

The 2019 National Basketball Strength and Conditioning Association (NBSCA) Performance Summit (PS) was held at Palmer House Hilton, Chicago, IL, May 19, 2019. With the largest contingent of strength and conditioning coaches, athletic trainers, and sports coaches in attendance to date, the 2019 NBSCA PS was well represented across the National Collegiate Athletic Association (NCAA), National Basketball Association (NBA), and NBA G-League. With several delegates representing sports outside of basketball, there was significant interest in the theme of a multi-faceted approach to strength and conditioning in the professional team setting. In conjunction with the National Strength and Conditioning Association (NSCA), this year's event was live streamed for the first time with online participants from seven countries. This article provides a review of sessions presented at the 2019 NBSCA PS including strength and conditioning methods and coaching strategies, in-season strength programming, force plate assessment, injury prevention, and player monitoring.

### LESSONS LEARNED ACROSS THE CAREER OF AN NBA ALL-STAR

**Opening Address: Shareef Abdur-Rahim**, President of NBA G-League and Former NBA All-Star

#### FROM BERKELEY TO VANCOUVER

One of the first “one and done” players, along with the likes of Stephon Marbury, Shareef left the University of California, Berkeley after one year to enter the 1996 NBA draft, where he was selected third overall by the Vancouver Grizzlies behind Allen Iverson and Marcus Camby. His playing career spanned from 1996 – 2008 across four NBA teams (Vancouver Grizzlies, Atlanta Hawks, Portland Trail Blazers, and Sacramento Kings). Shareef was a member of the United States Men’s National Basketball team that won the gold medal at the 2000 Sydney Olympics, and he was named an NBA All-Star in the 2001 – 2002 season. However, in reflection, Shareef acknowledges that he was not great at communicating early in his career, which could have impacted his professional development, and he highlighted a meeting with Robert Hackett (Head Strength and Conditioning Coach at the Vancouver Grizzlies) as a turning point where he learned the importance of “open communication.”

#### LESSONS LEARNED

Shareef highlighted the importance of developing strong, trusting relationships between the players, strength and conditioning coaches, and trainers in order to achieve continuous improvement. This is evidenced by his continued contact with trainers like Wally Blaze, Pete Youngman, and Manny Romero; trainers who possessed an energy and passion coupled with interpersonal skills that made “you feel as a player that they really cared about you, not only as a player but a person.” Such personal relationships were of extreme importance for Shareef in helping manage his body early in his career, and it was noted that the advanced athlete monitoring systems of today were not widely used at that

time (2,5,21). As such, player monitoring and management were heavily reliant upon quantifying court minutes (time on feet) combined with the professional judgement of the trainer, further emphasizing the significant role of building relationships and gaining trust between players and trainers. Outlining the lessons learned throughout his NBA career, Shareef identified three notable stages of learning; these being 1) initial, 2) developmental, and 3) transition (Table 1). Stage 1 introduces the importance of communication. Stage 2 provides opportunity for professional development (physical and mental improvements), while growing personally through meaningful relationships. Stage 3 promotes transition through education and experience, which is built on the solid foundations of communication and relationships.

**TABLE 1. THREE STAGES OF LEARNING—THROUGH THE EYES OF AN NBA ALL-STAR**

STAGE	DESCRIPTOR
<b>Stage 1: Initial</b>	Develop sound communication skills. I was not a good communicator.
<b>Stage 2: Developmental</b>	Trained a lot with Robert Hackett (Head Strength and Conditioning Coach, Vancouver Grizzlies) to develop body, which helped developed my skills. This time not only allowed me to develop as a player (physically and mentally), but I had personal growth through establishing meaningful relationships.
<b>Stage 3: Transition</b>	Being educated by the coaches I worked with and what worked with me. At times my body would not do what my mind wanted to do, I was in an athlete transition. But being around trainers, like Pete and Manny, who cared about you, not only as a player but a person provide you with confidence in the process to continually improve and develop as a player.

#### WHAT DOES IT ALL MEAN?

The three stages of learning are important considerations in Shareef’s role as President of the NBA G-League. As he openly communicates his lessons learned, he noted that more than 50% of current NBA players have spent time in the NBA G-League. This is an important consideration as a large part of the players’ development is spent with the strength and conditioning coach and training staff at this level. Additionally, it is not just the players that enter through the NBA G-League, but officials and coaches as well. A key goal of the NBA G-League is to provide a professional pathway program, not only to develop players, coaches and officials, but to provide opportunities to integrate with teams (i.e., NBA Summer league). All of this is made possible through clear communication and the development of sound personal relationships.

**TAKE-HOME POINTS: LESSONS LEARNED ACROSS THE CAREER OF AN NBA ALL-STAR**

1. Most important life skills are communication and building relationships.
2. As a player, explain to me how you can make me better, and then I am locked in.

**STATE OF PERFORMANCE ANALYTICS: PRACTICAL APPLICATION AND REALITIES**

Keith D’Amelio, Nike Performance Specialist

**INTRODUCING THE STOCKDALE PARADOX**

This presentation highlighted the Human Factor as the missing link in high-performance environments and introduced coaches to the Stockdale paradox, “You must retain faith that you will prevail in the end, regardless of the difficulties, while at the same time, confronting the brutal facts of your current reality, whatever they might be.” Admiral Jim Stockdale was an American pilot in the Vietnam War. In his book, “Good to Great,” he recounted what he had endured over eight years while in a prisoner of war camp, recollecting that he was repeatedly tortured (6). By his own account, Stockdale came out of the prison camp as a stronger person than he went in. The Stockdale paradox appears counterintuitive, however, relating the Stockdale paradox to high-performance staff, D’Amelio argued that in order to be successful in elite sport, “You must retain absolute faith you will prevail in the end, while as high-performance staff, we can’t ignore the chaos that is sport.” That is to say—as high-performance staff we must have faith in the program and process, despite the fact that we are often clouded in chaos that is elite sport.

**THE HUMAN FACTOR**

The modern high-performance environment utilizes technology for data capture and performance analytics. Organizations use this technology to unearth key metrics to solve performance related problems. However, the drive for increased technology overlooks the important human component—a situation best summed up by Patrick Ward “technology does not solve problems, people solve

problems.” That is to say—within your organization it is people that make your program, from the high performance staff that bridge the gaps between training information and data analytics, to the key stakeholders such as management, coaches, and players. Exercising critical thinking, professional judgment, and that even with so-called advanced technology, it requires a human being to understand, implement, and adapt to solve problems.

**COMMUNICATING WITH KEY STAKEHOLDERS**

High-performance staff must recognize that key stakeholders within an organization are driven by what is important to them within their context, as such they all think about things differently. This is an extremely important consideration in order for a coach to communicate among the varying personalities of key stakeholders within the NBA (i.e., management, coaches, and players). Reflecting on his personal experiences, D’Amelio outlined the primary objectives and individual characteristics of key stakeholders within the NBA, describing practical examples and key points (Table 2).

Communication is a reoccurring central theme, which is considered as one of the most vital tools for any business, and is a highly valued and regarded discipline in the theory and practice of sport leadership (14). Communication is considered to be the most imperative characteristic displayed in successful organizational leadership, and is a key factor when managing complex change (10,17). In order to successfully manage complex change, a framework for change can be useful (13). Knoster, Villa and Thousand present key themes when thinking about systems for managing complex change, which includes vision, skills, incentives, resources, and an action plan (13). Effective change is a result of all themes being addressed (Figure 1). Conversely, inability to address all themes (i.e., missing pieces in the sequences) can result in negative behavioral consequences, including: confusion, anxiety, resistance, frustration, and false starts. Hence, the take home message emphasizes the importance of the organizational vision being openly communicated and understood by the high-performance staff. This can only be achieved when there is clear purpose and meaning.



FIGURE 1. THEMES FOR EFFECTIVE CHANGE

# NATIONAL BASKETBALL STRENGTH AND CONDITIONING ASSOCIATION (NBSCA) PERFORMANCE SUMMIT 2019—CHICAGO IN REVIEW

TABLE 2. PRIMARY OBJECTIVES AND CHARACTERISTICS OF KEY STAKEHOLDERS WITHIN THE NBA

DESCRIPTOR	MANAGEMENT	COACHES	PLAYERS
<b>Primary Objective:</b>	Maximize return on investment	Winning	Winning, being competitive, part of team
<b>Noticeable Characteristics:</b>	Don't care about today, or tomorrow, they care about 3, 6, and 12 months from now	Unrelenting passion to improve and get better	Want direct honesty and transparency—athletes do not like gray areas
<b>Practical Example:</b>	<p>Return on Investment.</p> <p>While meeting with management, the strength and conditioning coach presents the idea that purchasing software X, although extremely expensive, would provide a significant direct return on investment and increase profit. The obvious tangible outcome here is increased profit.</p> <p>Management thinks this is a great idea and invests the money to purchase the software.</p>	<p>The Paradoxical World of the Head Coach.</p> <p>As an early-career strength coach working with a key draft pick who wasn't performing well on the practice court, the coach storms over to me, kicks the bike over and in front of all the staff pointing at me, yells "What are you doing in there (pointing to the weights area), he is shooting like ****, you keep him off the weights." Following a game, I see the coach walking over to me, and I'm thinking what now, the coach says "He is getting pushed around in the paint, get him on the weights and harden him up."</p>	<p>Burgers and fries, best food in the NBA.</p> <p>Chef asked to add burgers to the menu. Player A comes over, "Man these are the best burgers I have had, what's on it"... I reply, "Meat, like cow." Overtime, other players start eating the burgers. One day a player specifically asks, "What type of meat is this?" Reply, "Bison." Player A hears this, gets mad and storms out, "You lied to me, you said it was cow."</p>
<b>Key Point:</b>	<p>Return on investment is one of the most popular performance measurement and evaluation metrics used in business (4).</p> <p>The focus here is showcasing how high-performance staff can use this concept to argue for full-time employment?</p> <p>1) Will there be a significant direct return on investment?</p> <p>2) What is the obvious tangible outcome (increased profit)?</p>	<p>Coaches operate in an environment where there is a guillotine above their head. This changes how they think. Laird and Waters (15) reported that the probability of qualified, experienced coaches recalling critical things accurately is only 59.2%.</p> <p>Coaches remember what is important to them, so keep that in mind when you communicate with them.</p>	<p>Ensure that your communication answers the specific questions, which will alleviate any opportunity for miscommunication.</p> <p>Make an effort to be mindful of your body language and build positive rapport with verbal and nonverbal communication.</p>

## WHAT DOES IT ALL MEAN?

D'Amelio highlights that high-performance excellence within an organization starts with the fundamental principles of communication. This human factor allows staff to recognize what drives key stakeholders and through the use of deductive reasoning to gain insight into what is important to them within their context (management, coaches, and players). Such organizational excellence requires exceptional planning and belief in the program. The internal motivation and drive of high-performance staff to meet the organizational vision overrides the challenges and resistance to change. Finally, D'Amelio challenges coaches to ask themselves at the end of each day, "What can I do tomorrow that I didn't do today to improve my organization?"

## TAKE-HOME POINTS: THE IMPORTANCE OF THE HUMAN FACTOR

1. Embrace the Stockdale Paradox: Have faith in the program and process.
2. Human factor: Technology does not solve problems, people solve problems.
3. True culture of excellence does not accept complacency or mediocrity. There is no silo mentality.
4. Organizational vision well-communicated and understood; provides clear purpose and meaning.
5. Communication is the key for successful leadership; key stakeholders all think differently.

## BASKETBALL CONDITIONING: SPECIFIC APPLICATION AND DRILLS

**Brady Howe**, Phoenix Suns Head Strength and Conditioning Coach

### CONSIDERATIONS IN BASKETBALL-SPECIFIC CONDITIONING

Coach Howe provided an overview of five key considerations for basketball-specific conditioning (Figure 2). A central theme of this presentation was continuously questioning your current training programs in order to allow a forward-thinking mindset of the specific and transferable application of basketball-specific conditioning related to the five key considerations. Howe argues that by challenging individual training philosophies, coaches grow on a daily basis as basketball-specific conditioning may be approached and prescribed in multiple ways to maximize court transfer. It is suggested that strength and conditioning coaches resist the temptation to view conditioning solely as “cardiorespiratory,” but rather a metabolic conditioning continuum ranging from “alternate” to “basketball-specific” that also caters for players transitioning to return to play.

### KNOW YOUR SPORT AND KNOW YOUR ROSTER

When analyzing the activity demands of NBA basketball, many physiological variables require consideration. For example, a majority of the playing time is spent at more than 85% of the athlete’s maximum heart rate (HRmax), with players covering

an average of 4,500 – 5,000 m during the course of a game (8). High-intensity efforts generally last less than 20 s with guards performing more high-intensity efforts than forwards and centers (8,20). Additionally, the biological age and training experience of individual players may vary greatly. For example, a coach may have a 19-year-old first round draft pick who is unaccustomed to the training and playing load that an 82-game season brings. Conversely, the same team may have a 15-year veteran. Therefore, both players would be managed differently, highlighting the importance of knowing the roster. The structure of the team roster and coach’s playing style may also influence the demands of each player. Playing a small lineup presents different metabolic demands compared to having a taller lineup on the court. The lineup may be determined, in part, by the coach’s playing style, whether they play “up-tempo” in offense or creating more “switches” on defense. Howe presents a typical NBA team roster in Table 3.

### PLAYER PROFILING

In order to design player-specific conditioning programs, one of the first steps is to establish baseline testing data, which may include musculoskeletal screening and functional testing (3,9). Available resources at a strength and conditioning coach’s disposal, such as facilities and equipment, play a role in determining which test may be applicable for their environment. It

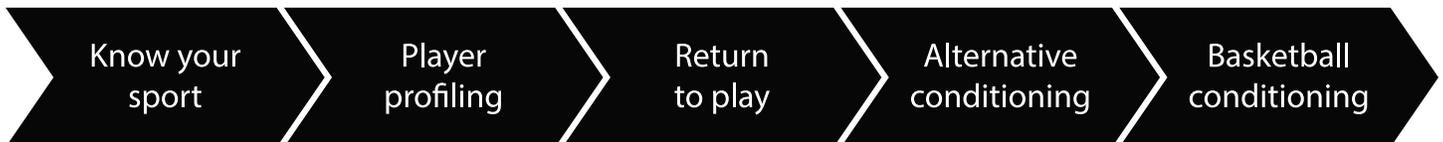


FIGURE 2. FIVE KEY CONSIDERATIONS FOR BASKETBALL-SPECIFIC CONDITIONING

TABLE 3. NBA ROSTER—PLAYER CLASSIFICATION AND PLAYING MINUTES

PLAYER CLASSIFICATION	NUMBER	MINUTES PER GAME
Star player	1 – 3	30 – 40
Role player	3 – 5	10 – 30
Back-up player	~ 5	5 – 15
Development player	~ 5	Less than 5

TABLE 4. NBA PLAYER PROFILE TESTING—PERFORMANCE QUALITIES AND TESTS

PERFORMANCE QUALITY	TEST
Power	Countermovement jump test
Endurance	Yo-Yo or 3-min step test
Strength	Isometric mid-thigh pull test
Strength-speed	135-lb trap bar jump test
Agility	505 test
Acceleration	10-m sprint
Speed	¾ court sprint test

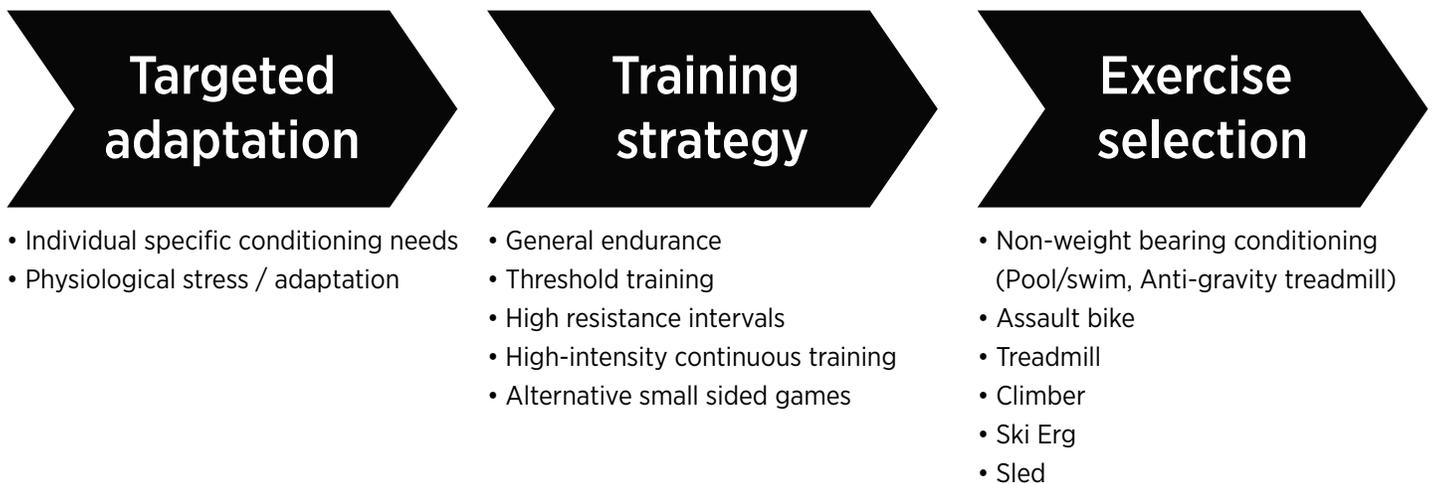
is important to establish the key performance qualities of interest with reliable and valid tests to provide consistent and high-quality player information. Table 4 displays key performance qualities and tests that may be considered in the development of an NBA player profile.

**RETURN-TO-PLAY CONDITIONING**

During the course of an 82-game regular season, NBA players play almost every other night. Therefore, the primary goal of basketball-specific conditioning is based on microdosing to optimize a high level of daily performance. However, if players are injured, they will not obtain the primary game-related stimulus. Return-to-play conditioning should provide progressive physiological stimuli aimed at targeted adaptation.

Figure 3 displays training strategies and exercise selections to achieve targeted adaptation to prepare players for the demands of competition.

Table 5 outlines metabolic conditioning strategies and prescriptions employed during the return-to-play process transitioning from general endurance towards basketball-specific conditioning. Important to note here is that the suggestions given in Table 5 should be viewed from a holistic standpoint rather than an isolated standpoint, as all types of work prescribed to the athlete (e.g., strength, basketball, conditioning) play a role into the evolution and development of a player’s ability to generate and use his energy system, if planned appropriately.



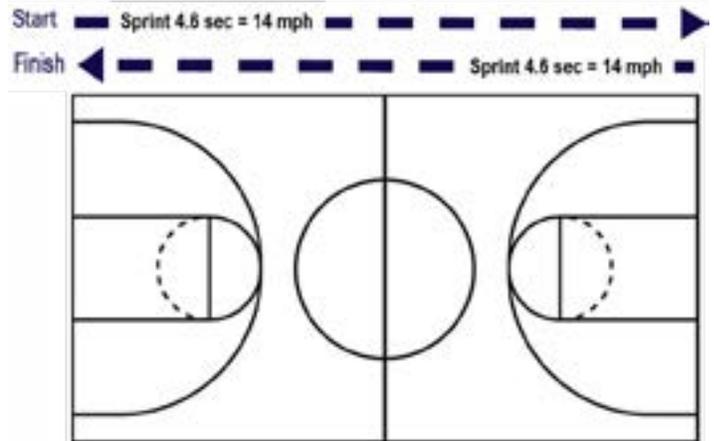
**FIGURE 3. TRAINING STRATEGIES AND EXERCISE SELECTION FOR TARGETED ADAPTATIONS**

**TABLE 5. METABOLIC CONDITIONING STRATEGIES USED IN THE RETURN-TO-PLAY PROCESS**

TRAINING STRATEGY	TRAINING ADAPTATIONS	TRAINING PROTOCOL	OBJECTIVE MEASURES
<b>General Endurance (aerobic capacity)</b>	Increase cardiac output, improve efficiency of O <sup>2</sup> supply Stimulate cardiac hypertrophy, increase left ventricular cavity volume	30-90 min continuous work (increase volume over time) Maintain HR ranges (130-150)	HR range Sustainable work rate
<b>Threshold Training (aerobic power)</b>	Increases the max rate of ATP regeneration with the goal of increasing aerobic power Raise anaerobic threshold, increase power output Rely less on anaerobic energy system to generate the necessary ATP	1-4 min continuous work 3-5 reps 1:1 work-to-rest ratio Keep HR within range of entire set Maintain HR 150-165 bpm	Repeatable work rate Wattage (sustainable power output)
<b>High-Resistance Interval Training (alactic power)</b>	Increase O <sup>2</sup> utilization and recruitment of type 2 fast twitch muscle fibers Working just under anaerobic threshold	8-12 second intervals, 10-15 reps, 45-60 second rest	HR recovery HR under anaerobic threshold Wattage (sustainable power output)

**ALTERNATIVE BASKETBALL CONDITIONING**

Once the player has re-established baseline conditioning levels and exhibit psychological readiness for court return with no obvious alternated movement strategy, they can proceed to the next stage. Three key implementation considerations include: 1) training doses are prescribed via graded exposure (i.e., progressive overloaded), 2) training progressions target more game-specific drills, and 3) monitoring the player's progress and training dose tolerance. Table 6 outlines times to complete on-court drills and distances, which allows for programming relative to speed zones, while Figure 4 displays an on-court maximal aerobic speed drill utilizing the time/speed zone approach.



**FIGURE 4. EXAMPLE OF ON-COURT MAXIMAL AEROBIC SPEED DRILL**

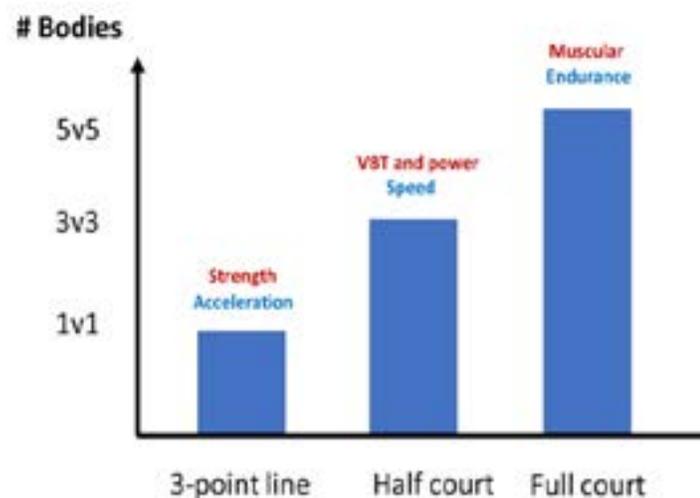
**TABLE 6. SAMPLE CLASSIFICATION TIMES FOR ON-COURT DRILLS RELATIVE TO SPEED ZONES**

SPEED (MPH)	FULL COURT	HALF COURT	WIDTH	FT LINE	3PT LINE	OPP. FT LINE
10.0	6.4	3.2	3.4	1.1	0.6	5.3
10.5	6.1	3.1	3.2	1.0	1.5	5.1
11.0	5.8	2.9	3.1	1.0	1.5	4.8
11.5	5.6	2.8	3.0	0.9	1.4	4.6
12.0	5.3	2.7	2.8	0.9	1.3	4.4
12.5	5.1	2.6	2.7	0.9	1.3	4.3
13.0	4.9	2.5	2.6	0.8	1.2	4.1
13.5	4.7	2.4	2.5	0.8	1.2	3.9
14.0	4.6	2.3	2.4	0.8	1.2	3.8
14.5	4.4	2.2	2.4	0.8	1.1	3.7
15.0	4.3	2.1	2.3	0.7	1.1	3.5
15.5	4.1	2.1	2.2	0.7	1.0	3.4
16.0	4.0	2.0	2.1	0.7	1.0	3.3
16.5	3.9	1.9	2.1	0.7	1.0	3.2
17.0	3.8	1.9	2.0	0.6	1.0	3.1
17.5	3.7	1.8	1.9	0.6	0.9	3.0
18.0	3.6	1.8	1.9	0.6	0.9	3.0
18.5	3.5	1.7	1.8	0.6	0.9	2.9
19.0	3.4	1.7	1.8	0.6	0.9	2.8
19.5	3.3	1.6	1.7	0.6	0.8	2.7
20.0	3.2	1.6	1.7	0.5	0.8	2.7

Abbreviations: mph = miles per hour; FT = free throw; Opp. = opposition

**BASKETBALL-SPECIFIC CONDITIONING**

Once the medical staff considers the player at full-health and pre-injury status, they can transition to basketball-specific conditioning. The primary goal of this stage is to progress the player to game-intensity basketball-specific conditioning, which may be achieved using small-sided games. Small-sided games may be implemented in collaboration with the coaching staff (e.g., skill drills can be blended into on-court conditioning). Importantly, basketball-specific conditioning and small-sided game situations must be planned in alignment with complementary strength training to ensure a matching overlap in physical quality development so that there is minimal interference from weight room intensities to on-court performance (Figure 5). It is paramount that the player’s internal and external load tolerance continues to be monitored. Frequently employed modalities include micro-technology (high-intensity efforts, speed, distance), wearables (acceleration/deceleration, change of direction, distance, jump count), and internal responses (heart rate and RPE).



**FIGURE 5. SMALL-SIDED GAMES - TRAINING OBJECTIVES**

**OTHER CONSIDERATIONS**

Finally, the NBA environment presents multiple logistic and travel-related limitations, which may impact opportunities to conduct conditioning. Despite this, practice days and game days offer unique training/conditioning opportunities. For instance, “breakfast club sessions” (early morning), as well as pre-practice/game, during practice/game, and post-practice/game sessions, are all periods that can be used appropriately to improve energy system development through proactive planning. However, strength and conditioning coaches must remain flexible towards the day-to-day changes in player readiness.

**TAKE-HOME POINTS: THE FOUR BS**

1. Be open-minded: use ideas that apply to your environment rather than set protocols.
2. Be proactive: plan to reduce overwhelming variables.  
Be specific: plan training according to sport-specific, position-specific, and player-specific demands with respect to context, situation and environment.
3. Be practical: find a way to get the job done and ensure players’ care and buy-in before anything else.

**FORCE PLATE ASSESSMENT AND PRACTICAL APPLICATION**

**Daniel Cohen**, Universidad de Santander/ Coldeportes, Colombia

**OVERVIEW**

Cohen introduced key principles related to the application of force plate assessments and measures of jump performance, emphasizing the practical and valid performance of the countermovement jump as a diagnostic tool (1,12,16). Other discussion points included the use of neuromuscular performance assessment tools, the practical applications of jump assessments in determination of fatigue, readiness, and adaptation, and the importance of benchmarking in the player progression during rehabilitation in the return to play process.

**OBJECTIVE DATA**

In the sporting context, objective data is often used as a conversation starter between medical professionals and strength and conditioning coaches. Examining the data may not only provide the health and performance team with new information, it may inform and validate the clinical practice and informed decision making of the health and performance staff. Objective data allows quantification of variables clinicians and coaches deem important, thereby bringing a perspective based on clinical evidence that shapes an evidence-based perspective. Health and performance teams may benefit from the use of force plate data as a piece of the bigger puzzle they wish to solve. However, this is by no means the end-all be-all, but another diagnostic tool in the toolbox (Table 7).

TABLE 7. STRENGTH AND POWER NEUROMUSCULAR PERFORMANCE ASSESSMENT TOOLBOX

ISOMETRICS	DYNAMIC SINGLE JOINT	DYNAMIC MULTI JOINT
Force Plate	Isokinetic Dynamometer	Force Plate
Hand Held Dynamometer	Nordboard	VBT Devices (Gymaware/Tendo)
Sphygmomanometer		Jump Mats (Just Jump)

### MEASURES OF JUMP PERFORMANCE: THE CASE FOR THE COUNTERMOVEMENT JUMP

Several measures of jump performance have been used in elite sports settings and are often incorporated in the testing battery. However, strength and conditioning coaches should be familiar with specific considerations for the use of various measures of jump performance. A reoccurring question posed by Cohen was that of whether single-leg jump measures are superior to a countermovement jump (CMJ) in detecting asymmetries. According to Cohen, while the single-leg jump better reflects asymmetrical differences, some limitations were presented. Specifically, due to the fact that the single-leg jump would likely be applied in the later stages of rehabilitation, the ability to quickly examine and compare previous data during a rehabilitation process may be limited to this stage. Second, testing the bilateral CMJ may be more time-efficient to examine asymmetries when utilizing dual force plates, in comparison to the single-leg jump. For example, three bilateral jump tests equate to six single-leg jump tests. Decreasing the amount of data analysis may promote a more manageable process. Additionally, dual force plates may allow practitioners to observe compensatory movement strategies, such as weight/load shifting, which cannot be examined during the single-leg jump. Another measure, the squat jump, provides the ability to examine the acceleration from zero as a purer measure of concentric force and concentric performance, however the eccentric phase is not included as it is in the CMJ. Finally, the drop jump can also be used with good reliability (18). However, Cohen debated that several CMJ attempts may be required to ensure maximal height, which may correspond with learning effects. Therefore, the ability of the drop jump to detect neuromuscular fatigue needs to be interpreted with caution. Table 8 outlines CMJ compared to various jump measures.

### WHAT IS THE VALUE OF PRE-SEASON TESTING?

Pre-season testing and player profiling should be used to understand individual abnormal changes that may occur throughout the season. By establishing individual variability, the coach can determine each athlete's adaptations in response to the workload during the season. Stronger and more aerobically robust athletes may show better recovery compared to their counterparts. Cohen provided examples of what changes may look like in-season for each individual athlete following initial pre-season testing compared to one day pre-game and two days post-game. His examples identified how some athletes were stable, some had decreases in neuromuscular performance, and some showed super compensation. Players with poor responses showed lower eccentric deceleration impulse for CMJ. This information can guide decision making for each athlete during their subsequent sessions in the weight room and on-court.

### CREATING COACH/ATHLETE BUY-IN

Implementing jump testing may provide some barriers; however, in order to overcome this, creating a culture where all interested parties (coaches, players, administration) see the value in collecting the data is key. When it comes to assisting athletes' buy-in, the concept of "gamification" via creating a leaderboard can draw upon the perceived competitive climate of athletes (23), as self-efficacy factors may moderate the relationship between social comparison via leaderboards and the athletes' attitude for success. This also provides a real-time immediate feedback loop for coaches and athletes during the assessment, promoting instant educational opportunities. The main goal of using the leaderboard is to create interest around force plate testing. If the goal is to quantify neuromuscular performance, force plates can provide instant data on numerous jump variables, which can be displayed with real-time feedback, whether that be eccentric and landing variables (16) or using a dual force plate system identifying asymmetries in different time-points of the jump (1).

TABLE 8. THE CASE FOR THE COUNTERMOVEMENT JUMP

CMJ VS. SL JUMP	CMJ VS. SQUAT JUMP	CMJ VS. DROP JUMP
Implemented in earlier rehabilitation stage	Evaluation of eccentric and concentric phase	Better reliability
More efficient to test bilateral (dual force plates)		Implemented in earlier rehabilitation stage
Expression of compensatory strategies		More compliance in-season with players

**REACTIVE STRENGTH INDEX, ASYMMETRIES, AND MORE**

The reactive strength index (RSI) and reactive strength index modified (RSI-mod), [calculated as  $RSI = \text{flight time (ms)} / \text{contact time (ms)}$ ], provides insight into the ability to engage the stretch-shortening cycle (SSC) (6,18). The RSI has been reported as a surrogate measure of neuromuscular status and used an athlete-monitoring tool to evaluate athlete “readiness” to train (6,7,18,22). Initial work by Cormack et al. reported that monitoring jump height may detect trivial changes in performance, whereas the RSI-mod displayed a substantial decrease post-match and game-day +1 (7). It was theorized that a potential mechanism for the resultant increased ground contact time in drop jump performance post-match and game-day +1 was due to decreased muscle-tendon stiffness from prior SSC exercise, as determined by RSI-mod (7). Because RSI-mod is a surrogate measure of lower body neuromuscular performance, it is not only a good predictor of jump performance, but may also provide insight into running performance as well, based on the impulse-momentum relationship (6,7,18). More recent works by Heishman and colleagues, examining CMJ inter-limb asymmetries in NCAA Division I collegiate basketball players, suggest that the CMJ may provide quantitative data to guide return-to-play and return-to-performance protocols following injury with respect to inter-limb asymmetries (12). While asymmetry greater than 10% between limbs is often used as a threshold criterion to guide return-to-play following injury (19), the authors identified reliable CMJ metrics associated with both the concentric and eccentric phases that may prove valuable in enhancing rehabilitation. Interestingly, the authors suggest that inter-limb variability in asymmetry may be positive, and theorize that during injury, an athlete would select a pre-determined movement strategy that would avoid force application to the injured limb, likely manifesting in a consistent asymmetry. This is in agreement, in part, with research demonstrating previous injury is associated with heightened CMJ force-time asymmetries (11). A novel finding was that the CMJ protocol (CMJ with an arm swing compared to CMJ with no arm swing) had an influence on the variability of lower extremity inter-limb asymmetries. This may be of particular

relevance and beneficial in guiding performance and medical staff in selecting a CMJ protocol (11), once they have established the key performance indices within their athlete monitoring and player assessment strategies.

Cohen also presented unpublished data examining changes throughout an NBA season for specific variables, noting that players’ jumping proficiency should be considered. For example, comparing the changes for NBA pre-season to NBA end of season, players improved their RSI-mod scores. This is likely attributed to becoming a more efficient jumper. During analysis of asymmetries coaches should establish what is “normal” for the playing roster and position-specific comparisons throughout the season (11). It was highlighted that during the NBA pre-season concentric and eccentric asymmetries were reduced; however, during early in-season competition increased asymmetries were observed. While pre-season training appears to reduce concentric and eccentric asymmetries, most likely due to training emphasizing pre-rehabilitation and specific strength development, the increase in asymmetries reported across the season may correspond with a change in this training focus (Table 9). Once again, this highlights the complexities of programming during an 82-game regular season.

**TAKE-HOME POINTS: MAY THE FORCE BE WITH YOU**

1. Force plate data: provides objective context for coaches and clinicians to aid in decision making.
2. CMJ: more efficient jump and provides similar metrics as the single-leg jump, squat jump, and drop jump.
3. Pre-season testing: used to understand each individual and establish norms.
4. Create interest: educate players and coaches to create value around force plate assessments.
5. Asymmetries: aim to minimize increases in asymmetries during the season.

**TABLE 9. ASYMMETRIES (%) COMPARISON OF NBA PLAYER PRE-SEASON TO EARLY IN-SEASON**

PHASE	CONCENTRIC PEAK FORCE	ECCENTRIC DECEL RFD	PEAK LANDING FORCE
Pre-Season	9.3	27.0	14.1
Early In-Season	6.7	23.9	17.7

Abbreviations: Decel = deceleration; RFD = rate of force development. Unpublished data Luke M. Hart.

## IN-SEASON STRENGTH PROGRAMMING: MULTI-FACETED APPROACH PANEL DISCUSSION

**Derek Millender**, Head Strength and Conditioning Coach,  
Cleveland Cavaliers

**Jeremy Holsopple**, Athletic Performance Director, Dallas Mavericks

**Bill Foran**, Assistant Coach/Strength and Conditioning, Miami Heat

**Matt Johnson**, Head Strength and Conditioning  
Coach, Chicago Bulls

**Brandon Gilliam**, Director of Rehab, Miami Heat

### QUESTION AND ANSWER DISCUSSION FORUM

This session provided an open question and answer discussion forum that allowed delegates an opportunity to ask questions related to these individuals' philosophies regarding successful, multi-faceted approaches to in-season strength programming.

#### What are the keys to training NBA players?

- Fundamentals, strength improves everything.
- Patiently and delicately. What are the player's goals?
- Make the athletes part of the program, get their feedback on what works best for them.
- Collective agreement - everyone needs to be on-board.
- Older athlete - individualize training to what they can do.
- Younger athletes - take into consideration the amount of games athletes are about to go through during the season.

#### What are your goals for injury prevention within inter-disciplinary teams?

- Flawless communication both within and between departments.
- Educating athletes during the injury rehabilitation process assists their understanding of the process.
- Establish relationship with training staff.
- Make the process inclusive.

#### What is one thing that you feel has been most useful in your program?

- Low-minute player will train differently compared than a high-minute player. Dial in to what they need.
- Multi-segmental foam rolling.
- Specific conversations with the certified athletic trainers to know what the strength and conditioning coach is going to do in the gym.
- Blood flow restriction training, unload athletes but still be able to make strength gains.
- Isometric (stress relaxation) programs with targeted nutrition for tendon health.
- Wim Hof breathing techniques, balance training, and cognitive (brain) training.

#### What do you do to continue to be innovative?

- Listen to podcasts or audiobooks every day; there is always time.
- Continue to search for educational opportunities.
- Open conversations with assistants and mentors.
- Look outside your sport; be open-minded.

#### Speaking from a psychological perspective, what do you do to build your relationship with the players?

- *Allow athlete ownership within the program.* While the players know the training program, ask them what exercise in the gym do they want to do in lifting today. Allow the players to have input and take some ownership.
- *Caring aspect.* This all starts with a conversation about what's happening, both with their on-court training and performance, along with what's happening outside of basketball. Sometimes, to show players that you care may require holding them back, reducing their load when they want to do more, or holding players accountable with non-negotiables. It's an old saying, but "no one cares about what you know until they know how much you care."
- *Connecting is caring.* Developing relationships with the players. Once again, this revolves around open communication, not only with the players, but everyone within the performance team. If they (the players and staff) know you care and you give them some ownership, you will always get their best.
- *Observe body language.* I observe their body language when they walk into the facility. If I can see that they are not their usual self, I may not get them to lift today, and sometimes I may have to forgo my planned 20-minute lift in order to make a positive connection with the player, and at that point, that may be just what they needed.

#### What are the biggest takeaways from the NBSCA Performance Summit?

1. *Relationships:* You must be able to build meaningful relationships with players and coaches.
2. *Collaborative effort:* It takes collaboration to be successful with your staff and players.
3. *Networking:* Very important to network with people across a variety of disciplines.
4. *Communication:* Develop your communication skills, verbal and nonverbal communication, soft skills (i.e., people skills, social skills, communication skills).
5. *Goal oriented:* Keep working towards both your goals and team's performance objectives. Are the goals aligned? Vertical and horizontal alignment.
6. *Context:* How can you take this information and apply it within the context of your training program?

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