FAST BREAK

PUBLICATION FOR TEAM MEDICAL PERSONNEL

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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 FIBA.

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FOREWORD

We are delighted to present the first edition of FIBA's FAST BREAK, an initiative to support team medical personnel and courtesy of our Canadian friends. This initiative is an outcome of the FIBA Medical Commission's work and it is designed to assist with evidence based health care practice in basketball. We will be publishing FAST BREAK every 3 months and plan to distribute to as many team doctors, physiotherapists and sports trainers as possible.

Basketball is entering an exciting period of expansion of its' international competition leading into the FIBA Basketball World Cup China 2019 and the new FIBA 3x3 discipline now selected for the 2020 Tokyo Olympics. The FIBA Medical Commission is looking to support and enhance the role of health care professionals in all basketball competitions. Other medical and anti-doping resources are available on the FIBA website.

Please share FAST BREAK with your basketball colleagues!

Dr Peter Harcourt

Chairman, FIBA Medical Commission

IN THIS ISSUE

SELECTED PUBLICATIONS OF INTEREST

The importance and development of ball control and (self-reported) self-regulatory skills in basketball players for different positions.

Te Wierike SCM, Huijgen BCH, Jonker L, Elferink-Gemser MT, Visscher C.

J Sports Sci. 2018 Mar;36(6):710-716.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/28644113

This study first investigated the importance of ball control and (self-reported) self-regulatory skills in achieving the elite level in basketball. The second aim was to gain insight into the development of, and association between ball control and (self-reported) self-regulatory skills that contribute to achieving the elite level, with taking into account positional differences. Talented male players (N = 73; age 16.56 ± 1.96) completed the STARtest to measure ball control and a questionnaire to measure (self-reported) self-regulation from 2008-2012. Results showed that (self-reported) reflective skills were most important to achieve the elite level (OR = 11.76; $P < 0.05$). There was no significant improvement in (self-reported) reflection over time for guards, forwards, and centers. Improvement in ball control was evident for guards ($r = -0.65$; $P < 0.05$). Furthermore, guards and forwards had better ball control compared to centers ($P < 0.01$). For those two positions, negative correlations were found between (self-reported) reflection and ball control, i.e., higher reflection was related to better ball control (guards $r = -0.19$; forwards $r = -0.18$) in contrast to centers ($r = 0.34$). It is concluded that (self-reported) reflective skills are important to achieve the elite level, while ball control seems especially important for guards.

Sport, sex and age increase risk of illness at the Rio 2016 Summer Paralympic Games: a prospective cohort study of 51 198 athlete days.

Derman W, Schwellnus MP, Jordaan E, Runciman P, Blauwet C, Webborn N, Lexell J, Van de Vliet P, Tuakli-Wosornu Y, Kissick J, Stomphorst J.

Br J Sports Med. 2018 Jan;52(1):17-23.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29074477

OBJECTIVE: To describe the epidemiology of illness at the Rio 2016 Summer Paralympic Games.

METHODS: A total of 3657 athletes from 78 countries, representing 83.5% of all athletes at the Games, were monitored on the web-based injury and illness surveillance system (WEB-IISS) over 51 198 athlete days during the Rio 2016 Summer Paralympic Games. Illness data were obtained daily from teams with their own medical support through the WEB-IISS electronic data capturing systems.

RESULTS: The total number of illnesses was 511, with an illness incidence rate (IR) of 10.0 per 1000 athlete days (12.4%). The highest IRs were reported for wheelchair fencing (14.9), para swimming (12.6) and wheelchair basketball (12.5) ($p<0.05$). Female athletes and older athletes (35-75 years) were also at higher risk of illness (both $p<0.01$). Illnesses in the respiratory, skin and subcutaneous and digestive systems were the most common (IRs of 3.3, 1.8 and 1.3, respectively).

CONCLUSION: (1) The rate of illness was lower than that reported for the London 2012 Summer Paralympic Games; (2) the sports with the highest risk were wheelchair fencing, para swimming and wheelchair basketball; (3) female and older athletes (35-75 years) were at increased risk of illness; and (4) the respiratory system, skin and subcutaneous system and digestive system were most affected by illness. These results allow for comparison at future Games.

Neuromuscular training reduces lower limb injuries in elite female basketball players. A cluster randomized controlled trial.

Bonato M, Benis R, La Torre A.

Scand J Med Sci Sports. 2017 Dec 14 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29239030

The study was a two-armed, parallel group, cluster randomized controlled trial in which 15 teams (160 players) were assigned to either an experimental group (EG, 8 teams n=86), which warmed-up with bodyweight neuromuscular exercises, or a control group (CG, 7 teams, n=74) that performed standard tactical-technical exercises before training. All injuries during the 2015-2016 regular season were counted. Epidemiologic incidence proportion and incidence rate, were also calculated. Counter movement jump (CMJ) and composite Y-Excursion balance test (YBT) were used to assess lower limb strength, and postural control. A total of 111 injuries were recorded. Chi-square test detected statistically significant differences between EG and CG (32 vs 79, p=0.006). Significant differences in the injuries sustained in the EG (21 vs 11, p=0.024) and CG (52 vs 27, p=0.0001) during training and matches respectively were observed. Significant differences in post-intervention injuries were observed between in EG and CG during training (21 vs 52, p<0.0001) and matches (11 vs 27, p=0.006). Significant differences in epidemiologic incidence (0.37 vs 1.07, p=0.023), and incidence rate (1.66 vs 4.69, p=0.012) between the EG and the CG were found. Significant improvement in CMJ (+9.4%, p<0.0001; d=1.2), and composite YBT (right: +4.4%, p=0.001, d=1.0; left: +3.0%, p=0.003; d=0.8) for the EG was noted. Significant differences in post-intervention CMJ (+5.9%, p=0.004) and composite YBT scores (right, +3.7%, p=0.012; left, +2.3%, p=0.007) between the EG and the CG were observed. Including bodyweight neuromuscular training into warm-up routines reduced the incidence of serious lower limb injuries in elite female basketball players.

Electrocardiographic Findings in National Basketball Association Athletes.

Waase MP, Mutharasan RK, Whang W, DiTullio MR, DiFiori JP, Callahan L, Mancell J, Phelan D, Schwartz A, Homma S, Engel DJ.

JAMA Cardiol. 2017 Dec 6 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29214319

IMPORTANCE: While it is known that long-term intensive athletic training is associated with cardiac structural changes that can be reflected on surface electrocardiograms (ECGs), there is a paucity of sport-specific ECG data. This study seeks to clarify the applicability of existing athlete ECG interpretation criteria to elite basketball players, an athlete group shown to develop significant athletic cardiac remodelling.

OBJECTIVE: To generate normative ECG data for National Basketball Association (NBA) athletes and to assess the accuracy of athlete ECG interpretation criteria in this population.

DESIGN, SETTING, AND PARTICIPANTS: The NBA has partnered with Columbia University Medical Center to annually perform a review of policy-mandated annual preseason ECGs and stress echocardiograms for all players and predraft participants. This observational study includes the preseason ECG examinations of NBA athletes who participated in the 2013-2014 and 2014-2015 seasons, plus all participants in the 2014 and 2015 NBA predraft combines. Examinations were performed from July 2013 to May 2015. Data analysis was performed between December 2015 and March 2017.

EXPOSURES: Active roster or draft status in the NBA and routine preseason ECGs and echocardiograms.

MAIN OUTCOMES AND MEASURES: Baseline quantitative ECG variables were measured and ECG data qualitatively analyzed using 3 existing, athlete-specific interpretation criteria: Seattle (2012), refined (2014), and international (2017). Abnormal ECG findings were compared with matched echocardiographic data.

RESULTS: Of 519 male athletes, 409 (78.8%) were African American, 96 (18.5%) were white, and the remaining 14 (2.7%) were of other races/ethnicities; 115 were predraft combine participants, and the remaining 404 were on active rosters of NBA teams. The mean (SD) age was 24.8 (4.3) years. Physiologic, training-related changes were present in 462 (89.0%) athletes in the study. Under Seattle criteria, 131 (25.2%) had abnormal findings, compared with 108 (20.8%) and 81 (15.6%) under refined and international criteria, respectively. Increased age and increased left ventricular relative wall thickness (RWT) on echocardiogram were highly associated with abnormal ECG classifications; 17 of 186 athletes (9.1%) in the youngest age group (age 18-22 years) had abnormal ECGs compared with 36 of the 159 athletes (22.6%) in the oldest age group (age 27-39 years) (odds ratio, 2.9; 95% CI, 1.6-5.4; P <.001). Abnormal T-wave inversions (TWI) were present in 32 athletes (6.2%), and this was associated with smaller left ventricular cavity size and increased RWT. One of the 172 athletes (0.6%) in the lowest RWT group (range, 0.24-0.35) had TWIs compared with 24 of the 163 athletes (14.7%) in the highest RWT group (range, 0.41-0.57) (odds ratio, 29.5; 95% CI, 3.9-221.0; P < .001).

CONCLUSIONS AND RELEVANCE: Despite the improved specificity of the international recommendations over previous athlete-specific ECG criteria, abnormal ECG classification rates remain high in NBA athletes. The development of left ventricular concentric remodeling appears to have a significant influence on the prevalence of abnormal ECG classification and repolarization abnormalities in this athlete group.

Biomechanical analysis of ankle ligamentous sprain injury cases from televised basketball games: Understanding when, how and why ligament failure occurs.

Panagiotakis E, Mok KM, Fong DT, Bull AMJ.

J Sci Med Sport. 2017 Dec;20(12):1057-1061.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/28587794

OBJECTIVES: Ankle sprains due to landing on an opponent's foot are common in basketball. There is no analysis to date that provides a quantification of this injury mechanism. The aim of this study was to quantify the kinematics of this specific injury mechanism and relate this to lateral ankle ligament biomechanics.

DESIGN: Case series.

METHODS: The model-based image-matching technique was used to quantify calcaneo-fibular-talar kinematics during four ankle inversion sprain injury incidents in televised NBA basketball games. The four incidents follow the same injury pattern in which the players of interest step onto an opponent's foot with significant inversion and a diagnosed ankle injury. A geometric analysis was performed to calculate the in vivo ligament strains and strain rates for the anterior talofibular ligament (ATFL) and the calcaneofibular ligament (CFL). RESULTS: Despite the

controlled selection of cases, the results show that there are two distinct injury mechanisms: sudden inversion and internal rotation with low levels of plantarflexion; and a similar mechanism without internal rotation. The first of these mechanisms results in high ATFL and CFL strains, whereas the second of these strains the CFL in isolation.

CONCLUSIONS: The injury mechanism combined with measures of the ligament injury in terms of percentage of strain to failure correlate directly with the severity of the injury quantified by return-to-sport. The opportunity to control excessive internal rotation through proprioceptive training and/or prophylactic footwear or bracing could be utilised to reduce the severity of common ankle injuries in basketball.

Activity Demands During Multi-Directional Team Sports: A Systematic Review.

Taylor JB, Wright AA, Dischiavi SL, Townsend MA, Marmon AR.

Sports Med. 2017 Dec;47(12):2533-2551.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/28801751

BACKGROUND: Late-stage rehabilitation programs often incorporate 'sport-specific' demands, but may not optimally simulate the in-game volume or intensity of such activities as sprinting, cutting, jumping, and lateral movement.

OBJECTIVE: The aim of this review was to characterize, quantify, and compare straight-line running and multi-directional demands during sport competition.

DATA SOURCES: A systematic review of PubMed, CINAHL, SPORTDiscus, and Cochrane Central Register of Controlled Trials databases was conducted.

STUDY ELIGIBILITY CRITERIA: Studies that reported time-motion analysis data on straight-line running, accelerations/decelerations, activity changes, jumping, cutting, or lateral movement over the course of an entire competition in a multi-directional sport (soccer, basketball, lacrosse, handball, field hockey, futsal, volleyball) were included.

STUDY APPRAISAL AND SYNTHESIS METHODS: Data was organized based on sport, age level, and sex and descriptive statistics of the frequency, intensity, time, and volume of the characteristics of running and multi-directional demands were extracted from each study.

RESULTS: Eighty-one studies were included in the review (n = 47 soccer, n = 11 basketball, n = 9 handball, n = 7 field hockey, n = 3 futsal, n = 4 volleyball). Variability of sport demand data was found across sports, sexes, and age levels. Specifically, soccer and field hockey demanded the most volume of running, while basketball required the highest ratio of high-intensity running to sprinting. Athletes change activity between 500 and 3000 times over the course of a competition, or once every 2-4 s. Studies of soccer reported the most frequent cutting (up to 800 per game), while studies of basketball reported the highest frequency of lateral movement (up to 450 per game). Basketball (42-56 per game), handball (up to 90 per game), and volleyball (up to 35 per game) were found to require the most jumping.

LIMITATIONS: These data may provide an incomplete view of an athlete's straight-line running load, considering that only competition and not practice data was provided.

CONCLUSIONS: Considerable variability exists in the demands of straight-line running and multi-directional demands across sports, competition levels, and sexes, indicating the need for sports medicine clinicians to design future rehabilitation programs with improved specificity (including the type of activity and dosage) to these demands.

Evaluation of a Shoulder Injury Prevention Program in Wheelchair Basketball.

Wilroy J, Hibberd E.

J Sport Rehabil. 2017 Nov 15:1-21.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29140190

CONTEXT: Previous literature has theorized that alterations in shoulder physical characteristics are present in wheelchair athletes and contribute to shoulder pain and injury. Limited empirical evidence is present that evaluates the effectiveness of a shoulder injury prevention program focusing on improving these altered characteristics.

OBJECTIVE: To evaluate the effectiveness of a 6-week intervention program at improving characteristics that increases the risk of developing pain or shoulder injury.

DESIGN: Pre and post-test.

SETTING: Home-based and controlled laboratory.

PARTICIPANTS: Seven collegiate wheelchair athletes.

INTERVENTIONS: Shoulder range of motion (ROM) and scapular muscle strength were assessed, and a 5-minute injury prevention program was taught to participants. Participants completed the intervention 3 times per week for 6 weeks. Following completion of the program, a post-intervention screening was performed.

MAIN OUTCOME MEASURES: Internal/external rotation ROM, retraction strength, and internal/external rotation strength.

RESULTS: Participants experienced a significant improvement in dominant limb shoulder internal rotation ROM ($t_6=3.56, p=0.012$) with an average increase of 11.4° of IR ROM, and a significant improvement in dominant limb shoulder external rotation (ER) ROM ($t_6=2.79, p=0.032$) with an average increase of 8.0° of ER ROM. There were no significant increases in shoulder IR or ER strength and scapular retraction strength ($p>0.05$).

CONCLUSIONS: Improvements in ROM have previously been linked to decreases in shoulder pain and injury in other upper-extremity dominant sports by improving scapular kinematics. These results provide evidence that a 6-week strengthening and stretching intervention program may decrease risk factors for shoulder injury in wheelchair athletics.

Heart Rate Monitoring In Basketball: Applications, Player Responses, and Practical Recommendations.

Berkelmans DM, Dalbo VJ, Kean CO, Milanović Z, Stojanović E, Stojiljković N, Scanlan AT.

J Strength Cond Res. 2017 Nov 13 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29140908

The aims of this review were to collate the existing literature encompassing heart rate (HR) monitoring in basketball to: (i) identify the applications of HR measurement; (ii) report HR responses in male and female players during training and game-play; (iii) evaluate use of current HR-based training load models; and (iv) provide recommendations for future research and best practice approaches for basketball practitioners. HR monitoring in basketball carries three primary applications: (i) monitoring exercise intensity; (ii) assessing player fatigue status; and (iii) quantifying internal training load. When interpreting the available training and game-play HR data in basketball players, key differences have been observed between playing positions and playing levels. Sex- and age-based differences in HR responses during basketball training and game-play are apparent across separate studies; however further research exploring HR responses in wider player groups is needed, especially in female and junior players. There is also a lack of research directly comparing player HR responses during training and game-play to ascertain the effectiveness of different drills in preparing players for competition. HR-based models have been frequently used to quantify the internal training load in basketball players, including Banister's Training Impulse, Lucia's Training Impulse, and Edwards' Summated-Heart-Rate-Zones (SHRZ). The SHRZ model appears to hold practical advantages and better detect changes in player responses across training cycles compared to other approaches. Practical outcomes of this review center on recommendations for position-specific training plans, drills to promote desired cardiovascular stress, analysis of HR outcome measures, and ideal training load monitoring approaches.

Impact of short- compared to long-haul international travel on the sleep and wellbeing of national wheelchair basketball athletes.

Thornton HR, Miller J, Taylor L, Sargent C, Lastella M, Fowler PM.

J Sports Sci. 2017 Nov 3:1-9 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29099652

Currently, very little is known about the impact of short- or long-haul air travel on the sleep and wellbeing of wheelchair basketball athletes. Eleven national wheelchair basketball athletes wore actigraphy monitors prior, during, and after air travel to the United Kingdom. Upon arrival, participants rated their subjective jet-lag, fatigue, and vigor. Individuals traveled to the United Kingdom from different locations in Australia, the United States, and Europe and were categorised according to travel length [LONG (up to 30.2 h) or SHORT (up to 6.5 h)]. Linear mixed models determined effects of travel length on sleep and subjective ratings of jet-lag, fatigue, and vigor. During competition, subjective fatigue and jet-lag were substantially higher (ES = 0.73; ±0.77) and (ES = 0.57; ±0.60), subjective vigor was lower (ES = 1.94; ±0.72), and get-up time was earlier (ES = 0.57; ±0.60) for LONG when compared to SHORT. Travelling greater distances by airplane had a larger effect on subjective ratings of jet-lag, fatigue and vigor, rather than sleep. Irrespective of travel group, sleep and subjective responses were compromised, reflecting the travel requirements, competition-mediated influences, and/or due to a change in environment.

The Effects of Playing Multiple High School Sports on National Basketball Association Players' Propensity for Injury and Athletic Performance.

Rugg C, Kadoor A, Feeley BT, Pandya NK.

Am J Sports Med. 2017 Nov 1:363546517738736 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/29135275

BACKGROUND: Athletes who specialize in their sport at an early age may be at risk for burnout, overuse injury, and reduced attainment of elite status. Timing of sport specialization has not been studied in elite basketball athletes.

HYPOTHESIS: National Basketball Association (NBA) players who played multiple sports during adolescence would be less likely to experience injury and would have higher participation rates in terms of games played and career length compared with single-sport athletes.

STUDY DESIGN: Descriptive epidemiology study.

METHODS: First-round draft picks from 2008 to 2015 in the NBA were included in the study. From publically available records from the internet, the following data were collected for each athlete: participation in high school sports, major injuries sustained in the NBA, percentage of games played in the NBA, and whether the athlete was still active in the NBA. Athletes who participated in sports in addition to basketball during high school were defined as multisport athletes and were compared with athletes who participated only in basketball in high school.

RESULTS: Two hundred thirty-seven athletes were included in the study, of which 36 (15%) were multisport athletes and 201 (85%) were single-sport athletes in high school. The multisport cohort played in a statistically significantly greater percentage of total games (78.4% vs 72.8%; $P < .001$). Participants in the multisport cohort were less likely to sustain a major injury during their career (25% vs 43%, $P = .03$). Finally, a greater percentage of the multisport athletes were active in the league at time of data acquisition, indicating increased longevity in the NBA (94% vs 81.1%; $P = .03$).

CONCLUSION: While a minority of professional basketball athletes participated in multiple sports in high school, those who were multisport athletes participated in more games, experienced fewer major injuries, and had longer careers than those who participated in a single sport. Further research is needed to determine the reasons behind these differences.

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