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Sports injuries and illnesses during the European Youth Olympic Festival 2013

Corresponding author

A.M.C. (Anne-Marie) van Beijsterveldt, PhD BEng ^{a,b}

Amsterdam University of Applied Sciences, P.O. Box 1025, 1000 BA Amsterdam, the Netherlands. E-mail: a.m.c.van.beijsterveldt@hva.nl.

Co-authors

K.M. Thijs, MD ^c, F.J.G. Backx, MD PhD ^c, K. Steffen, PhD ^d, V. Brozičević, MD ^e, J.H. Stubbe, PhD ^b.

Institution and affiliations

^a Netherlands Organization for Applied Scientific Research (TNO), Leiden, the Netherlands;

^b Amsterdam University of Applied Sciences, School of Sports & Nutrition, Amsterdam, the Netherlands;

^c University Medical Centre Utrecht, Department of Rehabilitation, Nursing Science & Sports, the Netherlands;

^d Norwegian School of Sport Sciences, Oslo Sports Trauma Research Centre, Department of Sports Medicine, Oslo, Norway;

^e European Olympic Committee, member of Medical Committee, Poliklinika Terme Selce, Selce, Croatia.

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ABSTRACT

Background

The European Youth Olympic Festival (EYOF) is a biennial sporting event of 9 Olympic Summer Sports for talented athletes, aged 13-18 years, from all over Europe.

Objective

To analyse the injuries and illnesses that occurred during the multi-sport event (14-19 July 2013), with the long-term aim of enabling international sports federations, the National Olympic Committees, and the European Olympic Committee to improve protection of athletes' health in youth.

Methods

Daily occurrence or non-occurrence of injuries and illnesses was recorded by using the IOC injury and illness surveillance system for multi-sport events. All National Olympic Committee physicians and healthcare providers and physicians of the Local Organizing Committee were invited to participate.

Results

In total 2,272 athletes from 49 countries took part in the EYOF 2013. During the 5 competition days of EYOF, 207 injuries and 46 illnesses were reported, resulting in an incidence of 91.1 injuries and 20.2 illnesses per 1,000 athletes. Almost 10% of the athletes sustained at least one injury or illness.

Conclusion

This study is the first multi-sport surveillance study on injuries and illnesses during the EYOF or any other summer Games organized for youth elite athletes. The data form the basis for further research on risk factors and injury mechanisms for this cohort. This research is needed to gain more knowledge and finally to implement effective injury and illness prevention measures.

INTRODUCTION

The European Youth Olympic Festival (EYOF) is a biennial sporting event for talented athletes, aged 13-18 years. This event is organised on behalf of the European Olympic Committee (EOC). The athletes compete in nine Olympic disciplines: athletics, basketball, cycling, gymnastics, handball, judo, swimming, tennis and volleyball. This makes the EYOF an ideal warm-up for the qualified youngsters in reaching the 'real' Olympics.

The protection of young athletes' health by preventing injuries is an important task for international sports federations, the EOC and the National Olympic Committees (NOCs).[1,2] Standardized assessment of sports injuries provides not only important epidemiological information, but also directions for injury prevention and the opportunity for monitoring long-term changes in the frequency, severity and circumstances of injuries.[1] Injury surveillance during sporting events should be a part of the duty of care to the participants to help make future events safer.[3] Injury surveillance is also important during in season prospective cohort studies and in multi-sport events for young elite athletes, since the current knowledge on injury risk for this cohort is scarce.[4] The age of initiation of intense training is decreasing and programs that expose youth to excessive amounts of exercise may increase the risk of injury.[5,6] Besides that, injury risk appears to be increased during the adolescent growth spurt.[7-9]

Since 2009 major international sports federations, such as FIFA (Fédération Internationale de Football Association), FINA (Fédération Internationale de Natation) and IAAF (International Association of Athletics Federations) introduced the surveillance of illnesses to their regular injury surveillance.[10-12] The International Olympic Committee (IOC) started collecting data on illnesses among competing athletes during the 2010 Olympic Games in Vancouver.[13] In comparison to surveillance of injuries, the prevalence of illness cases among athletes has been less studied.

The EOC decided to conduct an injury and illness surveillance study during the EYOF summer edition 2013. We aimed to analyse the injuries and illnesses that occurred during the 5-day youth multi-sport event, with the long-term aim to enable the NOCs and EOC to improve their work on protection of athletes' health in youth.

METHODS

This study was a prospective cohort study over the 5-day competition period of the 2013 edition (14-19 July) of the EYOF, which took part in Utrecht, the Netherlands. The IOC injury and illness surveillance system for multi-sport events was used.[1] This system was also used during the last Summer Olympic Games in Beijing [14] and London [15] and Winter Olympic Games in Vancouver.[13]

An injury was defined as: "any musculoskeletal complaint newly incurred due to competition and/or training during the tournament that received medical attention regardless of the consequences with respect to absence from competition or training". An illness was defined as: "any physical complaint (not related to injury) newly incurred during the tournament that receives medical attention regardless of the consequences with respect to absence from competition or training".

The following information was documented on the injury part of the injury and illness report form: accreditation code of the athlete, sport and event, round/heat/training, date and time of injury, injured body part, type of injury, cause of injury, estimate of the expected duration of subsequent absence from competition and/or training. The illness part of the report form follows a similar design.[12] The illness documentation included the athlete's accreditation code, sport discipline/event, date of occurrence, diagnosis, affected system, main symptom(s) and cause of illness, as well as an estimate of time loss from sports. See Appendix 1 for an example of the injury and illness report form. The forms were distributed in five languages: English, French, German, Russian and Spanish.

All physicians and healthcare providers of the participating NOCs were invited to participate in this study. The medical handbook of the EYOF, containing detailed information about the study, was sent to the NOCs one month before the Festival started. The study information was also available on a secured and private part of the tournament website. Subsequently, one day before the opening all NOCs were invited to a medical meeting, covering the details of the study and getting last instructions. All NOC head team physicians were asked to complete a daily injury and illness report form, about the occurrence or non-occurrence of all newly encountered injuries or illnesses. In addition, the Local Organizing Committee (LOC) physicians from the venue and athletes' accommodation clinics reported both injuries and illnesses. NOC head team physicians as well as LOC physicians were asked to return the forms to the study centre daily. One member of the research team collected all the forms daily. When a form was missing, the medical team of the NOC was contacted by telephone to ensure optimal response. If both NOC and LOC returned a form with information about the same injury or illness only one (combined) registration was stored in the database, to prevent double registrations. Finally, another member of the research team was responsible for collecting medical information about athletes who were referred to a hospital (e.g. for additional diagnostics) because of an injury or illness.

All collected information was treated in strict confidence. The athletes' accreditation code was only used to control for duplicate reports and to provide information on demographic characteristics (like age, gender, nationality and sport) of participating athletes. Ethical approval for the study was obtained from the Central Committee on Research Involving Human Subjects (CCMO). All injured/ill athletes gave their consent (orally) before their report form was filled in.

The response rate of the NOCs was calculated by dividing the number of received injury and illness report forms by the number of expected forms (a maximum of 5 forms from every participating NOC). The characteristics, circumstances and causes of injuries were described in detail. The athlete's individual risk of injury or illness was expressed as "injuries/illnesses per 1,000 athletes". All data were processed using Excel (Microsoft, Redmond, Washington) and SPSS 20 (Chicago, Illinois). Descriptive data are presented for categorical variables as frequencies and proportions, and for continuous variables as mean values with standard deviation. Furthermore, categorical variables (e.g. gender and age) were compared by using a χ^2 test. Significance was accepted at $p < .05$.

RESULTS

In total, 2,272 athletes from 49 countries and their respective NOCs took part in the European Youth Olympic Festival (48% girls, 52% boys; mean age 16.0 ± 1.0 years). One NOC, being represented with more than 100 athletes, declined to participate in this study. All other NOCs returned 95.4% of all daily reports during the EYOF. More than two-third of all injuries and illnesses (68.0%) were only captured by NOCs, while 26.9% of all injuries were reported solely by LOC's. One in 20 reports (5.1%) were filled in by both NOC and LOC.

During the 5 competition days of EYOF, 207 injuries and 46 illnesses were reported, resulting in an incidence of 91.1 injuries and 20.2 illnesses per 1,000 athletes. Almost 10% of the athletes sustained at least one injury or illness ($n=215$). A total of 23 athletes (1.0%) sustained multiple injuries and/or illnesses. Twenty-one athletes got injured and/or sick twice, and even two athletes sustained three injuries and/or illnesses. No significant differences were found when comparing the frequency of injuries between boys and girls ($p=0.75$). Similar, age did not have any influence on injury risk ($p=0.27$).

In total, 15 athletes (6.6%) were referred to a hospital for additional examination during the EYOF. The performed diagnostics were: x-ray ($n=10$), MRI ($n=2$), sonography ($n=2$) and blood test ($n=1$). Moreover, 3 sutures were performed on the field during competition, by the LOC medical staff (2 times during basketball and 1 time during handball).

Injury characteristics

Injury prevalence was highest in basketball (151.0 injuries/1,000 athletes), tennis (150.8), cycling (126.4), judo (125.4) and handball (120.3). Two-thirds of the injuries occurred during competition (67.1%). The knee (12.1%), ankle (11.1%) and thigh (10.6%) were the 3 most commonly injured body parts. No difference in injury risk was found for the occurrence of upper and lower extremity injuries (both 50%). The most frequently reported injury types were sprain (22.2%), contusion/ haematoma/ bruise (19.8%) and laceration/abrasion/skin lesion (16.4%). The most commonly mentioned injury causes were contact with another athlete (37.7%), overuse (gradual onset, 15.9%) and non-contact trauma (11.6%). All injury characteristics are listed in Table 1. Almost 4 out of 10 injuries (36.7%) were expected to result in time loss. Of these 76 injuries, 65.3% had an estimated absence from training or competition up to one week and 26.7% up to one month. Only 2.4% of the injuries were more severe and expected to result in long-term absence from sports (more than 1 month).

[Place table 1 about here]

Illness characteristics

Illness frequency was highest in gymnastics (4.1%) and swimming (3.6%), taking into account the respective number of participating athletes within each sport. Seven out of ten illnesses affected the gastro-intestinal (43.5%) or respiratory system (26.1%). Most frequently reported symptoms were diarrhoea, vomiting (43.5%) and pain (37.0%). Infection (56.5%) was the most commonly mentioned illness cause. All illness characteristics are listed in Table 2. Almost every fourth (23.9%) illness was expected to result in time loss. Of these 11 illnesses, 90.9% had an estimated absence from training or competition up to one week.

[Place table 2 about here]

DISCUSSION

We found that almost 10% of the athletes suffered from an injury or illness during the 5-days competition of the European Youth Olympic Festival. The vast majority of the injuries were minor and the young athlete could continue playing (61.4%) or had an expected absence from sports of less than one week (23.7%).

This study is the first multi-sport surveillance study on injuries and illnesses during the EYOF or any other summer Games organized for youth elite athletes. For that reason, it is difficult to compare the present data with similar studies, as the current knowledge on injury risk for these young elite athletes competing in summer sports is scarce.[4] In comparison with the Winter Youth Olympic Games (YOG) 2012, the only study including a similar cohort, injury incidence as well as illness incidence was lower in summer sports than in winter sports: 91.1 vs 108.7 injuries/1,000 athletes and 20.2 vs 84.2 illnesses/1,000 athletes.[16]

It is also possible to compare the incidence of injury and illness during the EYOF with the incidence of injury and illness of adults during the London Olympic Games 2012. The overall injury and illness incidence was lower for youth athletes than for adults: 91.1 vs 128.8 injuries/1,000 athletes and 20.2 vs 71.7 illnesses/1,000 athletes.[16] However, when comparing these data two comments need to be taken into account. The tournaments differed with fewer competition days (5 vs 17 days) and fewer sport disciplines (9 vs 28 sports) for the EYOF participants compared to the Olympic Games. Also the host city of the tournament could influence the illness incidence because of climate, eating habits, hygiene, etc.

Around 10% of athletes incurred an injury or illness during the tournament itself in all three aforementioned studies (EYOF, YOG, OG). Several sports had a higher injury risk: 15% of the basketball and tennis players sustained an injury during EYOF, although most of the injuries for these sports were minor (only 20% was expected to result in time loss). These data indicate that identifying risk factors for injury and implementing injury prevention strategies should be a high priority in these sports.

Most of the reported injuries were acute and more than 1 out of 3 injuries was caused by physical contact with another athlete, a recurrent concern in these team sports. Overuse injuries with a gradual onset accounted for around 15% of all registered injuries. These results should be interpreted with caution, as the present data collection procedures had limitations in recording overuse injuries: Clarsen et al. (2013) reported that standard injury surveillance methods, like we used in this study, only capture a small percentage of the overuse problems affecting the athletes, largely because few problems led to time loss from training or competition.[17] Subsequently, one might speculate overuse (of muscles, ligaments and tendons) as the most common cause of injuries in youth athletes, due to the contribution of several growth-related factors in this specific age group.[18] The present study did not support this hypothesis. However, we expect a certain degree of underreporting of already existing overuse injuries in athletes who did not seek medical care during the EYOF 2013. Finally, it is important to realize that the method of data collection (including the duration and setting of surveillance, the available resources, the type of injuries and illnesses of interest, how data are to be collected and what they are to be used for) may have important consequences on the reliability of data.[19]

Finally, during the EYOF most of the illnesses affected the gastro-intestinal system, while in other studies with adults the incidence of respiratory infections was high. The presence of gastro-intestinal symptoms may be due to the fact that not all athletes were used to the food served or the warm weather (around 25 °C) in the Netherlands during EYOF. Nevertheless, the cause of illness symptoms was predominantly infections. An illness may affect athletes, resulting in decreased performance. Therefore the importance of safe health strategies, like education of personal (hand) hygiene and prevention strategies to stop spreading the infectious organism to the surrounding team and other athletes is recommended.[20,21]

Strengths and limitations

One large NOC declined to participate, which may have resulted into underreporting of injuries and illnesses during the EYOF. Despite this weakness, a significant strength of this study is that we collected and analysed data on injuries and illnesses during the EYOF for the first time. The response rate of the participating NOCs on returning daily injury and illness reports back to the research team was more than 95%. Therefore, the issue of missing data is not relevant for this study. Another strength is that the information about injuries and illnesses was not self-reported, but collected by a (para)medic of the participating NOC or by a physician from the LOC.

Clinical implications

Our findings enable 6 practical recommendations to improve future surveillance projects and to make the next EYOFs as safe as possible for the participating NOCs by providing the best medical service. The first one is to actively monitor newly incurred injuries and illnesses among young elite athletes during multi-sport events. Although tournaments as the EYOF are too short to allow for risk factor studies, surveillance is needed to comprehend how and where to tailor prevention strategies.[22,23] Data from consecutive tournaments can be valuable for this goal, like is done in athletics and football.[24,26] Moreover, pooling data to reach greater sample sizes is recommended. Therefore, the use of uniform definitions and data collection methods is of great importance to ensure comparable results.[19,27] A second suggestion for the future is to build a health team around athletes (“team around team”) all year round. One of the tasks for that team should be monitoring the young elite athletes’ health and intervene early if necessary to detect or prevent further development of injuries or illnesses. Thirdly, the implementation of an online system to record injuries and illnesses (instead of paper forms) is recommended to easier facilitate data recording and this may improve compliance and accurate data collection. Such an electronic system would also make it more simple for (para)medics to collect data on injuries and illnesses during the tournament. Another advantage of digital data collection is that less work needs to be done by the research team before analysing the data. Our fourth suggestion is to keep both NOCs and LOCs involved in such surveillance studies, since not every NOC at the youth level has its own medical services. During EYOF 2013, 10 NOCs had less than 15 participants and some of these delegations were only accompanied by a coach. Fifth, we recommend, a quality check of

the medical services in a sport event with more than 2,000 participants to ensure high-quality medical service for all participating athletes (to diagnose all injuries/illnesses correctly and shorten the rehabilitation period after an injury/illness). Lastly, to improve future surveillance studies in multi-sport events their methodology should be evaluated using current experiences.

What are the new findings?

- Almost 10% of the athletes sustained at least one injury or illness during EYOF 2013.
- The vast majority of the injuries were minor and the young athlete could continue playing (61.4%) or had an expected absence from sports of less than one week (23.7%).
- Injuries were more prevalent than illnesses in EYOF participants (91.1 injuries vs 20.2 illnesses per 1,000 athletes).
- Most illnesses affected the gastro-intestinal (43.5%) or respiratory system (26.1%).

How might it impact on clinical practice in the near future?

The presented data can form the basis for further research on risk factors and injury mechanisms for this cohort. This research is needed to gain more knowledge and finally to implement effective injury and illness prevention measures.

Contributors

In accordance with the Vancouver Protocol, all six authors have substantially contributed to conception and design, acquisition of data or analysis and interpretation of data, drafting the article or revising it critically for important intellectual content and final approval of the version to be published.

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Competing interest

We declare that we have no conflicts of interest in the authorship or publication of this contribution.

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Table 1: Injury characteristics (location, type, cause) stratified by sport.

	Athletics (n=504)	Basketball (n=192)	Cycling (n=174)	Gymnastics (n=170)	Handball (n=241)	Judo (n=311)	Swimming (n=362)	Tennis (n=126)	Volleyball (n=192)	All (n=2,272)
Number of injuries	44	29	22	12	29	39	9	19	4	207
Injury location										
face (incl. eye, ear, nose)	--	4	1	1	7	6	--	--	--	19
head	--	2	1	--	3	--	--	--	--	6
neck / cervical spine	--	--	--	--	--	--	1	1	--	2
thoracic spine / upper back	3	--	1	--	--	--	1	1	--	6
sternum / ribs	--	2	--	--	1	1	--	--	--	4
lumbar spine / lower back	3	--	--	--	--	4	1	--	1	9
abdomen	--	--	--	--	--	--	--	3	--	3
pelvis / sacrum / buttock	2	--	--	--	--	--	--	--	--	2
shoulder / clavicle	3	1	4	--	1	4	1	3	--	17
upper arm	--	1	2	--	--	--	1	2	--	6
elbow	1	2	1	--	--	3	2	1	--	10
forearm	1	--	--	--	--	1	--	1	--	3
wrist	--	2	1	--	--	--	--	--	--	3
hand	1	--	--	--	1	--	--	--	--	2
finger	1	2	3	1	1	1	--	--	--	9
thumb	1	--	--	--	2	1	--	--	--	4
hip	2	2	2	--	1	1	--	1	--	9
thigh	9	3	2	2	4	1	--	1	--	22
knee	3	4	--	1	1	9	2	3	2	25
lower leg	4	2	4	1	--	--	--	1	--	12
Achilles tendon	1	--	--	--	--	--	--	--	--	1
ankle	4	2	--	4	6	5	--	1	1	23
foot / toe	4	--	--	2	1	2	--	--	--	9
Unknown *	1	--	--	--	--	--	--	--	--	1
Injury type										
concussion	--	2	1	--	4	--	--	--	--	7
fracture (trauma, stress, other bone injuries)	1	1	2	1	2	2	--	--	--	9

sprain (dislocation, subluxation, ligamentous rupture)	7	10	--	3	10	11	3	1	1	46
strain (muscle rupture, tear, tendon rupture)	10	--	--	1	3	4	--	5	--	23
contusion/ haematoma/ bruise	3	9	5	5	8	9	2	--	--	41
tendinosis / tendinopathy	3	2	2	2	--	2	--	8	1	20
impingement	--	--	--	--	--	1	1	1	--	3
laceration/abrasion/skin lesion	12	4	11	--	1	5	--	1	--	34
muscle cramps or spasm	5	1	--	--	--	3	2	2	1	14
other (e.g. lesion of meniscus or cartilage, fasciitis)	2	--	1	--	1	1	1	1	1	8
Unknown *	1	--	--	--	--	1	--	--	--	2
Injury cause										
overuse (gradual onset)	12	2	--	2	--	3	4	8	2	33
overuse (sudden onset)	8	1	--	--	1	2	1	6	--	19
non-contact trauma	5	3	1	4	5	2	1	2	1	24
recurrence of previous injury	3	--	--	--	--	--	--	1	--	4
contact with another athlete	3	15	8	--	21	30	--	1	--	78
contact: moving object	1	2	1	--	1	--	--	--	--	5
contact: stagnant object	4	4	3	5	--	1	1	1	--	19
field of play condition	--	--	5	--	--	--	--	--	--	5
weather condition	2	--	--	--	--	--	--	1	--	3
equipment failure	--	--	1	1	--	--	--	--	--	2
other	5	--	3	--	--	1	1	--	1	11
Unknown *	1	2	--	--	1	--	--	--	--	4

* Unknown, because injury location or injury type was not recorded.

Table 2: Illness characteristics (affected system, symptoms, cause) stratified by sport.

	Athletics (n=504)	Basketball (n=192)	Cycling (n=174)	Gymnastics (n=170)	Handball (n=241)	Judo (n=311)	Swimming (n=362)	Tennis (n=126)	Volleyball (n=192)	All (n=2,272)
Number of illnesses	10	3	1	7	3	5	13	3	1	46
Illness affected system										
respiratory / ear, nose, throat	3	1	--	--	1	1	4	1	1	12
gastro-intestinal	4	1	--	5	2	2	6	--	--	20
allergic / immunological	--	1	--	--	--	--	1	--	--	2
haematological	1	--	--	--	--	--	1	--	--	2
dermatologic	--	--	1	1	--	1	1	2	--	6
Other (e.g. uro-genital, cardio-vascular, neurological, psychiatric)	2	--	--	1	--	1	--	--	--	4
Illness symptoms										
fever	2	--	--	--	--	1	1	--	1	5
pain	3	--	1	1	1	3	5	2	1	17
diarrhoea, vomiting	6	1	--	5	2	2	4	--	--	20
dyspnoea, cough	--	1	--	--	--	--	2	--	--	3
hyper-thermia	2	--	--	--	--	--	--	1	--	3
other	--	1	--	2	--	--	2	1	--	6
Illness cause										
infection	6	3	--	5	3	4	3	1	1	26
exercise-induced	1	--	1	--	--	--	3	--	--	5
environmental	1	--	--	1	--	1	5	1	--	9
other	2	--	--	1	--	--	2	1	--	6