

ophthalmological point of view (already for a long time). For one-eyed athletes or sports persons with monocular defective vision protective sports goggles should be obligatory in order to protect the remaining healthy eye.

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HOW CAN WE PROTECT ATHLETES FROM DENTAL EROSION?

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Background Our data on more than 800 participants shows that dental erosion (DE) affects up to 45% of elite athletes and may have physical and psychosocial impacts. The condition is associated with consumption of sports drinks and is exacerbated by reduced salivary flow. The protein rich layer called dental pellicle (DP) may have a protective function for DE and this might prove to be a useful therapeutic target in elite sport.

Objectives To assess the protective function of DP against DE.

Design In vitro study.

Setting Laboratory.

Participants 40 bovine incisors

Interventions Two levels. 1: We exposed twenty bovine incisors to an energy drink (pH 3.1) at 24, 48 and 72 hours to create an in vitro erosion model. 2: We used fresh human saliva to form dental pellicle on the buccal surface of twenty incisors to create an in-vitro pellicle model. Erosive lesions were investigated both in the presence and absence of a layer of dental pellicle.

Main outcome measurement Mean depth of erosive lesions by optical coherence tomography (OCT) and X-ray Microtomography (XMT).

Results OCT showed the mean thickness of amorphous enamel before immersion in the erosive medium was 64 µm (SD 2.3, IQR 54.7 – 63.2). The mean depth of the erosive lesion after immersion was 240.8 µm (SD 32.7, IQR 244.6 – 263.8) ($p < 0.001$) at 72 hours. In contrast, mean depth of lesion in the presence of the dental pellicle was 84.3 (SD 18.9, IQR 93.2 – 75.3) ($p < 0.03$). XMT showed the mean depth of erosive lesions was 130 µm (SD 28.2), whereas in the presence of DP was 82.4 µm (SD 15.6) ($p < 0.001$).

Conclusions Erosion was reduced but not prevented by presence of dental pellicle. This model shows promise as a method to investigate novel interventions to prevent DE in elite athletes.

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MICROBIOME ANALYSIS IN ELITE SPORT

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Background There is increasing interest in the microbiome in performance and prevention of illness.

Objective To investigate characteristics of oral and gut microbiomes in elite sport.

Design Metagenomic sequencing performed on stool and saliva samples at baseline and three months. Taxonomic identification of the DNA sequence data generated on the Illumina sequencing platform, followed by unsupervised Principle Component Analyses (PCA). UCL Research Ethics Committee ID Number: 6388/002.

Setting 1: A GB Olympic team, n=18; 2: English premiership rugby team, n=18; 3: Healthy volunteers (non-athletes) n=28.

Participants Aged ≥ 18 years, able to understand consent process, for health controls body mass index 18 to 30 kg/m².

Assessment Of Risk Factors Oral health, BMI, use of antibiotics.

Outcome Measurements Unsupervised PCA.

Results Two distinct clusters emerged, one of athletes and one of non-athletes. Specific species-level signatures distinguishing the two clusters as well as each cohort were identified, including *Fusicatenibacter sacchrorivans* enriched in athlete samples relative to non-athlete controls, *Slackia isoﬂavoniconvertans* enriched in rugby relative to both Olympic athletes and non-athletes, and *Klebsiella pneumoniae* enriched in Olympic cohort relative to both rugby and non-athletes (all $P < 0.005$). For saliva PCA analyses, no distinct clusters emerged between the two athlete cohorts or timepoints. However, specific species-level signatures distinguishing the groups were identified, including multiple *Neisseria spp.* being elevated in rugby relative to Olympic athletes at both timepoints, *Prevotella histicola* being elevated in Olympic athletes relative to rugby at both timepoints, and *Bifidobacterium longum* being almost exclusively detected in the Olympic cohort but not rugby.

Conclusions Marked differences in microbiome signatures were found both between elite athletes and non-athletes and between team and individual sport cohorts. Further studies may help identify microbial factors related to optimal food conversion, performance or recovery, and prediction of illness risk.

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EQUIPMENT-RELATED RISK FACTORS FOR ACL INJURY AMONG RECREATIONAL SKIERS – A CASE CONTROL STUDY

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Background In recreational skiing, an ACL injury is one of the most common diagnosis.

Objective To compare equipment-related risk factors between ACL injured and uninjured skiers.

Design Case-Control study over the 3 winter seasons 2016/17–2018/19 in one major Austrian ski resort.

Participants 248 ACL injured (52% females) and 1054 uninjured skiers (48% females).

Assessment of Risk Factors ACL injury was diagnosed by MRI in a sports clinic located in the ski area. Ski length [m] and side cut radius [m] were taken from the information given on the ski and ski length was relativized to body height [%]. Combined height of ski and binding plate [mm] at the front (H_F) and back part (H_B) of the ski binding, and height at the toe (H_T) and heel piece (H_H) of the ski boot [mm] were measured with a digital sliding caliper. Quotients between H_F and H_B as well as between H_T and H_H were calculated.

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.