# FAST BREAK

PUBLICATION FOR TEAM MEDICAL PERSONNEL

APRIL 2018

ISSUE 2

## WELCOME TO FAST BREAK!

Welcome to FIBA's quarterly publication. Our goal is to introduce our FIBA Sport Medicine and Sport Science community to newsworthy research topics. We welcome your questions or comments and thank you for your ongoing commitment to basketball players' healthcare.

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## IN THIS ISSUE

# SELECTED PUBLICATIONS OF INTEREST

## Lower extremity strength-based profile of NCAA Division I women's basketball and gymnastics athletes: implications for knee joint injury risk assessment.

Thompson BJ, Cazier CS, Bressel E, Dolny DG.

J Sports Sci. 2018 Aug;36(15):1749-1756.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29212413

This study aimed to provide a comprehensive strength-based physiological profile of women's NCAA Division I basketball and gymnastic athletes; and to make sport-specific comparisons for various strength characteristics of the knee flexor and extensor muscles. A focus on antagonist muscle balance (hamstrings-to-quadriceps ratios, H:Q) was used to elucidate vulnerabilities in these at-risk female athletes. Fourteen NCAA Division I women's basketball and 13 gymnastics athletes performed strength testing of the knee extensors and flexors. Outcome measures included absolute and relative (body mass normalised) peak torque (PT), rate of torque development at 50, 100, 200 ms (RTD50 etc.) and H:Q ratios of all variables. The basketball athletes had greater absolute strength for all variables except for isokinetic PT at 240°s-1 and isometric RTD50 for the knee extensors. Gymnasts showed ~20% weaker body mass relative concentric PT for the knee flexors at 60 and 120°·s-1, and decreased conventional H:Q ratios at 60 and 240°·s-1 (~15%). These findings suggest that collegiate level gymnastics athletes may be prone to increased ACL injury risk due to deficient knee flexor strength and H:Q strength imbalance. Coaches may use these findings when implementing injury prevention screening and/or for individualised strength training programming centered around an athletes strength-related deficits.

## Vital statistics and early death predictors of North American professional basketball players: A historical examination.

Lemez S, Wattie N, Lawler T, Baker J.

J Sports Sci. 2018 Jul;36(14):1648-1655.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29183260

While empirical evidence suggests that elite athletes have superior lifespan outcomes relative to the general population, less is known regarding their causes of death. The purpose of this study was to critically examine the mortality outcomes of deceased National Basketball Association and American Basketball Association players. Death data were collected from publicly available sources until 11 December 2015, and causes of death were categorized using the International Classification of Diseases, Tenth Revision (ICD). Mortality was measured through: i) cause-specific crude death rates (CDR), ii) estimates of death rates per athlete-year (AY), and iii) binary and multinomial regression analyses. We identified 514 causes of death from 787 deceased players (M = 68.1 y ± 16.0) from 16 different ICD groups, 432 of which were from natural causes. Findings showed similar leading causes of death and CDRs to sex- and race-matched controls, higher death rate differences per AY within time-dependent variables (i.e., birth decade, race, and height), and a higher likelihood of dying below the median age of death for black and taller players, although this was highly confounded by birth decade. More complete knowledge of mortality outcomes would provide broad public health applications and disarm harmful stereotypes of elite athlete health.

## Return to pivoting sport after ACL reconstruction: association with osteoarthritis and knee function at the 15-year follow-up.

Øiestad BE, Holm I, Risberg MA.

Br J Sports Med. 2018 Mar 17.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29550753

OBJECTIVES: To examine the associations between return to pivoting sport following ACL reconstruction (ACLR) and knee osteoarthritis (OA), and self-reported knee symptoms, function and quality of life after 15 years. METHODS: Study sample included 258 participants with ACLR 15 years previously. Return to pivoting sport (handball, soccer and basketball) data were collected by interviews, and symptomatic OA was defined as Kellgren and Lawrence grade ≥2 plus almost daily knee pain in the last month. Self-reported symptoms, function and quality of life were assessed with the Knee Injury and Osteoarthritis Outcome Score. Adjusted regression models were used to analyse the associations between return to pivoting sport and OA (present or not), and self-reported outcomes. P values ≤0.05 were considered statistically significant. RESULTS: Two hundred and ten (81%) participants (57% men) with a mean age of 39.1 (±8.7) years completed the 15-year follow-up, and 109 (52%) had returned to pivoting sport. Returning to pivoting sport was associated with less symptomatic OA (OR 0.28, 95% CI 0.09 to 0.89) and radiographic OA (OR 0.40, 95% CI 0.17 to 0.98), adjusted for age, sex, combined injury, self-reported knee function, and time between injury and surgery. Those who returned to pivoting sport had better function in activities of daily living (ADL). CONCLUSION: The participants with ACLR who returned to pivoting sport had lower odds of knee OA and better self-reported ADL function. Further investigation is required to understand the clinical significance of these findings.

## Implementation of the 2017 Berlin Concussion in Sport Group Consensus Statement in contact and collision sports: a joint position statement from 11 national and international sports organisations.

Patricios JS, Ardern CL, Hislop MD, Aubry M, Bloomfield P, Broderick C, Clifton P, Echemendia RJ, Ellenbogen RG, Falvey ÉC, Fuller GW, Grand J, Hack D, Harcourt PR, Hughes D, McGuirk N, Meeuwisse W, Miller J, Parsons JT, Richiger S, Sills A, Moran KB, Shute J, Raftery M.

Br J Sports Med. 2018 Mar 2.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29500252

The 2017 Berlin Concussion in Sport Group Consensus Statement provides a global summary of best practice in concussion prevention, diagnosis and management, underpinned by systematic reviews and expert consensus. Due to their different settings and rules, individual sports need to adapt concussion guidelines according to their specific regulatory environment. At the same time, consistent application of the Berlin Consensus Statement's themes across sporting codes is likely to facilitate superior and uniform diagnosis and management, improve concussion education and highlight collaborative research opportunities. This document summarises the approaches discussed by medical representatives from the governing bodies of 10 different contact and collision sports in Dublin, Ireland in July 2017. Those sports are: American football, Australian football, basketball, cricket, equestrian sports, football/soccer, ice hockey, rugby league, rugby union and skiing. This document had been endorsed by 11 sport governing bodies/national federations at the time of being published.

## Sport Education as a Curriculum Approach to Student Learning of Invasion Games: Effects on Game Performance and Game Involvement.

Farias C, Valério C, Mesquita I.

J Sports Sci Med. 2018 Mar 1;17(1):56-65.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29535578

The teaching and learning of games and sport-based activities has historically been the dominant form of the physical education curricula. With an interest in providing to students meaningful and culturally situated sporting experiences, Sport Education is probably the most implemented and researched pedagogical model worldwide. However, although there is considerable evidence that the model as a curriculum approach can benefit the development of social goals and healthy sport behaviors, not a single study as to date examined students' game-play development beyond participation in single and isolated teaching units. Therefore, the purpose of this study was to examine students' development of Game Performance and Game Involvement during participation in three consecutive Sport Education seasons of invasion games. The participants were an experienced physical education teacher and one seventh-grade class totaling 26 students (10 girls and 16 boys). Using the Game Performance Assessment Instrument (Oslin et al., 1998), pre-test to post-tests measures of students' Game Performance and Game Involvement were collected during their participation in basketball (20 lessons), handball (16 lessons), and football (18 lessons) units. Inter-group differences and pre-test to post-test improvements within each season were analyzed through 2 (time) x group (sport) repeated measures ANOVA tests. There were found significant pre-test to post-test improvements in Game Performance and Game Involvement in the second (handball) and third (football) seasons, but not in the first season (basketball). Students' Game Performance and Involvement scores of handball and football were significantly higher than their scores while playing basketball. The opportunity for an extended engagement in game-play activities and prolonged membership of students in the same teams throughout three consecutive seasons of Sport Education were key to the outcomes found. The specific configurations of the game forms played by students either inhibited or enabled their game-play development.

## Epidemiology and Impact on Performance of Lower Extremity Stress Injuries in Professional Basketball Players.

Khan M, Madden K, Burrus MT, Rogowski JP, Stotts J, Samani MJ, Sikka R, Bedi A.

Sports Health. 2018 Mar/Apr;10(2):169-174.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29106811

BACKGROUND: Professional basketball players in the National Basketball Association (NBA) subject their lower extremities to significant repetitive loading during both regular-season and off-season training. Little is known about the incidence of lower extremity bony stress injuries and their impact on return to play and performance in these athletes.

HYPOTHESIS: Stress injuries of the lower extremity will have significant impact on performance. STUDY DESIGN: Case series.

LEVEL OF EVIDENCE: Level 4.

METHODS: All bony stress injuries from 2005 to 2015 were identified from the NBA. Number of games missed due to injury and performance statistics were collected from 2 years prior to injury to 2 years after the injury. A linear regression analysis was performed to determine the impact of injury for players who returned to sport.

RESULTS: A total of 76 lower extremity bony stress injuries involving 75 NBA players (mean age, 25.4 ± 4.1 years) were identified. Fifty-five percent (42/76) involved the foot, and most injuries occurred during the regular season (82.9%, 63/76), with half occurring within the first 6 weeks. Among players who sustained a fifth metatarsal stress fracture, 42.9% were unable to return to professional play. Players who sustained stress injuries had reduced play performance, specifically related to number of games played ( P = 0.014) and number of steals per game ( P = 0.004). Players who had surgery had significantly better performance at 2 years than those who were managed nonoperatively, independent of the type of injury (β = 4.561; 95% CI, 1.255-7.868).

CONCLUSION: Lower extremity bony stress injuries may significantly affect both short- and long-term player performance and career length. Stress injuries result in decreased player performance, and surgical intervention results in improved performance metrics compared with those treated using conservative methods.

CLINICAL RELEVANCE: Stress injuries result in decreased player performance, and surgical intervention results in improved performance metrics.

## Sleep Interventions Designed to Improve Athletic Performance and Recovery: A Systematic Review of Current Approaches.

Bonnar D, Bartel K, Kakoschke N, Lang C.

Sports Med. 2018 Mar;48(3):683-703.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29352373

BACKGROUND: Athletes experience various situations and conditions that can interfere with their sleep, which is crucial for optimal psychological and physiological recovery as well as subsequent performance. Conventional sleep screening and intervention approaches may not be efficacious for athletes given their lifestyle, the demands of training and travel associated with interstate/international competition.

OBJECTIVES: The present systematic review aimed to summarize and evaluate sleep intervention studies targeting subsequent performance and recovery in competitive athletes. Based on the findings, a secondary aim was to outline a possible sleep intervention for athletes, including recommendations for content, mode of delivery and evaluation.

METHODS: A systematic review was conducted based on the PRISMA guidelines in May 2016 with an update completed in September 2017. Ten studies met our inclusion criteria comprising a total of 218 participants in the age range of 18-24 years with athletes from various sports (e.g., swimming, soccer, basketball, tennis). A modified version of the quality assessment scale developed by Abernethy and Bleakley was used to evaluate the quality of the studies.

RESULTS: The included studies implemented several sleep interventions, including sleep extension and napping, sleep hygiene, and post-exercise recovery strategies. Evidence suggests that sleep extension had the most beneficial effects on subsequent performance. Consistent with previous research, these results suggest that sleep plays an important role in some, but not all, aspects of athletes' performance and recovery.

CONCLUSION: Future researchers should aim to conduct sleep interventions among different athlete populations, compare results, and further establish guidelines and intervention tools for athletes to address their specific sleep demands and disturbances.

## Center of Pressure and Perceived Stability in Basketball Shoes With Soft and Hard Midsoles.

Leong HF, Lam WK, Ng WX, Kong PW.

J Appl Biomech. 2018 Feb 27:1-23.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29485360

This study aimed to investigate the effects of varying midsole hardness on center of pressure (COP) and perceived stability during basketball-specific tasks, as well as the correlation between COP and perception measurements. Twenty male basketball players performed 45° cutting and lay-up while wearing basketball shoes with soft and hard midsoles. COP trajectories were obtained from the Pedar insole system. Stability perceptions at the forefoot and rearfoot were assessed using 150-mm visual analogue scales (VAS). Results indicated greater COP mediolateral deviations in soft midsole compared with hard midsole during lay-up (soft 16.6 ± 4.7 mm, hard 15.8 ± 4.6 mm, $p = .025$) but not 45° cutting (soft 15.7 ± 5.9 mm, hard 15.8 ± 5.6 mm, $p = .601$). While 16 out of 20 participants preferred soft midsole, no significant difference in VAS ratings was found between shoes for both tested movements. There was no significant correlation between COP and perceived stability during lay-up or 45° cutting. In conclusion, midsole hardness of basketball shoes did not consistently affect mediolateral stability of the foot during 45° cutting and lay-up. Subjective perception alone cannot be used to indicate mediolateral deviation of the foot when executing basketball-specific maneuvers.

## Examination of coach and player perceptions of recovery and exertion.

Kraft JA, Laurent ML, Green JM, Helm J, Roberts C, Holt S.

J Strength Cond Res. 2018 Feb 27.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29489724

Monitoring training and recovery are essential for exercise programming. Athletes can validly assess training load (TL) via the session rating of perceived exertion (SRPE) technique. However, it is unclear if coaches can successfully use this model.

PURPOSE: This study compared coach and athlete perceptions of effort and recovery and evaluated the efficacy of perceptually-based TL monitoring.

METHODS: Participants included 56 athletes (Women's volleyball, soccer, and basketball and Men's basketball) and their coaches (n = 4). Perceived recovery was estimated via the Perceived Recovery Status scale. TL scores were calculated using the Edward's HR method and by multiplying SRPE by duration. Coaches provided an intended SRPE (SRPE-CI) before practice. SRPE was independently estimated by coaches (SRPE-CO) and athletes (SRPE-A) ~15-20 minutes post-practice. Paired t-tests and Pearson correlations were applied to make comparisons ($\alpha \leq 0.05$).

RESULTS: SRPE-CI, SRPE-CO, SRPE-A TLs were strongly correlated with Edwards' HR-based TLs (R = 0.74, 0.73, and 0.76, respectively). SRPE-CI (5.5 ± 1.9) and SRPE-CO (5.0 ± 1.9) was higher than SRPE-A (4.5 ± 1.9). Coaches

estimated recovery (RPR-C) higher than athletes (RPR-A) (7.1 ± 1.3 vs 5.8 ± 1.6). CONCLUSIONS: TL estimates were strongly correlated with Edwards' TL regardless of information source (coach or athlete) or time point (SRPE-CI TL or SRPE-CO TL). Results suggest coaches' perceptions validly indicated TL. Coaches' perceptions provide parallel information (correlated strongly with Edwards TL), but not identical information (demonstrated by differences in SRPE) as athlete perceptions. Differences in perceived recovery indicate coaches overestimate recovery when compared to athletes' perceptions.

### Capability and opportunity in hot shooting performance: Evidence from top-scoring NBA leaders.

Chang SC.

PLoS One. 2018 Feb 12;13(2):e0179154.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29432458

In basketball games, whenever players successfully shoot in streaks, they are expected to demonstrate heightened performance for a stretch of time. Streak shooting in basketball has been debated for more than three decades, but most studies have provided little significant statistical evidence and have labeled random subjective judgments the "hot hand fallacy." To obtain a broader perspective of the hot hand phenomenon and its accompanying influences on the court, this study uses field goal records and optical tracking data from the official NBA database for the entire 2015-2016 season to analyze top-scoring leaders' shooting performances. We first reflect on the meaning of "hot hand" and the "Matthew effect" in actual basketball competition. Second, this study employs statistical models to integrate three different shooting perspectives (field goal percentage, points scored, and attempts). This study's findings shed new light not only on the existence or nonexistence of streaks, but on the roles of capability and opportunity in NBA hot shooting. Furthermore, we show how hot shooting performances resulting from capability and opportunity lead to actual differences for teams.


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