

Results Five cytokines (GM-CSF, IL-1 β , IL-4, IL-13, IL-17E/25) returned <20% concentrations within detection limits and were excluded from further analysis. The other cytokines returned >85% samples in range. IL-6, IL-8 and IL-10 increased after exercise (IL-6: $F=36$, $p<0.0001$; IL-8: $F=39$, $p<0.0001$; IL-10: $F(1,21)=8.9$, $p=0.0072$). There was a trend towards a greater post-exercise increase in IL-10 with HME (HME: median 0.062 (range -0.203–1.053) pg/mL; no-HME: 0.047 (-0.079–0.50) pg/mL; $F=3.0$, $p=0.096$). There were no significant interactions for other cytokines.

Conclusions Use of an HME during exercise in a sub-zero environment did not affect systemic pro- and anti-inflammatory cytokine responses to exercise. Local inflammatory markers in the lungs may be relevant to investigate in future studies.

391 A COMPARISON OF THE PREVALENCE AND SEVERITY OF HEALTH PROBLEMS IN NATIONAL TEAM CROSS-COUNTRY SKIERS OVER A COMPETITIVE SEASON

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Background A limited number of long-term prospective studies have investigated health problems in competitive cross-country skiers. Moreover, limited information exists regarding differences in the prevalence and severity of health problems between senior and development female and male cross-country skiers.

Objective To compare the prevalence and severity of health problems between senior and development female and male national team cross-country skiers.

Design Comparative, prospective, observational cohort study.

Setting Senior and development national cross-country ski teams.

Participants Eighteen (9 women, 9 men) senior and 22 (9 women, 13 men) development national team skiers.

Intervention Skiers self-reported their health problems weekly for 17 weeks throughout the 2019/2020 competitive cross-country ski season using the Oslo Sports Trauma Research Center Questionnaire on Health Problems (OSTRC-H2).

Main Outcome Measurements We calculated weekly prevalence and severity measures for illnesses, acute and overuse injuries, substantial health problems (i.e., health problems leading to moderate or severe reductions in training volume or sports performance, or a complete inability to participate) and all health problems combined.

Results Weekly response rate to the OSTRC-H2 was 90% (SD 7%). Average weekly prevalence of substantial (~12%) and all (~25%) health problems were similar between senior and development team skiers. However, illness prevalence was lower in senior vs. development skiers (8%, 95% CI [3%, 13%] vs. 13%, 95% CI [9%, 17%], respectively; $p = .026$) and injuries were higher (12%, 95% CI [9%, 15%] vs. 5%, 95% CI [3%, 7%]; $p < .001$). There were no differences in severity measures (all $p > .05$).

Conclusions Health problems were relatively common among the skiers, with one quarter affected by at least one problem at any given time. While the prevalence of all health problems was similar, illnesses were less prevalent in the senior

compared to the development team skiers and injuries were more prevalent.

392 THE PREVALENCE AND BURDEN OF HEALTH PROBLEMS IN MALE SENIOR ICE HOCKEY: A PROSPECTIVE STUDY IN THE NORWEGIAN PROFESSIONAL LEAGUE

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Background As previous epidemiological studies in elite ice hockey have focused on acute time-loss injuries, little is known about the burden of overuse injuries and illnesses in ice hockey.

Objective The aim of this study was to report the prevalence and burden of all health problems in male senior elite ice hockey during one competitive season.

Design Prospective cohort study.

Setting The 2017/2018 competitive season of the GET league (the premier professional league) in Norway.

Patients (or Participants) We included nine of the ten teams in the GET league (the premier professional league) in Norway. In the nine teams participating, five players declined to participate, six players did not report and one player dropped out. A total of 225 players finished the study.

Interventions (or Assessment of Risk Factors) Players reported all health problems; acute injuries, overuse injuries and illnesses, for 31 weeks using Oslo Sports Trauma Research Center Questionnaire on Health Problems.

Main Outcome Measurements Prevalence and burden of acute injuries, overuse injuries and illnesses.

Results At any given time, 40% (95% CI 37% to 43%) reported symptoms from injury or illness, and 20% (95% CI 19% to 22%) experienced health problems with a substantial negative impact on training and performance. Acute injuries represented the greatest incidence, prevalence and burden. The most burdensome acute injuries were to the head/face, shoulder, knee and ankle. The most burdensome overuse injury locations were knee, lumbar spine and hip/groin.

Conclusions This registration did capture a greater burden from overuse injuries than traditional injury registration, but acute injuries did represent the major problem.

393 PROMOTION FOR JAPAN SKIING SAFETY

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Background Niseko, which is located north of Japan, becomes a famous ski resort for the best powder snow called as 'JAPOW' or 'NISEPOW'. As the number of backcountry skiing's popularity increased, accidents related skiing also did in Niseko.

Objective The purpose was to show the effort for the safety of skiers in Niseko and how to prevent and decrease the number of ski accidents in Japan.

Design Cross-sectional study.

Setting Field of Niseko skiing resort.

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