total
Did not think the injury was serious	15		1	1			17
Concussions are part of the game	3	7	3	2	1		16
Did not know it was a concussion	2	7	1	2			12
Did not want to be removed from the game/practice	3	6	3				12
Did not want to let the team down		2	1		2	2	7

staff. Completed surveys were collected by the medical staff and returned to the investigative team. No attempt was made to follow-up with players, coaches or medical personnel that did not return surveys. Time to complete the survey was 5-10 minutes and informed consent exemption was obtained prior to administration of the forms.

The athlete survey was developed from previous investigations and designed to elucidate the athletes' concussion knowledge and how often and why the injury was or was not being reported (McCrea et al., 2004). The surveys distributed to the coaches were similar to prior works and intended to determine how coaches perceive concussions, their understanding of concussive signs and symptoms, as well as management practices (O'Donoghue et al., 2009). Medical staff surveys were developed from a variety of forms to elucidate concussion management practices (Notebaert and Guskiewicz, 2005; O'Donoghue et al., 2009; Valovich Mcleod et al., 2007). All questionnaires were written in English, translated by a native Italian speaker, and then translated back to English by a different native speaker to ensure proper word choice and phrasing in the Italian language. English versions of the surveys are provided in the Appendix.

Descriptive information and statistical analyses for each group was calculated using PASW Statistics (SPSS, Chicago, IL) with significance set *a priori* at $p < 0.05$. Based on the known relationship between previous history of concussion and future injury risk (Guskiewicz et al., 2003), a Chi-squared (χ^2) analysis was conducted to evaluate the relationship between concussion history during the previous and current seasons. A Pearson correlation was also conducted to evaluate the relationship between concussions during the previous and current seasons. Coaches' data analysis included Spearman's correlations between the years coaching and an athlete's concussion risk based on injury history, concussion signs and symptoms, loss of consciousness, and the severity of the terms 'dinger' / 'getting your bell rung.' Data analysis among the medical staff included Pearson correlations between age, years practicing, hours in the clinic, and hours with the team to the number of concussions evaluated annually and attempts to baseline test the athletes (Spearman correlation).

Results

Athletes

Among the 650 surveys distributed to the club level football players, 303 (46.6%) were returned. Not all athletes completed all aspects of the survey, so the data presented are relative to the valid responses. The athletes indicated a mean (standard deviation) age of 16.8 (3.0) years, 1.73 (.13) m, 65.5 (12.5) kg, and 8.9 (4.9) years of playing experience in the positions of defender (37%), mid-fielder (28.7%), forward (21.5%), and keeper (12.5%).

When questioned about concussions occurring prior to the current season, 15 (5.0%) athletes indicated they had experienced an injury with 14 indicating one previous concussion and one athlete with two concussions (278 indicated 'no' and 9 did not respond). The mean duration of symptoms was 3.1 (3.7) days with removal from participation 2.5 (4.0) days. When asked about concussions experienced in the current season, 29 (10.1%) athletes indicated they had sustained one (n = 24) or two (n = 5) injuries. When a concussion was sustained, symptoms lasted an average of 2.2 (1.6) days with a similar time removed from participation (2.1 (3.2) days). Among those indicating they had sustained a concussion during the current season, 18 (62.1%) indicated they did not report the injury to someone. The reasons for not reporting the injury are outlined in Table 1. When concussions were reported (n = 11), the athletes indicated they often disclosed the injury to multiple individuals, including the coach (n = 7, 38.9%), parents (n = 4, 22.2%), physiotherapist (n = 4, 22.2%), physician (n = 1, 5.6%) and teammate (n = 1, 5.6%).

The athletes were also asked to indicate if they were aware of any concussion among their teammates during the previous season. The majority indicated no (n = 229, 90.5%), while 9.5% (n = 24) indicated they knew of a concussed teammate (50 did not respond). A follow-up question as to why the teammate's injury was not reported indicated a belief that the injury was not serious (n = 16, 72.7%), not knowing it was a concussion (n = 4, 18.2%), not wanting to let the team down (n = 1, 4.5%) and believing that concussions are part of the game (n = 1, 4.5%).

Finally, the Chi-square analyses of the athlete surveys for current and past concussions revealed no significant relationships ($\chi^2 = 1.38$, $p = 0.24$). The correlational analysis of concussion frequency in the previous and current seasons could not be completed because only three athletes reported both prior and current injuries, all of whom sustained only one prior injury and one current injury.

Coaches

Among the 43 surveys distributed to club level football coaches, 27 (62.8%) were returned and used for analysis.

Table 2. Coaches indications of concussive signs and symptoms.

	Yes	No	Correct Response	Valovich-McLeod et al. (2007)
Drowsiness*	9	17	34.6%	
Eating more than usual	0	26	100.0%	
Hyperactivity	0	26	100.0%	
Excitement	0	26	100.0%	
Fatigue*	1	25	3.8%	
Talking more than usual	0	26	100.0%	
Difficulty Concentrating*	8	18	30.8%	
Calmness	0	26	100.0%	
Feeling Slowed Down*	6	20	23.1%	
Feeling Mentally Foggy*	8	18	30.8%	
Nausea*	8	18	30.8%	55.8%
Dizziness*	20	6	76.9%	88.5%
Difficulty Hearing	3	23	88.5%	
Headache*	21	5	80.8%	77.6%
Frustration	0	26	100.0%	
Impatient	0	26	100.0%	
Nervousness*	1	25	3.8%	
Sleeping More Than Usual*	2	24	7.7%	12.8%
Elation	0	26	100.0%	
Confusion*	16	10	61.5%	89.0%
Loss of Consciousness*	4	19	82.6%	42.3%

* indicates a sign or symptom commonly associated with concussion.

Not all coaches completed all aspects of the survey, so the data presented are relative to the valid responses. Those responding were 39.4 (9.3) years old with 6.5 (4.2) years of coaching experience as either a head coach (n=18, 66.7%) or assistant coach (n = 9, 33.3%) and predominately male (n = 26, 96.3%). Half had completed high school (n = 13, 50.0%), while the remaining had some high school education (n=3, 11.5%), some university education (n = 1, 3.8%), a bachelor's degree (n = 5, 19.2%), a professional degree (n = 2, 7.7%), or a doctorate (n = 2, 7.7%). None of the respondents reported attending a class or clinic specific to concussion, nor had they personally been diagnosed with a concussion.

When questioned about concussion risk, the majority (n = 18, 72.0%) understood that having a single concussion increases the risk of a second injury. Further questioning concerning the signs and symptoms indicated that the majority of coaches were able to accurately identify signs and symptoms not associated with concussion, but were less accurate in identifying those that are commonly associated with concussion (Table 2).

With regard to concussion assessment, most coaches indicated they would support baseline testing of their athletes if it resulted in a more informed medical decision (n = 22, 81.5%) or a faster return to play (n = 23, 85.2%). The specific contents of the baseline examination indicated little support for symptoms (n = 5, 18.5%), neurocognitive examination (n = 9, 33.3%), balance assessment (n = 6, 22.2%), and computed tomography (CT) or magnetic resonance imaging (MRI) scans (n = 7, 25.9%). The trend of misguided assessment techniques continued when asked about concussion diagnosis whereby 21 of 25 respondents (84%) indicated CT or MRI was the single best way to diagnosis a concussion.

The coaches' knowledge of concussion recovery indicates the majority support rest (n = 16, 59.3%) as the best course for recovery; followed by prescription medication (n = 7, 25.9%), imaging (n = 3, 11.1%), and exercise (n = 1, 3.7%). All of the respondents agreed that the medical staff should make the return to play decision, with the majority indicating this should occur once the athlete is symptom free (n = 19, 70.4%), has normal imaging (n = 7, 25.9%), or when the athlete indicated he/she is ready (n = 1, 3.7%). No coach indicated that he/she had ever placed pressure on the medical staff to return a concussed athlete nor had they ever knowingly returned a concussed athlete to a game or practice.

Correlational analyses between the years coaching and concussion risk relative to injury history; as well as years coaching and concussion signs and symptoms indicated no significant relationships (p's < 0.05) with the exception of headache ($r_s = -0.54$, $p = 0.004$). There was also a significant negative relationship between the years coaching and the understanding if 'dinger' / 'getting your bell rung' was a cause for concern ($r_s = -0.40$, $p = 0.04$)

Medical staff

Among the 34 surveys distributed to the medical staff of the football clubs, 12(35.3%) were returned and used for analysis. Not all medical personnel completed all aspects of the survey, thus the data presented are relative to the valid responses. Responses from the medical staff indicated they were 34.4 (6.0) years old, had 7.1 (4.6) years of experience, worked 37.3 (15.7) hours in the clinic, 18.5 (15.4) hours at the club, tended to 43.2 (33.8) athletes, and diagnosed 11 (mean 0.9 (1.1)) concussions in the previous season. They were predominately male (n=11, 91.7%) with training as a physiotherapist (n = 4, 33.3%), surgeon (n = 4, 33.3%), osteopath (n=2, 16.7%), exercise physiologist (n = 1, 8.3%), or in sports medicine (n = 1, 8.3%).

The majority of respondents indicated they completed baseline testing of the athletes (n = 11, 81.8%). Concussion diagnosis consisted primarily of the clinical exam (91.7%) and the use of athlete reported symptoms (91.7%) with minimal reliance on neurocognitive testing (16.7%), grading scales (8.3%), and balance testing (0.0%). Return to play decision making was driven by the

clinical exam (n = 8, 66.7%), followed by athlete reported symptoms (n = 4, 33.3%). When making the return to play decision, the medical staff reported being pressured by the coaching staff (n = 4, 33.3%) or the athlete (n = 2, 16.7%). None indicated that they had ever knowingly returned a concussed athlete to a game or practice.

The evaluation of medical staff's age and years practicing to the number of concussions evaluated each year or making an attempt to baseline test the athletes indicated no significant relationship (p's < 0.05). A significant positive relationship did exist between the number of concussions evaluated each year and time spent at the club (r = 0.67, p = 0.03) and a significant negative relationship relative to the number of hours spent in the clinic (r = -0.85, p = 0.03).

Discussion

Concussive injuries remain one of the most complex and poorly understood athletic injuries. In large part, injury identification relies on athlete self-report, while evaluation and treatment falls on the shoulders of medical personnel and often the coaching staff. This investigation is the first to simultaneously evaluate concussions and concussion knowledge among athletes, coaches, and the medical staff of Italian club level football (soccer). Despite findings that are similar to some previous investigations (detailed below), our results suggest that outside of the United States the unreported rate of concussions is high and knowledge about concussive injuries appears limited. This is particularly troubling given the known risks of one concussive injury followed by a second concussion within a relatively short time period (Cantu RC, 1995; Vagnozzi et al., 2007) and emerging evidence suggesting long-term cognitive health declines associated with multiple concussive injuries (Guskiewicz et al., 2005; 2007).

Athletes

It is largely believed that a significant portion of concussive injuries occurring during sporting activities go unreported. Indeed, the findings of this investigation from an athletic cohort participating in Italian football indicate that over 60% of concussions remain unreported and therefore untreated. This result is supported by our other findings indicating that 10.1% of athletes reported sustaining a concussion (reported and not), but only 5.3% (approximately half) of concussions were evaluated. This is comparable to the reporting patterns of adolescent American football (McCrea et al., 2004; Sallis and Jone, 2000) and New Zealand rugby athletes (Sye et al., 2006) who also reported only half of their injuries to a coach, parent, or medically trained individual.

Among the Italian athletes not reporting concussions, many believed the injury was not serious (94.4%) and most accepted concussion as part of the game (88.9%). Similarly, 72.7% of players that did not report a teammate's injury felt it was not serious. The American athletes' indicated similar responses with not thinking the injury was serious (66.4%) followed by not wanting to be removed from play (41.0%) (McCrea et al., 2004). While there are parallel justifications for not reporting injuries between the two investigations, cultural differences at the sport and national levels may explain the different under reporting explanations. For example, concussed rugby athletes in New Zealand have expressed that a concussed athlete should continue to play if the game/match is important and that concussed athletes have been pressured to continue playing (Sye et al., 2006). We do not know if the Italian athletes were pressured to continue playing, but we do find our results to be alarming. That is, these data suggest that the Italian athletes are aware they and their teammates have been concussed, but view the injury as an acceptable consequence of the game and thus fail to disclose them.

When concussions were reported to an authority figure, the coach (38.9%) was the most common followed by the physiotherapist (22.2%) and parent (22.2%). This pattern differs significantly from American football where the certified athletic trainer (ATC) appears to manage the majority of concussion cases (76.7%), followed by the coach (38.8%) and parent (35.9) (McCrea et al., 2004). These differences are likely explained by organizational differences between the two sports. That is, the investigation by McCrea was conducted in schools with a significant number of ATCs available during games and/or practices. In our investigation, only five of the medical staff respondents had full-time (~40 hours/week, n = 2) or half-time (~20 hours/week, n = 3) positions at the football club and it is likely that they may not be on the field at the time of injury. Conversely, coaches are available throughout all games and practices, making them the lead authority figure to which injuries could be reported. Thus, following a reported incident to a coach, we speculate the athlete may be referred on to the physiotherapist or parent for further evaluation. In light of this, additional educational materials on concussion should be provided to the coaching staff and a plan should be in place for injury information to be disseminated from the coach to the appropriate medical professional.

Coaches

Our survey of coaches focused primarily on their concussion knowledge in both recognizing and evaluating the injury. All of our respondents indicated they had no formal concussion training, despite being the primary individual to evaluate the injury among this population. Regardless, the majority clearly understood that a concussion history can increase the risk of future injuries (72.0%) and LOC is not the sole indicator of injury (82.6%). This was significantly better than the 50% of American youth coaches from mixed sports that indicated LOC was a requirement for concussion diagnosis (Valovich Mcleod et al., 2007).

When questioned about specific symptoms, the response from our coaching sample was mixed. The majority of Italian football coaches accurately identified non-concussion related symptoms (eg eating more), but were poor at identifying concussion related symptoms (eg drowsiness: Table 2). Overall, Italian coaches accurately identified those symptoms not related to concussion 98.7% of the time, but only 38.9% identified symptoms that are associated with concussion. By contrast American coaches were worse at identifying non-concussion symp-

toms (57.5%) and slightly better at identifying concussion symptoms (61.0%) (Valovich Mcleod et al., 2007). We are thusly troubled by the inability of coaches, who often serve as the primary caregiver for concussive injuries in both countries, to accurately identify this injury. Other factors, such as personal concussion history and concussion workshop attendance have been attributed to improved concussion awareness (O'Donoghue et al., 2009). These relationships however, could not be evaluated due to a lack of positive responses to either question.

In regard to concussion diagnosis and return to play criteria, although we included only the most common evaluative techniques, the coaching sample indicated MRI (50.0%) or CT (46.2%) scans were the best. While traumatic brain injuries resulting in cerebral bleeding can and do result from sport participation, they are rare. The imaging of concussions with standard techniques will not yield positive findings (McCrory et al., 2009) as the injury represents a functional change rather than structural damage (Giza and Hovda, 2001). Indeed, recent experimental and clinical data demonstrate that concussion is responsible for a substantial alteration of neuronal cell energy metabolism, an expression of a subcellular functional damage. The biochemical derangement reverses spontaneously, but is impossible to image with standard neuroradiology (McCrory et al., 2009). However, in the case of this investigation we enrolled football clubs (and thusly coaching and medical staff) that had participated in the development of ^{1}H-Magnetic Resonance Spectroscopy (MRS) scans to monitor the transient post-concussive induced alterations of brain injury metabolism (Vagnozzi et al., 2007; 2008). The use of this novel imaging technique among the sampled cohort likely explains the heavy reliance on imaging and is a limitation to our findings. MRS has shown promise in informing the return to play decision, but along with other imaging techniques, it cannot be used as a sideline diagnostic tool. Thus, the coaches lack of support for the clinical examination and other evaluative measures during the baseline and immediate post-injury assessments may ultimately be detrimental to the injured athlete's health. Educational programs may reduce some of the misunderstanding. For instance, in the United States the CDC's 'Head's Up' toolkit on concussion has been widely distributed and implemented with great success (Sarmiento et al., 2010; Sawyer et al., 2010) and supports the use of a multi-faceted approach to concussion assessment.

Finally, there was strong consensus among the coaches that athletes should be symptom free prior to returning to play (70.4%) and unanimous agreement that the medical staff should make the final playing decision and that they had never pressured the medical staff to return an athlete. This varies slightly with the Valovich-McLeod finding that only 61.5% of coaches felt the athlete needed to be symptom free(Valovich Mcleod et al., 2007).

Medical staff

Our medical staff survey focused primarily on concussion assessment and management. The significant relationship between the number of hours worked at the club and the number of concussions diagnosed supports the previous finding of coaches being the first to evaluate concussed athletes. The medical staff did report evaluating an average of 0.9 concussions per year or 11 total injuries within the previous year, identical to the number of concussions reported by the athletes.

The majority of our medical personnel (75%) reported attempting to administer baseline testing to the athletes. Although we failed to ask what tests were being used for the baseline assessment, a preponderance of respondents (91.7%) indicated the clinical exam and athlete reported symptoms were their primary choice for concussion assessment. The minimal reliance on objective measures of balance or neurocognitive testing that provide sensitivity to the subtle cognitive decrements induced by concussion (Broglio and Puetz, 2008) is in contrast with the tools commonly used by ATCs (Notebaert and Guskiewicz, 2005). Use of these tools is warranted by speculation that athletes may suppress symptoms to accelerate return to play. Indeed, even in instances when athletes are openly reporting symptoms, many may not be able to accurately identify cognitive and balance symptoms (Broglio et al., 2009a) and up to 35% of athletes reporting no symptoms continue to have neurocognitive deficits (Broglio et al., 2007a) and metabolic dysfunction (Vagnozzi et al., 2008).

However, accessibility to tests such as neurocognititve evaluations is of concern. For example, one investigation found that a large percentage (66%) of primary care providers were aware of the benefits of neurocognitive testing, but only 16% had access to testing within one week of injury (Pleacher and Dexter, 2006). Thus, in combination with the ^{1}H-MRS imaging that many of the medical staff have previously used, it would be beneficial to consider the addition of tests that can be administered and interpreted by the primary care provider. For example, neurostatus exams such as the Standardized Assessment for Concussion (SAC) (McCrea et al., 1998) and the Sideline Concussion Assessment Tool II (SCATII) (McCrory et al., 2009) used in combination with balance testing, such as the Balance Error Scoring System (BESS), may be helpful.

Finally, perhaps the most interesting finding from the medical staff survey was the report of coaches pressuring the staff to return athletes to play prior to full recovery. This is in direct contrast with the coaches' reports of never pressuring medical personnel. Our survey was not designed to identify an explanation for this finding, but we speculate that coaches may have unknowingly or unintentionally questioned the medical staff in a way that was interpreted as coercive.

Conclusion

On a global scale concussions incurred during sporting activities are a major medical concern. In the United States alone, sport related concussions account for $17 billion in medical expenses (Thurman et al., 1999) resulting from the 1.6 to 3.8 million injuries that occur annually (Langlois et al., 2006). A portion of these injuries will occur from American football participation where 3.6 to 5.6% of the athletes will be concussed each year (Guskiewicz et al., 2000; Powell and Barber-Foss, 1999).

This translates to 43,200 to 67,200 concussions (Broglio et al., 2009b) among the 1.2 million annual participants in American football. However, based on our estimates for unreported concussions in Italian football we approximate that of the 21 million adolescents worldwide that annually participate in football (Fédération Internationale de Football Association (FIFA), 2008), nearly 2.1 million concussions will occur, over half of which will go unreported and untreated. Thus, the global health implications for concussions in those participating in international football are far more significant and identifying and treating those with concussions may ultimately reduce the economic burden of the injury.

This investigation was the first survey of concussion incidence, knowledge, and evaluation techniques to be simultaneously conducted on athletes, coaches, and medical staff from the same athletic setting. In the final analysis the most significant finding was a clear need to educate athletes about concussive signs and symptoms. It is evident that the high levels of unreported concussions extend beyond American football and into other sports and cultures. While the implementation of additional medical staff will assist in the management of these injuries, nothing can be done until the athletes are aware of the seriousness of brain injury and are willing to report their injury and that of their teammates.

Further education should be made available to coaches and medical staff on the benefits of baseline testing and the specific tests to be included. The most recent position statement from the Concussion in Sport Group (McCrory et al., 2009) supports baseline testing all athletes at high risk for concussion with measures of symptoms, neurocognition and postural control. While imaging techniques have their place in ruling out more substantial injuries, the combined use of these objective measures offer the greatest sensitivity to concussion (Broglio SP et al., 2007b) and removes much of the subjective process inherent to the clinical examination.

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Key points

- Italian football (soccer) athletes report less than 40% of concussions.
- Injuries are most commonly reported to coaches, who may not be fully aware of concussive signs and symptoms.
- International educational measures on concussion awareness and management may be of use.

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APPENDIX

ATHLETE SURVEY ON CONCUSSION

Please complete the following questions as honestly as possible and return the completed form in the self-addressed stamped envelope. Your answers are completely private and will not be shared with coaches or staff.

Age _____ *Height* _____ *Weight* _____

Gender: Male Female

Primary Sport _____ *Position you play the most* _____
How many years have you been playing this sport? _____

Has a doctor said you have a learning disability (LD/ADD/HD)? Yes No

Use the following definition of concussion to answer the questions below

Definition of concussion: **A concussion is a blow to your head that causes a variety of symptoms that may last for a short period of time, such as a few plays or minutes of a game, or a longer period of time. These symptoms may include any of the following:**

- Headache
- Difficulty concentrating or focusing
- Feeling slowed down
- Dizziness or balance problems
- Nausea
- Fatigue
- Feeling like your in a fog
- Drowsiness
- Forgetting things
- Sensitivity to light
- Loss of balance
- Sensitivity to noise
- Blurred vision

IMPORTANT: A) **you can have a concussion** without **being "knocked out" or unconscious**

B) getting your "bell rung" **IS** a concussion

Not including the most recent season, *have you ever been told you had a concussion by an physiotherapist or doctor resulting from sports?*

_____Yes, how many concussions before this season? _____ No_____
If yes, please complete the following

	Approximate Date (month/ year)	How many days did you have any symptoms listed above?	How many days did you sit out of your sport because of the injury?
Injury #1			
Injury #2			
Injury #3			
Injury #4			
Injury #5			

PLEASE TELL US ABOUT THE MOST RECENT SPORTS SEASON

*12) In only the last playing season, did **you** experience any of the symptoms listed above or have a concussion playing your sport this school year after a blow to the head, even if you didn't tell anyone?*

_____ Yes, how many times in the previous sports season? _____ No_____

	Approximate Date (month/ year)	How many days did you have any symptoms listed above?	Did you report your injury to anyone?	How many days did you sit out of your sport because of the injury?
Injury #1			Yes No	
Injury #2			Yes No	
Injury #3			Yes No	
Injury #4			Yes No	
Injury #5			Yes No	

13) If you had an injury, to whom did you report your concussion? (check all that apply)

_____ Physiotherapist _____ Coach _____ Parent

_____ Teammate _____ Doctor _____ Other, who?_____

14) If you did not report your concussion to anyone, why not? (put a "1" by the first reason, "2" by the second reason, etc… for all that apply)

_____ Didn't think it was serious enough _____ Didn't know it was a concussion

_____ Didn't want to be pulled out of the game/practice _____ Didn't want to let teammates down

_____Having a concussion is part of the game _____ Other (why?)_____

*15) Did **one of your teammates** experience any of the above symptoms after a blow to the head, even if no one told anyone?*

_____ Yes, how many times in the previous sports season? _____ No_____

If you did not report the concussion to anyone, why not? (put a "1" by the first reason, "2" by the second reason, etc… for all that apply)

_____ Didn't think it was serious enough _____ Didn't know it was a concussion

_____ Didn't want him/her pulled out of the game/practice _____ Didn't want to let teammate down

_____Having a concussion is part of the game _____ Other (why?)_____

COACHES SURVEY ON CONCUSSION

Please complete the following questions as honestly as possible. Your answers are completely private and will not be shared with anyone.

*Age:*_____ *Gender*: Male Female

Education: ___Some High School ___Master's / Professional degree

___High school diploma ___PhD, EdD, or equivalent
___Some college / 2 year degree ____Other_____
___Bachelor's degree

Primary coaching position: Head Coach Assistant Coach
*Number of years coaching in this position*_____

Have you ever attended a clinic or taken a class on concussion? Yes No

Have you ever been diagnosed with a concussion? Yes No

Do you feel having a history of concussion makes an athlete more likely to experience a second injury
True False

Please indicate all symptoms you associate with concussion (Check all that apply).

____Drowsiness
____Eating more than usual
____Hyperactivity/high energy
____Excitement/happiness
____Fatigue
____Talking more than usual
____Difficulty Concentrating
____Calmness
____Feeling Slowed Down
____Feeling Mentally Foggy
____Nausea
____Dizziness/Balance Problems
____Difficulty hearing
____Headache
____Frustration
____Impatient
____Nervousness
____Sleeping More than Usual
____Elation
____Confusion

Must an athlete be knocked out (ie loss of consciousness) in order for him/her to have a concussion?
Yes No

Getting your "bell rung, knocking the cobwebs out, or a dinger" are all part of the game and not cause for concern
True False

Which of the following is the single best way to diagnose a concussion?
____X-ray
____MRI (Magnetic Resonance Imaging)
____CT Scan (Computed tomography scan)
____Clinical Assessment

Some medical organizations recommend a baseline/pre-season evaluation of athletes at risk for concussion. What measures do you feel should be included in this assessment (check all that apply)?

____Symptom report
____Neurocognitive examination
____Balance assessment
____Imaging study such as MRI or CT scan
____X-ray

Would you be interested in baseline testing your team (~ 30 min per athlete) if it meant the athletic trainer could make a more informed medical decision when dealing with concussions? **Yes No**

Would you be interested in baseline testing your team (~ 30 min per athlete) if it meant the physiotherapist would be able to return concussed athletes to play sooner by having more information on hand? **Yes No**

Following a concussion, what is the best course for recovery?

____X-rays and/or other imaging done by doctors
____Time to rest
____Exercise without contact to the head
____Prescription medication from your physician

Who is best trained to determine when a concussed athlete should return to play?

_____The athlete _____Physiotherapist/physician
_____Coaches _____Club Owners
_____Parents

In the event of a diagnosed concussion, when do you feel the athlete should return to full participation

_____During the same practice or game as the injury
_____Once the athlete indicates he/she is ready to return
_____Once he/she no longer reports having a headache
_____If the imaging study (CT, MRI, or x-ray) comes back normal
_____A minimum of one week (7 days) following the injury
_____When all symptoms have resolved and he/she is cleared by a doctor/physiotherapist

Would you like to receive more information/education on concussion? Yes No

If yes, what would you be interested in (check all that apply)?

_____Pamphlets and flyers
_____Presentations
_____Websites
_____Books
_____Other_____

Have you ever pressured an athlete, parent, physiotherapist, or physician to return a concussed athlete to play before he/she has recovered? Yes No

Have you ever knowingly returned a concussed athlete to play prior to full recovery?
Yes No

MEDICAL STAFF SURVEY ON CONCUSSION

Please complete the following questions as honestly as possible. Your answers are completely private and will not be shared with anyone.

Age _____ *Gender*: Male Female *Years practicing* _____

Approximate hours per week spent at a: Clinic_____ Club_____

What is your highest level of education?

___Some High School
___High school diploma
___Some college / 2 year degree
___Bachelor's degree
___Master's / Professional degree
___PhD, EdD, or equivalent
____Other_____

Approximate number of concussions you evaluated this past sport season _____

Please indicate the number of athletes on the roster for each sport over the last semester. Place an 'X' on the line to indicate your school doesn't have that sport.

Soccer (men's) _____ Soccer (women's) _____ American Football_____

Basketball (men's) _____ Basketball (women's) _____ Wrestling_____

Ice Hockey (men's) _____ Ice Hockey (women's) _____ Field Hockey_____

Lacrosse (men's) _____ Lacrosse (women's) _____ Cheerleading (men) _____
(women) _____

Do you make an honest attempt to baseline test you athletes at high risk for concussion?

_____Yes _____No: If "No," why? _____

What method(s) do you utilize to assess/diagnose concussion? (place a "1" by the primary method, "2" by the second method, etc… for all that apply)

_____Clinical Examination _____Symptom Checklist

_____Concussion Grading Scale _____Standardized Assessment of Concussion (SAC)

_____ Neurocognitive testing (Computer) _____Balance Error Scoring System (BESS)

_____ Neurocognitive testing (Pen/pencil) _____Other? _____

What methods do you typically utilize to make decisions about return to play after concussion? (place a "1" by the primary method , "2" by the second method, etc… for all that apply)

_____Clinical Examination _____Neurocognitive testing (Computerized)

_____Physician recommendations _____Neurocognitive testing (Paper/pencil)

_____Concussion Grading Scales/ Return to Play Guidelines _____Balance Error Scoring System (BESS)

_____Head CT/brain MRI

_____Symptom Checklist _____Player self-report

_____Standardized Assessment of Concussion (SAC) _____Other? _____

Do you use computer testing for concussion diagnosis or return to play decisions?

_____Yes _____No

If you indicate using a computerized neurocognitive test, please indicate which one:

_____Automated Neuropsychological Assessment Metrics (ANAM),

_____CogSport

_____ Headminder Concussion Resolution Index (CRI)

_____Immediate Postconcussion Assessment and Cognitive Testing (ImPACT)

_____Other_____

Why have you elected use computerized software over paper and pencil testing? (put a "1" by the primary reason, "2" by the second reason, etc… for all that apply)

_____Fast and easy to administer _____Improved accuracy of measures

_____Easy to interpret results _____Software was in place when you arrived

_____ Other_____

Have you ever been pressured by any of the following to return a concussed athlete to play before he/she has recovered? (put a "1" by the person(s) who give the most pressure, "2" by the person(s) applying the second most, etc… for all that apply)

_____ Coach
_____ Doctor
_____ Injured athlete
_____ Other_____

_____ Parent
_____ Administrator
_____ Athlete's teammate

Have you ever knowingly returned a concussed athlete to play prior to full recovery?

_____Yes _____No