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Football-specific extension of the IOC consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020

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► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2022-106405>).

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Accepted 19 December 2022
Published Online First
6 January 2023

ABSTRACT

Several sports have published consensus statements on methods and reporting of epidemiological studies concerning injuries and illnesses with football (soccer) producing one of the first guidelines. This football-specific consensus statement was published in 2006 and required an update to align with scientific developments in the field. The International Olympic Committee (IOC) recently released a sports-generic consensus statement outlining methods for recording and reporting epidemiological data on injury and illness in sport and encouraged the development of sport-specific extensions. The Fédération Internationale de Football Association Medical Scientific Advisory Board established a panel of 16 football medicine and/or science experts, two players and one coach. With a foundation in the IOC consensus statement, the panel performed literature reviews on each included subtopic and performed two rounds of voting prior to and during a 2-day consensus meeting. The panel agreed on 40 of 75 pre-meeting and 21 of 44 meeting voting statements, respectively. The methodology and definitions presented in this comprehensive football-specific extension should ensure more consistent study designs, data collection procedures and use of nomenclature in future epidemiological studies of football injuries and illnesses regardless of setting. It should facilitate comparisons across studies and pooling of data.

INTRODUCTION

Continuous injury and illness surveillance is essential to assess and direct efforts to improve athlete health. Several consensus statements aimed at standardising methodology and reporting of epidemiological studies were published during the 2000s for both team and individual sports.^{1–12}

The first consensus statement on injury definitions and data collection procedures in football was published in 2006,³ but requires an update to align with scientific developments on several aspects including onset, recurrent complaints and the inclusion of illness registration. The International Olympic Committee (IOC) recently released a

Key points

- ⇒ Standardised methods and reporting of studies on injuries and illnesses in sports are important to improve injury and illness management and prevention strategies.
- ⇒ The consensus statement for football published in 2006 covered only methodology in football injury epidemiological studies and required updating to align with scientific developments.
- ⇒ A diverse expert panel agreed on several recommendations in a football-specific extension of the International Olympic Committee (IOC) consensus statement on methods for recording and reporting epidemiological data on injury and illness in sport.
- ⇒ The main amendments from the IOC consensus statement were to use football-specific terminology, to define return to football after a health problem, to categorise the severity of a health problem in more detail, and to define match and perimatch exposures.
- ⇒ The proposed methodology and definitions presented in this comprehensive football-specific extension should ensure more consistent study designs, data collection procedures and use of nomenclature in future surveillance studies of football injuries and illnesses.
- ⇒ Methodological consistency should facilitate comparisons across studies and pooling of data.

sports-generic consensus statement on the methods for recording and reporting epidemiological data on injury and illness in sport.¹³ In that statement (hereafter referred to as the IOC consensus statement), there was a call for subsequent sport-specific extensions with more detailed recommendations relevant to a sport and/or setting. Sports-specific extensions have subsequently been published over the last 2 years for golf, tennis, cycling and Para sports.^{14–18} Sport-specific extensions should result



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To cite: Waldén M, Mountjoy M, McCall A, et al. *Br J Sports Med* 2023;**57**:1341–1350.

Consensus statement

in more consistent study designs, data collection procedures and nomenclature in future injury and illness surveillance studies in the sports targeted.

The objective of this comprehensive consensus statement is to provide a football-specific extension, with updated methodology and reporting of epidemiological studies in football.

METHODS

The Fédération Internationale de Football Association (FIFA) Medical Subdivision and the associated Medical Scientific Advisory Board initiated this project.

Project planning and panel selection

A steering group (MW, TEA, MM, AMc and AMa) was established to plan the consensus procedure and the consensus meeting. A first online meeting was held on 8 March 2021 when potential participants based on scientific merits, different expertise fields, previous consensus experience, international confederation representation and equity were identified by the steering group. A second online meeting was held on 28 September 2021 at which AS joined the steering group, and the participant invitation list was finalised. AMa sent official invitation letters in October 2021, and all invitees except one accepted the invitation to participate and were available for the consensus meeting scheduled for 14–15 March 2022.

The consensus panel consisted of members of the FIFA Medical Subdivision and its Medical Scientific Advisory Board (including all steering group members) and representatives of the FIFA Medical Committee, the FIFA Medical Centres of Excellence and all six FIFA confederations worldwide. The panel members represented multiple stakeholder groups with relevant professions and expertise and reflected a broad range of clinical, scientific, sex and geographical representation (online supplemental table 1). The panel and author list consist of five women and eleven men, ages 28–77 years. Eleven panel members are physicians from different disciplines, three are sports scientists and two are sports physiotherapists. In order to include relevant stakeholder perspectives, we additionally invited two players and one coach from men's and women's professional football through personal connections. They participated online during parts of the consensus meeting and shared their personal perspectives and experiences with injuries and illnesses via a discussion with the panel members. They declined to participate in the voting procedures and in the writing of the manuscript.

Meeting preparations and working groups

The steering group reviewed all existing consensus statements on injury and illness surveillance in sport and divided the panel members into working groups at the beginning of January 2022. The working groups were tasked to comprehensively review different subtopics in line with the subsections and main subheadings of the IOC consensus statement. Each working group consisted of 2–3 experts, led by a FIFA Medical Scientific Advisory Board member, and was given 4 weeks to draft an overview document of their topic. This overview document included the following points:

- ▶ Descriptions/definitions from previous relevant consensus statements.
- ▶ A brief summary of the IOC consensus statement recommendation(s).
- ▶ Any potentially relevant adjustments from consensus extensions of other sports.

- ▶ Non-systematic literature reviews of relevant topic-specific publications similar to the IOC consensus statement and other sport-specific extensions.
- ▶ Initial preliminary recommendations for amendments and suggested voting statements for the consensus meeting.

Pre-meeting voting on the preliminary recommendations

The steering group reviewed the documents from all working groups in mid-February 2022, collated and aligned the voting statements related to each topic, and subsequently circulated for anonymous voting to all participants using a Microsoft Forms online questionnaire. Participants were given 1 week, including one reminder after 5 days, to complete the voting. Each statement was scored independently by all participants (100% response rate) using a 9-point Likert scale ranging from 1 (strongly disagree) to 9 (strongly agree), based on the Grading of Recommendations Assessment, Development and Evaluation scale.¹⁹ For each topic, there was also an optional free text box to allow participants to provide further comments on their scoring and to propose new or modified statements. A priori, we decided that agreement was reached if $\geq 70\%$ of participants scored 7–9 and $< 15\%$ of panel members scored 1–3, and disagreement if $\geq 70\%$ scored 1–3 and $< 15\%$ of panel members scored 7–9, respectively.²⁰ Finally, the steering group reviewed the premeeting voting results, the optional free text comments, and any new or modified statements to develop the agenda and voting statements for the consensus meeting. The panel agreed on 40 of 75 pre-meeting voting statements (online supplemental table 2).

Consensus meeting

The consensus meeting took place in Zurich, Switzerland, 14–15 March 2022. Given the travel restrictions associated with the COVID-19 pandemic, one participant (MF) joined online, whereas the rest of the panel participants were present in-person. The steering group lead (MM) chaired the meeting. A working group representative presented their recommendations and discussion points along with the corresponding premeeting voting results and free-text comments. Statements reaching premeeting voting agreement were not discussed further unless there were related free text comments. All participants were provided the opportunity to present their views on statements not reaching premeeting agreement. Following each topic discussion, a subsequent round of anonymous voting, using the same scoring as for the premeeting voting, was carried out for all original statements that did not reach agreement initially as well as for all new and modified statements. The panel agreed on 21 of 44 meeting voting statements (online supplemental table 2).

Manuscript preparation

Following the consensus meeting, the steering group prepared a first draft of the manuscript and circulated it to the panel members for review. After that, based on feedback, a second draft was prepared and sent to all authors for final comments/approval. The manuscript was prepared while considering recent methodological recommendations,^{21 22} as well as the consensus-specific author guidelines.²³ In particular, panel members were informed that they were able to present their potential dissent on statements that reached group agreement by writing a minority opinion in online supplemental table 2.

CONSENSUS RECOMMENDATIONS

The following sections provide an overview of recommended amendments to the IOC consensus statement with a summary in [table 1](#).

Table 1 Summary of the main additions and modifications to the IOC consensus statement¹³ relevant to football

Topic	Amendments
Sport, athlete and competition	Football, player and match
Mechanism of injury	Football-specific player actions to be reported for sudden-onset injuries
Injury diagnosis	Hip and groin categorised separately (and not combined), and adding complete and partial tendon avulsions to the descriptive notes for tendon rupture
Table 6	Adding percentage to the absolute number of injuries and to report the IQR for median time-loss days (not the CI)
Table 6	Less focus on upper limb injuries and more focus on lower limb injuries
Injury severity categories	0 days, 1–3 days, 4–7 days, 8–28 days, 29–90 days, 91–180 days and >180 days
Return to football	The date when the injured player returns to full unrestricted team training without modifications in duration and/or activities
Match exposure	Organised scheduled match play between opposing teams (not including internal training matches within the same team/club)
Prematch warm-up	Reported as a separate training category
Postmatch cool-down	Reported as other training
Rehabilitation sessions	Excluded from training exposure
Expressing risk	Reporting measures of occurrence
Players (according to age)	Adults or youths
Players (according to contract)	Amateurs or professionals
Players (non-organised)	Recreational players
Playing level	International league ranking (where accessible) and actual playing division (out of the total number of divisions in the league system) to be reported
IOC, International Olympic Committee.	

A full list of voting results, including any dissenting opinions or areas of disagreement, can be found in online supplemental table 2. A plain language summary is enclosed in online supplemental table 3. To adapt the general terminology to football, we agreed to replace athlete with player, sport(s) with football and competition with match throughout this consensus extension.

Defining and classifying health problems

Terminology

We support the IOC consensus statement definition of a health problem. For clarity, we integrated the health definition from the WHO and reformulated the wording to ‘any condition that reduces a player’s normal state of complete physical, mental and social well-being, irrespective of its consequences on the player’s football participation or performance or whether the player sought medical attention’. We agreed to adopt the recommended separation of health problems by their consequence of any complaint, medical attention and time loss.

Defining injury and illness

To harmonise with the separate categorisation of health problems according to the relationship to sports activity, we agreed to remove ‘participation in sports (football)’ in the definition of *injury* from the IOC consensus statement. Thus, the recommended definition of injury is: ‘tissue damage or other derangement of normal physical function, resulting from rapid or repetitive transfer of kinetic energy’. The definition of illness was modified by adding the word ‘health’ and replacing ‘related to’ with ‘considered as’. The recommended definition of illness is: ‘a health complaint or disorder experienced by a player not considered as an injury’. For example, a mental illness can be considered ‘related to’ a long-term injury but cannot be ‘considered as’ an injury.

Relationship to football activity

We recommend using the definition from the IOC consensus statement, dividing health problems as resulting directly from participation in football, indirectly from participation in football, or not at all related to participation in football.

Mode of onset

There was agreement to recommend using the definition of mode of onset from the IOC consensus statement, dividing health problems by presentation into sudden onset and gradual onset.

Mechanism of injury

The consensus of the panel was to recommend using the definition of mechanism of injury from the IOC consensus statement, dividing the sudden-onset injuries by mechanism into non-contact, indirect contact (person or object) and direct contact (person or object). For other football-specific contact categories, we added categories of person into opponent, team-mate, match official, pitch invader and other pitch-side staff, and objects into ball, goal post, pitch object, object from the crowd, and other (unspecified) object. Furthermore, we recommend expanding on the main injury-inciting circumstance by providing a general impression of the football-specific player actions that should be reported for all sudden-onset injuries (table 2). We recognise that there might be some overlap between actions (eg, if a player is running with the ball and simultaneously being tackled). In such cases, the player action considered most relevant for the injury should be selected. We acknowledge that this table requires additional validation and may likely be modified in the future as well as it only provides a general impression of injury mechanisms. A more detailed analysis of the injury inciting circumstances of specific injuries is recommended to better understand potential injury mechanisms. This can follow more comprehensive standardised reporting, such as recommended in the Football Injury Inciting Circumstances Classification System.²⁴ Ideally, video reviews are recommended to be performed by both analysts and injured players, as this can potentially assist in determining a more accurate time of injury/symptom onset. For sudden-onset match injuries, details on any rule infringement (foul/no foul and any cards awarded by the referee to the players involved) should be reported.

Multiple events and health problems

We agreed to recommend using the system from the IOC consensus statement on how to record multiple health problems during the study period (see figure 2 in that statement). The

Consensus statement

Table 2 Recommended reporting categories and definitions of player actions at the time of a sudden-onset injury

Player action	Definition
Running	Running at any speed (acceleration/steady speed/deceleration), including linear, curved or other types of runs with or without the ball
Change of direction	A specific moment in a run with a sharp deviation (any angle) from the line of running with and without the ball
Kicking	Any type of kick, including shooting/passing/crossing/set pieces/penalty
Heading	Heading or attempting to head the ball (in a duel or alone)
Tackle	Injured player being tackled or is tackling an opponent with any body part
Landing	Landing on one or both feet after a jump
Falling	When a player is falling or diving—for example, loses balance/stability and ends up on the ground with any part of the body other than the feet
Controlling the ball	When a player attempts to control the ball—for example, while receiving the ball, reaching for the ball or sliding for the ball (not a sliding tackle)
Hit by ball	Any hit by the ball including a block, deflection or other accidental hits
Collision	Players unintentionally running/jumping into each other, the goal post or any other object on/around the pitch
Other player action	For example, a throw-in, setting off in a jump, or specific goalkeeper actions not included in the other categories
Unknown	The action of the player at the time of injury is unknown: either not witnessed by others, or the player is unable to recollect

number of reported health problems and the number of players affected must be reported because these measures will unlikely be the same.

Subsequent, recurrent and/or exacerbation of health problems

We agreed to recommend using the categories from the IOC consensus statement where it should initially be determined whether a health problem following an index injury/illness is a subsequent injury/illness to the same location (body area/system) or a subsequent new injury/illness. As this is not clearly specified in the IOC consensus statement, we recommend that a subsequent health problem is called a recurrence if it is the same type/diagnosis; if not, it is called a subsequent local injury/illness. For recurrences, if the player's health problem was fully healed/recovered and the player has returned to football, the subsequent health problem is called a reinjury/repeated illness; if not, it is called an exacerbation (table 3).

A typical football-relevant example of an exacerbation is gradual-onset tendinopathies, where players can often play matches in parallel with modified football training and rehabilitation. Consequently, this injury is counted only once rather than recording several early reinjuries, which would distort the overall injury statistics; one further example of how to record subsequent injuries is seen in table 3. We recommend reporting details on injury recurrence in days rather than the categorisation of 'early' (within 2 months following return to football), 'late' (two to twelve months) and 'delayed' (more than twelve months) recurrences as was originally recommended in the 2006 football consensus statement.³

Football injury and illness diagnoses

We recommend classifying injuries according to body regions/areas, tissue types and pathology, and illnesses using organ systems/regions and aetiology, as categorised in tables 4–5 and 7–9 in the IOC consensus statement. Exceptions include dividing the body area 'hip/groin' to 'hip' and 'groin' and adding 'complete and partial tendon avulsions' to the notes for the pathology type tendon rupture.

The separation of the hip and groin areas will affect the grouping of diagnoses used in diagnostic coding systems and will need further standardisation to ensure reliable categorisation. For example, when using the Orchard Sport Injury & Illness Classification System (OSIICS),²⁵ we recommend to group diagnostic codes related to:

- ▶ Hip joint under 'hip' (codes beginning with GA, GC, GD, GE, GG, GL, GQ).
- ▶ Muscles, tendons, bursae, abrasions etc (codes beginning with GB, GH, GI, GK, GM, GN, GO, GR, GT) may be grouped according to their position:
 - Anterior locations grouped under 'groin'.
 - Lateral and posterior locations under 'hip'.
- ▶ Bone stress, fractures and non-specific diagnoses (codes beginning with GF, GG, GJ, GP, GS, GU, GZ) may be differentiated according to their proximity to either the pubic symphysis or the hip joint.

The IOC consensus statement recommends a structured, standardised overview table (see table 6 in that statement) to provide an overview of the most common injuries. We agreed to modify this table according to the most common injuries in football. We also recommend reporting the percentages of all injuries with

Table 3 Examples of how to record subsequent injuries in football

Index injury Diagnosis and injury date	Subsequent injury Diagnosis and injury date	Subsequent injury to the same location?	Same type/diagnosis as the index injury?	Was the index injury healed/fully recovered?	Classification
Biceps femoris muscle injury (right) 21 November 2022	Biceps femoris muscle injury (right) 18 December 2022	Yes	Yes	Yes	Recurrence: Re-injury
	Biceps femoris muscle injury (right) 29 November 2022	Yes	Yes	No	Recurrence: Exacerbation
	Semimembranosus muscle injury (right) 18 December 2022	Yes	No	N/A	Subsequent local injury
	Biceps femoris muscle injury (left) 18 December 2022	No	N/A	N/A	Subsequent new injury
N/A, not applicable.					

the absolute numbers and the median with the IQR for time-loss days instead of a 95% CI. We recommend the revised overview table in the main manuscript be the minimum requirement for each future study (table 4). Importantly, studies should also specify data on training and match injuries in a separate table or an online supplemental file. We recommend that authors create at least one expanded table in an online supplemental file using the same structure and column headings but with a more extensive overview of diagnoses, ensuring player confidentiality for injuries with small numbers. Especially if the study objective is on specific injury types (eg, muscle injuries or fractures) and specific populations (eg, detailed apophysis injuries in youth players), it will also facilitate improved future pooling of data from studies.

There was an agreement to record and classify multiple injuries in the same event separately but only to count once for incidence calculations as per the IOC consensus statement. Injury severity should also be based on the principal (most severe) injury. For example, when a player sustains a wrist sprain and an anterior cruciate ligament (ACL) injury of the knee after a one-legged landing and fall following a heading duel, these injuries should be counted only once in the incidence statistics, and the severity determined according to the ACL injury.

Finally, we also encourage researchers to use recommended and updated sports-specific diagnostic coding systems, such as the Sport Medicine Diagnostic Coding System or the OSIICS, which has an accompanying Excel data file.²⁶

Severity of health problems and return to football

Time-loss data distribution is likely to be right-skewed.¹³ Therefore, in line with the IOC consensus statement, aggregated data across players should report severity as the total number of days lost together with median days lost and quartiles. If large, normally distributed datasets report mean and SD, the median should also be reported to facilitate comparisons across studies. As recommended in the IOC consensus statement, describing severe health problems leading to retirement from football, permanent disability or death in days of time-loss is considered inappropriate. Also, there were no amendments regarding specific definitions of catastrophic injury or fatality.

Time loss from training and match play

We recommend using the concept of counting days from occurrence of a health problem to return to play from the IOC consensus statement. Specifically, we recommend that researchers record the number of days the player is unavailable for training or match play, that is, from the date of onset (day 0) to the date of return to football. We recommend using the following time bins when categorising injury severity: 0 days, 1–3 days, 4–7 days, 8–28 days, 29–90 days, 91–180 days and >180 days. The underlying rationale is that more detailed severity categories than designated in the IOC consensus statement can help to communicate the consequences of injuries, especially severe injuries, more precisely with other stakeholders such as the coaching staff, the club and national association management, media, etc. Table 5 presents examples of how to count time loss and categorise severity with elements combined from table 1 in the football consensus statement and table 10 in the IOC consensus statement.^{3 13} In the rare occurrences of injuries or illnesses leading to retirement from football, permanent disability or death should be excluded from the calculations of days lost and in the categorisation into severity categories.

Return to football

When reviewing the literature, we found three, somewhat differing models, interpreting and describing return to sport as a continuum.^{27–29} We believe it is important to understand that returning to football involves several stages, from injury to full team training, match play and preinjury performance.²⁸

For injury and illness surveillance studies in football, however, there is a need for a fixed time point for return to football to standardise time-loss duration (figure 1). We, therefore, recommend defining this according to the date when the injured player returns to full unrestricted team training without modifications in duration and/or activities. Normally, return to training will precede return to match play. However, in cases where the player participates in partial or full match play prior to full team training, the date of this match should be recorded. In periods without training or matches (eg, during off-season periods), the date when the player is considered medically cleared and available for full team training should be used. Online supplemental table 4 shows the different stages of the return to football continuum illustrated for a player with ACL reconstruction.

Capturing and reporting player exposure

Training and match exposures

In agreement with the IOC consensus statement, we recommend recording exact exposure time for each player (player exposure) rather than estimating the number of training sessions and matches and their match duration during the study period (team exposure), also during multiday competitions. Similarly, we recommend defining training exposure as ‘physical activities performed by the player aimed at maintaining or improving their skills, physical condition and/or performance in football’. Ideally, at least in professional football, all training exposures should be monitored and assessed by objective measures such as wearable tracking and monitoring devices or motion-sensitive technology.

We modified the IOC consensus statement definition of match exposure: ‘organised scheduled match play between opposing teams (not including internal training matches)’. Namely, to include a friendly match between two different clubs but exclude a friendly match within the same team/club.

In line with the IOC consensus statement, however, we recommend tracking illness exposure based on the time players are under surveillance (eg, days or years) instead of using specific training and match exposures.

Training subcategories

Training exposure should be subcategorised into specific categories where possible. We recommend using the categories in the IOC consensus statement with minor modifications, with a prematch warm-up before kick-off reported as a separate training category and a postmatch cool-down as ‘other training’ to differentiate these activities from conventional football training sessions. The categories recommended are: (1) football-specific training, (2) prematch warm-up, (3) strength and conditioning and (4) other training. Importantly, rehabilitation and postrehabilitation transition sessions (included in ‘other training’ in the IOC consensus statement) should be excluded from training exposure because such sessions are part of the duration of the injury or illness.

Reporting measures of occurrence

To align with general epidemiological terminology, we recommend using the term ‘reporting measures of occurrence’ rather

Table 4 Football-specific recommendations and additions to table 6 in the IOC consensus statement¹³

Region	Injuries	Injury incidence	Median time-loss	Injury burden
Body area	n (%)	Injuries/1000 hours (95% CI)	Days (IQR)	Days lost/1000 hours (95% CI)
Tissue				
Type				
Diagnosis				
Head				
<i>Concussion</i>				
Neck				
Shoulder				
Upper arm, elbow and forearm				
Wrist and hand				
Chest and thoracic spine				
Lumbosacral				
<i>Non-specific low back pain</i>				
Abdomen				
Hip				
<i>Muscle/tendon</i>				
<i>Iliopsoas muscle injury</i>				
<i>Cartilage/synovium/bursa</i>				
<i>Femoroacetabular impingement syndrome</i>				
Groin				
<i>Muscle/tendon</i>				
<i>Adductor muscle injury</i>				
<i>Adductor-related groin pain</i>				
Thigh				
<i>Muscle/tendon</i>				
<i>Hamstring muscle injury</i>				
<i>Quadriceps muscle injury</i>				
<i>Muscle contusion</i>				
Knee				
<i>Muscle/tendon</i>				
<i>Patellar tendinopathy</i>				
<i>Cartilage/synovium/bursa</i>				
<i>Cartilage injury</i>				
<i>Meniscal injury</i>				
<i>Ligament/joint capsule</i>				
<i>Anterior cruciate ligament injury</i>				
<i>Medial collateral ligament injury</i>				
<i>Lateral collateral ligament injury</i>				
<i>Posterior cruciate ligament injury</i>				
Lower leg				
<i>Muscle/tendon</i>				
<i>Calf muscle injury</i>				
<i>Achilles tendinopathy</i>				
<i>Muscle contusion</i>				
<i>Fracture (including stress fracture)</i>				
Ankle				
<i>Muscle/tendon</i>				
<i>Fracture (including stress fracture)</i>				
<i>Bone contusion</i>				
<i>Cartilage/synovium/bursa injury</i>				
<i>Ligament/joint capsule</i>				
<i>Lateral ligament injury</i>				
<i>Medial ligament injury</i>				
<i>Syndesmosis injury</i>				
Foot				
<i>Muscle/tendon</i>				
<i>Fracture (including stress fracture)</i>				
<i>Bone contusion</i>				
IOC, International Olympic Committee.				

Table 5 Examples of how to record time-loss and calculate injury/illness severity in football

Case	Medical attention/time-loss definition	Days lost	Severity category	Comment
A player interrupts a training session due to diarrhoea but resumes full training the following day	One time-loss illness	0	0 days	Day 0 illness
A player injures the left hamstring muscle during a match and cannot continue to play. Images show a partial muscle rupture affecting the long head of the biceps femoris	One time-loss injury	45	29–90 days	
A young player with Osgood-Schlatter disease reports knee pain at the start of a training camp and trains fully on Monday, Tuesday and Thursday but misses training sessions on Wednesday and Friday	One time-loss injury	2	1–3 days	'Intermittent' time-loss
A player sustains a thigh contusion on Sunday and can train on Monday and Tuesday, but is unable to train due to increased pain on Wednesday and returns to play next Monday	One time-loss injury with injury date 'Sunday', but with time-loss from Wednesday to Sunday	5	4–7 days	'Delayed' time-loss
A player suffers iliopsoas-related groin pain not resulting in any time-loss initially, followed by a 1 month pain-free period. The pain then relapses, requiring time loss from play for 3 weeks. Following another pain-free interval of 9 weeks, the player suffers hip joint-related pain indicative of femoral acetabular impingement syndrome requiring time loss from play for the remaining 6 weeks of the campaign	Record the first pain episode as a medical attention injury and both the second and third episodes as time-loss injuries	0 21 42	0 days 8–28 days 29–90 days	Index injury, recurrence (reinjury) and subsequent local injury with a medical attention injury definition
				No injury, index injury and subsequent local injury with a time-loss injury definition
A player steps on the forearm of a goalkeeper who suffers both a superficial laceration and contusion of the forearm with the development of an acute compartment syndrome requiring surgical intervention and 2 months off	The two injuries should be recorded separately but counted only once in the calculation of incidence with a time-loss definition	0 61	0 days 29–90 days	Multiple injuries with injury severity determined by the most severe injury
A senior footballer suffers a total Achilles tendon rupture when pushing off for a heading duel. It requires surgery, but the player suffers a deep wound infection with repeated surgeries needed. After 15 months, the player decides to retire from football	Retirement from football	N/A	N/A	Should be reported separately

than 'expressing risk', as the measures in this section do not correspond to risk in probabilistic terms.³⁰ With this general exception, we recommend following the descriptions of rates and proportions and expressing and communicating risk from the IOC consensus statement; for example, by presenting injury incidence as the number of injuries per 1000 hours.³¹

Burden of health problems

We recommend using the definition of injury burden in football as 'the number of days lost per 1000 hours' and illness burden as 'the number of days lost per 365 player-days' as in the IOC consensus statement. Both injury and illness burden can also be visualised using a risk matrix (see figure 5 in that statement).

Study population characteristics

As injuries and illnesses may differ between populations, we have added some recommended categories related to age and playing level for use in football epidemiological studies.

Age categorisation

We recommend classifying players as either adults or youths with a clear description of the age cut-off chosen to distinguish adult from youth players in each study. We also agreed that a minimum requirement should be reporting mean age, including both SD and range from the youngest to oldest player. In studies on mixed cohorts, such as female and male players, age data should be reported separately for each cohort, thus allowing

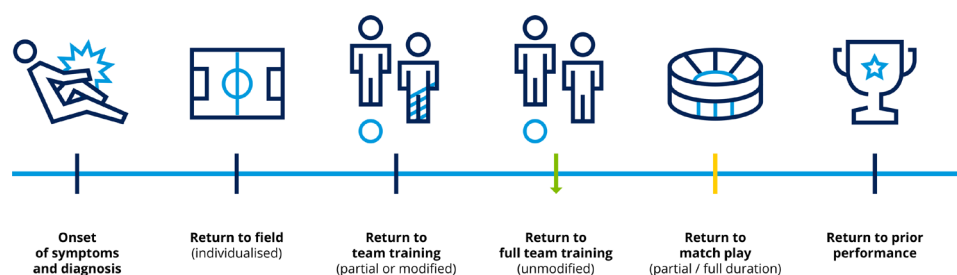


Figure 1 Overview of key time points in the return to football continuum modified from Ardern and Pruna.²⁸ The green arrow highlights the recommended end time-point following a time-loss injury/illness in surveillance studies (first full team training). The yellow line highlights the date of the first match (partial or full duration), used if occurring prior to the first full team training.

the reader or researcher to extract data on, for example, female players only.

Playing level

FIFA defines players participating in organised football as either amateurs or professionals,³² and we agreed to harmonise with this categorisation. A professional is defined as a player who has a written contract with a club and is paid more for his/her footballing activity than the expenses he/she effectively incurs. Players not fulfilling these two criteria are amateurs. The term semi-professional, which represents an interface sometimes seen in the literature, is not clearly defined. Therefore, we do not recommend using this term, nor do we recommend using the term subelite for the same reason. The term elite is often used, especially in women's football, even if they are amateurs,³³ but it is rarely defined sufficiently. Unfortunately, league systems and the corresponding definitions of elite, vary from association to association (country to country) and from confederation to confederation.³⁴ Official league rankings, such as the one from the Union des Associations Européennes de Football,³⁵ could help better classify the team or the cohort as being elite or not. We agreed that the sample needs to be specified for both international league ranking (where accessible) and the playing division (out of the total number of divisions in the league system). Moreover, we also recommend not using elite in studies on children's football up to 12 years of age regardless of the setting, as this term has recently been questioned in this age group.³⁴

At the highest club level, many players will have international duties during a study period. It is important to include these data with as many details as possible in order to document the overall load for players and ensure a full injury and illness overview.^{35 36} Finally, some players play football mainly for fun, fitness and social interaction rather than for competition.³⁷ Although sometimes used interchangeably with amateur players in the literature, these players should be termed recreational players. This cohort includes non-organised football players outside the national league system, such as employee tournaments and 'weekend warriors'.³⁸

Data collection methods

We recommend following the considerations on data collection described in the IOC consensus statement, including encouraging researchers to use the extension of Strengthening the Reporting of Observational Studies in Epidemiology for Sport Injury and Illness Surveillance (STROBE-SIIS) and the accompanying STROBE-SIIS checklist.¹³

Validation and implementation

In addition to the IOC consensus statement, we also would like to stress the importance of using a surveillance system evaluated with methodological rigour, that is scientific soundness in terms of planning, data collection, analysis and reporting of results, and published in the scientific literature to reduce error and to improve the quality of health problem surveillance.³⁹ We also recommend including relevant football stakeholders, such as players, coaches and governing bodies in the planning, implementation, evaluation and communication of findings.⁴⁰ In addition, the identification of implementation principles and having a communication strategy for the preimplementation, implementation and postimplementation phases are recommended. Preimplementation encompasses the development and piloting of the surveillance system, implementation incorporates the definition of roles and responsibilities, and postimplementation

refers to the football-specific interpretation and dissemination of outcomes.⁴¹ Finally, the provision of adequately skilled and experienced human resources as well as sufficient financial support is required to ensure the appropriate implementation of the programme.⁴² In line with this, medically trained personnel (rather than technical or coaching staff) should be recruited to record injury and illness data, as it has been shown that the quality of data and research outcomes are of a higher standard.³⁹

DISCUSSION

We provide an updated guideline on definitions, data collection procedures and reporting standards for studies on injuries and illnesses in football with the objective of improving injury and illness management and prevention strategies.

Research implications

This consensus extension should ensure more consistent study designs and the use of recommended nomenclature in future surveillance studies of football injuries and illnesses regardless of setting, thus facilitating comparisons across studies and pooling of data. Nonetheless, we think that a further update will likely be needed within the next decade from this publication because of an expected surge of new literature in the field and scientific developments. Until then, we encourage journal editors and peer reviewers to check that submitted manuscripts harmonise with the generic IOC consensus statement and the current football-specific consensus extension.

Limitations

There are some limitations to this football-specific consensus extension. First, we did not conduct a systematic literature search, including assessing evidence level, methodological quality and risk of bias among cited studies. Second, dissenting opinions have not been fully clarified or discussed within the main body of the manuscript. Importantly, despite the ensuing recommendations having met the predefined 'threshold' set for reaching agreement, there were nevertheless differing opinions within the panel (online supplemental table 2).²¹ Third, there was an underrepresentation of panel members from low-income countries, implying we may not have included specific context-related challenges. In general, the methodological recommendations can be carried out in low resource settings, as the injury and illness surveillance in its simplest form can be performed using paper and pen only. However, we acknowledge that there may be other practical challenges, which we have not covered in this process and these should be addressed in future updates. Fourth, we did not include a voting statement or a discussion around study preregistration. Study preregistration, not only for clinical trials but also for observational studies, allows editors, peer-reviewers and readers to transparently evaluate if the paper follows an a priori communicated protocol for the data collection procedure and planned analyses.⁴³ We encourage researchers to preregister their injury and illness surveillance studies in the future. Fifth, in addition to adjustments specifically related to football, we also modified some of the general recommendations included in the IOC statement as our recommendation for future injury and illness surveillance studies in football. This includes dividing the body area 'hip/groin' to 'hip' and 'groin' and adding 'complete and partial tendon avulsions' to the notes for the pathology type tendon rupture. This means methodology across sports may vary slightly, but, for example, the 'hip' and 'groin' categories can easily be combined from table 4, if this is required to compare data with other sports. We therefore recommend that the IOC

statement is revised at regular intervals, including considerations on fundamental changes proposed in all sport-specific extensions. Sixth, it was beyond the scope to also create guidelines for other variants of football such as futsal, beach soccer or Para football of which there are several categories. These variants and Para football can use some relevant parts of the current extension while their own consensus extensions are being created and published.

CONCLUSION

This comprehensive football-specific extension of the IOC consensus statement should ensure more consistent study designs, data collection procedures and use of nomenclature in future injury and illness surveillance studies in football, improving injury and illness management and prevention strategies. It should facilitate comparisons across studies and pooling of data.

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Correction notice This article has been corrected since it published Online First. The supplementary file has been amended.

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Acknowledgements We acknowledge the support of the FIFA Medical Subdivision, especially Mrs Mary Lawless, for administrative tasks. We are also grateful to Mr Steve McClaren, UK, for being the coach's voice and to Ms Linda Sällström, Finland and Mr Alfred Finnbogason, Iceland, for being the players' voices. We would also like to thank Dr John Orchard for his thoughts on the influence of the body area separation on the OSIICS.

Contributors MW and TEA: Conceptualisation, methodology, investigation, writing—original draft; MM: Conceptualisation, methodology, investigation, project

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Funding The consensus meeting in Zürich was sponsored by FIFA, including all costs for meeting facilities, travels and accommodations, but there were no daily allowances or other funding specifically for this consensus extension to panel members.

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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REFERENCES

- 1 Orchard JW, Newman D, Stretch R, *et al.* Methods for injury surveillance in international cricket. *Br J Sports Med* 2005;39:e22.
- 2 Orchard JW, Ranson C, Olivier B, *et al.* International consensus statement on injury surveillance in cricket: a 2016 update. *Br J Sports Med* 2016;50:1245–51.
- 3 Fuller CW, Ekstrand J, Junge A, *et al.* Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Br J Sports Med* 2006;40:193–201.
- 4 Fuller CW, Molloy MG, Bagate C, *et al.* Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby Union. *Br J Sports Med* 2007;41:328–31.
- 5 King DA, Gabbett TJ, Gissane C, *et al.* Epidemiological studies of injuries in rugby league: suggestions for definitions, data collection and reporting methods. *J Sci Med Sport* 2009;12:12–19.
- 6 Pluim BM, Fuller CW, Batt ME, *et al.* Consensus statement on epidemiological studies of medical conditions in tennis, April 2009. *Br J Sports Med* 2009;43:893–7.
- 7 Turner M, Fuller CW, Egan D, *et al.* European consensus on epidemiological studies of injuries in the thoroughbred horse racing industry. *Br J Sports Med* 2012;46:704–8.
- 8 Timpka T, Alonso J-M, Jacobsson J, *et al.* Injury and illness definitions and data collection procedures for use in epidemiological studies in athletics (track and field): consensus statement. *Br J Sports Med* 2014;48:483–90.
- 9 Yamato TP, Saragiotto BT, Lopes AD. A consensus definition of running-related injury in recreational runners: a modified Delphi approach. *J Orthop Sports Phys Ther* 2015;45:375–80.
- 10 Mountjoy M, Junge A, Alonso JM, *et al.* Consensus statement on the methodology of injury and illness surveillance in FINA (aquatic sports). *Br J Sports Med* 2016;50:590–6.
- 11 Gijon-Nogueron G, Ortega-Avila AB, Kaldau NC, *et al.* Data collection procedures and injury definitions in badminton: a consensus statement according to the Delphi approach. *Clin J Sport Med* 2022;32:e444–50.

- 12 Schwellnus M, Kippes C, Roberts WO, *et al.* Medical encounters (including injury and illness) at mass community-based endurance sports events: an international consensus statement on definitions and methods of data recording and reporting. *Br J Sports Med* 2019;53:1048–55.
- 13 Bahr R, Clarsen B, Derman W, *et al.* International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020 (including STROBE extension for sport injury and illness surveillance (STROBE-SIIS)). *Br J Sports Med* 2020;54:372–89.
- 14 Murray A, Junge A, Robinson PG, *et al.* International consensus statement: methods for recording and reporting of epidemiological data on injuries and illnesses in golf. *Br J Sports Med* 2020;54:1136–41.
- 15 Verhagen E, Clarsen B, Capel-Davies J, *et al.* Tennis-specific extension of the International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020. *Br J Sports Med* 2021;55:9–13.
- 16 Clarsen B, Pluim BM, Moreno-Pérez V, *et al.* Methods for epidemiological studies in competitive cycling: an extension of the IOC consensus statement on methods for recording and reporting of epidemiological data on injury and illness in sport 2020. *Br J Sports Med* 2021;55:1262–9.
- 17 Heron N, Sarriegui I, Jones N, *et al.* International consensus statement on injury and illness reporting in professional road cycling. *Phys Sportsmed* 2021;49:130–6.
- 18 Derman W, Badenhorst M, Blauwet C, *et al.* Para sport translation of the IOC consensus on recording and reporting of data for injury and illness in sport. *Br J Sports Med* 2021;55:1068–76.
- 19 Guyatt GH, Oxman AD, Kunz R, *et al.* GRADE guidelines: 2. framing the question and deciding on important outcomes. *J Clin Epidemiol* 2011;64:395–400.
- 20 Williamson PR, Altman DG, Blazeby JM, *et al.* Developing core outcome sets for clinical trials: issues to consider. *Trials* 2012;13:132.
- 21 Shrier I. Consensus statements that fail to recognise dissent are flawed by design: a narrative review with 10 suggested improvements. *Br J Sports Med* 2021;55:545–9.
- 22 Blazeby P, Crossley KM, Arden CL, *et al.* It is time for consensus on ‘consensus statements’. *Br J Sports Med* 2022;56:306–7.
- 23 British Medical Journal. BJSM author guidelines for consensus statements. accessed 26/09/2022: BJSM-Author-Guidelines-and-Considerations-for-Consensus-Statements-31-AUG-2021.pdf (bmj.com).
- 24 Aiello F, McCall A, Brown SJ. Development of a standardised system to classify injury inciting circumstances in football: the football injury inciting circumstances classification system, in review 2022.
- 25 Orchard J, Genovesi F. Orchard Sports Injury and Illness Classification System (OSIICS) version 14 and Italian translation. *Br J Sports Med* 2022;56:1144–5.
- 26 Orchard JW, Meeuwisse W, Derman W, *et al.* Sport Medicine Diagnostic Coding System (SMDCS) and the Orchard Sports Injury and Illness Classification System (OSIICS): revised 2020 consensus versions. *Br J Sports Med* 2020;54:397–401.
- 27 Arden C, Glasgow P, Schneiders A, *et al.* Consensus statement on return to sport from the first world Congress in sports physical therapy, Bern. *Br J Sports Med* 2016;2016:853–64.
- 28 Arden C, Pruna R. Return to play in football: a dynamic model. In: Muscle Injury Guide: Prevention of and Return to Play from Muscle Injuries. In: Pruna R, Andersen TE, Clarsen B, *et al.*, eds. *Barca Innovation Hub*, 2018: 80–1.
- 29 Buckthorpe M, Frizziero A, Roi GS. Update on functional recovery process for the injured athlete: return to sport continuum redefined. *Br J Sports Med* 2019;53:265–7.
- 30 Impellizzeri FM, McCall A, Meyer T, *et al.* Measures of (injury and illness) occurrence: a primer on epidemiological concepts and terminology for authors. *Sci Med Football* 2022;6:137–40.
- 31 van Mechelen W, Hlobil H, Kemper HCG. Incidence, severity, aetiology and prevention of sports injuries. *Sports Med* 1992;14:82–99.
- 32 Fédération Internationale de Football Association. Regulations on the status and transfer of players. January 2021 edition. accessed 14/02/2022: g1ohngu7qdbxyo7kc38e-pdf.pdf (fifa.com).
- 33 Horan D, Blake C, Häggglund M, *et al.* Injuries in elite-level women's football—a two-year prospective study in the Irish Women's National League. *Scand J Med Sci Sports* 2022;32:177–90.
- 34 McAuley ABT, Baker J, Kelly AL. Defining “elite” status in sport: from chaos to clarity. *Ger J Exerc Sport Res* 2022;52:193–7.
- 35 Union des Associations Européennes de Football. Association Club coefficients. accessed 14/02/2022: country coefficients | UEFA coefficients | UEFA.com.
- 36 Waldén M, Häggglund M, Ekstrand J. UEFA Champions League study: a prospective study of injuries in professional football during the 2001–2002 season. *Br J Sports Med* 2005;39:542–6.
- 37 Krstrup P, Aagaard P, Nybo L, *et al.* Recreational football as a health promoting activity: a topical review. *Scand J Med Sci Sports* 2010;20:1–13.
- 38 Dönmez G, Korkusuz F, Özçakar L, *et al.* Injuries among recreational football players: results of a prospective cohort study. *Clin J Sport Med* 2018;28:249–54.
- 39 Ekegren CL, Gabbe BJ, Finch CF. Sports injury surveillance systems: a review of methods and data quality. *Sports Med* 2016;46:49–65.
- 40 Harvey G, Kitson A. PARIHS revisited: from heuristic to integrated framework for the successful implementation of knowledge into practice. *Implement Sci* 2015;11:33.
- 41 Moullin JC, Sabater-Hernández D, Fernandez-Llamos F, *et al.* A systematic review of implementation frameworks of innovations in healthcare and resulting generic implementation framework. *Health Res Policy Sys* 2015;13:16.
- 42 Finch CF, Staines C. Guidance for sports injury surveillance: the 20-year influence of the Australian sports injury data dictionary. *Inj Prev* 2018;24:372–80.
- 43 Williams RJ, Tse T, Harlan WR, *et al.* Registration of observational studies: is it time? *Can Med Assoc J* 2010;182:43:1638–42.

Supplementary table 1. Consensus panel members (listed in author order)

Name (abbreviation)	Representation	Profession	Academic title	Sex	Country	Country income*	Confederation
Markus Waldén (MW)	FIFA Medical Scientific Advisory Board	Orthopaedic surgeon	Associate professor, MD, PhD	M	Sweden	High	UEFA
Margo Mountjoy (MM)	FIFA Medical Scientific Advisory Board	Sports medicine physician	Professor, MD, PhD	F	Canada	High	CONCACAF
Alan McCall (AMc)	FIFA Medical Scientific Advisory Board	Sports scientist	Research fellow, PhD	M	Scotland	High	UEFA
Andreas Serner (AS)	FIFA Medical Subdivision	Sports physiotherapist	Medical researcher, PT, PhD	M	Denmark	High	UEFA
Andrew Massey (AMa)	FIFA Medical Subdivision	Sports physician	MD	M	Northern Ireland	High	UEFA
Hans Tol (HT)	FIFA Medical Scientific Advisory Board	Sports physician	Professor, MD, PhD	M	Netherlands	High	UEFA
Roald Bahr (RB)	FIFA Medical Scientific Advisory Board	Sports physician	Professor, MD, PhD	M	Norway	High	UEFA
Michel D'Hooghe (MDH)	FIFA Medical Scientific Advisory Board	Physical & rehabilitation medicine physician	MD	M	Belgium	High	UEFA
Natalia Bittencourt (NB)	Scientific expert	Sports physiotherapist	Professor, PT, PhD	F	Brazil	Upper-middle	CONMEBOL
Francesco Della Villa (FDV)	FIFA Medical Centre of Excellence	Sports physician	Medical researcher, MD	M	Italy	High	UEFA
Michiko Dohi (MD)	FIFA Medical Committee	Sports physician	MD, PhD	F	Japan	High	AFC

Gregory Dupont (GD)	Scientific expert	Sports scientist	Professor, PhD	M	France	High	UEFA
Mark Fulcher (MF)	Scientific expert	Sports & exercise physician	MD	M	New Zealand	High	OFC
Dina C Janse van Rensburg (DCJvR)	Scientific expert	Physical medicine & rheumatology physician	Professor, MD, PhD	F	South Africa	Upper-middle	CAF
Donna Lu (DL)	Scientific expert	Sports scientist	Lecturer, PhD	F	Australia	High	AFC
Thor Einar Andersen (TEA)	FIFA Medical Scientific Advisory Board	Physical & rehabilitation medicine physician	Professor, MD, PhD	M	Norway	High	UEFA

* <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

AFC, Asian Football Confederation; CAF, Confédération Africaine de Football; CONCACAF, Confederation of North, Central America and Caribbean Association Football;

CONMEBOL, Confederación Sudamericana de Fútbol; F, Female; FIFA, Fédération Internationale de Football Association; M, Male; MD, Medical Doctor; OFC, Oceania

Football Confederation; PhD, Doctor of Philosophy; PT, Physiotherapist; UEFA, Union des Associations Européennes de Football

Supplementary table 2. Summary of all pre-meeting and meeting votes; agreement to accept the voting statement (green colour) was reached if $\geq 70\%$ of participants scored 7 to 9 and $<15\%$ of panel members scored 1 to 3, and agreement to reject the voting statement (red colour) if $\geq 70\%$ scored 1 to 3 and $<15\%$ of panel members scored 7 to 9 (only the voting statements with agreement to accept changes are included in the main manuscript)

Voting	Number	Question	Decision	Disagree			Neither			Agree			Minority opinion (if any)
				1	2	3	4	5	6	7	8	9	
		Defining and classifying health problems											
Pre-meeting	1	To what extent do you agree to keep the IOC recommended terminology and definition of a health problem?	No agreement	-	2	1	-	1	2	2	3	5	
Meeting	1	To what extent do you agree to keep the IOC recommended terminology and definition of a health problem?	Agreement to reject the statement	12	2	2	.	.	.	.	.	.
Pre-meeting	2	To what extent do you agree to include the WHO definition in the definition of a health problem, so the definition in football would be “any condition that reduces a player’s normal state of complete physical, mental, and social well-being, irrespective of its consequences on the player’s football participation or performance or whether the player sought medical attention”?	Agreement to accept the statement	-	-	-	-	1	1	2	2	10	

Pre-meeting	3	To what extent do you agree to keep the IOC recommended terminology and definition of a medical attention health problem?	Agreement to accept the statement	-	-	-	-	1	1	3	3	8	
Pre-meeting	4	To what extent do you agree to keep the IOC recommended terminology and definition of a time-loss health problem?	Agreement to accept the statement	-	-	-	-	1	-	4	1	10	
Meeting	5	Do you agree to change “sport”, “athlete” and “competition” to “football”, “player” and “match” throughout the consensus document?	Agreement to accept the statement	-	-	-	-	-	-	2	-	13	
Pre-meeting	6	To what extent do you agree to keep the IOC recommended definition of an injury?	Agreement to accept the statement	-	-	-	-	-	1	4	5	6	
Pre-meeting	7	To what extent do you agree to keep the IOC recommended definition of an illness?	No agreement	-	-	1	-	3	2	2	5	3	
Meeting	7	To what extent do you agree to keep the IOC recommended definition of an illness?	Agreement to reject the statement	12	2	2	-	-	-	-	-	-	
Pre-meeting	8	To what extent do you agree to remove "due to participation in sports" from the definition of an injury?	No agreement	3	1	1	-	5	-	1	2	3	
Meeting	8	To what extent do you agree to remove "due to participation in sports" from the definition of an injury?	Agreement to accept the statement	-	-	-	-	-	-	1	1	13	
Pre-meeting	9	To what extent do you agree to change the definition of illness to from “...not related to injury” to “...not considered as an injury”?	No agreement	1	-	-	-	4	-	1	5	5	

Meeting	9	To what extent do you agree to change the definition of illness to from “...not related to injury” to “...not considered as an injury”?	Agreement to accept the statement	-	-	-	-	-	-	2	12		
Pre-meeting	10	To what extent do you agree to change the definition of illness to add “health”, so it becomes “a health complaint or disorder experienced by the athlete”?	Agreement to accept the statement	1	-	-	-	1	-	1	6	7	
Pre-meeting	11	To what extent do you agree to keep the IOC recommended categorisation of a direct, indirect, or no relationship to sports activity?	Agreement to accept the statement	-	-	-	1	-	-	3	3	9	
Pre-meeting	12	To what extent do you agree to keep the IOC recommended combination of presentation (onset of symptoms) and mechanisms?	No agreement	1	-	-	-	5	2	2	2	4	
Meeting	12a	To what extent do you agree to keep the IOC recommended presentation of onset of symptoms (sudden vs gradual)?	Agreement to accept the statement	-	-	-	-	-	-	1	2	13	
Meeting	12b	To what extent do you agree to discuss reporting of injury mechanism as acute or repetitive or unknown in the text?	Agreement to accept the statement	-	-	1	-	1	-	4	2	8	
Meeting	12c	To what extent do you agree to remove table 1?	Agreement to accept the statement	1	1	-	-	2	-	2	2	8	
Pre-meeting	13	To what extent do you agree to remove the judgement on whether an injury mechanism is acute or repetitive?	No agreement	1	1	1	-	4	1	5	2	1	

Meeting	13	To what extent do you agree to remove the judgement on whether an injury mechanism is acute or repetitive?	Agreement to reject the statement	11	1	1	-	1	-	1	-	1	
Pre-meeting	14	To what extent do you agree to keep the IOC recommended terminology and definitions of direct, indirect, and non-contact mechanisms of injury?	Agreement to accept the statement	-	-	-	-	3	-	2	4	6	
Pre-meeting	15	To what extent do you agree to add if contact was from an opponent, a teammate, a pitch invader, or an object?	Agreement to accept the statement	-	-	1	-	1	1	3	6	4	
Meeting	15	Do you want to add match officials, and other pitch-side staff (e.g., ball people/media)" to the above?	Agreement to accept the statement	1	-	-	-	1	-	4	2	8	
Pre-meeting	16	To what extent do you agree to categorise objects into: ball, pitch object, object from the crowd, and other?	No agreement	1	-	1	1	2	2	1	4	4	
Meeting	16	To what extent do you agree to categorise objects into: ball, pitch object, object from the crowd, goal post, and other?	Agreement to accept the statement	1	-	-	-	1	-	5	1	8	
Pre-meeting	17	To what extent do you agree to report the player action at the time of injury into: static, walking, jumping, falling, and running?*	No agreement	-	1	-	1	2	1	3	5	3	AS: Not separating player velocity and movement from other player actions influences alignment with more detailed assessments of injury inciting circumstances.
Meeting	18	To what extent do you agree to report information on ball possession into controlling the ball, running with ball, throw in, hit by ball,	Agreement to accept the statement	1	-	-	1	2	-	5	4	3	

		kicking, heading, goalkeeping, not in ball possession?										
Meeting	19	To what extent do you agree to report on rule infringement as foul, no foul and cards - to or by injured player?	Agreement to accept the statement	-	-	-	-	-	2	12		
Pre-meeting	20	To what extent do you agree to keep the IOC recommended approach to multiple events and health problems?	Agreement to accept the statement	-	-	1	-	1	1	5	3	4
Pre-meeting	21	To what extent do you agree with the additional sub-classification proposed by the authors of the Para sport extension paper?	No agreement	1	1	1	1	6	2	1	2	-
Meeting	21	To what extent do you agree with the additional sub-classification proposed by the authors of the Para sport extension paper?	Agreement to reject the statement	7	4	2	-	-	-	2	-	-
Pre-meeting	22	To what extent do you agree to keep the IOC recommended approach to subsequent, recurrent and/or exacerbation of health problems?	Agreement to accept the statement	-	-	-	-	2	-	4	3	7
Pre-meeting	23	To what extent do you agree to recommend reporting subsequent injury/illness using days following return to football rather than early and late recurrences?	Agreement to accept the statement	-	-	-	-	-	1	2	6	7
Pre-meeting	24	To what extent do you agree to keep the IOC recommended approach to classifying injuries using body areas and tissue types and pathology?	Agreement to accept the statement	-	-	1	-	1	1	3	2	8

Pre-meeting	25	To what extent do you agree to keep the IOC recommended approach to classifying illnesses using organ/system region and aetiology?	Agreement to accept the statement	-	-	-	-	-	2	3	2	9	
Pre-meeting	26	To what extent do you agree to keep the IOC recommended injury body area categories as they are?	No agreement	-	-	3	-	-	3	4	2	3	
Meeting	26	To what extent do you agree to keep the IOC recommended injury body area categories as they are?	No agreement	6	1	5	-	-	-	1	-	2	
Pre-meeting	27	To what extent do you agree to change the definition of abdomen to “above the inguinal ligament” rather than “above the inguinal canal”?	No agreement	1	1	-	1	2	2	3	1	5	
Meeting	27	To what extent do you agree to change the definition of abdomen to “above the inguinal ligament” rather than “above the inguinal canal”?	No agreement	6	1	5	-	-	-	1	-	2	
Pre-meeting	28	To what extent do you agree to split the body area “hip/groin” to “hip” and “groin” separately?	Agreement to accept the statement	1	-	-	1	2	-	4	5	3	
Meeting	29	If hip and groin areas are split, to what extent do you agree to categorise iliopsoas injuries under hip?	No agreement	1	-	-	1	4	1	3	3	3	AS: Because no agreement is reached, clinicians may now categorise these differently. Further agreement on the division of specific diagnoses into the hip or groin region is needed also for other diagnoses within hip/groin in the coding systems.

Pre-meeting	30	To what extent do you agree to include proximal adductor muscle injuries under thigh injuries together with mid-distal adductor injuries?	No agreement	2	-	1	-	4	3	3	-	3	
Meeting	30	To what extent do you agree to include proximal adductor muscle injuries under thigh injuries together with mid-distal adductor injuries?	Agreement to reject the statement	10	1	3	-	-	-	-	-	1	AS: It does not make sense to separate muscle injuries within the adductors into two different regions without a clearly defined cut-off. Proximal may refer to both insertional and musculo-tendinous injuries in the upper part of the muscle.
Pre-meeting	31	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under hip/groin)?	No agreement	2	-	1	-	3	2	3	1	4	
Meeting	31	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under hip/groin)?	No agreement	8	1	3	-	-	-	-	1	2	MW: To align with previous literature on football injuries, all adductor muscle group injuries should preferably be classified as hip/groin and not thigh.
Pre-meeting	32	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under thigh injuries)?	No agreement	3	1	1	-	4	2	2	1	2	

Meeting	32	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under thigh injuries?	Agreement to reject the statement	9	2	3	-	-	-	-	-	-	
Pre-meeting	33	To what extent do you agree to split the body area lumbosacral into lumbar spine and pelvis/buttocks (excluding groin)?	No agreement	1	-	1	-	3	1	1	5	4	
Meeting	33	To what extent do you agree to split the body area lumbosacral into lumbar spine and pelvis/buttocks (excluding groin)?	Agreement to reject the statement	7	3	4	-	1	-	-	-	-	
Pre-meeting	34	To what extent do you agree to keep the IOC recommended injury tissue type and pathology type categories?	Agreement to accept the statement	-	-	-	-	1	3	5	2	5	
Pre-meeting	35	To what extent do you agree to change the name of muscle injuries to muscle strains?	No agreement	3	1	1	-	3	-	1	4	3	
Meeting	35	To what extent do you agree to change the name of “muscle injuries” to “muscle strains”?	Agreement to reject the statement	10	3	-	-	1	-	1	-	-	AS: Muscle contusions may be considered a sub-category of muscle injuries, but is differentiated by the mechanism. For a clearer separation, the alternative should also include the mechanism, i.e., muscle strain injuries.
Pre-meeting	36	To what extent do you agree to change the notes for “tendon rupture” to include both complete and partial tendon avulsion injuries”?	Agreement to accept the statement	-	-	-	-	3	-	4	4	5	

Pre-meeting	37	To what extent do you agree to keep the summary table very short and provide recommendation that studies on specific areas/populations should provide further details?	Agreement to accept the statement	1	-	-	-	2	-	4	5	4	
Pre-meeting	38	To what extent do you agree to recommend the summary table should be included in the main manuscript and at least one detailed table should be included in the supplements?	Agreement to accept the statement	-	-	-	-	-	1	4	2	8	
Pre-meeting	39	To what extent do you agree to keep the IOC recommended Illness categories for organ system and aetiology?	Agreement to accept the statement	-	-	-	-	1	1	1	4	9	
	Severity of health problems												
Pre-meeting	40	To what extent do you agree to modify the subsection title to “Severity of health problems and return to football”?	Agreement to accept the statement	-	-	1	-	2	-	1	6	6	
Pre-meeting	41	To what extent do you agree to modify and extend the severity categories as identified in the supportive information notes?	No agreement	1	-	1	-	2	1	4	4	3	
Meeting	41	To what extent do you agree to modify and extend the severity categories as identified in the supportive information notes?	Agreement to accept the statement	-	-	-	-	-	-	3	3	9	
Pre-meeting	42	To what extent do you agree to modify the categories in a table X combining the combining elements (columns) from table 1 in Fuller et al., 2006 and elements from table 10 in Bahr et al.,	Agreement to accept the statement	1	-	-	-	1	-	7	3	3	

		2020 and incorporating examples of injuries/illnesses frequent in football?											
Pre-meeting	43	To what extent do you agree that recording the severity of health problems based on clinical assessment (such as the need for hospitalisation or surgery, retirement from sport, permanent disability or death) should be according to the IOC?	Agreement to accept the statement	1	-	1	-	1	-	5	3	5	
Pre-meeting	44	To what extent do you agree to include the return to football continuum figure by Ardern & Pruna, 2018 to illustrate the return to football continuum?	No agreement	-	1	2	-	3	2	1	3	4	
Meeting	44	To what extent do you agree to include the return to football continuum figure by Ardern & Pruna, 2018 to illustrate the return to football continuum?	Agreement to accept the statement	1	-	-	-	-	-	3	3	7	
Pre-meeting	45	To what extent do you agree to include the return to sport figure by Ardern et al., 2016?	No agreement	3	4	1	-	2	1	4	-	1	
Meeting	45	To what extent do you agree to include the return to sport figure by Ardern et al., 2016?	No agreement	9	-	3	-	-	-	1	2	-	
Pre-meeting	46	To what extent do you agree to use the return to training phase by Buckthorpe et al., 2019 as the definition for return to football?	Agreement to accept the statement	1	-	-	-	2	1	4	3	5	
Meeting	46	To what extent do you agree to use the return to training phase by Buckthorpe et al., 2019 as the definition for return to football?†	Agreement to reject the statement	5	-	2	-	-	-	-	-	1	

Pre-meeting	47	To what extent do you agree to use the return to play date by Waldén et al. 2005 as the definition for return to football definition?	No agreement	1	2	2	1	2	2	1	-	4	
Meeting	47	To what extent do you agree to use the return to play date by Waldén et al. 2005 as the definition for return to football definition?	Agreement to reject the statement	9	-	3	-	2	-	-	-	-	
Meeting	48	To what extent do you agree to define injury severity as the date of return to full unrestricted team training (or date of first match if prior to first full team training) or available for full team training in periods without training (e.g. end of season)?	Agreement to accept the statement	2	-	-	-	-	-	5	2	6	
Meeting	49	To what extent do you agree to define injury severity as the date of availability for pre-injury level match play (regardless of whether there is a match scheduled)?	No agreement	4	1	3	1	1	1	-	1	2	
	Capturing and reporting athlete exposure												
Pre-meeting	50	To what extent do you agree to keep the IOC recommended exposure recording for each individual (rather than team exposure)?	Agreement to accept the statement	-	-	1	-	-	1	1	5	8	
Pre-meeting	51	To what extent do you agree to keep the IOC definition of competition as organised scheduled play between opposing athletes or teams of athletes, or athlete(s) competing (i) against time and/or (ii) to obtain a score (judged or measured)?	No agreement	-	1	1	-	2	2	2	4	4	

Meeting	51	To what extent do you agree to define competition as organised scheduled match play between opposing teams (not including internal training matches)	Agreement to accept the statement	-	-	-	-	-	-	2	1	13	
Pre-meeting	52	To what extent do you agree to keep the IOC definition of training as physical activities performed by the athlete (player) that are aimed at maintaining or improving their skills, physical condition and/or performance in their sport?	Agreement to accept the statement	-	-	-	-	1	1	2	5	6	
Pre-meeting	53	To what extent do you agree to keep the IOC recommendation to report such as warm up and cool down should be counted separately and reported as training injuries, even if occurring around competition?	No agreement	-	1	-	-	4	1	2	5	3	
Meeting	53	To what extent do you agree to report pre-match warm-up as a separate training category and post-match cool down reported as other training?	Agreement to accept the statement	-	-	-	-	-	-	1	2	13	
Pre-meeting	54	To what extent do you agree to keep the IOC recommendation that it is inappropriate to use exposure measures such as playing hours to quantify illness risk?	No agreement	-	-	2	-	2	-	2	2	7	
Pre-meeting	55	To what extent do you agree to keep the IOC recommendation that it is most appropriate to use exposure measures based on the time athletes (players) are under surveillance (e.g., days or years) rather than time engaged in competition (match) and training?	Agreement to accept the statement	-	-	1	-	3	-	-	3	9	

Pre-meeting	56	To what extent do you agree to keep the IOC recommended recording exposure during multi-day competitions of every athlete's (player's) individual participation minutes?	Agreement to accept the statement	-	-	-	-	1	-	3	5	7	
Pre-meeting	57	To what extent do you agree to keep the IOC recommended subcategories of training (1. sport-specific, 2. strength and conditioning, and 3. other (e.g., recovery and rehabilitation sessions)?	No agreement	-	-	-	-	3	3	2	3	4	
Pre-meeting	58	To what extent do you agree to keep the IOC encouraged use of wearable tracking activity devices for tracking exposure?	Agreement to accept the statement	-	-	1	-	2	-	2	5	6	
	Expressing risk and reporting guidelines												
Pre-meeting	59	To what extent do you agree to change the title of the sub-section from "Expressing risk" to "Reporting measures of occurrence" as the measures in this section do not correspond to risk in probabilistic terms?	Agreement to accept the statement	1	-	-	-	1	2	3	5	4	
Pre-meeting	60	To what extent do you agree to clarify that incidence is not synonymous with rate and should be operationalised as defined in the epidemiological literature as either rate or proportion?	No agreement	-	1	-	-	3	1	3	4	4	
Meeting	60	To what extent do you agree to clarify that incidence is not synonymous with rate and should be operationalised as defined in the epidemiological literature as either rate or proportion?	No agreement	2	1	-	-	-	-	5	3	4	AMc & GD: It was proposed to clarify that incidence can be measured as either a rate or a proportion, both providing different information, and should not be used synonymously, as

													recommended in most seminal epidemiological research literature.
Pre-meeting	61	To what extent do you agree to clarify the use of prevalence measures to period prevalence if the researcher’s interest is to know the proportion of both new and already existing conditions (e.g. pre-existing before the start of a new season) and incidence proportion if the interest is to understand the proportion of new cases of a specific injury or illness during the season?	No agreement	2	1	-	-	-	1	2	5	5	
Meeting	61	To what extent do you agree to clarify the use of prevalence measures to period prevalence if the researcher’s interest is to know the proportion of both new and already existing conditions (e.g. pre-existing before the start of a new season) and incidence proportion if the interest is to understand the proportion of new cases of a specific injury or illness during the season?	No agreement	2	1	-	-	-	-	5	3	4	AMc & GD: Period prevalence includes new and existing conditions. Incidence proportion can be used if practitioners’ interest is to know proportion of new cases.
Pre-meeting	62	To what extent do you agree that recurrent injuries should not be used in calculating injury incidence unless the researchers can justify confidently that the initial event does not impact subsequent events?	No agreement	1	1	3	-	1	-	2	6	2	
Meeting	62	To what extent do you agree that recurrent injuries should not be used in calculating injury incidence unless the researchers can justify confidently that the initial event does not impact subsequent events?	No agreement	7	2	1	-	3	-	2	-	-	AMc & GD: Incidence rate ranges from 0 to infinite range. The incidence rate can include recurrent events, but only if the researchers are confident that the initial event does not impact

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		outcome of interest in addition to measures based on sport-specific exposures?											
Meeting	65	To what extent do you agree that, to facilitate comparison among sports, investigators should consider reporting the number of days of time loss per 365 athlete(player)-days for each outcome of interest in addition to measures based on sport-specific exposures?	Agreement to reject the statement	9	1	3	-	-	-	1	-	1	
Pre-meeting	66	To what extent do you agree to adopt that injury burden also could be visualised using a risk matrix in which the incidence of each health problem of interest is plotted against its consequences?	Agreement to accept the statement	-	-	-	-	2	-	2	4	8	
	Study population characteristics												
Pre-meeting	67	To what extent do you agree with classifying football players as adult (senior) from 18-19 years with no upper age limit and youth ranging from older toddlers up to 18-19 years?	No agreement	2	1	2	1	1	-	3	4	2	
Meeting	67	To what extent do you agree with classifying football players as adult (senior) from 18-19 years with no upper age limit and youth ranging from older toddlers up to 18-19 years?	No agreement	2	1	2	-	-	-	3	1	6	
Meeting	68	To what extent do you agree with classifying football players as adult and youth with a clear description of the cut-off used?	Agreement to accept the statement	-	-	-	1	-	-	2	1	11	

Pre-meeting	69	To what extent do you agree that youth players are sub-divided into children up to 12 years and adolescent from 13 years?	No agreement	2	-	1	1	2	-	4	3	3	
Meeting	69	To what extent do you agree that youth players are sub-divided into children up to 12 years and adolescent from 13 years?	No agreement	5	-	2	-	-	-	3	4	-	MW: Injury occurrence/landscape differ between pre-pubertal and pubertal/post-pubertal players so a classification into children (≤ 12 years) and adolescent (13-18 years) would have been preferable.
Pre-meeting	70	To what extent do you agree that the minimum age data reported should be mean age with both standard deviation and range from the youngest to oldest player included?	Agreement to accept the statement	-	-	-	-	1	1	4	5	5	
Pre-meeting	71	To what extent do you agree that players participating in organised football are categorised as amateurs or professionals, where a professional is defined as a player who has a written contract with a club and is paid more for his/her footballing activity than the expenses he/she effectively incurs?	No agreement	-	1	2	-	-	-	3	5	5	
Meeting	71	To what extent do you agree that players participating in organised football are categorised as amateurs or professionals, where a professional is defined as a player who has a written contract with a club and is paid more for his/her footballing activity than the expenses he/she effectively incurs?	Agreement to accept the statement	-	-	-	-	-	-	3	5	7	
Pre-meeting	72	To what extent do you agree that the sample needs to be specified for international league ranking (where accessible) and actual playing	No agreement	-	-	1	-	3	1	3	4	4	

		division (out of the total number of divisions in the league system)?											
Meeting	72a	To what extent do you agree that the sample needs to be specified for international league ranking (where accessible)?	Agreement to accept the statement	2	-	-	-	-	-	4	2	7	
Meeting	72b	To what extent do you agree that the sample needs to be specified for actual playing division (out of the total number of divisions in the league system)?	Agreement to accept the statement	-	-	-	-	-	-	3	1	11	
Pre-meeting	73	To what extent do you agree that studies refrain from using the term elite for children’s football, mainly as this is criticised for being based on inaccurate/unreliable talent prediction models?	No agreement	2	-	1	-	-	1	5	3	4	
Meeting	73	To what extent do you agree that studies refrain from using the term elite for children up to 12 years, mainly as this is criticized for being based on inaccurate/unreliable talent prediction models?	Agreement to accept the statement	-	-	-	-	-	-	4	-	10	
Pre-meeting	74	To what extent do you agree that studies at the highest professional/elite level need to report demographics for players involved in international duties during the study period?	No agreement	-	-	-	1	2	2	2	6	3	
Meeting	74	To what extent do you agree that studies report whether the sample or parts hereof participate in international football (club or national team) – with as much details as possible?	Agreement to accept the statement	1	-	-	-	1	-	1	3	9	

Pre-meeting	75	To what extent do you agree that players who participate in non-organised football mainly for fun, fitness and social interaction rather than competition are preferably termed recreational players?	Agreement to accept the statement	-	-	1	-	1	1	4	3	6	
Pre-meeting	76	To what extent do you agree that the terms sub-elite and semi-professional are difficult to standardise, and are open for varying interpretations, and thus should not be used in future studies?	Agreement to accept the statement	1	-	1	-	1	1	3	4	5	
	Data collection methods												
Pre-meeting	77	To what extent do you agree with the adoption of the IOC recommendations as written in the data collection methods section?	Agreement to accept the statement	-	-	-	-	-	-	4	5	7	
Pre-meeting	78	To what extent do you agree to include the use of a validated surveillance system is used to reduce error and to improve the quality of the injury and illness surveillance?	Agreement to accept the statement	-	-	-	-	-	-	4	4	7	
Pre-meeting	79	To what extent do you agree that football stakeholders (players and coaches) be included in the planning, implementation, evaluation, and communication of results?	Agreement to accept the statement	-	1	-	-	-	-	2	2	11	
Pre-meeting	80	To what extent do you agree with the recommendation to identify implementation principles and a communication strategy for pre-implementation (developing and piloting surveillance system), implementation (clearly defining roles and responsibilities) and post-	Agreement to accept the statement	-	-	-	-	1	-	4	2	9	

		implementation (football-specific interpretation and dissemination of outcomes)?										
Pre-meeting	81	To what extent do you agree to recommend that medical personnel be engaged to record the data (rather than technical or coaching staff) to improve the quality of the data and research outcomes?	Agreement to accept the statement	1	-	-	-	-	1	2	3	9
Pre-meeting	82	To what extent do you agree to recommend the provision of adequate skilled and experienced human resources as well as sufficient financial support to ensure appropriate implementation of the programme?	Agreement to accept the statement	-	-	-	-	-	-	2	3	11

Italics denotes new questions identified during the consensus meeting without any pre-meeting voting

* A sub-group of AMc, AS, JT, RB, GD, FDV and TEA created table 2 following the discussions held during the consensus meeting instead of a formal voting statement

† Error in the voting procedure resulting in missing votes from half of the consensus panel

Supplementary table 3. Plain language summary

Several sports published methodological consensus statements for epidemiological studies on injuries and illnesses, with football having one of the first guidelines in 2006. Recently, the International Olympic Committee (IOC) released a sports-generic consensus statement and encouraged the publication of new and/or updated sport-specific extensions.

Therefore, a panel of 16 football medicine and/or science experts formed a consensus panel that reviewed the literature in small groups and performed two rounds of voting before and during a 2-day consensus meeting. Based on the voting results and the subsequent discussions, this consensus extension for football was created. It should ensure more consistent methodology in future epidemiological studies of football injuries and illnesses.

Supplementary table 4. Example of the different time-points in the return to football

continuum after injury

Progression	Time-points
A 26-year-old female professional regular starting midfielder twists her knee in a home match on Wednesday evening. The team physician and physiotherapist examined her immediately on the pitch and again in the locker room. The following day, the MRI shows a total ACL rupture and a small radial tear of the lateral meniscus. The player undergoes ACL reconstruction and a small partial meniscus resection the following week.	Onset of symptoms and diagnosis
She already starts supervised rehabilitation with her physiotherapist the first postoperative day in the gym and continues with this for three months in parallel with home exercises. Then the player starts jogging on the pitch in football shoes and can do some simple technical ball-controlling exercises. This transition will count as the return to field time-point even if she continues with gym and home exercises.	Return to field (individualised)
Following an approved test battery with isokinetic muscle strength tests and different hop tests at six months, showing almost similar results on both the injured and non-injured leg, she is introduced to more demanding individualised football-specific on-field rehabilitation exercises. One month later, she is cleared for team training without player contact. This will count as the return to team training partially/modified.	Return to team training (partially/modified)
Following an endurance test eight months post-injury, showing similar maximum oxygen uptake as pre-injury, and one month later showing identical movement patterns as pre-injury on GPS analysis, she starts training with the team without any restrictions. The latter will count as the return to team training fully/unmodified.	Return to team training (fully/unmodified)
Ten months post-injury, the player is cleared for match play but is not picked by the coach for the subsequent two matches. She is also sitting on the bench all 90 minutes in another two matches before earning 15 minutes of playing time in the second half of the fifth club match following the full clearance for match play.	Return to match play
The player is not a regular starter during the remaining month of the season. She is, however, back in the starting eleven at the start of the following campaign and plays all matches in the subsequent season, except for missing one match because of a suspension and three matches due to a biceps femoris injury in the same leg. She scores seven goals and makes eleven assists during the campaign, which is a new personal record and she is awarded “The player of the year” trophy at the club for the second time in her career.	Return to pre-injury performance

ACL, Anterior cruciate ligament; GPS, Global positioning system; MRI, Magnetic resonance imaging

Supplementary table 1. Consensus panel members (listed in author order)

Name (abbreviation)	Representation	Profession	Academic title	Sex	Country	Country income*	Confederation
Markus Waldén (MW)	FIFA Medical Scientific Advisory Board	Orthopaedic surgeon	Associate professor, MD, PhD	M	Sweden	High	UEFA
Margo Mountjoy (MM)	FIFA Medical Scientific Advisory Board	Sports medicine physician	Professor, MD, PhD	F	Canada	High	CONCACAF
Alan McCall (AMc)	FIFA Medical Scientific Advisory Board	Sports scientist	Research fellow, PhD	M	Scotland	High	UEFA
Andreas Serner (AS)	FIFA Medical Subdivision	Sports physiotherapist	Medical researcher, PT, PhD	M	Denmark	High	UEFA
Andrew Massey (AMa)	FIFA Medical Subdivision	Sports physician	MD	M	Northern Ireland	High	UEFA
Hans Tol (HT)	FIFA Medical Scientific Advisory Board	Sports physician	Professor, MD, PhD	M	Netherlands	High	UEFA
Roald Bahr (RB)	FIFA Medical Scientific Advisory Board	Sports physician	Professor, MD, PhD	M	Norway	High	UEFA
Michel D'Hooghe (MDH)	FIFA Medical Scientific Advisory Board	Physical & rehabilitation medicine physician	MD	M	Belgium	High	UEFA
Natalia Bittencourt (NB)	Scientific expert	Sports physiotherapist	Professor, PT, PhD	F	Brazil	Upper-middle	CONMEBOL
Francesco Della Villa (FDV)	FIFA Medical Centre of Excellence	Sports physician	Medical researcher, MD	M	Italy	High	UEFA
Michiko Dohi (MD)	FIFA Medical Committee	Sports physician	MD, PhD	F	Japan	High	AFC

Gregory Dupont (GD)	Scientific expert	Sports scientist	Professor, PhD	M	France	High	UEFA
Mark Fulcher (MF)	Scientific expert	Sports & exercise physician	MD	M	New Zealand	High	OFC
Dina C Janse van Rensburg (DCJvR)	Scientific expert	Physical medicine & rheumatology physician	Professor, MD, PhD	F	South Africa	Upper-middle	CAF
Donna Lu (DL)	Scientific expert	Sports scientist	Lecturer, PhD	F	Australia	High	AFC
Thor Einar Andersen (TEA)	FIFA Medical Scientific Advisory Board	Physical & rehabilitation medicine physician	Professor, MD, PhD	M	Norway	High	UEFA

* <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

AFC, Asian Football Confederation; CAF, Confédération Africaine de Football; CONCACAF, Confederation of North, Central America and Caribbean Association Football;

CONMEBOL, Confederación Sudamericana de Fútbol; F, Female; FIFA, Fédération Internationale de Football Association; M, Male; MD, Medical Doctor; OFC, Oceania

Football Confederation; PhD, Doctor of Philosophy; PT, Physiotherapist; UEFA, Union des Associations Européennes de Football

Supplementary table 2. Summary of all pre-meeting and meeting votes

Voting	Number	Question	Decision	Disagree			Neither			Agree			Minority opinion (if any)
				1	2	3	4	5	6	7	8	9	
	Defining and classifying health problems												
Pre-meeting	1	To what extent do you agree to keep the IOC recommended terminology and definition of a health problem?	No agreement	-	2	1	-	1	2	2	3	5	
Meeting	1	To what extent do you agree to keep the IOC recommended terminology and definition of a health problem?	No agreement	12	2	2	.	.	.	.	.	.
Pre-meeting	2	To what extent do you agree to include the WHO definition in the definition of a health problem, so the definition in football would be “any condition that reduces a player’s normal state of complete physical, mental, and social well-being, irrespective of its consequences on the player’s football participation or performance or whether the player sought medical attention”?	Agreement	-	-	-	-	1	1	2	2	10	
Pre-meeting	3	To what extent do you agree to keep the IOC recommended terminology and definition of a medical attention health problem?	Agreement	-	-	-	-	1	1	3	3	8	
Pre-meeting	4	To what extent do you agree to keep the IOC recommended terminology and definition of a time-loss health problem?	Agreement	-	-	-	-	1	-	4	1	10	

Meeting	5	Do you agree to change “sport”, “athlete” and “competition” to “football”, “player” and “match” throughout the consensus document?	Agreement	-	-	-	-	-	-	2	-	13	
Pre-meeting	6	To what extent do you agree to keep the IOC recommended definition of an injury?	Agreement	-	-	-	-	-	1	4	5	6	
Pre-meeting	7	To what extent do you agree to keep the IOC recommended definition of an illness?	No agreement	-	-	1	-	3	2	2	5	3	
Meeting	7	To what extent do you agree to keep the IOC recommended definition of an illness?	No agreement	12	2	2	-	-	-	-	-	-	
Pre-meeting	8	To what extent do you agree to remove "due to participation in sports" from the definition of an injury?	No agreement	3	1	1	-	5	-	1	2	3	
Meeting	8	To what extent do you agree to remove "due to participation in sports" from the definition of an injury?	Agreement	-	-	-	-	-	-	1	1	13	
Pre-meeting	9	To what extent do you agree to change the definition of illness to from “...not related to injury” to “...not considered as an injury”?	No agreement	1	-	-	-	4	-	1	5	5	
Meeting	9	To what extent do you agree to change the definition of illness to from “...not related to injury” to “...not considered as an injury”?	Agreement	-	-	-	-	-	-	-	2	12	
Pre-meeting	10	To what extent do you agree to change the definition of illness to add “health”, so it becomes “a health complaint or disorder experienced by the athlete”?	Agreement	1	-	-	-	1	-	1	6	7	

Pre-meeting	11	To what extent do you agree to keep the IOC recommended categorisation of a direct, indirect, or no relationship to sports activity?	Agreement	-	-	-	1	-	-	3	3	9	
Pre-meeting	12	To what extent do you agree to keep the IOC recommended combination of presentation (onset of symptoms) and mechanisms?	No agreement	1	-	-	-	5	2	2	2	4	
Meeting	12a	To what extent do you agree to keep the IOC recommended presentation of onset of symptoms (sudden vs gradual)?	Agreement	-	-	-	-	-	-	1	2	13	
Meeting	12b	To what extent do you agree to discuss reporting of injury mechanism as acute or repetitive or unknown in the text?	Agreement	-	-	1	-	1	-	4	2	8	
Meeting	12c	To what extent do you agree to remove table 1?	Agreement	1	1	-	-	2	-	2	2	8	
Pre-meeting	13	To what extent do you agree to remove the judgement on whether an injury mechanism is acute or repetitive?	No agreement	1	1	1	-	4	1	5	2	1	
Meeting	13	To what extent do you agree to remove the judgement on whether an injury mechanism is acute or repetitive?	No agreement	11	1	1	-	1	-	1	-	1	
Pre-meeting	14	To what extent do you agree to keep the IOC recommended terminology and definitions of direct, indirect, and non-contact mechanisms of injury?	Agreement	-	-	-	-	3	-	2	4	6	
Pre-meeting	15	To what extent do you agree to add if contact was from an opponent, a teammate, a pitch invader, or an object?	Agreement	-	-	1	-	1	1	3	6	4	

Meeting	15	Do you want to add match officials, and other pitch-side staff (e.g., ball people/media)” to the above?	Agreement	1	-	-	-	1	-	4	2	8	
Pre-meeting	16	To what extent do you agree to categorise objects into: ball, pitch object, object from the crowd, and other?	No agreement	1	-	1	1	2	2	1	4	4	
Meeting	16	To what extent do you agree to categorise objects into: ball, pitch object, object from the crowd, goal post, and other?	Agreement	1	-	-	-	1	-	5	1	8	
Pre-meeting	17	To what extent do you agree to report the player action at the time of injury into: static, walking, jumping, falling, and running?*	No agreement	-	1	-	1	2	1	3	5	3	AS: Not separating player velocity and movement from other player actions influences alignment with more detailed assessments of injury inciting circumstances.
Meeting	18	To what extent do you agree to report information on ball possession into controlling the ball, running with ball, throw in, hit by ball, kicking, heading, goalkeeping, not in ball possession?	Agreement	1	-	-	1	2	-	5	4	3	
Meeting	19	To what extent do you agree to report on rule infringement as foul, no foul and cards - to or by injured player?	Agreement	-	-	-	-	-	-	-	2	12	
Pre-meeting	20	To what extent do you agree to keep the IOC recommended approach to multiple events and health problems?	Agreement	-	-	1	-	1	1	5	3	4	

Pre-meeting	21	To what extent do you agree with the additional sub-classification proposed by the authors of the Para sport extension paper?	No agreement	1	1	1	1	6	2	1	2	-	
Meeting	21	To what extent do you agree with the additional sub-classification proposed by the authors of the Para sport extension paper?	No agreement	7	4	2	-	-	-	2	-	-	
Pre-meeting	22	To what extent do you agree to keep the IOC recommended approach to subsequent, recurrent and/or exacerbation of health problems?	Agreement	-	-	-	-	2	-	4	3	7	
Pre-meeting	23	To what extent do you agree to recommend reporting subsequent injury/illness using days following return to football rather than early and late recurrences?	Agreement	-	-	-	-	-	1	2	6	7	
Pre-meeting	24	To what extent do you agree to keep the IOC recommended approach to classifying injuries using body areas and tissue types and pathology?	Agreement	-	-	1	-	1	1	3	2	8	
Pre-meeting	25	To what extent do you agree to keep the IOC recommended approach to classifying illnesses using organ/system region and aetiology?	Agreement	-	-	-	-	-	2	3	2	9	
Pre-meeting	26	To what extent do you agree to keep the IOC recommended injury body area categories as they are?	No agreement	-	-	3	-	-	3	4	2	3	
Meeting	26	To what extent do you agree to keep the IOC recommended injury body area categories as they are?	No agreement	6	1	5	-	-	-	1	-	2	

Pre-meeting	27	To what extent do you agree to change the definition of abdomen to “above the inguinal ligament” rather than “above the inguinal canal”?	No agreement	1	1	-	1	2	2	3	1	5	
Meeting	27	To what extent do you agree to change the definition of abdomen to “above the inguinal ligament” rather than “above the inguinal canal”?	No agreement	6	1	5	-	-	-	1	-	2	
Pre-meeting	28	To what extent do you agree to split the body area “hip/groin” to “hip” and “groin” separately?	Agreement	1	-	-	1	2	-	4	5	3	
Meeting	29	If hip and groin areas are split, to what extent do you agree to categorise iliopsoas injuries under hip?	No agreement	1	-	-	1	4	1	3	3	3	AS: Because no agreement is reached, clinicians may now categorise these differently. Further agreement on the division of specific diagnoses into the hip or groin region is needed also for other diagnoses within hip/groin in the coding systems.
Pre-meeting	30	To what extent do you agree to include proximal adductor muscle injuries under thigh injuries together with mid-distal adductor injuries?	No agreement	2	-	1	-	4	3	3	-	3	
Meeting	30	To what extent do you agree to include proximal adductor muscle injuries under thigh injuries together with mid-distal adductor injuries?	No agreement	10	1	3	-	-	-	-	1	2	AS: It does not make sense to separate muscle injuries within the adductors into two different regions without a clearly defined cut-off. Proximal may refer to both insertional and musculo-tendinous injuries in the upper part of the muscle.

Pre-meeting	31	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under hip/groin)?	No agreement	2	-	1	-	3	2	3	1	4	
Meeting	31	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under hip/groin)?	No agreement	8	1	3	-	-	-	-	1	2	MW: To align with previous literature on football injuries, all adductor muscle group injuries should preferably be classified as hip/groin and not thigh.
Pre-meeting	32	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under thigh injuries)?	No agreement	3	1	1	-	4	2	2	1	2	
Meeting	32	If all adductor muscle injuries are classified as thigh injuries, to what extent do you agree to include gradual-onset adductor-related groin pain (including diagnoses of adductor tendinopathy and enthesopathy under thigh injuries)?	No agreement	9	2	3	-	-	-	-	-	-	
Pre-meeting	33	To what extent do you agree to split the body area lumbosacral into lumbar spine and pelvis/buttocks (excluding groin)?	No agreement	1	-	1	-	3	1	1	5	4	
Meeting	33	To what extent do you agree to split the body area lumbosacral into lumbar spine and pelvis/buttocks (excluding groin)?	No agreement	7	3	4	-	1	-	-	-	-	

Pre-meeting	34	To what extent do you agree to keep the IOC recommended injury tissue type and pathology type categories?	Agreement	-	-	-	-	1	3	5	2	5	
Pre-meeting	35	To what extent do you agree to change the name of muscle injuries to muscle strains?	No agreement	3	1	1	-	3	-	1	4	3	
Meeting	35	To what extent do you agree to change the name of “muscle injuries” to “muscle strains”?	No agreement	10	3	-	-	1	-	1	-	-	AS: Muscle contusions may be considered a sub-category of muscle injuries, but is differentiated by the mechanism. For a clearer separation, the alternative should also include the mechanism, i.e., muscle strain injuries.
Pre-meeting	36	To what extent do you agree to change the notes for “tendon rupture” to include both complete and partial tendon avulsion injuries?”	Agreement	-	-	-	-	3	-	4	4	5	
Pre-meeting	37	To what extent do you agree to keep the summary table very short and provide recommendation that studies on specific areas/populations should provide further details?	Agreement	1	-	-	-	2	-	4	5	4	
Pre-meeting	38	To what extent do you agree to recommend the summary table should be included in the main manuscript and at least one detailed table should be included in the supplements?	Agreement	-	-	-	-	-	1	4	2	8	
Pre-meeting	39	To what extent do you agree to keep the IOC recommended Illness categories for organ system and aetiology?	Agreement	-	-	-	-	1	1	1	4	9	
	Severity of health problems												

Pre-meeting	40	To what extent do you agree to modify the sub-section title to “Severity of health problems and return to football”?	Agreement	-	-	1	-	2	-	1	6	6	
Pre-meeting	41	To what extent do you agree to modify and extend the severity categories as identified in the supportive information notes?	No agreement	1	-	1	-	2	1	4	4	3	
Meeting	41	To what extent do you agree to modify and extend the severity categories as identified in the supportive information notes?	Agreement	-	-	-	-	-	-	3	3	9	
Pre-meeting	42	To what extent do you agree to modify the categories in a table X combining the combining elements (columns) from table 1 in Fuller et al., 2006 and elements from table 10 in Bahr et al., 2020 and incorporating examples of injuries/illnesses frequent in football?	Agreement	1	-	-	-	1	-	7	3	3	
Pre-meeting	43	To what extent do you agree that recording the severity of health problems based on clinical assessment (such as the need for hospitalisation or surgery, retirement from sport, permanent disability or death) should be according to the IOC?	Agreement	1	-	1	-	1	-	5	3	5	
Pre-meeting	44	To what extent do you agree to include the return to football continuum figure by Ardern & Pruna, 2018 to illustrate the return to football continuum?	No agreement	-	1	2	-	3	2	1	3	4	
Meeting	44	To what extent do you agree to include the return to football continuum figure by Ardern &	Agreement	1	-	-	-	-	-	3	3	7	

		Pruna, 2018 to illustrate the return to football continuum?											
Pre-meeting	45	To what extent do you agree to include the return to sport figure by Ardern et al., 2016?	No agreement	3	4	1	-	2	1	4	-	1	
Meeting	45	To what extent do you agree to include the return to sport figure by Ardern et al., 2016?	No agreement	9	-	3	-	-	-	1	2	-	
Pre-meeting	46	To what extent do you agree to use the return to training phase by Buckthorpe et al., 2019 as the definition for return to football?	Agreement	1	-	-	-	2	1	4	3	5	
Meeting	46	To what extent do you agree to use the return to training phase by Buckthorpe et al., 2019 as the definition for return to football?†	No agreement	5	-	2	-	-	-	-	-	1	
Pre-meeting	47	To what extent do you agree to use the return to play date by Waldén et al. 2005 as the definition for return to football definition?	No agreement	1	2	2	1	2	2	1	-	4	
Meeting	47	To what extent do you agree to use the return to play date by Waldén et al. 2005 as the definition for return to football definition?	No agreement	9	-	3	-	2	-	-	-	-	
Meeting	48	To what extent do you agree to define injury severity as the date of return to full unrestricted team training (or date of first match if prior to first full team training) or available for full team training in periods without training (e.g. end of season)?	Agreement	2	-	-	-	-	-	5	2	6	
Meeting	49	To what extent do you agree to define injury severity as the date of availability for pre-injury	No agreement	4	1	3	1	1	1	-	1	2	

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Meeting	53	To what extent do you agree to report pre-match warm-up as a separate training category and post-match cool down reported as other training?	Agreement	-	-	-	-	-	-	1	2	13	
Pre-meeting	54	To what extent do you agree to keep the IOC recommendation that it is inappropriate to use exposure measures such as playing hours to quantify illness risk?	No agreement	-	-	2	-	2	-	2	2	7	
Pre-meeting	55	To what extent do you agree to keep the IOC recommendation that it is most appropriate to use exposure measures based on the time athletes (players) are under surveillance (e.g., days or years) rather than time engaged in competition (match) and training?	Agreement	-	-	1	-	3	-	-	3	9	
Pre-meeting	56	To what extent do you agree to keep the IOC recommended recording exposure during multi-day competitions of every athlete's (player's) individual participation minutes?	Agreement	-	-	-	-	1	-	3	5	7	
Pre-meeting	57	To what extent do you agree to keep the IOC recommended subcategories of training (1. sport-specific, 2. strength and conditioning, and 3. other (e.g., recovery and rehabilitation sessions)?	No agreement	-	-	-	-	3	3	2	3	4	
Pre-meeting	58	To what extent do you agree to keep the IOC encouraged use of wearable tracking activity devices for tracking exposure?	Agreement	-	-	1	-	2	-	2	5	6	
	Expressing risk and reporting guidelines												

Pre-meeting	59	To what extent do you agree to change the title of the sub-section from “Expressing risk“ to “Reporting measures of occurrence“ as the measures in this section do not correspond to risk in probabilistic terms?	Agreement	1	-	-	-	1	2	3	5	4	
Pre-meeting	60	To what extent do you agree to clarify that incidence is not synonymous with rate and should be operationalised as defined in the epidemiological literature as either rate or proportion?	No agreement	-	1	-	-	3	1	3	4	4	
Meeting	60	To what extent do you agree to clarify that incidence is not synonymous with rate and should be operationalised as defined in the epidemiological literature as either rate or proportion?	No agreement	2	1	-	-	-	-	5	3	4	AMc & GD: It was proposed to clarify that incidence can be measured as either a rate or a proportion, both providing different information, and should not be used synonymously, as recommended in most seminal epidemiological research literature.
Pre-meeting	61	To what extent do you agree to clarify the use of prevalence measures to period prevalence if the researcher’s interest is to know the proportion of both new and already existing conditions (e.g. pre-existing before the start of a new season) and incidence proportion if the interest is to understand the proportion of new cases of a specific injury or illness during the season?	No agreement	2	1	-	-	-	1	2	5	5	
Meeting	61	To what extent do you agree to clarify the use of prevalence measures to period prevalence if the researcher’s interest is to know the proportion of both new and already existing conditions (e.g. pre-existing before the start of a	No agreement	2	1	-	-	-	-	5	3	4	AMc & GD: Period prevalence includes new and existing conditions. Incidence proportion can be used if

		new season) and incidence proportion if the interest is to understand the proportion of new cases of a specific injury or illness during the season?											practitioners' interest is to know proportion of new cases.
Pre-meeting	62	To what extent do you agree that recurrent injuries should not be used in calculating injury incidence unless the researchers can justify confidently that the initial event does not impact subsequent events?	No agreement	1	1	3	-	1	-	2	6	2	
Meeting	62	To what extent do you agree that recurrent injuries should not be used in calculating injury incidence unless the researchers can justify confidently that the initial event does not impact subsequent events?	No agreement	7	2	1	-	3	-	2	-	-	AMc & GD: Incidence rate ranges from 0 to infinite range. The incidence rate can include recurrent events, but only if the researchers are confident that the initial event does not impact subsequent events, e.g., as in re-injury or subsequent injury.
Pre-meeting	63	To what extent do you agree to clarify that there are no confident recommendations that can be made on communicating risk, given the complete lack of evidence base in sports, never mind football and the lack of clarity even in epidemiological research?	No agreement	1	-	2	-	4	2	4	1	2	
Meeting	63	To what extent do you agree to clarify that there are no confident recommendations that can be made on communicating risk, given the complete lack of evidence base in sports, never mind football and the lack of clarity even in epidemiological research?	No agreement	10	1	2	-	-	-	1	-	1	AMc & GD: Effective risk communication has not been sufficiently studied in football to give confident recommendations. Communicating risk as currently recommended could be misunderstood by practitioners as 'the probability of

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Pre-meeting	67	To what extent do you agree with classifying football players as adult (senior) from 18-19 years with no upper age limit and youth ranging from older toddlers up to 18-19 years?	No agreement	2	1	2	1	1	-	3	4	2	
Meeting	67	To what extent do you agree with classifying football players as adult (senior) from 18-19 years with no upper age limit and youth ranging from older toddlers up to 18-19 years?	No agreement	2	1	2	-	-	-	3	1	6	
Meeting	68	To what extent do you agree with classifying football players as adult and youth with a clear description of the cut-off used?	Agreement	-	-	-	1	-	-	2	1	11	
Pre-meeting	69	To what extent do you agree that youth players are sub-divided into children up to 12 years and adolescent from 13 years?	No agreement	2	-	1	1	2	-	4	3	3	
Meeting	69	To what extent do you agree that youth players are sub-divided into children up to 12 years and adolescent from 13 years?	No agreement	5	-	2	-	-	-	3	4	-	MW: Injury occurrence/landscape differ between pre-pubertal and pubertal/post-pubertal players so a classification into children (≤ 12 years) and adolescent (13-18 years) would have been preferable.
Pre-meeting	70	To what extent do you agree that the minimum age data reported should be mean age with both standard deviation and range from the youngest to oldest player included?	Agreement	-	-	-	-	1	1	4	5	5	
Pre-meeting	71	To what extent do you agree that players participating in organised football are categorised as amateurs or professionals, where a professional is defined as a player who has a written contract with a club and is paid more for	No agreement	-	1	2	-	-	-	3	5	5	

		his/her footballing activity than the expenses he/she effectively incurs?											
Meeting	71	To what extent do you agree that players participating in organised football are categorised as amateurs or professionals, where a professional is defined as a player who has a written contract with a club and is paid more for his/her footballing activity than the expenses he/she effectively incurs?	Agreement	-	-	-	-	-	-	3	5	7	
Pre-meeting	72	To what extent do you agree that the sample needs to be specified for international league ranking (where accessible) and actual playing division (out of the total number of divisions in the league system)?	No agreement	-	-	1	-	3	1	3	4	4	
Meeting	72a	To what extent do you agree that the sample needs to be specified for international league ranking (where accessible)?	Agreement	2	-	-	-	-	-	4	2	7	
Meeting	72b	To what extent do you agree that the sample needs to be specified for actual playing division (out of the total number of divisions in the league system)?	Agreement	-	-	-	-	-	-	3	1	11	
Pre-meeting	73	To what extent do you agree that studies refrain from using the term elite for children’s football, mainly as this is criticised for being based on inaccurate/unreliable talent prediction models?	No agreement	2	-	1	-	-	1	5	3	4	
Meeting	73	To what extent do you agree that studies refrain from using the term elite for children up to 12 years, mainly as this is criticized for being	Agreement	-	-	-	-	-	-	4	-	10	

		based on inaccurate/unreliable talent prediction models?											
Pre-meeting	74	To what extent do you agree that studies at the highest professional/elite level need to report demographics for players involved in international duties during the study period?	No agreement	-	-	-	1	2	2	2	6	3	
Meeting	74	To what extent do you agree that studies report whether the sample or parts hereof participate in international football (club or national team) – with as much details as possible?	Agreement	1	-	-	-	1	-	1	3	9	
Pre-meeting	75	To what extent do you agree that players who participate in non-organised football mainly for fun, fitness and social interaction rather than competition are preferably termed recreational players?	Agreement	-	-	1	-	1	1	4	3	6	
Pre-meeting	76	To what extent do you agree that the terms sub-elite and semi-professional are difficult to standardise, and are open for varying interpretations, and thus should not be used in future studies?	Agreement	1	-	1	-	1	1	3	4	5	
	Data collection methods												
Pre-meeting	77	To what extent do you agree with the adoption of the IOC recommendations as written in the data collection methods section?	Agreement	-	-	-	-	-	-	4	5	7	
Pre-meeting	78	To what extent do you agree to include the use of a validated surveillance system is used to	Agreement	-	-	-	-	-	-	4	4	7	

		reduce error and to improve the quality of the injury and illness surveillance?											
Pre-meeting	79	To what extent do you agree that football stakeholders (players and coaches) be included in the planning, implementation, evaluation, and communication of results?	Agreement	-	1	-	-	-	-	2	2	11	
Pre-meeting	80	To what extent do you agree with the recommendation to identify implementation principles and a communication strategy for pre-implementation (developing and piloting surveillance system), implementation (clearly defining roles and responsibilities) and post-implementation (football-specific interpretation and dissemination of outcomes)?	Agreement	-	-	-	-	1	-	4	2	9	
Pre-meeting	81	To what extent do you agree to recommend that medical personnel be engaged to record the data (rather than technical or coaching staff) to improve the quality of the data and research outcomes?	Agreement	1	-	-	-	-	1	2	3	9	
Pre-meeting	82	To what extent do you agree to recommend the provision of adequate skilled and experienced human resources as well as sufficient financial support to ensure appropriate implementation of the programme?	Agreement	-	-	-	-	-	-	2	3	11	

Italics denotes new questions identified during the consensus meeting without any pre-meeting voting

* A sub-group of AMc, AS, JT, RB, GD, FDV and TEA created table 2 following the discussions held during the consensus meeting instead of a formal voting statement

† Error in the voting procedure resulting in missing votes from half of the consensus panel

Supplementary table 3. Plain language summary

Several sports published methodological consensus statements for epidemiological studies on injuries and illnesses, with football having one of the first guidelines in 2006. Recently, the International Olympic Committee (IOC) released a sports-generic consensus statement and encouraged the publication of new and/or updated sport-specific extensions.

Therefore, a panel of 16 football medicine and/or science experts formed a consensus panel that reviewed the literature in small groups and performed two rounds of voting before and during a 2-day consensus meeting. Based on the voting results and the subsequent discussions, this consensus extension for football was created. It should ensure more consistent methodology in future epidemiological studies of football injuries and illnesses.

Supplementary table 4. Example of the different time-points in the return to football

continuum after injury

Progression	Time-points
A 26-year-old female professional regular starting midfielder twists her knee in a home match on Wednesday evening. The team physician and physiotherapist examined her immediately on the pitch and again in the locker room. The following day, the MRI shows a total ACL rupture and a small radial tear of the lateral meniscus. The player undergoes ACL reconstruction and a small partial meniscus resection the following week.	Onset of symptoms and diagnosis
She already starts supervised rehabilitation with her physiotherapist the first postoperative day in the gym and continues with this for three months in parallel with home exercises. Then the player starts jogging on the pitch in football shoes and can do some simple technical ball-controlling exercises. This transition will count as the return to field time-point even if she continues with gym and home exercises.	Return to field (individualised)
Following an approved test battery with isokinetic muscle strength tests and different hop tests at six months, showing almost similar results on both the injured and non-injured leg, she is introduced to more demanding individualised football-specific on-field rehabilitation exercises. One month later, she is cleared for team training without player contact. This will count as the return to team training partially/modified.	Return to team training (partially/modified)
Following an endurance test eight months post-injury, showing similar maximum oxygen uptake as pre-injury, and one month later showing identical movement patterns as pre-injury on GPS analysis, she starts training with the team without any restrictions. The latter will count as the return to team training fully/unmodified.	Return to team training (fully/unmodified)
Ten months post-injury, the player is cleared for match play but is not picked by the coach for the subsequent two matches. She is also sitting on the bench all 90 minutes in another two matches before earning 15 minutes of playing time in the second half of the fifth club match following the full clearance for match play.	Return to match play
The player is not a regular starter during the remaining month of the season. She is, however, back in the starting eleven at the start of the following campaign and plays all matches in the subsequent season, except for missing one match because of a suspension and three matches due to a biceps femoris injury in the same leg. She scores seven goals and makes eleven assists during the campaign, which is a new personal record and she is awarded “The player of the year” trophy at the club for the second time in her career.	Return to pre-injury performance

ACL, Anterior cruciate ligament; GPS, Global positioning system; MRI, Magnetic resonance imaging