

Patients (or Participants) Skiers and snowboarders who played in Niseko were subjected in this study.

Interventions (or Assessment of Risk Factors) Interview survey was carried out in Niseko. We investigated the number of injuries in Niseko ski resort and the situation of severe ski accidents in Japan.

Main Outcome Measurements The type, part, and cause of injury and the effort for preventing accidents in Niseko ski resort.

Results About 50 severe backcountry skiing injuries occur every year in Japan, and 20 of them were fatal. Severe injuries means head injury, back injury and suffocation. During 1985 and 2000, there were 9 skiing fatalities in Niseko every year. All fatalities were caused by avalanches. 8 fatalities were backcountry skiing. These Niseko ski resorts prohibited out of bounds skiing ('Niseko Rule'). The Niseko Rule was promulgated in 2001. No fatalities have occurred since 2001 for backcountry skiing. Only 20% of skiers wear helmets in Japan, however approximately over 60% people wear the helmet.

Conclusions The unique point of the Niseko Rule is that Niseko resorts and the local community respect the freedom of mountain users and place a strong emphasis on the sage usage of the mountain. Ski Patrol checks the conditions of each ski resort for the boundaries of the Niseko Rule. Niseko resorts are increasing the rate of wear the skiing helmets. It was influenced by foreign tourist. It will contribute to skiing safety.

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PREVENTING INTENTIONAL INJURY (HARASSMENT AND ABUSE) IN SPORT: ASSESSING ATHLETES' KNOWLEDGE, ATTITUDES, AND BELIEFS ABOUT THEIR HUMAN RIGHTS IN THE OLYMPIC AND PARALYMPIC MOVEMENTS

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Background Egregious cases of athlete abuse continue to demonstrate the link between human rights and sport. However, it is unclear if athletes see themselves as rights-holders in the sports context, and what this means for preventing intentional injury (harassment and abuse).

Objective Assess athletes' knowledge, attitudes, and beliefs about their rights as articulated by the International Olympic Committee Athletes Rights Declaration.

Design Cross-sectional web-based survey.

Setting Web-based communication and social media platforms used to assess elite athletes.

Participants 645 athletes participating in the Olympic and Paralympic movements, representing 70 countries.

Intervention Athletes and sport organizations distributed the survey to Para and non-disabled athletes. Data was collected from February to September 2020.

Main Outcomes Part 1 (Knowledge construct) used yes/no questions to test athletes' knowledge of five rights from the IOC Declaration. Part 2 (Attitudes/Beliefs construct) used Likert scales to test agreement with eight plain language right statements. Correlation analysis examined the relationship

between athletes' knowledge and their attitudes/beliefs. Demographic data were analyzed for trends.

Results Athletes' knowledge of the right to protect their name, image, and performance, as well as their right to unbiased redress for rights violations, was weakest. There were varied perceptions about freedom of expression and how acceptable 'pressure' from coaches and teammates was. There was low correlation between athletes' knowledge of a right and their positive attitudes and beliefs about embodying that right in sport-specific scenarios. Gender and union membership significantly impacted athletes' rights-experience.

Conclusions Athletes have incomplete knowledge and mixed perceptions of their rights in the sports realm. Furthermore, knowledge of their rights does not guarantee athletes' confidence in defending those rights during real-life sport experiences. To prevent athlete harassment and abuse, a culture change is required in sport. This cannot happen until athletes' rights are clearly understood and guaranteed by all.

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ASSESSMENT OF RISK FACTORS ASSOCIATED WITH INCLUSION IN THE US CENTER FOR SAFESPORT CENTRALIZED DISCIPLINARY DATABASE

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Background Intentional injury (abuse) prevention efforts in sport can benefit from empirical data, but evidence delineating victim-, perpetrator-, and sport-setting-related risk factors over time, are limited. The U.S. Center for SafeSport, which houses a national-level database of disciplinary cases across American sports, provides opportunity to expand this evidence base.

Objective Identify abuse patterns in the U.S. Center for SafeSport Centralized Disciplinary Database (CDD).

Design Retrospective analysis of CDD cases. An alpha of 0.05 was used to test for significance.

Setting SafeSport CDD.

Patients (or Participants) 1164 CDD cases issued between January 1st, 1980 and January 16th, 2020.

Interventions (or Assessment of Risk Factors) Variables including year, sport, victim gender, team structure, uniform coverage, contact level, gender culture, gender structure, and subjective judging were analyzed, and their association with cases, identified.

Main Outcome Measurements Exploratory data analysis, with additional analyses on cases explicitly mentioning sexual harassment or abuse, or involvement of a minor. Comparisons were analyzed with chi-square.

Results 680 of 1164 cases were adjudicated in 2017 or later. 40 distinct sports were represented, including one Paralympic sport (Athletics). USA Gymnastics (217), Swimming (185), and Ice Hockey (110) had the most cases.

532 of 1164 cases mentioned sexual misconduct or sexual harassment. There was an association between this and individual sports ($p < 0.01$), lower levels of clothing ($p < 0.01$), non-contact sports ($p < 0.01$), gender culture ($p < 0.01$), and sports with subjective judging ($p < 0.01$). 473 out of 1164 cases mentioned the involvement of a minor. There was an

association between this and high clothing levels ($p < 0.01$) and gender culture ($p < 0.01$).

Conclusions CDD reports are associated with sport characteristics such as team structure, contact level, and presence of subjective judging. These may represent true risk factors for misconduct or a stronger culture of reporting. Implications for intentional injury (abuse) prevention are clear.

396 THE ASSOCIATION BETWEEN PRESEASON FITNESS LEVEL AND RISK OF INJURY OR ILLNESS – A PROSPECTIVE COHORT STUDY IN MALE ELITE ICE HOCKEY

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Background Little is known about the association between physical fitness and the risk of injury or illness in ice hockey.

Objective The aim of this study was to examine the association between pre-season fitness level and injury or illness risk among elite ice hockey players during the subsequent season.

Design Prospective cohort study.

Setting The GET League (the premier professional league in Norway).

Participants Male ice hockey players ($n = 133$).

Interventions (or Assessment of Risk Factors) The players reported all health problems, acute injuries, overuse injuries and illnesses, using the Oslo Sports Trauma Research Center Questionnaire on Health Problems weekly during the 2017/2018 competitive season (31 weeks), and completed eight different exercises (40 m sprint, countermovement jump, 3000 m run, squat, bench press, chins, brutal bench, and box jump) at the annual one-day, pre-season testing combine.

Main Outcome Measurements Number and severity of acute injuries, overuse injuries and illnesses.

Results The number of any health problem did not differ between fitness rank groups, except for all substantial health problems. There was no association between low physical fitness and the number of health problems, comparing the least fit tercile of the players to the rest of the cohort. The least fit players reported a greater cumulative burden of health problems, after adjusting for time on ice per game, position on ice and age.

Conclusions We found no association between low physical fitness and the number of health problems, comparing the least fit tercile of the players to the rest of the cohort. The least fit players reported a greater cumulative burden of health problems, after adjusting for time on ice per game, position on ice and age. Future research focusing on physical performance as risk factors for injury could consider including more specific performance tests on ice.

397 ABSTRACT WITHDRAWN

398 ARE IMUS SUFFICIENTLY ACCURATE TO MEASURE CHANGES IN 3D KNEE ANGLES AND VELOCITIES DURING THE 70 MS WEIGHT ACCEPTANCE PHASE OF A JUMP LANDING?

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Background The accurate tracking of knee joint motions during maneuvers associated with non-contact ACL injury is important for identifying injury mechanisms.

Objective We tested the hypothesis that motion capture and inertial measurement unit (IMU) measures of 3D changes in tibiofemoral angle and velocity are interchangeable in the ~70 ms weight acceptance phase of a 3–4*BW dynamic jump landing movement involving knee flexion and tibial internal rotation.

Design Two APDM IMUs and NDI Certus marker triads were rigidly attached to the mid-tibial and -femoral bone of cadaver knees to record motions during simulated jump landings. The initial knee angle was 15 degrees maintained by preparatory quadriceps muscle forces and tensile stiffness for the landing. The Bland-Altman Limits of Agreement (LoA) was used to compare the 3D data from 852 trials.

Setting University biomechanics research laboratory.

Patients Nine cadaveric knees harvested from six male and three female adult human donors.

Main Outcome Measurements The 3D knee angle changes from motion capture system were considered the gold standard and compared to calculated IMU data from the fusion algorithm provided by APDM Opal. The 3D tibial and femoral angular velocity changes measured by the IMUs were considered the gold standard and compared to the differentiated Certus angular data.

Results Although the mean peak IMU knee angle changes were slightly underestimated in all three orthogonal planes, the LoA bands were large, ranging from 35.9% to 49.8%. Certus had acceptable accuracy in the camera plane for angular velocity changes, with LoAs of ± 54.9 %/sec and ± 32.5 %/sec, respectively, for the tibia and femur.

Conclusions These IMUs could not reliably measure the peak 3D knee angle changes. Certus measurements of tibiofemoral angular velocity changes were comparable to IMU measures in the camera plane, and when velocities were sufficiently large.

399 EPIDEMIOLOGY OF NON-CONTACT ACL INJURIES IN TEAM BALL-SPORTS: A SYSTEMATIC REVIEW WITH META-ANALYSIS AND META-REGRESSION OF 2748 INJURIES ACROSS 42 MILLION PLAYER-HOURS AND - EXPOSURES COMBINED

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Background Not all ACL injuries are preventable. The epidemiology of non-contact ACL injuries is not known.