EXPLORING THE POSITIONING OF SPORT SCIENCE PROGRAMS WITHIN INTERCOLLEGIATE ATHLETICS

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INTRODUCTION

In coach education resources, guidance for effective coaching in any context involves understanding and manipulating details and optimizing processes (11,17). Multiple challenges exist that may reduce coach effectiveness in every coaching context. Because of the voluminous tasks inherent in running a sport team, most coaches will benefit from infrastructure provided to support them. This point is demonstrated well by the development of the strength and conditioning field several decades ago and the proliferation of jobs across the sport industry. As it may be observed in professional and Olympic-level sport, it is also possible for intercollegiate coaches to benefit from further specialist support, such as the assistance of a sport scientist—a formally trained individual who specializes in applying the scientific method to sport in order to enhance player performance, maximize player availability, and maintain player health (4,8).

Recently, an increase in sport science (SS) opportunity has emerged within intercollegiate sport. This has been generally brought about by sport coaches and athletic directors who seek to better inform their processes of training and optimize performance. In many ways, this trend has been fueled by the proliferation of sport technology, despite the reality that validity, reliability, and interpretability are still ongoing concerns for many emergent technologies that have not been exposed to sufficient scientific rigor. Ultimately, SS aims to use an applied scientific process to aid coaches' decision-making processes and enhance athlete development in competitive sporting environments (8,14). If performed optimally, this process involves an uninterrupted loop of collecting quality data, accurately interpreting the data, and disseminating relevant information to stakeholders within an appropriate timeline (1,2,6,14,15,17,20). This process involves a spectrum of low-tech and high-tech tools with the intent to inform coaching decisions.

VARIATIONS IN APPLICATION

At this point in time in the literature, very little attention has been paid to how SS programs are positioned within intercollegiate athletic departments in the United States. Therefore, the purpose of this article is to outline the three general formats in which SS programs are implemented within intercollegiate athletic departments and to provide pros and cons of each situation. This information may be used to guide decision makers seeking to begin SS programs at their own institution.

FORMAT 1: ATHLETIC DEPARTMENT PARTNERS WITH ACADEMIC DEPARTMENT

Presently, there is only one US university, East Tennessee State University, participating in National Collegiate Athletic Association (NCAA) Division I sports that features formally integrated academic SS activities and athletic department processes. In this model, SS duties, including laboratory testing, field testing, and monitoring services, are handled by graduate students under close mentorship of experienced faculty. Additionally, most of the physical preparedness training that occurs in the athletic department is led by the program's graduate students, leading to opportunities for data collection not present in other models. In this model, sport stakeholders such as strength and conditioning, sport medicine, sport coaches, and others form a sport performance enhancement group that oversees training and rehabilitation of athletes within a particular sport. Several other universities, such as the University of Kansas, the University of Memphis, and West Virginia University, are in various stages of development of SS programs. Other programs have existed previously, such as the now-defunct SS program at the U.S. Air Force Academy (USAFA) Athletic Department, which was most likely the first formal, large-scale SS partnership between a college athletic department and an academic program in the U.S. (12). While this endeavor at USAFA is certainly noteworthy, it was short-lived, most likely due to the transient nature of military assignments and limited availability of subject matter experts within the workforce of active-duty military personnel.

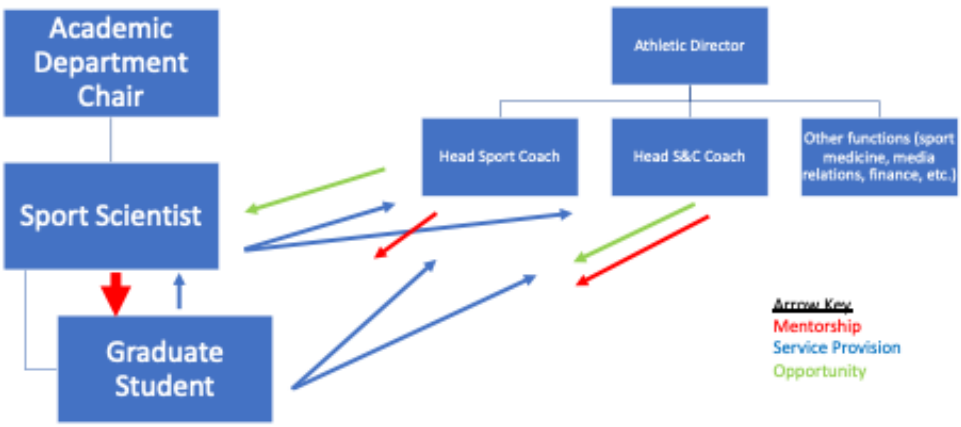

FIGURE 1. FORMAT 1: ATHLETIC DEPARTMENT PARTNERS WITH ACADEMIC DEPARTMENT

At a less formal level of involvement, individual coaches may seek assistance from a relevant university faculty member (Figure 1). This often involves the faculty member consulting on team processes, assisting with coaching services, or research and development projects intended to provide competitive advantages. The level of commitment and duration of these relationships vary, ranging from formal and somewhat integrated arrangements to one-on-one informal arrangements constructed to solve a particular problem. Athletic departments, particularly sport coaches or strength and conditioning coaches, partnering with a relevant faculty member(s) in a kinesiology department is not a new concept. Historically, the athletic department-faculty arrangement is the most long standing format.

FIGURE 2. DR. JOHN IVY AND COACH MACK BROWN FORMED ONE OF THE EARLIEST COLLABORATIONS BETWEEN AN ATHLETIC DEPARTMENT AND ACADEMIC DEPARTMENT (INDIVIDUAL COACH AND SCIENTIST) AT THE NCAA DIVISION I POWER 5 LEVEL

The following points offer the pros and cons of a SS model within the athletic department and academic department collaboration.

PROS

- Technological tools may be selected deliberately and validated before integration into decision-making processes (19).
- Existing faculty often know the university landscape better than coaches due to longer duration of employment versus the typical coaching cycle.
- Faculty members may be able to recruit graduate students to assist with projects, providing the labor to offset competing professional commitments of the faculty member (e.g., teaching, research, service).
- Grants, though limited, may be secured to fund research projects that contribute to sport nutrition needs of athletes (10).

CONS

- A limited number of universities in the U.S. employ specialists, such as SS faculty (18).
- Faculty may have limited time available to interact with coaches due to academic responsibilities.
- Faculty may have limited time available to be present for athlete training due to academic and research obligations.
- Grant money for equipment or scholarships is quite difficult to secure and typically not earmarked for SS projects.
- Historically, U.S. athletic departments have not frequently welcomed research projects, which could lead a qualified faculty member to become resistant to involvement (5).

Collaborations between athletic departments and qualified, full-time faculty members present at a university may seem like a natural fit, however, systems issues exist that can make it difficult for these partnerships to work well in the short- or long-term. Two primary issues include: 1) athletics and academics are housed in separate places on campus (different departments with different physical locations), and 2) athletic departments work in a very different manner compared to academic units. In some ways, a sport system may be seen to parallel medicine, as both fields involve using research and science in an artistic manner (9). As medicine is positioned within higher education, medical schools, biomedical research labs, medical related academic units, and hospitals are frequently housed in the same place. The same observation may be made for performing and fine arts academic units, which house both their education and performance operations in the same location. For example, at the conclusion of a music class, a student may perform a recital before an audience; the recital is part of a college course in which the course instructor is also a professor (and a musician). Additionally, the student can be on scholarship due to possessing a high level of musical ability. This reality led former NCAA President Myles Brand to suggest that intercollegiate sport should indeed be considered in the same light as the performing arts (3). Though each field in sport, medicine, and art is unique and has a different culture, history, structure, and system, comparisons between fields can be helpful in determining optimal system organization. By comparing sport to art and medicine, a sport scientist working in academia may carve out a more creative path in an effort to work with collegiate coaches and athletes.

FORMAT 2: ATHLETIC DEPARTMENT HIRES IN-HOUSE SPORT SCIENTIST(S)

Several Division I Power 5 athletic departments and teams have hired their own sport scientist(s) (7,21). While this format is likely the newest and least evolved of the three formats, it may be the format most likely to grow in popularity over the next decade. Indeed, many U.S. professional sport organizations employ at least one sport scientist; full-time applied sport scientists can be found within many high performance departments overseas. Currently, a lack of uniformity and clarity exists as to what qualifies someone

to be a sport scientist in the U.S., or what they should do, and this is a major goal of the National Strength and Conditioning Association (NSCA) Certified Performance and Sport Scientist® (CPSS®) certification.

Delivering high-quality day-to-day SS services could be a full-time job. Hiring in-house a sport scientist(s) may be considered an improvement in capacity over partnering with academic personnel because specialist sport scientists in the traditional academic roles often must "dabble" in performing applied or practitioner-driven SS work due to their academic responsibilities. When creating a sport performance division or SS job description, it is import to consider how the applicant pool is vetted, what is the structure and system that the sport scientist is brought into, or will the new sport scientist be expected to create a new system or support an existing system within the athletic department? A full discussion on what a sport scientist is and does is well beyond the scope of this article; however, generally speaking, a sport scientist is: 1) a support staff member involved in the training process, 2) a problem solver, 3) an educator, and 4) an individual that speaks all languages between sports medicine, coaches, athletes, physical therapists, and medical doctors. They have to be able to look at all the data, understand it, but more importantly communicate to everyone in terms they can understand to facilitate the progression of the athlete and team performance.

PROS

- An in-house professional with appropriate expertise may focus on tailoring processes to better support coaches and athletes.
- Sport scientists can help build an appropriate structure and system for sport science integration across the department.
- Sport scientists can answer specific coach-driven questions (perform exploratory research).
- Coaching duties are seldom given to the sport scientist; they may focus on SS work.
- In-house sport scientists could provide a recruiting advantage as more attention may be paid to athletes in supported sports.
- Sport scientists alleviate some workload (e.g., assessment and monitoring) from strength and conditioning coaches and sport coaches.

CONS

- Cost of additional employee(s).
- Challenges for the athletic department to identify credible applicants.
- Challenges for athletic department leadership to create a productive system for the sport scientist to work due to stakeholders' resistance to change.
- Some sport coaches and strength and conditioning coaches may feel that SS is being "forced on them" or view the SS program as "too many cooks in the kitchen" due to reliance on more traditional decision-making processes.

In addition to sport scientists being hired within athletic departments, high performance directors (HPDs) or equivalent positions have also become more common positions within intercollegiate athletic departments (e.g., Pennsylvania State University, University of Louisville). Previously limited to national sporting organizations, these positions have been adapted from common use for application in the collegiate sector (15,16). HPDs are charged with overseeing various sport support functions and tasked to integrate and align various disciplines (4). As more jobs in sport support roles become established in the intercollegiate sector, HPDs can help ensure that silos are avoided through establishing data streams and communication lines (4). Though a HPD differs in responsibilities from a traditional SS position, the training and skills of a sport scientist may serve as a strong base to prepare them for success in a HPD role. As this pertains to the SS program, services may only be optimized with sufficient organizational direction from someone in a leadership role so that sport coaches and support staff members properly understand

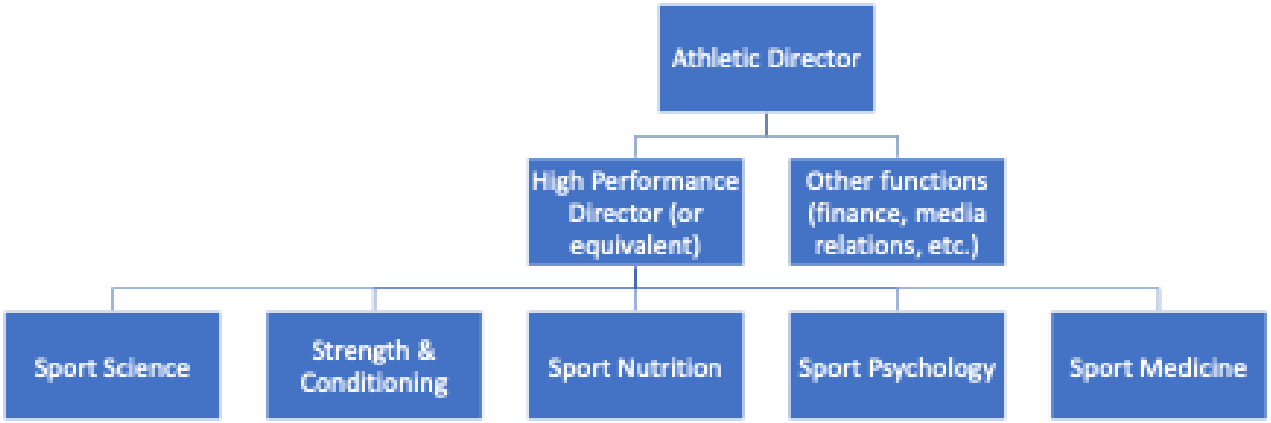

FIGURE 3. FORMAT 2: ATHLETIC DEPARTMENT HIRES IN-HOUSE SPORT SCIENTIST(S)

the role of the sport scientist and the processes are supported and valued by those in authority. In this way, the legitimacy of SS is established within the organization.

FORMAT 3: EXISTING ATHLETIC DEPARTMENT STAFF OVERSEE SS PROCESSES AND SPORT TECHNOLOGY

In an effort to purchase and manage the various technologies commonly used, while also minimizing budget impact, some athletic departments invest all of their SS funds towards hardware and software without hiring additional personnel. This situation seldom involves collaboration with an academic unit. For this "in-house" SS arrangement, technology assignments are most often given to sport support staff members, such as strength and conditioning staff or sport medicine personnel (13). Assignment of duties in this way may or may not be appropriate due to the expertise required to manage data and success likely depends upon the knowledge and training that these professionals have obtained.

PROS

- Existing coach relationships may aid integration.
- No "middle-man." The person collecting data (e.g., sport coach or strength and conditioning coach) is also the person writing programming and overseeing athlete training.
- Formally trained sport scientist and coaches may optimize integration in hybrid roles.
- More money may be available for technology tools (salaries are a fixed expense).

CONS

- Staff have less expertise and experience in use of monitoring tools and data analysis (18).
- Strength and conditioning staff and sport medical staff often possess less knowledge of SS-relevant statistical methods compared to a formally trained sport scientist.
- Less connection is made with academic personnel for support in product vetting and additional support.
- Less likelihood exists of appropriate product vetting before implementation (18).
- Conflict of job roles may develop for those who already have full-time job filled with other responsibilities.
- Coaches or staff members may not understand proper implementation of a certain tool.
- Potential exists for wasteful spending on technology: tools may be poorly utilized or budget-friendly options may not be considered due to less expertise in SS (e.g., a professional team has X device, thus a collegiate program wants X device, even when there are lower cost devices or other ways to collect the same or similar data).

Format 3 is most likely the most common format of application in the intercollegiate setting at this time. To confirm prevalence of this format in the landscape of a NCAA Power 5 conference, we emailed inquiries to strength and conditioning coaches or sport scientists working at all of the Pac-12 universities. Of the 12 universities contacted, four operated under format 2 (two SS programs were led by employees who had obtained PhDs), four operated under format 3 (no PhDs), and four did not respond and had no sport scientists listed on the athletic staff directory. A non-scientific online search suggests that, based on staff pages and job posts, well over 100 programs involved strength coaches using some type of SS technology. Very recently, strength and conditioning staffs have even posted opportunities in which work duties of an intern-level strength coach are specifically focused on technology and SS-related tasks.

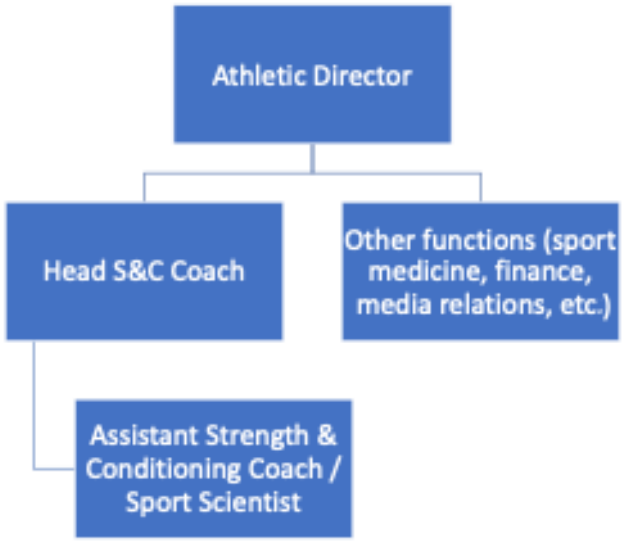

FIGURE 4. FORMAT 3: EXISTING ATHLETIC DEPARTMENT STAFF OVERSEE SS PROCESSES AND SPORT TECHNOLOGY

PRACTICAL APPLICATION

Important aspects for administrators and coaches to consider in developing a SS program include: reasons for why a given device is purchased, the familiarity and knowledge of the practitioner (not just how to use the device, but also data management and formal product evaluation), and the system or interpersonal situation between staff members (e.g., sport coaches, strength and conditioning staff, and sport medicine staff). A few Power 5 schools employ format 2 and charge a HPD to provide a framework for practices related to use of technology and data analysis. Even though few universities have opted to adopt such a position, it is appropriate to point out that proper application of SS depends on the collection and communication of relevant data and effective application of technology to training; this requires a certain level of training and expertise. Furthermore, technology and SS are not synonymous; while certain technologies can be helpful (and often necessary) for collecting and delivering

information, a substantial volume of SS tasks can be carried out at a relatively inexpensive price point. In fact, some of the classic examples of athlete monitoring do not require a large budget (e.g., weight room volume load, session rating of perceived exertion [RPE], field testing, etc.).

CONCLUSION

The field of SS is slowly growing within the U.S. intercollegiate setting as athletic departments seek additional resources to support team operations. A return on investment is sought in terms of improved athletic performance, health, and athlete availability. This article presented three common formats of SS programs in the U.S. intercollegiate setting and presented pros and cons of each. This information may be used by athletic departments to develop strategies on how to integrate the specialist role of sport scientist or add day-to-day SS duties for relevant personnel. In planning a SS program, it is important to purposefully design a structure of specialist involvement that is likely to produce the desired outcome, evaluate financial resources available to devote to the new SS program, consider the expertise of existing staff, and also consider partnerships with on-campus resources, such as professors who are experts in SS disciplines. A wide range of support is certainly possible in the intercollegiate setting; however, it is our recommendation that the design of a SS program should be centered upon hiring the right people and initiating a sensible and well-informed process, not just enthusiasm about technology implementation. Ultimately, SS is a collaborative and integrative process, and experience and training are key to success. Further research and conceptual work is required to identify and promote best practices in the field.

REFERENCES

1. Balagué, N, Torrents, C, Hristovski, R, and Kelso, JAS. Sport science integration: An evolutionary synthesis. *European Journal of Sport Science* 17(1): 51-62, 2017.

2. Bishop, D. An applied research model for the sport sciences. *Sports Medicine* 38: 253-263, 2008.

3. Brand, M. The role and value of intercollegiate athletics in universities. *Journal of the Philosophy of Sport* 33(1): 9-20, 2006.

4. Brocherie, F, and Beard, A. All alone we go faster, together we go further: The necessary evolution of professional and elite sporting environment to bridge the gap between research and practice *Frontiers in Sports and Active Living* 27, 2021.

5. Coakley, J. Studying intercollegiate sports: High stakes, low rewards. *Journal of Intercollegiate Sport* 1: 14-28, 2008.

6. Fullagar, HK, McCall, A, Impellizzeri, FM, Favero, T, and Coutts, AJ. The translation of sport science research to the field: A current opinion and overview on the perceptions of practitioners, researchers, and coaches. *Sports Medicine* 49: 1817-1824, 2019.

7. Goon, K. Utah athletics: Led by Ernie Rimer, Utes have embraced sports science as competitive edge. *The Salt Lake Tribune*. February 19, 2017.

8. Haff, GG. Sport science. *Strength and Conditioning Journal* 32(2), 33-45, 2010.

9. Hornsby, WG, Gleason, B, Wathen, D, Deweese, B, Stone, M, Pierce, K, et al. Servant or service? The problem and a conceptual solution. *Journal of Intercollegiate Sport* 10(2): 228-243, 2017.

10. Kreider, RB, Ferreira, M, Wilson, M, Grindstaff, P, Plisk, S, Reinardy, J, et al. Effects of creatine supplementation on body composition, strength, and sprint performance. *Medicine and Science in Sports and Exercise* 30: 73-82, 1998.

11. Martens, R. *Successful Coaching* (4th ed). Champaign, IL: Human Kinetics; 2012.

12. Petosa, SP. A sport science model for enhancing intercollegiate performance. *Strength and Conditioning Journal* 18(2): 58-64, 1996.

13. Sabin, R. Inside the technology giving Alabama a competitive edge. *AL.com*. July 2, 2017.

14. Schelling, X, and Robertson, S. A development framework for decision support systems in high-performance sport. *International Journal of Computer Science in Sport* 19(1): 1-23, 2020.

15. Smith, J, and Smolianov, P. The high performance management model: From Olympic and professional to university sport in the United States. *The Sports Journal* 21: 1-12, 2016.

16. Sotiriadou, P. The roles of high performance directors within national sporting organizations. In Sotiriadou, P, and DeBosscher, V (Eds.). *Managing High Performance Sport.* Routledge; 1-14, 2013.

17. Stone, ME, and Gray, H. The responsibilities of the elite coach: Embracing the science of coaching. *Journal of Coaching Education* 3(2): 74-83, 2010.

18. Stone, MH, Sands, WA, and Stone, ME. The downfall of sports science in the United States. *Strength and Conditioning Journal* 26(2): 72-75, 2004.

19. Torres-Ronda, L, and Schelling, X. Critical process for the implementation of technology in sport organizations. *Strength and Conditioning Journal* 39(6): 2017.

20. Turner, AN, Bishop, C, Cree, J, Carr, P, McCann, A, Bartholomew, B, and Halsted, L. Building a high-performance model for sport: A human development-centered approach. *Strength and Conditioning Journal* 41(2): 100-107, 2019.

21. Walsh, C. Alabama's new sports science center is all about the pursuit of high performance. Sports Illustrated *SI.com*. Oct 30, 2020.

ABOUT THE AUTHORS

Guy Hornsby is an Assistant Professor in Coaching and Performance Science (CPS) at West Virginia University (WVU) in the College of Physical Activity and Sport Sciences. His primary responsibilities involve overseeing CPS's strength conditioning minor and graduate assistant strength and conditioning program that provides strength and conditioning to three local area high schools. His primary research focus centers around optimizing the training process for strength power based athletes. He is the Head Coach of West Virginia Weightlifting, a volunteer coach for WVU track and field (throws) and collaborates with WVU athletics in various sport science/athlete monitoring efforts. He is a Certified National Level Coach by United States of America Weightlifting (USAW) and currently serves as Chair of the National Strength and Conditioning Association (NSCA) Weightlifting Special Interest Group (SIG).

Ben Gleason has worked in a variety of coaching roles at the high school and college levels. He also served in several management and sport science roles within military organizations before working as a faculty member at Northwestern State University and Louisiana Tech University. He earned his PhD in Sport Physiology and Performance from East Tennessee State University in 2015; his primary research interests are in American football performance enhancement and the organizational processes and structures of high performance sport organizations. He is presently an entrepreneur and coach based in East Tennessee.

Kristen Dieffenbach is the Director of the Center for Applied Coaching and Sport Science at West Virginia University and an associate professor of Athletic Coaching Education. She earned her PhD in exercise and sport science with an emphasis in Sport and Exercise Psychology from the University of North Carolina-Greensboro and is currently serving as the president of the United States Center for Coaching Excellence. She has been a professional endurance sport coach and a sport psychology educational consultant for over 20 years working with developmental through Olympic level athletes and coaches. Her research interests focus on coach developer training, coaching and professionalism, ethics and moral decision making in coach development.

Clive Brewer is a world-recognized expert in athletic preparation with many years experience as a Performance Director, consultant, and strength and conditioning coach. In this time, he has established a reputation for integrating sports science, sports medicine, and strength and conditioning into a player-centered and evidence-based program. He has applied this plan within soccer (Columbus Crew SC, Liverpool Ladies, and consultant to Manchester United Football Club and Scottish Football Association), Major League Baseball (Toronto Blue Jays), Rugby League (Widnes Vikings, England RL, and Scotland RL), tennis (20 years as training facility manager, part of the sports medicine delivery team at Wimbledon tennis championships, and consultant to individual players), and track and field (national coach to Scotland, advisor to the International Association of Fire Fighters [IAFF], coach to Olympic athletes). He is a Fellow of the United Kingdom Strength and Conditioning Association (UKSCA) and accredited as a strength and conditioning coach by the UKSCA, Australian Strength and Conditioning Association (ASCA), and National Strength and Conditioning Association (NSCA). He is also accredited by the British Association of Sport and Exercise Sciences (BASES) as a Support Scientist, and is a Chartered Scientist with the UK Science Council.

Mike Stone is internationally recognized as a favorite presenter at events across the nation and considered one of the leading minds in research in the field of sport science. Now at East Tennessee State University (ETSU), Stone has served as the Director of the Exercise and Sports Science Lab since August 2005. Stone helped establish the Center of Excellence for Sport Science and Coach Education in October of 2008. Stone has also helped to implement the first Sport Physiology and Performance PhD program in the nation at ETSU. During his more than 45-year academic career, Stone has been on the faculty at five different foreign and domestic universities and has seen his work published more than 250 times. Additionally, he has served multiple positions with the United States Olympic Committee, and as the Head Strength and Conditioning Coach at Louisiana State University and as a strength and conditioning coach for basketball at Auburn University. He has coached several international and national level weightlifters—including one Olympian—and throwers in both the United States and Great Britain. He continues to consult with several professional and collegiate teams concerning their strength and conditioning programs. Stone was recognized as the recipient of the ETSU award for Distinguish Research Faculty in 2008. He is a Fellow of the NSCA and United Kingdom Strength and Conditioning Association (UKSCA). He holds the Certified Strength and Conditioning Specialist® (CSCS®) certification from the NSCA and Accredited Strength and Conditioning Coach (ASCC) certification from UKSCA. In 1991, the NSCA named Stone the Sports Scientist of the Year. Nine years later, the NSCA also honored him with the Lifetime Achievement Award.

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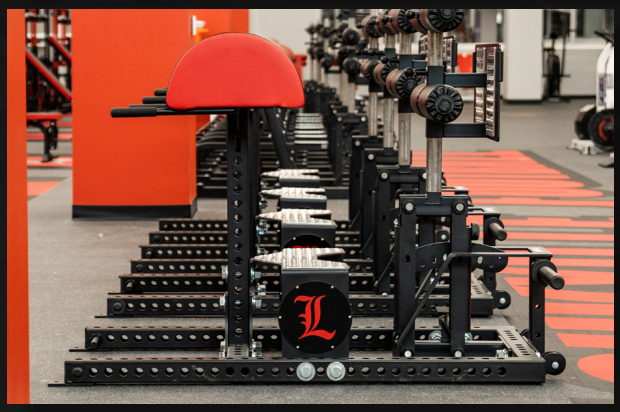

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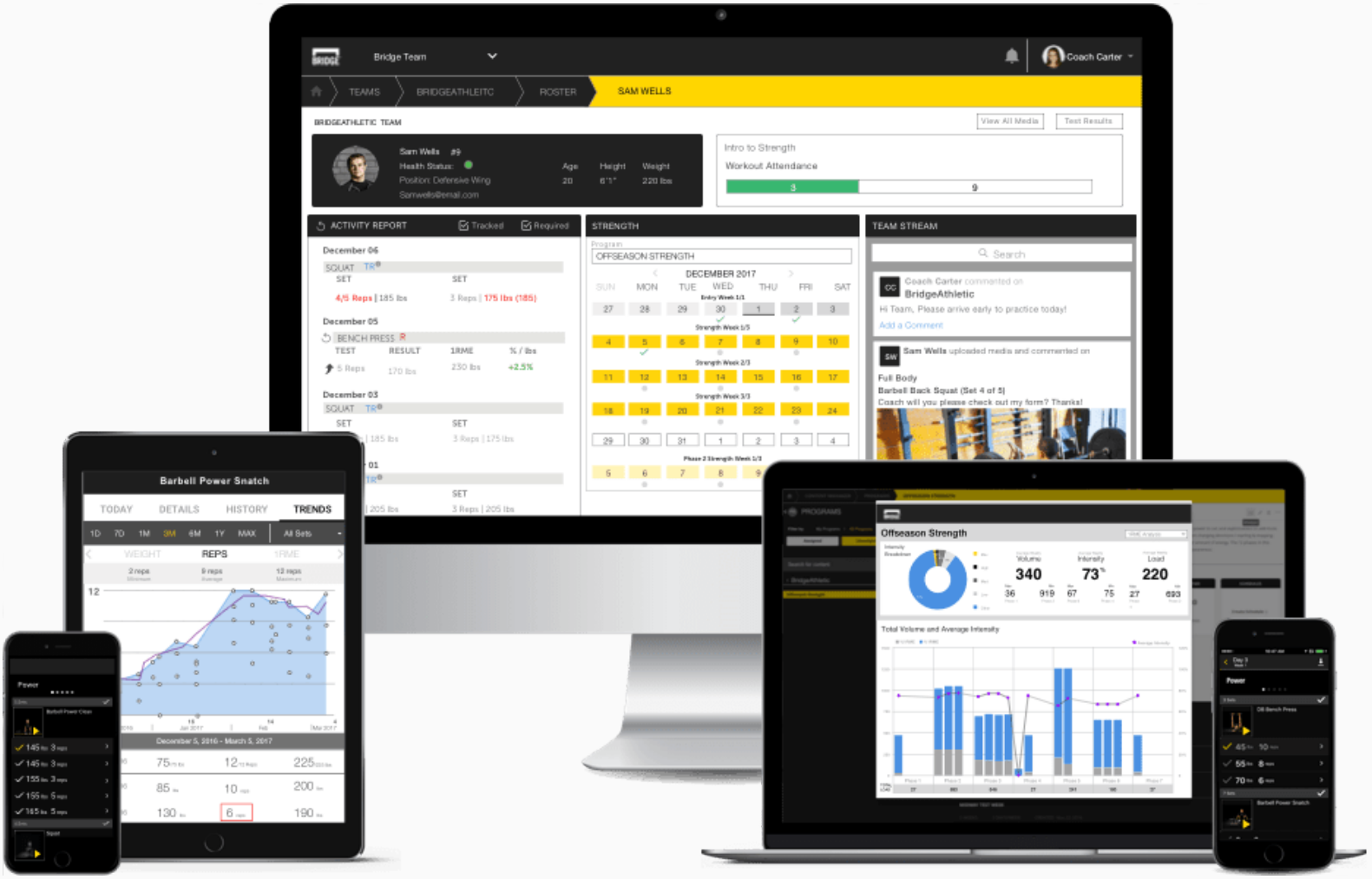

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