ball pass before and after a high-speed 180° pivot turn on the force plates.

Following variables were analysed

Peak vertical ground reaction force (N/kg), peak trunk lateral flexion angle (degree), peak knee flexion angle (degree), peak knee valgus angle (degree), peak knee flexion moment (Nm/kg), peak knee abduction moment (Nm/kg), and peak knee internal and external rotation moments (Nm/kg). Mean of three trials was used. Injuries and exposure were registered for 12 months.

Main Outcome Measurements New acute non-contact knee injury.

Results The complete data was obtained from 109 female and 149 male basketball (n=130) and floorball (n=128) players. A total of 18 new non-contact knee injuries were registered (0.3 injuries/1000 h of exposure). Female players sustained 14 knee injuries and male players 4. A higher rate of knee injuries was observed in females compared with males (incidence rate ratio 6.2, 95% CI 2.1–21.7). Eight ACL injuries were registered (all in female players). Females displayed significantly larger peak knee valgus angles compared with male (mean for female and male, respectively: 13.9 and 2.0 degree). No significant associations between biomechanical variables and knee injury risk were found.

Conclusions Female players were at increased risk of knee and ACL injury compared with males. Female players performed the 180-degree pivot turn with significantly larger knee valgus compared with male. However, none of the investigated variables were associated with knee injury risk in youth basketball and floorball players.

043

INJURY BURDEN DIFFERS CONSIDERABLY BETWEEN SINGLE TEAMS FROM GERMAN PROFESSIONAL MALE HANDBALL: SURVEILLANCE OF THREE CONSECUTIVE SEASONS

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Background Although high injury prevalences and incidences for professional handball were reported, longitudinal analysis of injury burden remain rare.

Objective Analysis of the injury data of the national statutory accident insurance (VBG) for the two highest divisions in German professional male handball over three consecutive seasons regarding interseason, inter-division and inter-team differences of injury burden.

Design Prospective observational open cohort study over the seasons 2014/2015, 2015/2016 and 2016/2017.

Setting German professional male handball (Handball Bundesliga=HB, 2. Handball Bundesliga=HB2).

Patients (or Participants) All first and second division handball players who played at least one competitive club match within the seasons 2014/15 (n=808), 15/16 (n=757) and 16/17 (n=758) were included.

Interventions (or Assessment of Risk Factors) Analysis of all injuries that were registered by clubs or physicians with the German statutory accident insurance for professional athletes (VBG) as part of occupational accident reporting and that led to time loss and/or to medical attention.

Main Outcome Measurements Inter-team comparisons were calculated using the following formula: 'Cumulative injury burden resulting from mandatory reportable injuries (≥4 days) per team-season/number of competitive matches per team-season'.

Results Every German professional handball player missed on average (cumulative) 28.7 days per season due to injuries. The total burden equalled 66,597 days of absence (HB: 31,247, HB2: 35,350). The mean injury burden per competitive match over the three observed seasons for all HB teams ranged from 12.5 to 14.2 days of absence with individual rates ranging from 4.3 to 28.8 (2014/2015), 2.1 to 27.5 (2015/2016) and 2.3 to 33.6 (2016/2017). For HB2 teams the mean burden ranged from 13.3 to 14.6 days of absence per competitive match, with individual rates ranging from 3.0 to 25.1 (2014/2015), 2.5 to 30.0 (2015/2016) and 0.9 to 35.7 (2016/17).

Conclusions These wide ranges indicate that a reduction in the injury burden seems generally possible and that some teams and coaching staffs are more successful concerning their preventive (coach, medical and therapeutic specific) player support.

044

EVALUATION OF BODY CHECKING POLICY FOR INJURY PREVENTION IN NON-ELITE ADOLESCENT ICE HOCKEY PLAYERS

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Background Body checking is associated with an increased risk of injury and concussion in Pee Wee (ages 11–12) and non-elite (lower 70% by division of play) Bantam (ages 13–14) ice hockey players. This research informed local and provincial policy changes disallowing body checking in non-elite Midget (ages 15–17).

Objective To evaluate the rate ratios of game-related injury and concussion in non-elite Midget players following policy change disallowing body checking in games compared with similar leagues still allowing body checking.

Design Prospective cohort.

Setting Community ice hockey rinks.

Participants Non-elite Midget ice hockey players from 44 teams (453 player-records) where policy disallowed body checking in the lower 70% of divisions of play, and 52 teams (674 player-records) from similar divisions where policy

allowed body checking; 120 players participated in more than one season.

Assessment of Risk Factors Exposure to policy that permits body checking (Edmonton 2015–17 and Calgary 2015–18) vs. policy disallowing body checking (Vancouver 2015–16, Edmonton 2016–17, and Calgary 2016–18).

Main Outcome Measurements All game-related ice hockey-related injuries were identified by a team safety designate. Suspected concussions were referred to a study sport medicine physician.

Results In divisions allowing body checking, there were 213 injuries [incidence rate (IR)= 12.96/1000 player-hours; 95% CI: 9.21–16.70] including 69 concussions (IR= 4.20/1000 player-hours; 95% CI: 2.63–5.76). In divisions disallowing body checking, there were 40 injuries (IR=5.13/1000 player-hours; 95% CI: 1.71–8.56) including 18 concussions (IR= 2.31/1000 player-hours; 95% CI: 0.62–4.00). Using multilevel Poisson regression adjusted for cluster and several important covariates (year of play, player weight, previous injury/concussion history, position), policy disallowing body checking was associated with a lower rate of all injury [incidence rate ratio [IRR]=0.38; 95% CI: 0.24–0.60], and concussion (RR=0.49; 95% CI: 0.26–0.89).

Conclusions Policy disallowing body checking reduced the rate of game-related injuries in Midget non-elite levels of ice hockey. This research should inform body checking policy change nationally.

045

PERCEIVED BARRIERS AND FACILITATORS TOWARDS AN INJURY PREVENTION PROGRAM AMONG PROFESSIONAL MALE ICE HOCKEY PLAYERS AND STAFF MEMBERS

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Background Lower extremity injury prevention programs are effective in team sport athletes.

Objective This study identifies barriers to and facilitators for an injury prevention program in professional male ice hockey teams among players and staff members.

Design Cross-sectional survey.

Setting Professional male ice hockey teams.

Participants Eight Swiss National League A (NLA) teams and their staff members were invited to participate in the study and voluntarily completed the questionnaire. Inclusion criteria were the ability to understand German or English and signed informed consent. Six teams completed the questionnaire (148 players and 11 staff members).

Main outcome measurements Frequency of ratings related to knowledge, attitude, adherence and habits were analysed. Binary logistic regression analysis was applied to predict a relationship between players' characteristics and positive attitude towards an injury prevention program.

Results Knowledge, perceived benefit and relevance of injury prevention as well as awareness of high risk of injuries in ice hockey were identified as important facilitators. Players' habit of exercise performance was identified as a barrier. Program understanding of staff members was identified as a facilitator

and barrier. No significant relationships were observed between a high/low perceived benefit of an injury prevention program and age ($p = 0.85$), nationality ($p = 0.53$), level of education ($p = 0.63$), National League experience ($p = 0.50$) or occurrence of lower extremity injuries in the previous season ($p = 0.10$).

Conclusion Identified barriers and facilitators should be addressed when developing and implementing an injury prevention program in a setting of professional ice hockey teams. An injury prevention program should be offered to and implemented in players of all ages, levels of education and experience in National League, irrespective of previous injuries.

046

THE MECHANISMS OF ANTERIOR CRUCIATE LIGAMENT INJURIES IN MALE PROFESSIONAL FOOTBALL PLAYERS IN THE MIDDLE EAST: A SYSTEMATIC VIDEO ANALYSIS OF 15 CASES

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Background While effective programmes to prevent anterior cruciate ligament (ACL) injury have been established, it is important that programme design, consistent with the van Mechelen model, is based on the specific injury mechanisms, representative of the region and playing conditions. Presently, no such data exist for professional football players competing in the Middle East.

Objective To describe the mechanisms of ACL injury in male professional football players in the Qatar Star League (QSL) based on systematic video analysis.

Design Systematic video analysis of prospective injury surveillance data.

Setting Male professional football in Qatar.

Participants Fifteen professional male football players in the QSL, who sustained an ACL injury in a match during the seasons 2013/2014 through 2018/2019.

Assessment of injury mechanisms Injuries were recorded through the Aspetar Injury Surveillance Programme and high definition broadcast videos were analyzed (49 views; 34 slow motion). Five analysts independently described the injury mechanisms in detail (situation, behavior, biomechanical characteristics), using validated observational tools (Walden et al. 2015).

Results A knee valgus mechanism was observed in 10 cases (1 with direct contact to the knee, 3 with contact to other body part and 6 with no body contact), no valgus was observed in 2 cases (both direct knee contact), while 3 were unclear. Of the 12 non-contact/indirect-contact situations, we saw 4 main categories of injury situations (multiple combinations were possible): pressing ($n=6$), tackling or to be tackled by another player ($n=4$), blocking ($n=3$) and screening ($n=2$). In the 3 direct contact injuries, the player was tackling in 2 cases and being tackled by another player in 1 case.

Conclusions Only 20% of match ACL injuries were contact injuries. Knee valgus was consistently observed, independent of the playing situation. Pressing was the main mechanism leading to injury. Landing after heading was not observed in any of these injuries.