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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IN THIS ISSUE

SELECTED PUBLICATIONS OF INTEREST

Effects of training and competition on the sleep of elite athletes: a systematic review and meta-analysis.

Roberts SSH, Teo WP, Warmington SA.

Br J Sports Med. 2018 Sep 14 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30217831

OBJECTIVES: To characterise the sleep of elite athletes and to identify factors associated with training and competition that negatively affect sleep. DESIGN: Prognosis systematic review. DATA SOURCES: Three databases (PubMed, SCOPUS and SPORTDiscus) were searched from inception to 26 February 2018. ELIGIBILITY CRITERIA FOR SELECTING STUDIES: Included studies objectively reported total sleep time (TST) and/or sleep efficiency (SE) in elite athletes. Studies were required to be observational or to include an observational trial. RESULTS: Fifty-four studies were included. During training, many studies reported athletes were unable to achieve TST (n=23/41) and/or SE (n=16/37) recommendations. On the night of competition, most studies reported athletes were unable to achieve TST (n=14/18) and/or SE (n=10/16) recommendations. TST was shorter (60 min) the night of competition compared with previous nights. SE was lower (1%) the night of competition compared with the previous night. TST was shorter the night of night competition (start ≥18:00; 80 min) and day competition (20 min) compared with the previous night. SE was lower (3%-4%) the night of night competition but unchanged the night of day competition compared with previous nights. Early morning training (start <07:00), increases in training load (>25%), late night/early morning travel departure times, eastward air travel and altitude ascent impaired sleep. CONCLUSION: Athletes were often unable to achieve sleep recommendations during training or competition periods. Sleep was impaired the night of competition compared with previous nights. Early morning training, increases in training load, travel departure times, jet lag and altitude can impair athletes' sleep.

Competition-Based Heart Rate, Training Load, and Time Played Above 85% Peak Heart Rate in NCAA Division I Women's Basketball.

Sanders GJ, Boos B, Rhodes J, Kollock RO, Peacock CA.

J Strength Cond Res. 2018 Oct 5 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30299392

Basketball athletes frequently engage in intensities ≥85% HRpeak throughout competition. Knowing the time spent competing at intensities ≥85% HRpeak can improve training protocols. The purpose of the study was to assess heart rate responses across 4-quarter games (N = 31) in an NCAA division I women's basketball season. Ten female athletes were tested and monitored with heart rate-based wearable microsensor devices. Before the season, HRpeak was recorded through a peak metabolic test (V[Combining Dot Above]O2peak). Average (HRavg) and HRpeak were recorded for each game, and time spent in 5 heart rate zones (HRZones) were recorded: HRZone1 = 50-60% HRpeak, HRZone2 = 60-70% HRpeak, HRZone3 = 70-76% HRpeak, HRZone4 = 77-84% HRpeak, and HRZone5 = 85-100% HRpeak. Training load was calculated with the summated-heart-rate-zone model (SHRZmod). There was a main effect of position ($p \leq 0.019$) and quarter ($p \leq 0.005$) on SHRZmod and on time spent in HRZone1-5. Athletes accumulated the most time in HRZone4 and HRZone5 and in the fourth

quarter, and SHRZmod was the greatest in the fourth quarter. There was no main effect for HRavg and HRpeak ($p \geq 0.110$). Athletes averaged 34.5 minutes per game competing in HRZone5 or ≥85% HRpeak with nearly one-third of those minutes accumulated in the fourth quarter. Although there were no differences in HRavg and HRpeak from quarter to quarter, SHRZmod increased from the first to fourth quarter. Utilizing time spent in heart rate zones and training load with SHRZmod can provide valuable information to practitioners regarding the intensity and physiological demands of competitive basketball games.

Relationships Between Personal Values and Leadership Behaviors in Basketball Coaches.

Castillo I, Adell FL, Alvarez O.

Front Psychol. 2018 Sep 12;9:1661.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30258379

Background: Based on the refined theory of basic individual values and transformational leadership theory, this study focuses on the associations between coaches' value priorities and their transformational leadership behaviors, exploring the potential mediation versus moderation effect of two alternative variables in this relationship: perceived club pressure or an autonomy supportive environment. Methods: Participants were 266 basketball coaches (85.7% men) from 17 to 66 years old (M = 32.82, SD = 9.2) from 119 different Spanish clubs. On average, they had worked for their current sport clubs for 5.02 years, and they had a mean of 11.10 years of experience. The coaches were all Spanish speakers, and they trained players at different levels of competition. Results: The stronger the importance of the coaches' self-transcendent values (i.e., universalism and benevolence), the more they displayed transformational behaviors (i.e., individual consideration, inspirational motivation, intellectual stimulation, and fostering acceptance of group goals) toward the basketball players and perceived a more autonomy supportive environment and lower pressure from the club. Coaches who held conservation values (i.e., humility and face) displayed inspirational motivation behaviors. When coaches held openness to change values (i.e., stimulation and self-direction thought), they tended to display inspirational motivation and intellectual stimulation. Finally, coaches who held beliefs in self-enhancement values (i.e., power) displayed lower transformational behaviors (intellectual stimulation and fostering acceptance of group goals) toward their basketball players, and they perceived higher pressure from the club and a less autonomy supportive environment. Moreover, the club's autonomy supportive environment played a mediator role between self-transcendence values and some transformational behaviors; however, moderator effects were not significant, with the exception of coaches with self-enhancement values, who tended to avoid intellectual stimulation to a larger extent when they perceived high levels of pressure at the club. Conclusion: These results highlight the importance of identifying the value base on which to develop transformational leadership programs in order to enhance positive experiences in the sport domain.

Kinetics and perception of basketball landing in various heights and footwear cushioning.

Wei Q, Wang Z, Woo J, Liebenberg J, Park SK, Ryu J, Lam WK.

PLoS One. 2018 Aug 9;13(8):e0201758.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30092009

BACKGROUND: The previous studies on basketball landing have not shown a systematic agreement between landing impacts and midsole densities. One plausible reason is that the midsole densities alone used to

represent the cushioning capability of a shoe seems over simplified. The aim of this study is to examine the effects of different landing heights and shoes of different cushioning performance on tibial shock, impact loading and knee kinematics of basketball players. METHODS: Nineteen university team basketball players performed drop landings from different height conditions (0.45m vs. 0.61m) as well as with different shoe cushioning properties (regular, better vs. best-cushioned). For each condition, tibial acceleration, vertical ground reaction force and knee kinematics were measured with a tri-axial accelerometer, force plate and motion capture system, respectively. Heel comfort perception was indicated on the 150-mm Visual Analogue Scale. A 2 (height) x 3 (footwear) ANOVA with repeated measures was performed to determine the effects of different landing heights and shoe cushioning on the measured parameters. RESULTS: We did not find significant interactions between landing height and shoe conditions on tibial shock, impact peak, mean loading rate, maximum knee flexion angle and total ankle range of motion. However, greater tibial shock, impact peak, mean loading rates and total ankle range of motion were determined at a higher landing height ($P < 0.01$). Regular-cushioned shoes demonstrated significantly greater tibial shock and mean loading rate compared with better- and best-cushioned shoes ($P < 0.05$). The correlation analysis indicated that the heel comfort perception was fairly associated with impact peak and mean loading rate regardless of heights ($P < 0.05$), but not associated with tibial shock. CONCLUSIONS: Determination of shoe cushioning performance, regardless of shoe midsole materials and constructions, would be capable in order to identify optimal shoe models for better protection against tibial stress fracture. Subjective comfort rating could estimate the level of impact loading in non-laboratory based situations.

Effects of basketball-specific high-intensity interval training on aerobic performance and physical capacities in youth female basketball players.

Aschendorf PF, Zinner C, Delextrat A, Engelmeyer E, Mester J.

Phys Sportsmed. 2018 Sep 7:1-6.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30193074

OBJECTIVE: The goal of this study was to investigate the effects of a 5-week, basketball-specific high-intensity interval training (HIIT) on aerobic performance in youth female basketball players. METHODS: Twenty-four athletes (age 15.1 ± 1.1 years; height: 170 ± 5.2 cm; body mass: 60.9 ± 6.0 kg) took part in the investigation. The training group (TG, n = 11) integrated 10 basketball-specific HIIT sessions in their normal team training, the other group (n = 13) continued their team training routine and served as controls (CG). All HIIT sessions contained different basketball-specific drills. Before (pre-) and after the training period (post-) physical fitness was tested. RESULTS: The Yo-yo intermittent recovery test (Yo-yo IR) performance was very likely increased in the TG (26,5 %). No improvements in the Yo-Yo IR performance were found in the CG (-6,8%). Likely positive effects in the TG were evident for the sprint and agility tests with (1.2 ± 2.4%, ES: 0.25, p = 0.29) and without ball (1.5 ± 4.6%, ES: 0.34, p = 0.20). The sprint and agility performance with ball significantly decreased in the CG by -2.8 ± 4.7% (ES: 0.49, p < 0.01). No differences between the groups were found for counter movement jump with arm swing (TG: ES = 0.14, p = 0.45, CG: ES = 0.20 p = 0.18), counter movement jump (TG: ES = 0.05, p = 0.70, CG: ES = 0.19, p = 0.10), squat jump (TG: ES = 0.06, p = 0.72, CG: ES = 0.10, p = 0.54) and long jump (TG: ES = 0.00, p = 0.82, CG: ES = 0.00, p = 0.81). CONCLUSION: A 5-week, basketball-specific HIIT improves the aerobic performance in young female basketball athletes.

Quantifying Physical Demands in the National Basketball Association (NBA): Challenges in Developing Best-Practice Models for Athlete Care and Performance.

McLean BD, Strack D, Russell J, Coutts A.

Int J Sports Physiol Perform. 2018 Jul 24:1-22.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30039990

The National Basketball Association (NBA) has an extremely demanding competition schedule, requiring its athletes to compete in 82 regular-season games over a 6-mo period (~ 3.4 games/wk). Despite the demanding schedule and high value of athletes, there is little public information on the specific game and training demands required to compete in the NBA. While provisions in the NBA collective bargaining agreement allow for research designed to improve player health and broaden medical knowledge, such information is sparse in the available literature. In relation to the physical demands of the NBA, the current lack of information likely results from multiple factors including limited understanding of (basketball-related) emerging technologies, impact of specific league rules, and steps taken to protect players in the age of Big Data. This article explores current limitations in describing specific game/training demands in the NBA and provides perspectives on how some of these challenges may be overcome. The authors propose that future collaborations between league entities, NBA clubs, commercial partners, and outside research institutions will enhance understanding of the physical demands in the NBA (and other health- and performance-related areas). More detailed understanding of physical demands (eg, games, practices, travel) and other health-related areas can augment player-centered decision making, leading to enhanced player care, increased availability, and improved physical performance.

Acute Effects of Battle Rope Exercise on Performance, Blood Lactate Levels, Perceived Exertion, and Muscle Soreness in Collegiate Basketball Players.

Chen WH, Yang WW, Lee YH, Wu HJ, Huang CF, Liu C.

J Strength Cond Res. 2018 Jul 17 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30024481

This study investigated the acute effects of battle rope (BR) exercise on basketball players' performance, blood lactate levels, rating of perceived exertion (RPE), and perceived muscle soreness. Fifteen well-trained Division-I male basketball players underwent the same test procedure at baseline, before BR exercise (30 minutes of rest after the baseline test), and after BR exercise. The 30-minute experimental protocol comprised 6 BR exercises at a work-to-rest ratio of 1:2 (20-second exercise and 40-second rest). Shooting accuracy, basketball chest pass speed, countermovement jump (CMJ) height, blood lactate levels, RPE (Borg Category-Ratio-10 scale), and perceived muscle soreness (visual analog scale, 0-100 mm) were measured in each test. The results indicated no change for any variables between baseline and before BR exercise. After BR exercise, performance decrements ($p < 0.05$) were recorded in shooting accuracy (16.9%) and basketball chest pass speed (9.1%), but no significant changes were observed for CMJ height. Battle rope exercise caused increases in blood lactate levels (13.6 mmol·L), RPE (9.9), and perceived muscle soreness (upper-limb: 63-67 mm; trunk: 43-68 mm; and lower-limb: 45-52 mm). In conclusion, BR exercise is physically demanding on the upper body, resulting in decreased performance in shooting accuracy and basketball chest pass speed. Battle rope exercise may not be beneficial before a practice or game because it triggers acute exercise-induced performance decrements and

fatigue. However, BR exercise may be suitable for basketball training sessions in which the objective is to strengthen technical skills under fatiguing conditions.

Changes in Energy Expenditure, Dietary Intake, and Energy Availability Across an Entire Collegiate Women's Basketball Season.

Zanders BR, Currier BS, Harty PS, Zabriskie HA, Smith CR, Stecker RA, Richmond SR, Jagim AR, Kerksick CM.

J Strength Cond Res. 2018 Sep 17 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30234694

The purpose of this study was to identify changes in energy expenditure and dietary intake across an entire women's basketball season. On 5 different occasions across the competitive season, female collegiate basketball players (19.8 ± 1.3 years, 173.9 ± 13.6 cm, 74.6 ± 9.1 kg, 27.1 ± 3.2% fat, 53.9 ± 6.4 ml·kg·min, n = 13) were outfitted with heart rate and activity monitors over 4 consecutive days and completed 4-day food and fluid records to assess changes in energy expenditure and dietary status. Dual-energy x-ray absorptiometry was used to assess baseline body composition and resting energy expenditure (REE) was measured before and after the season. Data were analyzed using 1-factor repeated-measures analysis of variance. Total daily energy expenditure (TDEE, $p = 0.059$) and physical activity levels (TDEE/REE, $p = 0.060$) both tended to decrease throughout the season. Energy balance was negative at all time points throughout the season. Absolute and normalized daily protein intake at the end of the season was significantly ($p < 0.05$) lower than at the beginning of the season. Carbohydrate (3.7 ± 0.4 g·kg·d) and protein (1.17 ± 0.16 g·kg·d) intakes were lower than commonly recommended values based on previously published guidelines. These findings suggest that greater education and interventions for collegiate athletes and coaches regarding dietary intake and energy expenditure are warranted.

Survival After Exercise-Related Sudden Cardiac Arrest in Young Athletes: Can We Do Better?

Drezner JA, Peterson DF, Siebert DM, Thomas LC, Lopez-Anderson M, Suchsland MZ, Harmon KG, Kucera KL.

Sports Health. 2018 Sep 11 [Epub ahead of print].

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30204540

BACKGROUND: Sudden cardiac arrest (SCA) is the leading cause of death in young athletes during sports. HYPOTHESIS: Survival after SCA in young athletes is variable. STUDY DESIGN: Prospective, active surveillance study. LEVEL OF EVIDENCE: Level 3. METHODS: From July 1, 2014, to June 30, 2016, exercise-related SCA in competitive young athletes was identified through a systematic search of traditional and social media sources, direct reporting to the National Center for Catastrophic Sports Injury Research, searching of the National Collegiate Athletic Association Resolutions List, regular communication with national and state high school athletic associations, and review of cases in the Parent Heart Watch database. RESULTS: A total of 132 cases were identified during the 2-year study period (mean patient age, 16 years; age range, 11-27 years; 84% male; 51% white non-Hispanic/Latino, 30% black/African American, and 11% white Hispanic/Latino). High school athletes accounted for 78 (59%) cases, with 28 (21%) in middle school and 15 (11%) in college athletes. Overall survival was 48% (95% CI, 40%-57%; 64 survivors, 68 deaths). Survival was similar in male versus female athletes but higher in white non-Hispanic/Latino (40/67; 60%) versus black/African American (13/39; 33%) athletes

(difference, 27%; 95% CI, 7%-45%; P = 0.008) and white non-Hispanic/Latino versus all minority (18/59; 31%) athletes (difference, 29%; 95% CI, 13%-46%; P = 0.001). Basketball accounted for 30% of cases, followed by football (25%), track/cross-country (12%), and soccer (11%). The majority (93%) of cases were witnessed. If a certified athletic trainer was on-site and involved in the resuscitation, 83% of athletes survived. If an on-site automated external defibrillator was used in the resuscitation, 89% of athletes survived. CONCLUSION: Exercise-related SCA in young, competitive athletes is typically witnessed, providing an opportunity for rapid resuscitation. Additional research is needed to identify factors that affect survival in different athlete populations. CLINICAL RELEVANCE: Public access defibrillator programs should be universal in schools and youth sporting venues and have the potential to increase survival after SCA in young athletes.

Mental fatigue impairs technical performance and alters neuroendocrine and autonomic responses in elite young basketball players.

Moreira A, Aoki MS, Franchini E, da Silva Machado DG, Paludo AC, Okano AH.

Physiol Behav. 2018 Aug 31;196:112-118.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30172721

This study investigated the effects of mental exertion on Small-Sided-Games (SSG) technical performance, salivary testosterone (T), cortisol (C), and alpha-amylase (sAA) responses in 32 basketball players (15.2 ± 1.2 years; 180 ± 11 cm; 72 ± 15 kg). Technical performance and heart rate (HR) were assessed on two occasions, preceded by a 30-min incongruent Stroop task (mentally exertion treatment) or a 30-min control treatment. Saliva samples were collected before and after the treatment and after the SSG, and ratings of perceived exertion (session-RPE) was assessed. Large increase was observed from pre-control treatment to post-SSG for T (ES = 0.98) and sAA (ES = 0.82), but there was a small difference from pre-Stroop-task to post-SSG in T (ES = 0.33) and a moderate difference for sAA (ES = 0.55). Small changes in C for both conditions were observed (ES = 0.00 and 0.15, respectively). There were small differences between treatments for session-RPE (ES = 0.07), maximum (ES = -0.35) and average HR (ES = -0.16). Increased turnovers during the SSG (ES = 0.71) was seen following the Stroop task. The data suggest that mental fatigue state is a key regulator of technical performance of basketball players and that mental fatigue seems to modulate endocrine and autonomic responses.

Effects of an Intervention Program on Lower Extremity Biomechanics in Stop-Jump and Side-Cutting Tasks.

Yang C, Yao W, Garrett WE, Givens DL, Hacke J, Liu H, Yu B.

Am J Sports Med. 2018 Oct;46(12):3014-3022.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/30148646

BACKGROUND: Anterior cruciate ligament (ACL) injury is one of the most common injuries in sport. To reduce the risk of noncontact ACL injury, it is critical to understand the effects of an intervention program on neuromuscular control-related biomechanical risk factors. HYPOTHESIS: A newly developed 4-week intervention program would significantly increase the knee flexion angle at peak impact posterior ground-reaction force and would significantly decrease the peak impact posterior and vertical ground-reaction forces in

the stop-jump and side-cutting tasks, while the intervention effects would be retained after the training was completed. STUDY DESIGN: Controlled laboratory study. METHODS: A total of 22 male and 18 female collegiate basketball and volleyball players with biomechanical characteristics associated with increased risk of ACL injury were recruited and randomly assigned to either the intervention group or the control group. The intervention group executed a program to improve landing techniques through strength and plyometric training 3 times a week for 4 weeks while participating in their regular training. The control group participated in only their regular training for 4 weeks. Three-dimensional kinematic and kinetic data in the stop-jump and side-cutting tasks were collected at week 0 (the beginning of the study) and at the ends of weeks 4, 8, 16, and 20. Knee flexion angle and ground-reaction forces were calculated. Analyses of variance with a mixed design were performed to determine the intervention effects and the retention of intervention effects for each sex. RESULTS: Male participants in the intervention group significantly increased the knee flexion angle at peak impact posterior ground-reaction force in the stop-jump task at weeks 8, 12, and 20 when compared with that at week 0 and with the male control group ($P \leq .002$). No significant intervention effects on knee flexion angle and ground-reaction force were found in the side-cutting task for male participants. No significant interaction effects on takeoff velocities were detected in any task for male participants. No significant intervention effects on knee flexion angle and ground-reaction force were found in any task for female participants. Vertical takeoff velocity in the stop-jump task was significantly lower in the intervention group at week 20 compared with the control group ($P = .011$). CONCLUSION: A 4-week intervention program significantly increased the knee flexion angle at peak impact posterior ground-reaction force of male collegiate athletes in the stop-jump task without significant effect on the performance of the task. This intervention effect was retained for at least 16 weeks after the training was completed. The intervention program, however, did not affect knee flexion angle and ground-reaction force in any task for female collegiate athletes. A reduction in vertical takeoff velocity of the stop-jump task was observed for female collegiate athletes 16 weeks after the intervention. CLINICAL RELEVANCE: The intervention program with strength conditioning and plyometric exercises could modify landing biomechanics of male collegiate athletes in a stop-jump task. The intervention program may be a useful tool for preventing noncontact ACL injury for male collegiate athletes.

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