

Results ACL injured and uninjured skiers did not differ regarding ski length to height ratio (95.3 ± 4.6 vs. $94.9 \pm 3.8\%$, $p=.503$) or side cut radius (13.9 ± 2.0 vs. 14.4 ± 2.7 mm, $p=.243$). Compared to uninjured skiers, ACL injured skiers had a significantly lower absolute mean H_F (40.7 ± 5.7 vs. 38.3 ± 4.8 mm, $p < .001$, $d=0.44$) and H_B (44.9 ± 6.7 vs. 39.2 ± 5.1 mm, $p < .001$, $d=0.82$) and a higher quotient H_F/H_B (0.91 ± 0.08 vs. 0.98 vs, $p < .001$, $d=0.75$). Moreover, a lower absolute mean H_T (16.8 ± 2.3 vs. 13.8 ± 1.6 mm, $p < .001$, $d=1.19$) and H_H (26.8 ± 2.6 vs. 24.2 ± 1.9 mm, $p < .001$, $d=0.99$) and a lower quotient H_T/H_H (0.63 ± 0.09 vs. 0.57 ± 0.06 , $p < .001$, $d=0.65$) of the ski boots were found in ACL injured skiers.

Conclusions ACL injured and uninjured skiers differed significantly regarding ski boot sole abrasion and combined height of ski and binding plate, which should be considered as potential risk factors for ACL injuries among recreational skiers.

350 USING TIME TO EVENT METHODS TO EVALUATE SPORTS PARTICIPATION, SPECIALIZATION, AND INJURY

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Background Sport specialization is being widely implicated as a cause of increasing youth injury and drop out rates. No published data encompasses the variety of variables that define the individual athletes' sports participation history. The literature currently evaluates the impact of sports specialization on injury using univariate analysis. There are multiple potential factors that impact injury that need to be considered.

Objective To develop an appropriate analysis plan to determine the impact of sports specialization compared to multiple sport participation on injury incorporating age at which sport participation began in the sport specialized in and age at which specialization in the target sport relative to current age as a function of duration of participation in years.

Design Statistical Analysis Comparisons.

Setting Academic University.

Patients (or Participants) Professional athletes.

Interventions (or Assessment of Risk Factors) Yrs of participation, specialization, current age.

Main Outcome Measurements Impact of Sport Specialization.

Results We compare the assumptions and results of modelling the time to event outcome sports injury with different analysis methods and time scales. The relationship between the time scale and the outcome is non-parametric and very flexible, while the relationships between adjustment variables and the outcome are not as flexible if standard modelling approaches are used (Cox model). Investigators should weigh this and their scientific question of interest when selecting an analysis approach. In our scenario, we felt that modelling time to injury with a time varying covariate representing specialization, possibly adjusted for the age participants started the main sport, with time to injury measured from the age that the individual started playing their main sport, provided useful insight into the impact of sports specialization compared to multiple sport participation on injury.

Conclusions The presented methodology is a recommendation for future researchers to consider when collecting and presenting data.

351 RECORDING INJURIES ONLY DURING WINTER COMPETITIVE SEASON UNDERESTIMATES INJURY INCIDENCE IN ELITE ATHLETES OF THE FRENCH SKI FEDERATION: A TWO-YEAR PROSPECTIVE COHORT STUDY

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Background The implementation of an optimal injury prevention program is based primarily on a solid epidemiological injury surveillance system. Current epidemiological studies in skiing disciplines of International Skiing Federation are limited to retrospective surveys only on winter competitive season (WCS).

Objective The aim of this study was to determine the pattern of injuries in elite athletes of French Ski Federation (FFS) during the winter competitive season and the summer off-season (SOS).

Design Two-year prospective cohort study.

Setting and participants Data of two complete seasons, from 1 May 2017 to 31 April 2018, within elite athletes of FFS (alpine skiing, freestyle skiing, snowboarding, ski jumping, biathlon and crosscountry skiing) were recorded. WCS and SOS were defined from 1 November to 31 April, and from 1 May to 31 October respectively.

Main Outcome Measurements Injury was defined as any physical complaint during training or competition. Each injury was further categorised by location, mechanism, structure, severity and circumstances. Diagnoses were provided by the team doctor according to Orchard Sports Injury Classification.

Results During the study period (2017–2019), 647 skiers-season, 421 (65.1%) males and 226 (34.9%) females, were covered. In total, 352 injuries were recorded. Of these 235 (66.8%) injuries occurred during WCS and 117 (26.4%) during SOS. The higher absolute injury incidences were 110.1 (88.2–135.8) injuries per 100 athletes per seasons in snowboarding, 84.7 (66.3–106.7) in freestyle skiing and 51.6 (43.1–61.1) in alpine skiing. In our sample, 145 (41.2%) of injuries were severe (>28 days of absence). The most frequent injury localisations were knee (20.7%), ankle (16.8%) and head/face (11.9%). Joint/ligament injuries represented 46% of all injuries. Over the study period, 34 concussions and 1 death were recorded.

Conclusions Recording elite athlete injuries only during the competition period is not sufficient. To not record summer off-season injuries among elite FFS athletes would result in more than 25% of injuries being missed and would hinder the implementation of an optimal preventive policy.

352 TWO-YEAR HEALTH SURVEILLANCE AND RECOMMENDED METHODS FOR AN INTERNATIONAL SHORT-TRACK SPEED SKATING TEAM

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Background Health risk mitigation strategies in sport commence with establishing injury and illness burden trends. There is little health surveillance data to inform threats to Short Track Speed Skating (STSS) training and performance.

Further, the published research employs various injury definitions, data collection procedures and results presentation, limiting intergroup comparisons.

Objective To present health surveillance data from the Great Britain STSS (GBSTSS) elite training group across two competitive seasons and to recommend data collection and standardised injury and illness definitions.

Design Retrospective health surveillance report.

Setting Analysis of English Institute of Sport Performance Data Management System (PDMS) medical records alongside athlete reported training time and activity from GBSTSS athletes based in Nottingham, UK.

Patients (or Participants) Fifteen athletes from the GBSTSS World Class Programme squad. Nine males aged 17–33 years (mean 22.7 ±5.21) and six females aged 17–26 (mean 22.7 ±3.01).

Main Outcome Measurements Number of injuries/illness by body area, cause and incidence (per 1000 hrs of STSS).

Results In 2016–18 182 new injuries/illness were reported to the medical staff at GBSTSS. 126 of these (69%) incurred any time loss/time restriction from training or competition. The sum of time loss/time restricted days was 1346 (illness and injury). The biggest threats to athlete availability in the GBSTSS programme were thigh, knee and lumbar spine injuries. The overall incidence per 1000 h of varied short track training and competition was 9.9 time loss episodes/1000 h (injury 4.4/1000 & illness 5.5/1000).

Conclusions Injury had a larger impact on athlete availability in the GBSTSS despite the incidence of illness being greater. This data can be used to inform mitigation strategies in practitioners working to reduce time loss in the sport. STSS should follow other sports in agreeing definitions, methodologies and reporting procedures through consensus to improve consistency of data and intergroup comparisons, this should include incidence exposure based on hours of STSS activity.

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THE DESIGN AND IMPLEMENTATION OF SPORT INJURY SURVEILLANCE SYSTEM

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Background The increase in sport injuries is a big challenge in public health which requires preventive measures. To reach a successful prevention, implementation of an injury surveillance system is the first and important step.

Objective The present study aimed to design and implement a sport injury surveillance system.

Design Athletic trainers recorded athlete's sport injuries in soccer, volleyball, handball, taekwondo and wrestling in a period of 6 months via a comprehensive sport injury surveillance system prospectively, using a web-based sport injury recording application on smart phones designed for athletic trainers to collect data.

Setting The pilot study was implemented in Alborz province of Iran. Finally, results were compared with the previous sport injury recording system.

Patients (or Participants) All professional and nonprofessional men and woman included.

Main Outcome Measurements Collecting injuries via surveillance

Results 81 sport injuries were reported in surveillance system. An incidence rate of 1.39 injuries per 1000 athletes was registered in the surveillance system, while there was 0.32 injury per 1000 athletes registered in the sport injury recording system with 19 reported injuries. Contusions and bruising were the most common types of injuries. Finger and knee injuries were the most common body parts in sport injury surveillance system, while knee and thigh injuries were most common in sport injury recording system. There was a significant difference between the results of two systems as well ($p < 0.05$).

Conclusions Sport injury recording was done using a comprehensive web-based system for the first time in Iran. Different implementation and reporting methods and having injury definition may affect the results. Use of injury record application on cellphones may facilitate injury recording as well. Use of surveillance system with successful implementation is a prerequisite for effective prevention, especially in a sports population. Application of simple and user friendly tools and providing acceptance and developing prevention culture in athletes and coaches are necessary to succeed in injury surveillance.

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THE SWISS REGISTRY OF FATALITIES IN SPORTS: HOW TO OVERCOME DATA GAPS

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Background Fatality tops the injury pyramid. Knowledge of the extent and nature of fatal sports injuries is a key element in prevention. However, those data were not available for a long time in Switzerland. Like other countries, Switzerland has a mortality database, but with 3 major shortcomings: it is almost impossible to identify sports fatalities with the International Statistical Classification of Diseases and Related Health Problems 10th version (ICD-10) external causes; data are entered with a time lag of three years; and fatal injuries in tourists are not recorded.

Objective To estimate the extent of sports fatalities in Switzerland.

Design We retrieved data from a registry of sports fatalities established in 2000, by the Swiss Council for Accident Prevention BFU. The main source of data was a standardized query, conducted by a Swiss media agency. The registry was supplemented and validated with data from partner organizations, like the Swiss Alpine Club or the Swiss Life Saving Organization. Sports, age, sex, date, time, location of fatal injury, and numerous other characteristics were encoded.

Setting Recreational sports.

Results Since 2000, 3397 fatalities were registered (179 annually, SD: 26; 83% males). The mean age was 45 y (SD: 19). Among the fatally injured, 32% were tourists from abroad. Most deaths occurred while mountain hiking, mountaineering, and climbing, followed by swimming in open water and back-country skiing.

Conclusions The sports fatality registry established by the Swiss Council for Accident Prevention is an important, valid supplement to existing injury data. It allows detailed, up-to-date analyses of fatal sports injuries, which supports the priorities of the BFU's nationwide prevention strategy.