

Conclusions The annual incidence of paediatric ACL-reconstructions in Norway increased from 2005 to 2019. ACL injury imposes an increasing health burden on the young population which warrants further attention - especially regarding prevention.

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HIGH INCIDENCE OF ANTERIOR CRUCIATE LIGAMENT INJURIES WITHIN THE TWO FIRST MONTHS OF THE SEASON IN AMATEUR TEAM BALL SPORTS

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Background The incidence of anterior cruciate ligament (ACL) injuries is commonly reported as an annual rate. There is relatively little information about their seasonal aspects.

Objective The aim was to analyze the distribution of ACL injuries during the season in amateur football, handball and basketball. It was hypothesized that ACL injuries they were more common after the summer break in comparison to the rest of the season.

Design Retrospective case series

Setting Hospital-based registry

Patients Three hundred and seventy-one (282 males, 89 females) injuries were included according to the following criteria: ACL injury occurring in football (n=258), handball (n=56) or basketball (n=57) and confirmed through clinical examination, MRI and arthroscopy where applicable, under 35 years of age and pre-injury participation in competitive sport.

Interventions (or Assessment of Risk Factors) Gender; age; sport at injury; injury mechanism; previous or contralateral ACL injury.

Main Outcome Measurements The injury occurrence during the calendar year was divided into six periods of two months. Segment 1 (S1) represented the first two months after summer break (Football: September/October, handball/basketball: October/November).

Results The occurrence of ACL injuries differed significantly between segments ($p < 0.01$) and according to sports ($p < 0.01$). Almost one third occurred in S1 (n=104; 28%). The distribution was similar in other segments (S2: 13%, S3: 16%, S4: 16%; S5: 12%, S6: 15%). Fewer ACL injuries occurred in S2 in football (9%) compared to basketball (23%) ($p < 0.05$). More ACL injuries occurred in S5 in football (17%) compared to handball (2%) and basketball (2%) ($p < 0.05$).

Conclusions The majority of ACL injuries in amateur football, handball and basketball sports occurred immediately after the summer break in the first two months of the season. This indicates that amateur athletes should start ACL injury prevention programs before the start of the season to allow for gradual increases of load.

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PATIENTS WITH KNEE INJURY HAVE WORSE POSTURAL ORIENTATION THAN HEALTHY CONTROLS

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Background Patients with knee injury appear to have worse postural orientation (i.e., alignment between body segments), at the knee, measured with gold standard three-dimensional motion analysis, compared with controls. However, there is a lack of studies on postural orientation for other joints than the knee, e.g., hip and trunk, as well as with a clinically applicable method.

Objective To investigate whether visual assessment of Postural Orientation Errors (POEs) differs between patients with anterior cruciate ligament reconstruction (ACLR) and healthy controls.

Design Cross-sectional study

Setting Clinical setting

Participants Inclusion criteria were: age 18–39 years, >16 weeks post-ACLR, and initiated jumping exercises. Fifty-three patients with ACLR (45% women), mean age 26.7 (SD 6.5) years, and 30 controls (50% women), mean age 28 (SD 7.9) years, were included.

Interventions Six POEs of the lower extremity and trunk, e.g., knee medial-to-foot position and femoral valgus, were visually assessed as good, fair, or poor, from video-recordings of 5 functional tasks. A score from 0 (good) to 100 (poor) was calculated for two subscales; activities of daily living (ADL) (single-leg squat, stair descending, forward lunge) and Sport (single-leg hop, side-hop), and a Total POE score (all 5 tasks). The injured leg was assessed in patients, and the right leg in controls.

Main Outcome Measurements POE scores

Results Patients with ACLR had significantly worse POE scores compared with controls, POE subscale ADL (ACLR: median 18.5 (quartiles 11–26), controls: 11 (3.7–14.8), $p = 0.0001$), POE subscale Sport (ACLR: 26 (16.7–29.6), controls: 7.4 (3.7–15.7), $p = 0.0001$), and Total POE score (ACLR: 23.2 (14.3–25.9), controls: 8 (5.4–16), $p = 0.0001$).

Conclusions Patients with ACLR appear to have worse postural orientation, measured with visual assessment, compared with controls. Visual assessment of POEs could be used to guide injury treatment aimed at improving postural orientation before return to sport, and potentially also to guide prevention training.

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DOES SOMATOSENSORY DYSFUNCTION EXIST AT RETURN TO PLAY FOLLOWING CONCUSSION IN ELITE ATHLETES

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Background A growing body of evidence suggests athletes may be over two times more likely to sustain a musculoskeletal (MSK) injury following concussion, highlighting significant clinical need to understand the pathophysiological changes in function and guide long term management of these patients. Reduced somatosensory function is considered one potential influencing factor for this phenomenon, whereby decreased postural control and bodily awareness leads to poor technique or abnormal movement strategies

Objective Using a measure of postural sway (Sway medical app, SMBA) and a balance assessment marker (Y-balance) this study aims to establish if somatosensory function is reduced at the point or return to play in a group of elite athletes.

Design Observational cohort study**Setting** British Olympic network**Patients (or Participants)** Men's and Women's Great Britain boxing, skeleton and hockey and elite women's rugby**Interventions (or Assessment of Risk Factors)** Baseline SMBA and Y-balance measures were taken as part of a bi-annual squad profiling battery.

Concussion was diagnosed by one of the team physiotherapists or sports medicine consultants. Testing was repeated within three days of initial injury (where possible) and upon clearance for return to play following completion of the return-to-play protocol.

Main Outcome Measurements Postural sway (SMBA) and the Y-balance test**Results** To date five concussions have been recorded across all groups, demonstrating a mean percentage reduction in postural sway of 18.3% (87.2 SD = 11.3 - 71.2 SD = 23.7). There was no significant difference in baseline postural sway between the concussed and non-concussed groups ($p=0.204$).For Y-balance, a 0.6% drop in return to play (RTP) reach was recorded in the concussed group when compared to group baseline scores ($p=0.852$, mean baseline- 96.3cm SD = 2.3, RTP 95.7cm SD = 3.94).**Conclusions** This study highlights a trend towards a residual reduction in somatosensory function upon return to play following concussion, despite normalisation of symptoms and SCAT5 testing. Despite this not being a statistically significant change, the study offers a promising start to warrant further investigation of somatosensory function and its relationship with increased MSK injury rates.

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THE RELATIONSHIP BETWEEN NECK STRENGTH AND CONCUSSION IN MALE PROFESSIONAL RUGBY PLAYERS^{1,2}Theo Farley, ¹Ed Barry, ¹Richard Sylvester, ¹Akbar De Medici, ¹Mathew Wilson. ¹The Institute of Sport Exercise and Health, London, UK; ²The English Institute of Sports, London, UK

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Background Sports related concussion has become one of the highest burden injuries within professional and amateur sports. There is currently limited evidence as to the existence of modifiable intrinsic risk factors to concussion however lab and field based studies indicate that muscle function may be a significant factor in reducing an external force and therefore the head accelerations thought to lead to a concussive injury. To date only one study supports the association of neck strength and concussion incidence with no unique range known to be significant.**Objective** To investigate whether neck strength is significantly associated with concussion incidence in a group of male professional rugby players.**Design** Prospective cohort study**Setting** Conducted in a National Rugby base on 225 elite rugby union club players, during the 2018–2019 season.**Interventions** Athletes were assessed for neck strength at three time points throughout the season using a method of self-resisted isometric contraction.**Main Outcome Measurements** Associations with diagnosed concussion injuries are presented as Incidence Rate Ratios (IRR) with 95% confidence intervals. we present the IRR for a 10% increase in each variable and compared results against concussion using match minutes to allow for risk exposure.**Results** A 10% increase in extension strength was associated with a 13% decrease in concussion risk.

A neck extension strength score of 41.2kg or below indicated athletes most at risk of sustaining a concussion with a true positive rate of 71.4% and a false positive rate of 46.1%

Conclusions To our knowledge this is the first study to demonstrate a unique strength range associated with concussion and to identify a minimum strength score associated with a quantifiable risk. Neck extension strength is a modifiable intrinsic risk factor to concussion in professional male rugby players and may be considered as part of a pre-season strength and conditioning regime.

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DOES A MANDATORY 36-TO-48-HOUR LATER ASSESSMENT FOR SPORT-RELATED CONCUSSIONS REDUCE THE RISK OF ATHLETES INAPPROPRIATELY RETURNING TO PLAY?^{1,2}Steffan Griffin, ⁶Matt Cross, ¹Lewis Henderson, ⁴Geraint Ashton Jones, ^{1,3}Keith Stokes, ^{1,5}Simon Kemp. ¹Rugby Football Union, London, UK; ²University of Edinburgh, Edinburgh, UK; ³University of Bath, Bath, UK; ⁴Alligin Performance, Glasgow, UK; ⁵London School of Hygiene and Tropical Medicine, London, UK; ⁶Premiership Rugby Limited, London, UK

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Background Concussion is one of the key player welfare issues in rugby union. A post-match assessment is a mandatory part of the head injury assessment (HIA) process in elite men's rugby union, something unique to the sport and not seen in many other sporting settings. There is little evidence surrounding the potential value of this mandatory post-match assessment.**Objective** To analyse at what stage of rugby union's head injury assessment (HIA) protocol match-related concussions are diagnosed over the course of one season.**Design** Prospective analysis.**Setting** Twelve professional rugby union clubs in the highest league in England (UK) in 2019–2020.**Participants** Professional male rugby union players who were diagnosed with a match-related concussion across all competitions.**Outcome measures** Number and proportion of concussions diagnosed at different stages of HIA protocol: HIA1 (in-game, using an abridged version of the Sports Concussion Assessment Tool 5 (SCAT5); HIA2 (within 3-hours of match, supported by the SCAT5); HIA3 (within 48-hours of match, supported by the SCAT5); or outside of these windows.**Main Results** There were 109 concussions (incidence 21.3/1000 player hours) across all competitions. 32 (29%) of concussions were formally diagnosed in game at the HIA1 stage. 65 (60%) of concussions were formally diagnosed at the HIA2 stage, and 9 (8%) post-match at the HIA3 stage. Three (3%) were diagnosed outside of the HIA window.**Conclusions** The majority of formal diagnoses were made on match-day (in-game or post-match). However, the number of diagnoses made outside of this time period suggests that a later mandatory formal clinical assessment, based on the widely available SCAT5, can help clinicians to identify delayed presentations. As such, later assessments could help minimise the risk of players inappropriately returning to sport without following the appropriate graduated return-to-play protocol.