

INTRODUCTION

Sport scientists function as professionals specializing in the application of scientific principles and techniques to improve sport performance (5). Anecdotally, it is reported that career prospects in sport science are limited, particularly without some sort of postgraduate qualification (22). A 2018 survey evaluated the post-graduation careers of 747 Australian exercise and sport scientists, assessing specific occupations, employment conditions, career progressions, and overall satisfaction (22). The most reported careers were exercise physiologists (29%), personal trainers (9%), and research academics (8%). Of those surveyed, 42% had some sort of postgraduate qualification, 40% reported having a clear career progression, and 35% were extremely satisfied with their careers (22).

Though there is a lack of research investigating the nature of sport science careers in the United States, similar research has been performed in allied fields. A 2018 survey conducted by the National Strength and Conditioning Association (NSCA) of over 2,300 US strength and conditioning coaches found that 57% of all respondents possessed a master's degree, while 38% had only a bachelor's degree; and the remaining 5% possessed a doctoral degree (4). Additionally, almost 85% of all respondents identified as male. Over half of all respondents held a degree in exercise science or physiology, with the remainder of degrees (in descending order of frequency) including kinesiology, other, physical education, or other health and wellness (4). Most participants had between 1 – 5 years of experience (40%) or between 6 – 10 years of experience (26%), suggesting a relatively young workforce with much room for growth (4). A similar review also described that the majority of strength and conditioning coaches reported overall job satisfaction (10).

Despite these seemingly positive workforce reports, many recent sport science graduates reported being involved in part-time work while seeking full-time employment, suggesting the need for improved career opportunities, professional developmental resources, and advocacy for the importance of sport scientist roles (22). Concurrent with this is a generally blunted sense of confidence among strength and conditioning professionals (24). Many professional organizations, such as the NSCA, do offer a multitude of professional development resources (14). Several international organizations have established sport scientist credentials aimed at improving career clarity and development. For example, Exercise and Sport Science Australia (ESSA), Sport and Exercise Science New Zealand (SESNZ), the British Association of Sport and Exercise Sciences (BASES), and Sport Science Canada offer various sport scientist accreditations (1,5,13,19,20). However, the many emerging roles and new credentials for sport scientists, such as the NSCA's Certified Performance and Sport Scientist® (CPSS®), may require further clarification (13). This article aims to describe the development of the sport scientist role and clarify the common qualifications and responsibilities therein.

SILOS, INTEGRATION, AND TEAM LEADERSHIP

The expansion of professional support staff in modern sport has led to the stratification and delineation of many key positions (2). The overall managerial position is embodied in the recently defined high performance director (HPD); this director oversees and organizes all the sport science and medicine departments (11). The sports performance staff may include various roles, such as sport scientists, physiologists, biomechanists, nutritionists, psychologists, and data scientists/statisticians. Within such a model, the sports medicine departments usually encompass all medical care and therapy staff, and may include the involvement of professional health management specialists (2).

Unfortunately, many sports programs still operate on a “siloed” structure, in which individual professionals or departments operate wholly independently from one another (18). This can lead to conflicting agendas, inefficient or redundant procedures, or, in the worst-case scenario, “turf wars.” Such an organizational process may lead to each department functioning worse than they would on their own.

Evidence of siloing can still be seen in contemporary sports organizations. A 2019 study conducted by Waters et al. investigated the various factors that influence the coach-sport scientist relationship, in this case, a biomechanist (25). In general, sport coaches tend to view sport scientists in support roles, with application being solely the job of the sport coaching staff (25). Both sport coaches and sport science specialists recognize that communication skills and exchanging discipline-specific knowledge between the professions are areas in need of drastic improvement (25).

To facilitate communication and sports performance, organizations must create independently synergistic environments that foster communication between all parties (2,25). This process is broadly known as “integration,” or the combining of multiple smaller components into a single cohesive functioning system (18). Integration is more than simply having all parties present and accounted for; it is an active process requiring commitment, time, teamwork, and leadership (18). While integration may be an assumed process in other professions, its role is particularly important within sport science. Still, the concept itself has only recently been included in sport science texts and curriculums. For example, the chapter “Interdisciplinary Support” in *NSCA's Essentials of Sport Science* points out that although sport performance is indeed a multidisciplinary arena, the multiple factors within must come together in an interdisciplinary or integrated style to truly achieve optimal performance (6).

Integrated performance support should have an element of “multilingual” leadership, or someone who is able to speak the different “languages” of each scientific discipline and its practitioners (18). This approach accounts for understanding and respect for each practitioner's skillset and allows for a more

focused and efficient collaboration. Further, each member of the team should bring a specialized skillset that is best suited to managing specific aspects of athletic health or performance. This allows for true collaboration as each individual brings their unique “toolkit.” There also must be an understanding of both shared and shifting responsibilities; this allows for decisions to be shared across the team while shifting primary responsibility to the performance staff member whose “toolbox” is best suited in that moment. Finally, integrated performance support must be context-dependent; the operating processes of a team is much more important than the exact composition of that team (18).

A substantial challenge to successful integration is found within more traditional settings still operating under a silo approach, whether in the form of specific individuals or the team culture as whole (2,18). Integration must be espoused and supported in a top-down approach, from organization administration to individual coaches and support specialists (2). It is important to bring on team members who embrace this integrative and collaborative approach to team management and to put forth continual effort to foster a culture of integration (18). There should be open communication between team members and coaches, adequate time set aside to discuss and make decisions, and clearly established roles and responsibilities for all team members, as well as leadership strategies in place for instances of communication breakdown or a slight derailing of integration (18).

DATA SCIENCE AND STATISTICS—WHOSE JOB IS IT ANYWAY?

There exists a growing concern regarding how sport science research is performed. A recent systematic review found that only 13% of sport science research was conducted under guidance of a trained and qualified data scientist or statistician (17). As appears to be the case with most other academic disciplines, the majority of sport science research is designed, conducted, and analyzed by the sport scientists themselves. While some sport scientists are indeed properly trained in research design and data analysis, those who are not may design and conduct research that is rife with error. With the growing popularity of sport science technologies, such as Global Positioning System (GPS) tracking, and the incredibly vast amount of raw data generated by them, these errors may become more pronounced (17,26). Further, there is apparently a growing number of statistical models being developed by sport scientists without adequate review from the data science community or even consultation from a trained statistician. According to Sainani et al., collaborations between sport scientists and statisticians are the exception, not the norm (17).

There are several broad recommendations to address this disconnect. First, it is the responsibility of sport scientists to seek more collaboration with data scientists and statisticians. Second, the sport science field could involve statisticians in research projects from the initial planning and design stages, with sport science departments taking steps to improve their own in-

house statistics education. Finally, there could be promotion and recognition of a sports biostatistician or other analytics-heavy specialization within the sport science field. Indeed, another realization is that the fields of statistics and sport science are distinctly different and should be recognized for their unique methods and skills in application.

Adding to the confusion, many recent sport science job postings have emphasized knowledge of statistics and data science as a requirement. However, there is still somewhat conflicting or vague stratification as to what “statistical knowledge” versus “data science” means. For example, a recent job posting for a “Sports Science Data Analyst” with the United States Army Special Operations Command Preservation of the Force and Family (USSOCOM POTFF) program required applicants to have experience using statistical software such as Statistical Package for the Social Sciences (SPSS), Statistical Analysis System (SAS), and R (12). Conversely, a posting for a “Sport and Data Scientist” with the National Basketball Association (NBA) Philadelphia 76’ers required applicants to have experience not only with statistics software, but also with data engineering; extract, transform, and load (ETL) processes; and database architecture via programs such as Python, Structured Query Language (SQL), and Tableau (16). This discrepancy highlights the growth and development of the sport scientist profession to the point of needing clear definitions and separation of its roles, responsibilities, and scopes of practice.

THE DEVELOPMENT OF SPORT SCIENCE JOBS

To fully realize the concept of integration in the sports performance setting, the specific roles and responsibilities of sport scientists must first be fully delineated. A cursory view of available sport science job postings online reveals that there is a broad range of jobs and responsibilities available to trainee interns, recent graduates, and experienced professionals. However, common requirement themes of education, experience, certifications and licensure, data and statistical knowledge, and knowledge of sports technology across postings begin to make themselves apparent. These themes can allow for certain postings to be placed into broad groupings or “buckets” with other similar such postings. The authors identified four such “buckets” from the available literature that represent the main categories of sport science positions available in today’s job market: trainee sport scientist, full-time sport scientists, sport science directors, and sport science administrators (1,3,5,6,7,8,9,11,13,16,19,20,21,23,27).

TRAINEE SPORT SCIENTIST

Job postings aimed at trainee sport scientists tend to be built around a role of support to full-time sport scientists. Such positions are geared towards learning and gaining competence in the field and may assist with athlete monitoring, performance assessments, technology use, and data collection and analysis. Job postings at this level may involve at least enrollment in a related academic field, such as exercise or sport science, physiology, or biomechanics. Additionally, applicants can be expected to

have some sort of involvement in sport, either in a coaching or otherwise applied capacity. Additionally, individuals in these roles may work as an extension of an embedded PhD program in sport and exercise science (23).

FULL-TIME SPORT SCIENTIST

Job postings aimed at full-time scientists are aimed at individuals fully trained in athlete monitoring, data collection, research methods, and general strength and conditioning applications. Additionally, positions in this level may function as a sport science department manager or coordinator position. Such positions may be expected to have a full understanding of modern sport science technologies and should have experience and basic proficiency in data analysis and statistics. Job postings at this level tend to require completed degree work in the exercise or sport science field. Additionally, applicants to these positions may be expected to have experience with sports organizations, either in performance, strength and conditioning, or applied research.

Applicants may also be required to possess some sort or relevant certification or qualification beyond education level, such as an NSCA Certified Strength and Conditioning Specialist® (CSCS®) or CPSS®. Proper certification at the full-time level mitigates liability and risk vis a vis ensured scope of practice and proper prerequisite training (15).

SPORT SCIENCE DIRECTORS

In general, director-level roles are responsible for overseeing an organization's development and achievement of goals and objectives (27). Sport science careers at this level are focused mainly on coordination of a sport science department, with specific focuses on research, integration of strength and conditioning protocols, and team performance monitoring and testing. Individuals in such roles serve as the primary sport science research scientists, overseeing all aspects of data collection, evaluation, and integration. Such positions require heavy collaboration with other related departments, such as coaching and sports medicine, to maximize player development and overall sports performance.

Individuals in director-level positions are usually required to have at least a master's degree in sport science or a related field, with many organizations preferring a doctoral degree. Additionally, applicants may be expected to have relevant work experience in high-level performance settings as well as expert knowledge of kinesiology, strength and conditioning, and sports performance principles. To that end, most postings require advanced professional certification, expertise in data analysis and reporting, and proficiency across multiple modes of sport science technology. These roles may also coincide with senior sport and exercise research scientists from academic departments, as was seen in a now-filled job posting from the Stanford University Football Program; this position was responsible for coordinating clinical studies with the Human Performance Alliance Program and Human Sports Performance Lab (21).

SPORT SCIENCE ADMINISTRATORS

These positions are seen as the most senior-level positions and are usually responsible for the leadership and direction of the sports performance team as a whole. Individuals in these positions may be expected to oversee all cross-departmental operations between the individual sports performance teams, as well as develop budgets and manage relationships with outside vendors and organizations. Qualifications for these positions are like those of the sport science director position, with additional emphasis being placed on long-term involvement in athletic administration and leadership roles.

Buchheit and Carolan sought to categorize the various directorial positions in this arena and developed four basic job levels (3). Level one consists of working professionals (strength and conditioning coaches, sport scientists, etc.), level two consists of heads of these departments, level three consists of heads of performance overseeing the lower levels, and level four consists of the high performance manager overseeing all. This level four is analogous to this administrative director of sport science category.

CONCLUSION AND TAKEAWAYS

The growing field of sport science offers new and unique opportunities for career experiences and development. Individuals looking to advance in this competitive field should be sure to accumulate the proper education and certifications in applied statistical, technological, and performance experiences. However, to accurately steer recommendations for professional development pathways, more direct empirical research needs to be undertaken in terms of sport science-specific career development and outcomes.

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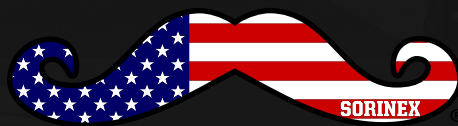
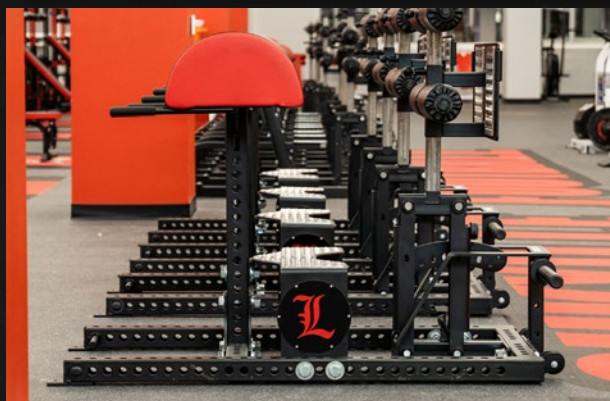
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B E L E G E N D A R Y ™



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