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

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ABSTRACT

The incidence of injuries reported in artistic gymnastics varies greatly. This is partly due to inconsistencies in defining and reporting injuries in artistic gymnastics. The objective was to develop consistent definitions and methodology for reporting injuries in artistic gymnastics. A group of medical practitioners working with international-level artistic gymnasts from America, Asia, Australia and Europe came to a consensus on recommendations for defining and reporting injuries in artistic gymnastics. Development of the consensus statement was achieved through in-person and online discussions, online surveys and post meeting electronic discussions. This consensus statement is meant to serve as an extension to the recommendations made by the IOC on injury surveillance. The statement includes specific recommendations of injury definitions, characterising activity at the time of injury, and describing injury burden in artistic gymnastics. The following consensus statement has been developed to encourage consistency of injury surveillance in artistic gymnastics. Reporting injury in a consistent manner will help understand the true burden of injury in artistic gymnastics and help guide future work in injury prevention.

INTRODUCTION

Artistic gymnastics is performed recreationally and competitively around the world. Women participate in four events (vault, uneven bars, balance beam and floor exercise) and men in six events (floor, pommel horse, rings, vault, parallel bars and high bar). Despite the many benefits from gymnastics participation, gymnasts are at high risk of injury.^{1,2} The incidence of injury in artistic gymnastics has been previously reported to be between 1.5 and 9.37 injuries per 1000 athlete exposures (exposure represents participation in one training

session or competition).^{2,3} When compared with other sports, such as collegiate sports in the USA, artistic gymnastics has a higher rate of injury than that of almost every other sport.⁴ However, due to the inconsistency of injury reporting methodologies, the true burden of injuries in artistic gymnastics is unclear.

In 2019, Campbell *et al* published a systematic review paper highlighting the inconsistencies of injury data collection and reporting in artistic gymnastics.¹ These include inconsistent injury definitions and variable reporting methods. Other papers focused on injury in artistic gymnastics have emphasised similar concerns.^{5–7} Over the past 15 years, recommended methods of injury reporting through consensus statements have been developed in a variety of other sports.^{8–15} More recently, the IOC published a consensus statement on methods for recording and reporting epidemiological data on injury and illness in sport.¹⁶ This statement was designed to be broad in nature and acknowledges that sport-specific statements will provide more detailed and relevant recommendations.¹⁶ Accordingly, this sport-specific consensus statement for injury surveillance in artistic gymnastics was developed to encourage more consistent injury reporting and it is designed to be used as a companion document in conjunction with the 2020 IOC consensus statement.¹⁶ It is anticipated that consistent injury reporting in artistic gymnastics will bolster injury surveillance efforts and enable researchers to test the efficacy of injury reduction strategies, including changes to training, equipment or competition rules.



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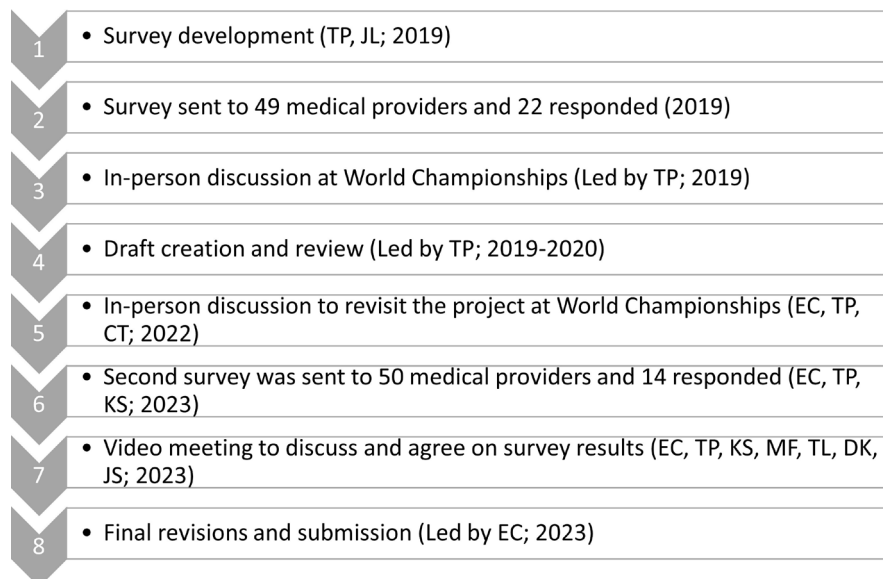


Figure 1 Flow diagram of the process of writing this extension statement.

METHODS

The consensus statement was developed through surveys, face-to-face meetings and electronic discussions (figure 1). The survey questions were based on content from international injury surveillance consensus statements in other sports^{8–10 12–15} and aimed to guide the face-to-face meetings. Surveys were sent out via email to known medical practitioners, primarily physicians and physiotherapists, working with international and university-level gymnasts from around the world (first survey in 2019 and follow-up survey in 2023). Respondents were encouraged to share the survey with other medical practitioners with gymnastics expertise. No patients were involved in the creation of this extension statement.

On 9 October 2019, at the 49th Fédération Internationale de Gymnastique (FIG) Artistic Gymnastics World Championships (Stuttgart, Germany), 28 medical practitioners (11 medical physicians, 17 physiotherapists) working with artistic gymnasts competing at the international level came together to develop the statement. The meeting was facilitated by TP and observed by the FIG Anti-doping, Medical and Scientific Commission representative, YI. Each topic from the survey was presented by the facilitator, followed by a discussion among medical practitioners. The meeting was recorded in audio format to capture the discussion. Under the guidance of the facilitator, consensus was reached by vote for each item. One vote was allocated per country, and 80% agreement was required to be added to the consensus statement. There were a total of 14 votes per item from the following countries (*participating authors in italics*): Australia (JR), Austria (BH), Belgium (WT), Brazil (RSa, FV), Canada (JM, MZ), France (SN), Germany (HB, RE, HS, AE, RSc, PS), Great Britain (CT, JL, JB), Italy (MF), Japan (TO), Netherlands (KT, MS, TT), Spain (ML), Switzerland (WS, CS, FW), and USA (EC, DK).

Following the meeting, the first round of amendments was made through a survey (December 2019–January 2020), and an 80% agreement from practitioners was required for changes to be accepted. The survey was open to known medical practitioners from around the world working with international elite gymnasts (n=49), including those who did not attend the meeting in Stuttgart. A draft statement was then written and emailed to all practitioners in the medical group. Practitioners had the opportunity to provide feedback and alterations to the statement (February–April 2020). The revision process was managed by TP, JL, CT and SW (supporting academic author). Progress was halted secondary to the COVID-19 pandemic, and in the meantime the IOC consensus was released. Our prior work was aligned with the consensus statement and discussions were facilitated by TP, CT and EC at the 2022 World Championships in Liverpool, England. Finally, TP, EC and KS facilitated a final survey, virtual discussions and revisions.

Equity, diversity and inclusion statement

The medical practitioners who developed this consensus statement represented multiple disciplines in different countries throughout America, Asia, Australia and Europe. Both men and women comprised the group.

Gymnastics-specific definitions of injury

We suggest that gymnastics medicine providers and researchers use the definitions for injury and illness proposed in the IOC consensus statement,¹⁶ but that injuries, medical illnesses and mental health concerns should be documented and further characterised under injury type. For gymnastics-related injuries, we suggest characterising injuries in terms of level of medical attention, injury type, setting, mode of onset and mechanism (figure 2).

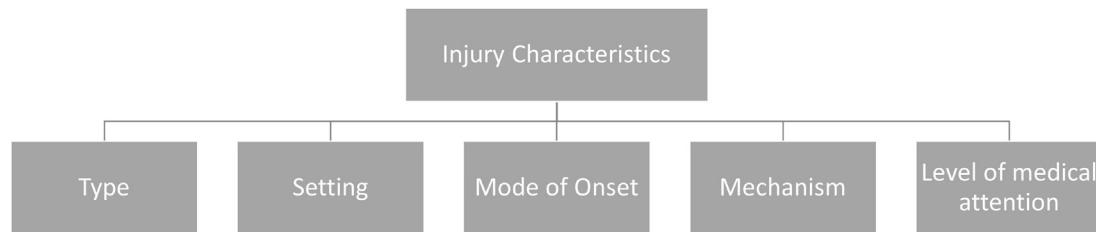


Figure 2 Gymnastics-specific injury definitions.

Level of medical attention

The IOC consensus recommended three levels of injury consequence: any complaint, injuries requiring medical attention and injuries resulting in time loss. We agreed that limiting to only a ‘Time-loss’ definition for injury was unsuitable for artistic gymnastics since a Time-loss definition fails to account for gymnasts who train or compete through an injury, particularly overuse injuries which are so common in gymnastics.^{17 18} In addition, gymnastics training can be modified through variable event participation and routine adjustments to accommodate for an injury and therefore a Time-loss definition would fail to capture a large portion of artistic gymnastics injuries.¹⁸ Consequently, it was agreed that the gymnastics-specific delineation of level of consequence be whether or not medical attention was required.

‘Medical attention’ injury

A medical attention injury is any complaint that requires medical attention (assessment and/or intervention by a medical provider) and has the potential to influence artistic gymnastics training or competition. This definition is independent of any resultant loss of participation and can incorporate injuries that do or do not require modification in training or competition.

‘Gymnast-reported’ injury

A gymnast-reported injury is any complaint that is considered an injury by a gymnast or a representative of the gymnast (ie, coach, parent or any non-medical provider reporting injury) and has the potential to influence artistic gymnastics training or competition. Similar to the ‘medical attention’ definition, this definition is independent of any resultant loss of participation in training or competition.

The ‘gymnast-reported’ definition should be used when a medical provider is not present. When using this definition, injuries should be described by its anatomical region only (eg, knee, back, ankle and so on) to avoid any inaccurate diagnoses. It should be acknowledged that this definition is both subjective and relies on the gymnast and/or representative to report injury consistently and accurately.

Injury setting

The injury setting should be reported as a training, competition or other injury.

Training injury

A training injury is one that occurs during all gymnastic activity and other related training activities, such as resistance training. This also includes the training that takes place during the warm-up period prior to marching out for the competition. It does not include the ‘one-touch’ just prior to competition since this occurs after the march out.

Competition injury

A competition injury is any injury that occurs during a competition (after the march out).

Other injury

Other injuries occur outside of artistic gymnastics participation, for example, concussion from a car accident or an injury sustained during non-gymnastics recreational activity.

Mode of onset

It was agreed that the mode of onset terminology suggested in the IOC consensus statement (mix of acute and repetitive mechanisms) may cause confusion among practitioners collecting injury data. The consensus was to document mode of onset as sudden versus gradual. Sudden onset injuries can be related to a single, identifiable occurrence and all other injuries are categorised as gradual. In an effort to understand the relationship of a current injury to prior injuries or symptoms, we recommend asking gymnasts if the current injury is a recurrence of a prior problem that was fully resolved or worsening of an injury that has been ongoing.

Mechanism of injury

It was agreed that two of the categories used to classify the mechanism of injury (direct contact mechanisms and indirect contact mechanisms) by Bahr *et al* would not be appropriate in artistic gymnastics as direct contact with equipment is intentional and routine. Mechanisms of injury can be best described in gymnastics through characterisation of activity at the time of injury, including the event and skills being performed.

Activity at the time of injury

When characterising the injury mechanism, we suggest that five categories of the movement be described: (1) apparatus, (2) sequence, (3) phase, (4) skill and (5) surface (figure 3). The apparatus notes the gymnastics

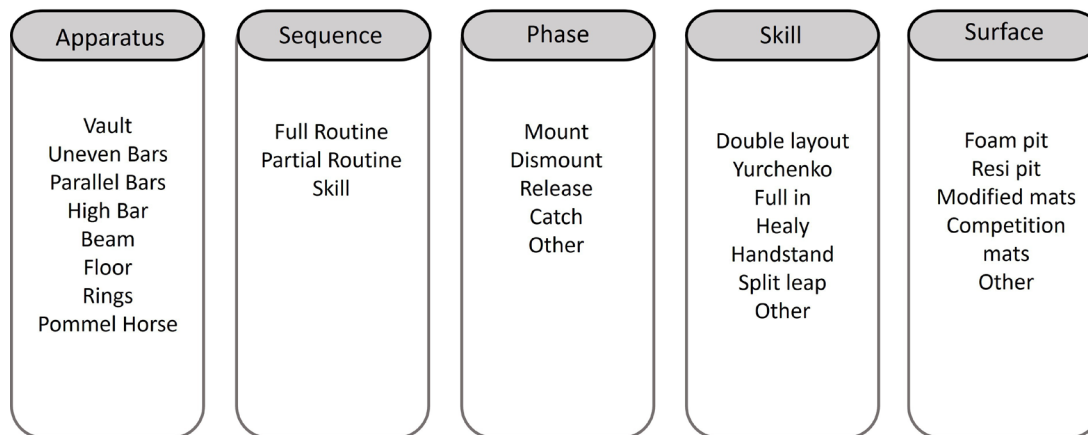


Figure 3 Characterising the mechanism of injury in artistic gymnastics. Skills provided are examples and not a complete list of all options.

event the athlete is performing at the time of the injury. The sequence of skills notes if the injury occurred while attempting a full routine, partial routine or a single element. The skill phase describes the portion of the skill when the injury occurred. Finally, the skill is the specific movement being performed. We have provided an example in [figure 3](#) of recommended entries for categories 1–3. The list of skills in category 4 is for the purpose of example; this is not an exhaustive list. It is recommended that in a club environment, a minimum of level 1 (apparatus) and level 5 (surface) should be recorded when reporting the activity at the time of injury, whereas a minimum of levels 1–3, 5 (activity, combination of skills, skill phase and surface) should be reported in a national/international environment.

In collaboration with the FIG medical committee, a revised medical form, which has been approved for use at all FIG sanctioned events online supplemental appendix 1 has been developed in order to help standardise the data collection of injury and illness. National federations are encouraged to adopt this form for all medical reporting at artistic gymnastics competitions. The sections highlighted in bold can be completed by any stakeholder (medical or non-medical), whereas the remaining sections should only be completed by a medical provider.

Injury burden

Injury burden includes incidence calculations and the severity of injury. The incidence of injury is the number of new injuries within a given time period, including new and recurrent injuries. Injury incidence can be calculated by either injuries ‘per 1000 athlete exposures’ or ‘per 1000 hours of exposure’. An athlete exposure is defined as one athlete participating in a single training session or competition session, whereas hours of exposure is the total number of hours an athlete is exposed to in training or competition. For artistic gymnastics, we recommend that injury incidence should aim to be reported per 1000 hours of exposure where possible, rather than having exposure represent one training session, as training

sessions can vary in the length of time. For example, one gymnastics training session could be an hour in duration, while another could be 3 hours. If reliable training load tracking systems become available to allow for tracking of specific numbers of movements and movement combinations, then it may be possible to determine cut-offs for repetitions of a specific skill or series of skills to reduce risk of injury, such as pitch counts in baseball. Finally, competition and training injury incidence should be reported separately.

It was unanimously agreed that in order to recognise the full severity of an injury in artistic gymnastics, injury severity should be calculated from the day of injury (day 0) up until the day before the return to full training/participation. Full training could either be the return to the level of artistic gymnastics training and competition prior to injury or to a new permanent modification of gymnastics training and competition, including the need for ongoing taping or bracing. The severity of an injury therefore accounts for the days of modified training as a result of an injury. It should also be noted when an injury results in retirement from the sport. Thus, the burden of an injury can be reported as the product of the injury incidence and the severity, such as the number of ‘modified training days per 1000 hours of exposure’ or the ‘modified training days per 1000 athlete exposures’.

Communicating risk and burden to stakeholders

We acknowledge that a more simplified method may be required when communicating risk and burden to coaches/support staff. In these circumstances, risk should be communicated through ‘injuries per squad per year’. For example, if the incidence of an injury per gymnast per year (0.4 ankle injuries per gymnast per year) is multiplied by the average number of gymnasts on a squad of 10 gymnasts, the risk of injury communicated would be 4 ankle injuries per squad per year. Burden should simply be communicated by calculating the total days of modified training for an injury in a year. For example, a total of 100 days of

training were modified in a year due to shoulder injuries.

Future recommendations

The consensus statement has been developed to provide artistic gymnastics-specific adaptations to established international injury surveillance recommendations¹⁶ to encourage consistent injury reporting in artistic gymnastics. Future studies examining injuries in artistic gymnastics should report injuries using these recommendations. Additionally, with modifications to ‘characterisation of activity at the time of injury’, recommendations for injury surveillance in artistic gymnastics could be applied to other gymnastics disciplines (eg, trampoline and tumbling, rhythmic, acrobatic, parkour and team gym). These recommendations should be reviewed as the sport and competition structure continue to evolve. We hope that this serves as an initial step that will be improved and modified through use and ongoing conversations with gymnastics medicine professionals with a greater international input than we were able to achieve in this version.

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