

2025 CASEM Podium Presentation Abstracts

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Transitioning Out of Elite Sport: The Experience of Integrated Support Team Members

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Objective: Integrated Support Teams (IST) are composed of multidisciplinary professionals dedicated to enhancing the performance of elite sport teams, and commonly include psychologists, athletic trainers, strength and conditioning coaches, physiotherapists, and physicians. IST membership is often perceived as the pinnacle of one's career, yet the opportunity also comes with substantial demands, drawbacks, and career-defining decisions. Therefore, understanding IST members' experiences is warranted, especially the culmination of their careers in elite sport. This study explored transitions out of an IST with an emphasis on barriers and facilitators to a successful transition.

Study Design: The study was guided by an interpretive description (ID) framework. Participants completed one-on-one semi-structured interviews, and data were analysed following the 6 recursive phases for ID as outlined by Thorne (2016).

Subjects: Six former IST members (4 physicians, 2 physiotherapists; 4 women, 2 men) who supported international-level teams and transitioned within the past 5 years.

Intervention: Semi-structured interviews.

Results: Data analysis resulted in 4 pre-transition themes (managing time demands, feeling undervalued/underappreciated, navigating evolving role expectations, preparing a transition plan), 4 during-transition themes (service continuity, variation in communication, lack of support, seeking mentorship), and 3 post-transition themes (managing identity, reconciling a hope to remain in sport, coping with post-transition emotions) and illustrated barriers and facilitators to successful transition. Key barriers included poor organizational oversight of ISTs, role instability, and members' ego-involvement, while key facilitators were social support, involvement in the transition, and continuation of meaningful work. Overall, the lack of organizational responsibility resulted in inconsistent processes and inadequate support for IST members transitioning from elite sport.

Conclusions: Clarifying organizational responsibility, formalizing transition processes, providing support resources, and implementing mentoring schemes appear crucial in supporting IST transitions and service provision.

An Evaluation of Self-Identified Amenorrhea, Oral Contraceptive Use and Sport-Related Injury in Female Varsity Endurance Athletes

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Objective: Menstrual irregularities have been associated with decreased bone mineral density, but their relationship with musculoskeletal injuries in female athletes is unknown. The objective of this study is to explore self-identified amenorrhea, oral contraceptive use and sport-related injury in female varsity athletes.

Study Design: Retrospective chart review.

Subjects: Eighty female varsity athletes who completed a pre-participation evaluation (PPE) between June 1, 2016 and December 31, 2019 were identified. Eight athletes using intra-uterine devices (IUDs) were excluded, 72 athletes were included in final analysis, cross-country (n = 25) and rowing (n = 47). 35% (n = 25) of athletes reported using an oral contraceptive pill (OCP). Mean age at PPE completion was 19 ± 2 years.

Observation Technique: Independent variables were self-identified amenorrhea (90 days or more without a menstrual period) in the past year and use of OCPs at the time of PPE completion.

Outcome Measures: The primary outcome was the number of musculoskeletal sport-related injuries per varsity season.

Results: Sixty-one injuries were reported among the 72 athletes, 48 (79%) in rowing and 13 (21%) in cross-country. The median injuries per season (interquartile range) was 0.5 (0.1). The median number of menstrual periods per year was 12 (10.75, 12) among athletes. The median menstrual cycle length was 28 (5, 30) days, and median number of days without a menstrual period in the past year among athletes was 34 (28, 51). The median number of sport-related injuries per season among athletes who self-reported amenorrhea was 0.5 (0.1) versus those who did not was 0.42 (0.1). Similarly, the median number of sport-related injuries per season in athletes who used OCPs was 0.5 (0.1) versus those who did not was 0.33 (0.1).

Conclusions: There are a low number of sport-related injuries per season among endurance varsity female athletes regardless of self-identified amenorrhea and OCP use. Future research is needed to longitudinally evaluate sport-related injuries in a larger sample of athletes.

Using Metabolic Biomarkers of Cartilage Degeneration for Diagnosing Osteoarthritis Earlier Than X-Ray Changes

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Objective: By the time Osteoarthritis (OA) is detected via radiology, irreversible cartilage damage has often occurred. This study hypothesizes that metabolic biomarkers, in conjunction with structural biomarkers, can identify the onset of OA inflammation, enabling earlier diagnosis and preventative treatment before X-ray-visible changes occur.

Study Design: Cross sectional design with in-vitro/in-vivo approaches: **In vitro:** ATDC5 mouse chondrocytes and bovine chondrocytes were exposed to oxidative stress and pro-inflammatory cytokines (IL-1 β and TNF α) under normoxic and hypoxic conditions. Biomarker expression including Enolase-1, HIF-1, COMP, Paraonase and Lamin were evaluated using qPCR. **In vivo:** Synovial fluid from 20 patients undergoing arthroscopy (minimal or no OA) or arthroplasty (advanced OA) was analyzed for metabolic and structural biomarkers using ELISA for Enolase-1, HIF-1, COMP and Paraonase. Correlations were drawn between biomarker levels and patient-reported outcomes (ICRS/IKDC scores).

Subjects: Chondrocyte cultures were used for laboratory experiments. Synovial fluid was collected from 20 patients divided into minimal/absent and advanced OA groups based on clinical assessment.

Outcome Measures: Primary outcomes included expression levels of metabolic and structural biomarkers, such as Enolase-1, HIF-1 α , COMP, and Paraonase, in response to hypoxia and inflammation. Secondary measures included the correlation of these biomarkers with patient-reported outcomes and OA stage.

Results: Under hypoxia, IL-1 β and TNF α increased biomarker expression. Enolase-1 levels increased by 587% under IL-1 β and by 266% under TNF α , indicating a metabolic shift. HIF-1 α expression increased 70% under IL-1 β . COMP levels, linked to cartilage degradation, and Paraonase, indicative of oxidative stress, were elevated under hypoxia. In in-vivo analysis, Enolase-1 levels were 810% higher in advanced OA compared to early OA, while Paraonase levels increased by 68%. HIF-1 α showed moderate increases, with variability across samples. Biomarker levels correlated with patient outcomes, providing insight into OA progression.

Conclusions: Enolase-1, Paraonase, COMP, and HIF-1 α show potential for detecting OA earlier than X-ray-visible changes. The above study was a pilot project, and we are awaiting funding to strengthen the statistical relationships between biomarkers and patient outcomes to establish thresholds for interventions.

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E-Consults to Sports and Exercise Medicine Specialists Improve Access and Modify Primary Care Provider Management and Referral Behaviour

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Objective: To describe the impact of an electronic consult (eConsult) service on access to sports and exercise medicine specialists and the impact on primary care providers' (PCP) referral behaviour.

Study Design: A cross-sectional study of eConsults submitted by PCPs to sports and exercise medicine specialists between January 2021 and December 2023.

Subjects: All eConsults to sports and exercise medicine concerning 143 patients (56% female and 44% male).

Intervention: Use of the Champlain BASE eConsult service by PCPs and a mandatory closeout survey completed by PCPs.

Outcome Measures: We report patient demographics, PCP rurality, referral behaviour of PCPs, eConsult response times, clinical topics, and overall satisfaction of primary care physicians with eConsult services.

Results: Seniors aged 65 years and over were the subject of 23.8% of all eConsults. PCPs serving patients in rural locations made up 15.7% of all eConsults. The median time for a PCP to receive a reply to an eConsult was 5 days. Approximately 52.4% of eConsults pertained to treatment recommendations. Leg, foot, and knee symptoms or complaints were most often discussed, representing 19.6%, 19.6%, and 17.5% of eConsults, respectively. PCPs received new or additional courses of action in 68.5% of submitted cases. Approximately 32.7% of in-person referrals contemplated by PCPs were deemed unnecessary and thus avoided. Approximately 93.7% of eConsults were rated highly useful by PCPs.

Conclusions: The eConsult service provides PCPs with prompt and highly rated access to sports and exercise medicine specialists, which results in timely management of patient cases while reducing unnecessary in-person referrals.

Analyzing the Risk of Avascular Necrosis Post Hip Intra-Articular Steroid Injection; A Systemic Review of the Literature

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Objective: This systematic review looked at the risks of AVN post intra-articular steroid injections into the hip. The quality of evidence was evaluated and used to make treatment recommendations.

Data Sources: Information was gathered via 3 databases (Medline, Embase and sportsdiscus); looking for the risks of AVN post intra-articular hip injection of steroid. Special consideration was used for the osteoarthritis population. A sole reviewer conducted searches of titles, abstracts and articles in the aforementioned databases. Inclusion and exclusion criteria were applied, and information was compiled.

Main Results: Through 3 database searches, 26 articles were identified post duplicate removal and abstract review. The vast majority had AVN as their primary outcome, measured via either XR or MRI. Compiling of the literature revealed mixed results, with both case studies and reviews studies presenting both an association of steroid injection with AVN and others rejecting it. Deeper review of this nuanced literature pointed away from this association, but literature on both sides of the argument were of lower power, retrospective and failed to control for confounding variables. The mean study quality can be considered fair. The overall quality of the literature used in this review would be consider low in relation to GRADE guidelines.

Conclusions: The following review demonstrates the limitations of the current state of literature regarding hip AVN post intra-articular cortisone injection(s). Given the limited evidence of its association and the large potential benefits of the injection, shared decision making is recommended for next steps. Caution should be taken on both sides and definitive recommendations are limited.

Clinical and Radiographic Characteristics of Patients With Knee Osteoarthritis With and Without a Previous Knee Injury: A Cross-Sectional Study

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Objective: To compare clinical and radiographic characteristics and physical activity levels of patients with mild to moderate knee osteoarthritis (OA) with and without previous knee injuries associated with post-traumatic osteoarthritis (PTOA) presenting to a sport medicine clinic.

Study Design: Cross-sectional study.

Subjects: A total of 262 patients (147 females) over 40 years of age who were diagnosed with mild-to-moderate knee OA using clinical and radiographic criteria.

Comparison: Patients were categorized into 2 groups: 1) previous knee injury associated with PTOA (PTOA), or 2) no previous knee injury associated with PTOA (NTOA).

Main Outcome Measures: Knee Injury and Osteoarthritis Outcome Score (KOOS) subscales (primary), Kellgren-Lawrence (KL) radiographic OA scores, functional tests (40-metre fast-paced walk, 30-second chair stand), physical activity levels (daily steps), general patient characteristics including comorbidities and anthropometrics, Intermittent and Constant Osteoarthritis Pain (ICOAP) questionnaire, Arthritis Self-efficacy (ASE) questionnaire, Patient Global Assessment of Health Status (PGAHS), and Center for the Epidemiological Studies—Depression Scale (CESD-R).

Results: While the PTOA group ($n = 67$) was 4.1 years younger on average than the NTOA group ($n = 195$, $P < 0.001$), there were no differences in sex distribution, body mass index, comorbidities, or KL radiographic OA scores. The PTOA group had higher scores on the KOOS Pain (63.6 ± 15.3 vs 58.3 ± 18.0 , $P < 0.05$) and Activities of Daily Living subscales (73.6 ± 15.3 vs 65.7 ± 20.1 , $P < 0.01$), PGAHS (62.5 ± 20.5 vs 53.5 ± 22.7 , $P < 0.001$), and ASE (62.5 ± 21.8 vs 54.2 ± 21.1 , $P < 0.01$) and lower scores on the ICOAP (32.8 ± 23.8 vs 40.3 ± 26.7 , $P < 0.005$) and CESD-R questionnaires (17.4 ± 6.6 vs 19.3 ± 18.0 , $P < 0.05$). They also had superior physical function with higher daily steps (5944 ± 443 vs 4312 ± 265 , $P < 0.01$), faster 40-metre fast-paced walk speeds (23.6 ± 4.3 vs 27.2 ± 6.5 , $P < 0.001$) and more 30-second chair-stand repetitions (14.4 ± 5.6 vs 12.1 ± 5.6 , $P < 0.05$).

Conclusions: This was the first study to compare clinical and radiographic characteristics between knee OA patients with and without a previous PTOA-associated knee injury. Despite having similar radiographic scores, patients with PTOA-associated injuries demonstrated better physical and psychological health outcomes. Therefore, NTOA patients may require different interventions to alleviate symptomology and improve function, like increasing physical activity levels, than PTOA patients. This study also shows a discordance between clinical and radiological findings, suggesting further research is needed.

Concussion Risk and Severity Associated With a Pre-Season Multi-Modal Neurologic Training Program among Elite Male Ice Hockey Players

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Objective: To determine if the risk of concussion and its severity differs between male ice hockey players associated with a pre-season training program.

Study Design: Prospective cohort study (2022-2024).

Subjects: Twelve elite male ice hockey players (mean age: 15.2 years) and 142 age and sex-matched athletes assigned to intervention (IG) and control groups (CG) respectively.

Intervention: The IG completed a two-month pre-season multi-modal training program alongside their usual training, while CG followed their usual pre-season training. The IG program encompassed dynamic vision, dynamic neck strength, neuromuscular and cardiovascular training, custom performance mouthwear, psychological counseling (if indicated), and sleep performance eyewear and mouthwear (if indicated).

Outcome Measures: Athlete participation exposure (practices and games) throughout the season was calculated for each cohort. Poisson regression was used to calculate incidence rate ratios (IRRs) for concussion differences between IG and CG, adjusting for age, competition level (AA vs AAA), and concussion history. Linear regression was used to compare the average time loss due to concussion between the IG and CG and model fitted to identify potential predictors.

Results: Twenty-four athletes were diagnosed with a concussion (IG: 1, CG: 23). Players in the IG were found to be at significantly lower risk of concussion compared to those in CG (IRR = 0.029, 95% CI: 0.001-0.661, $P = 0.026$). Previous history of concussion was a significant predictor of increased risk (IRR = 2.04, 95% CI: 1.47-2.83). Concussion severity (average time loss in days) was not significantly different between cohorts (IG: 12.0 days, CG: 11.7 days). However, older athletes (2.99 days, 95% CI: 0.31-5.66) and higher level of competition (4.48 days, 95% CI: 0.82-8.15) were significant predictors of time loss ($P < 0.05$).

Conclusions: Controlling for athlete participation, age, and competition level, results of this study suggest completion of a two-month multi-modal neurologic training program reduces the risk of concussion by approximately 3-fold for elite male ice hockey players compared with those who did not. Time loss from concussion did not differ significantly between cohorts, however, older age and a higher competition level predicted greater time loss.

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Development and Initial Insights into the Australian Knee Injury Study: A Nationwide Knee Injury Inception Cohort

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Objective: To describe development and initial insights from first 150 participants of the Australian knee injury study.

Study Design: Inception cohort study.

Subjects: Australians of any age with an acute (<6 months) knee injury that required them to seek healthcare.

Observation Technique: Self-reported online questionnaires (REDCap) at baseline, 6-months, 1-, 2-, 5-, and 10-years post-injury.

Outcome Measures: Baseline data includes: age, sex/gender, current/prior knee injuries, physical activity level (Tegner Activity Scale), health-related quality of life (EQ-5D-5L), recovery expectations (7-point Likert scale from “very much worse” to “completely recovered”), and current pain, mental health and knee instability (all on Visual Analog Scale [VAS], 0 = no problem). At each follow-up, data collected includes (not presented in this abstract): healthcare pathway (types of healthcare provider seen, decision to undergo surgery or not), recovery status (Patient Acceptable Symptom State, Global Rating Of Change), reinjuries, physical activity level (Tegner Activity Scale), quality of life (EQ-5D-5L), mental health (VAS) and knee instability (VAS).

Results: The first 150 participants with baseline data were 32 ± 14 years old, predominantly female (70%), and representing 7 of the 8 Australian states and territories. The most frequently reported injuries are isolated anterior cruciate ligament (ACL) rupture ($n = 61$), combined ACL rupture and meniscal tear ($n = 52$) and isolated meniscal tear ($n = 15$). Median number of months since injury is 3 (IQR = 3), and 37% of participants had already undergone surgery for their injury. The median Tegner Activity Scale score in the year before injury was 7 (IQR 4). Self-reported levels of pain, mental health and knee instability are $32 \pm 24\%$, $37 \pm 30\%$, and $35 \pm 29\%$, respectively. Sixty-one percent of respondents expected to be completely recovered one-year post-injury, and 36% expected a moderate recovery. Of the 55 who reached the 6-month milestone, 94% have completed their 6-month follow-up questionnaires.

Conclusions: Findings will help to understand patient- and healthcare-related factors that predict treatment pathways and long-term outcomes, including sex/gender disparities. This study can act as a blueprint to evaluate care for knee injuries in other countries. It could provide an ideal platform for an injury registry to be launched that includes both operative and non-

operatively managed patients, which is currently a limitation of existing knee injury registries that focus on surgical patients.

The Use of Point-of-Care Ultrasound in Sideline Medicine in the Canadian Football League

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Objective: To describe the use of point-of-care ultrasound (POCUS) within sideline sports medicine.

Study Design: Prospective observational study using an online questionnaire.

Subjects: Two team physicians for the Calgary Stampeders, who are trained in POCUS.

Observation Technique: Team physicians completed anonymized online surveys after each POCUS scan on 1 CFL team throughout the 2024 football season.

Outcome Measures: Description of the use of POCUS among Calgary Stampeders team physicians, including time since injury, type of injury, certainty of findings, and time required.

Results: A total of 28 POCUS scans were completed. Most scans were completed within 1 hour of injury (32.1%), 25% were completed more than 48 hours after injury, 3.6% within 6 to 24 hours, and 17.9% between 24 and 48 hours post-injury. The majority of POCUS scans occurred after the game (85.7%); 14.3% occurred during the game. Most scans were completed in the training room (85.7%), followed by the physician’s office (10.7%) and the sideline (3.6%). POCUS was mostly used for lower extremity injuries (60.7%), followed by upper extremity (28.6%), and chest wall (7.1%). Of the lower extremity injuries, 41.2% involved the ankle or achilles tendon, 35.3% the knee or hamstring, and 23.5% the calf. Most injuries assessed were soft tissue injuries and fractures. POCUS was most often used to confirm a suspected diagnosis (71.4%), as a standard part of the examination (57.1%), to improve patient understanding (46.4%), and to rule out a suspected diagnosis (32.1%). Most POCUS scans were positive for the clinically suspected injury (71.4%), 21.4% were negative and 7.1% were inconclusive; 67.9% of players were sent for additional imaging. On average, POCUS took 6.1 minutes (SD = 2.0) to complete, with 3.6 minutes (SD = 1.3) required for documentation.

Conclusions: In this group of sports medicine physicians, POCUS was used to scan a wide variety of acute injuries in professional athletes. POCUS was most frequently performed immediately after matches, and predominately helped to confirm the clinically suspected injury. Overall, POCUS aided clinical decision making and required minimal time to complete.

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A Massive Open Online Course in Concussion: Impact on Knowledge About Current and Previous Consensus Recommendations

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Context and Objective: The constant evolution of knowledge on the prevention and management of sport-related concussions (SRC) results in evolving clinical recommendations that constitute a challenge for knowledge transfer (KT). The objective of this study was to evaluate the impact of a MOOC as a KT strategy in terms of SRC knowledge improvement and successful completion of the course.

Methodology: A French language MOOC in concussion was updated to support the dissemination of the recommendations from the Amsterdam consensus statement on SRC published in June 2023. The MOOC included modules on the following topics: introduction to concussion, prevention, detection, initial management, management of persistent symptoms and valid resources for updates. The MOOC was openly accessible to self-registered participants for 8 weeks in the fall of 2024. Successful completion rates and knowledge improvement were the primary outcomes. Pre- and post-intervention knowledge was assessed using a 15-question pre-test composed of questions that were also embedded in the evaluation of each module. Five (5) of these questions could be answered based on recommendations that remained unchanged since the Berlin consensus (2017) and 10 questions reflected recommendations that changed following the Amsterdam consensus (2023).

Results: Of the 948 people that registered, 529 (56%) accessed the course at least once and 309 (33%) successfully completed the course. Participants included: 40% physiotherapists, 33% other health care providers, 27% other groups (sport, education, parents, etc). The average pre- and post-course quiz scores improved from 48.4% to 75.8% (+27.4%). Performance on the 5 questions reflecting unchanged recommendation since Berlin improved by 15.0% (70.7%-85.7%) compared to 33.5% (from 37.3% to 70.8%) for the recommendations that changed following the Amsterdam consensus.

Conclusions: These results further demonstrate that a MOOC is feasible and has a positive impact on concussion knowledge. The results also suggest that knowledge about the most recent recommendations had a greater change in quiz scores than recommendations that were unchanged from the previous consensus. Thus, the use of a MOOC in concussion as a strategy for knowledge translation is recommended. Collection of further data is required to determine if new recommendations are implemented in sports communities.

Advancing Compassion Concussion Education: Application of Cultural Historical Activity Theory Analytical Framework

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Objective: Interprofessional collaboration is integral to high-quality compassionate concussion care (CCC). Limited research examines how CCC is enacted collaboratively within healthcare teams. This narrative review aims to explore published descriptions of CCC in interprofessional healthcare practice, using a Cultural-Historical Activity Theory (CHAT) lens. The findings aim to inform the development of an interprofessional compassion concussion training curriculum.

Data Sources: Five major databases (Medline, Embase, PsycINFO, CINAHL, Web of Science) were systematically searched for studies on compassionate concussion care, interprofessional collaboration, and CHAT applications in healthcare. The search, completed in November 2024, identified 2133 citations prior to deduplication. Following full-text screening, 25 high-relevance studies from the past 15 years will be selected based on their alignment with CHAT principles and focus on interprofessional care in concussion contexts.

Methods: Using a meta-narrative review approach structured according to RAMSES guidelines, the inclusion criteria prioritized empirical and conceptual works on CCC emphasizing interprofessional collaboration. The data analysis maps findings to CHAT framework, focusing on interactions between 3 components: subjects (healthcare providers, caregivers, patients), tools (communication strategies, technologies), and objects (patients, families, etc.) to identify contradictions between them.

Main Results: Preliminary themes include the importance of defining shared goals, effective communication strategies, and positive leadership for interprofessional teams to deliver CCC. CHAT guided analysis revealed common tensions such as professional role conflicts, institutional constraints, and power imbalances, which may impact delivery of CCC. We also identified opportunities for resolutions to these tensions as pathways for integrating compassion into care.

Conclusions: CCC delivery is shaped by complex interactions between health professionals. Our study results provide evidence and practical insights for developing an interprofessional compassionate concussion care curriculum, which may enhance team-based care, mitigate conflicts, and improve patient-centered outcomes.

Validity of a Smartphone App to Serve as Proxy for Activity Level in Functionally Active Patients Post-ACL Reconstruction or With Knee OA

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Objective: To evaluate whether the myrecovery© Smartphone app is a valid proxy for activity in patients with knee osteoarthritis (OA) and anterior cruciate ligament reconstruction (ACLR) surgery by examining associations between app-measured activity and self-reported journals.

Study Design: Observational study.

Subjects: One hundred ninety-eight functionally active patients: 98 with OA (39% female, age 58 ± 8 years) and 100 at least 9 months post-ACLR (43% female, age 25 ± 8 years).

Intervention/Observation Technique: Participants tracked their daily exposure to activity for 4 weeks and utilized the myrecovery© app for the same period. Participants were encouraged to carry their phone unless not permitted by their sport/activity.

Outcome Measures: Participants reported their daily activities for 4 weeks through self-reported diaries, which were converted to metabolic equivalent of task (1 kcal/kg/h) per minute (MET/min). The myrecovery© app tracked their step count during the same timeframe. After the 4-week

period, patients completed a Marx Activity Rating Scale (MARX) to denote their activity intensity over the past month. To investigate the association between activity measures, we constructed scatterplots and used Pearson's r for linear data. Associations were interpreted as follows; poor: <0.2 , fair: $0.2 < 0.4$, moderate: $0.4 < 0.6$, strong: $0.6 < 0.8$, very strong: $0.8 < 1.0$.

Results: For the OA group, the association between MET/min and step count was $r = 0.51$ ($P = 0.002$). For the ACLR group, it was $r = 0.40$ ($P = 0.03$). The association between MET/min and MARX was $r = 0.01$ ($P = 0.95$) for the OA group and $r = 0.45$ ($P = 0.01$) for the ACLR group.

Conclusions: The myrecovery© app demonstrated statistically significant associations with MET/min for both groups but was stronger for OA patients, likely due to ACLR patients' limited ability to carry their phone during sports. For ACLR patients, MARX scores showed a stronger association with MET/min, suggesting it may better reflect activity intensity. The myrecovery© app may be more appropriate for older, less active OA patients, while alternative measures like MARX may better suit highly active ACLR patients.