Journal of Intercollegiate Sport, 2017, 10, 228-243
https://doi.org/10.1123/jis.2017-0029

Human Kinetics
ARTICLE

Servant or Service? The Problem and a Conceptual Solution

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The present article addresses issues within U.S. collegiate sport as it pertains to the physical preparation and health and well-being of intercollegiate athletes. Specifically, the sport coach is often perceived as "all knowing" about every facet of their sport when, in fact, they typically are not formally educated or well-trained in current methods of enhancing sport performance. Often strength and conditioning coaches, who may also be poorly trained, are tied directly (financially and administratively) to the sport coach—a situation which has led to a subservient role heavily influenced by the wishes of the sport coach. This has unfortunately resulted in the multidimensional well-being of the athlete clearly not being a primary objective in many programs.

Keywords: strength and conditioning, coach education, NCAA, athlete development

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Introduction

The purpose of this editorial is threefold: 1) to provide an historical overview and background information on the collegiate strength and conditioning (SC) profession, 2) it is an effort to shed light on what the authors believe to be a situation detrimental to the development of collegiate athletes, and 3) to present a conceptual solution to the problem. The collective professional experience of the authors is diverse, as it includes strength and conditioning coaches, researchers, sport coaches, and sport medicine personnel. While all of the authors have worked with collegiate athletes, several of the authors now work (or have previously worked) in other arenas as well—such as high school sport, professional sport, Olympic sport, and the military. Furthermore, the list of universities where the authors have worked span across a wide spectrum including NCAA Division I (D-I), Division II (D-II), and Division III (D-III) institutions. Regardless of differing individual experiences (school, conference, sport, etc.), major consensus exists among the authors that current hiring practices, as well as the process of maintaining employment within collegiate strength and conditioning often fails to meet the standards commonly observed for other professions and may result in undesirable situations—particularly for athletes and strength and conditioning coaches (SCC). It is important to note that the opinions within this article demonstrate a common personal experience with an undesirable practice of marginalizing the expertise of the strength and conditioning coach within the overall athlete training process at many collegiate athletic departments in the United States of America (U.S.). It is also important to note that there exist excellent examples of collaboration and professionalism between administrators, sport coaching staff, SC staff, and sport medicine staff—in both winning and losing programs. However, it may be a less common situation than most would assume.

History of Collegiate Strength and Conditioning

The earliest known SCC was several decades ahead of his time; Bernard Lange, a University of Notre Dame priest, began leading weight training sessions with the Notre Dame football team in 1922 under the direction of Head Coach Knute Rockne (Lukacs, 2010). This was unusual outside of track and field as before the 1960s many (if not most) U.S. coaches and athletes believed that strength training was detrimental to performance, led to a "musclebound" athlete, and presented too much of an injury risk (Shurley & Todd, 2012). Around this time, athletics in the U.S. experienced a slow paradigm shift in which a better understanding and appreciation of strength training arose (Todd, 2008).

In the collegiate setting, large strides countering these false beliefs were led by SCC pioneer Alvin (Al) Roy (Todd, 2008). In the mid 1950s, Coach Roy was an SCC who trained high school athletes at Istrouma High School in Baton Rouge, LA (Todd, 2008). While there, Roy had the privilege of coaching Billy Cannon, an incredibly talented football player, sprinter, and thrower (Todd, 2008). In 1956, Cannon enrolled at Louisiana State University (LSU). Cannon was a firm believer in the importance of the weight-room's effect on performance, as he experienced great improvements in muscle mass and speed in high school with Coach Roy (Todd, 2008). There was not an organized strength training program at LSU at

the time, and Cannon continued to train in the weight room often with the help of Coach Roy and LSU head athletic trainer, Marty Broussard (Todd, 2008). After two years of viewing Cannon's excellent performances, LSU's head football coach Paul Dietzel asked Roy to become his SCC (Todd, 2008). In Coach Roy's first year, LSU football won the national championship and Cannon won the Heisman Trophy (Todd, 2008). Shortly after this, many collegiate coaches began to question some of the antiweight training notions that were prevalent at the time, and the hiring of full-time SCCs began—particularly at universities with renowned football programs.

By the late 1970s and 1980s, many D-I universities and professional sports teams employed at least one full time SCC. The majority of power-based sports competing at the highest levels of collegiate competition engaged in some form of SC. In 1978, Boyd Epley, University of Nebraska's first SCC, formed the National Strength Coaches Association (NSCA), later renamed the National Strength and Conditioning Association (Shurley & Todd, 2012). The initial membership of the NSCA was comprised of 76 SCCs (Shurley & Todd, 2012). A rapidly growing organization, the NSCA now has more than 45,000 members, with the number of new CSCS certifications totaling 3920 in 2015 (NSCA membership office, personal communication, September 15, 2016).

In 2000, led by long-time Brigham Young University SCC Chuck Stiggins, the Collegiate Strength and Conditioning Coaches Association (CSCCa) was created to meet the needs and challenges of the collegiate strength and conditioning coach. To some extent a competing organization to the NSCA, the formation of the CSCCa was a response to the growth and expansion of the NSCA beyond SC (e.g., personal training, tactical training, etc.) and a perceived lack of emphasis on the collegiate sector by many collegiate SCCs. The CSCCa now has over 1,600 members (CSCCa, n.d.). The CSCCa and NSCA are now frequently involved in the discussion of issues in collegiate sports as they pertain to SC.

Collegiate Strength and Conditioning: An Overview of the Profession

Collegiate SCCs are responsible for the physical and physiological (and in part psychological) development of athletes. Ideally, this occurs through managing an evidence-based training program in a manner that allows athletes to continue to develop over time (e.g., their collegiate career) and at specific time points express their cumulative adaptations in important competitions. This is accomplished through developing and directing efficacious and efficient training processes.

To describe the SCC's job responsibilities, a highly respected SCC explained: "What [SCCs] do is trainable (e.g. strength, power, speed) and, at least to some degree, measureable." (J. Cavallini, personal communication, November 29, 2016). In addition to directing an athlete's performance related adaptations, there are other varied and potentially measureable aspects of an SCC such as: 1) interpersonal skills with coaches and athletes (e.g., communication, team buy in, team culture), 2) psychological development (e.g., dedication to the training process, effort in the weight room, etc.), and 3) being a good professional (e.g., representing the team(s) and school in an appropriate manner). In the authors' opinion, these qualities and skills (particularly an evidence-based training plan and athlete monitoring data

allowing for the assessment of the athletes' individual responses to the training program) should be at the forefront of an SCC's job evaluation. Currently, we often see SCCs lose their job solely based on win-loss records. While we appreciate that the goal of competitive sport is to win, SCCs: 1) do not recruit the athletes, 2) do not always have complete control over all training and development for a given team, nor 3) do they make tactical in-competition decisions. These are all very important aspects of winning. It is very possible for an SCC to achieve excellent results for a given period (e.g., athletes are better prepared than when they arrived on campus) that do not match poor on-field outcomes.

While exact SCC employment details are unavailable (number of jobs available, specific graduate assistant duties, numbers employed per university, etc.), it can be estimated that there are currently around 2,000 SCCs employed in the collegiate setting (per school: wealthy D-I ≈ 9–12, less wealthy D-I ≈ 3–6, D-II ≈ 1–2, D-III ≈ 0–2) (Gleason, 2016). Depending on the specific situation, an SCC's day-to-day responsibilities can vary. The number of teams an SCC works with typically determines the amount of time spent with each team. For example, if an SCC works with only one team (hired specifically for that sport) they will likely travel with the team to all competitions and attend that team's practices, while an SCC that works with eight teams will primarily see their teams in the weight room or during other conditioning activities and perhaps attend an occasional home competition on a weekend.

Specific collegiate SCC structures and hierarchies exist and may differ from one athletic department to the next; those differences are likely to depend on the given athletic department's budget. In the 1980s, it was commonplace for one head SCC to oversee an entire athletic program at most D-I universities, but the wealthiest universities employed assistant or graduate assistant SCCs. In this situation, it was often the coach(es) of the revenue sports (the most important in the eyes of the athletic department's administration) that made hiring and evaluation decisions regarding the SCC. This ultimately led to football and basketball coaches hiring their own SCCs, a common trend seen today. In the 1980s, most D-II and D-III athletic programs did not have an SCC. Many D-II and D-III athletic departments are currently in a similar situation to D-I programs in the 1980s, with one head SCC and possibly a few assistants. Currently, at bigger-budget programs (such as the Power 5 universities within the Atlantic Coast, Big Ten, Big 12, Pac-12, and Southeastern Conferences), separate staffs exist to theoretically better serve individual teams. A common structure at the D-I level (particularly for Power 5) is an "Olympic sports" SCC staff and separate football and basketball SCC staffs (in this case, the term Olympic sports describes sports that are not either football or basketball, not necessarily sports that are in the Olympic Games). With the example of a D-I football or basketball SCC staff, the SCC(s) work primarily with only one sport, thus, it is easy to understand how the SCC can become "tied" to the head sport coach. It is worth pointing out that even for "Olympic" sports, a SCC that is hired to work with 3 teams (e.g., wrestling, soccer, and tennis) is often in a situation where one team has a higher status in the athletic department than the others. Within athletic departments at any level, the administration may have biases toward a specific team's priority or coach's preferences. This could be due to interpersonal relationships or one team historically having more success than the other teams. Thus, the D-I Olympic sport SCC can encounter the same stressors of

one who works with football or basketball only—this is seen in the industry much more frequently than some may realize.

Problems in Strength and Conditioning

> "Strength and Conditioning professionals have placed themselves in a state of servitude by tying their employment status to sports coaches. Thus, to ensure their continued employment they have given up professionalism and do as instructed by the sport coach. Tradition gets in the way of good coaching and teaching."

This quote from a D-I SCC profoundly summarizes the current state of strength and conditioning within the United States, particularly among colleges. To date, almost every strength and conditioning coach ($n \approx 60$) with which the authors have discussed this issue has reported: 1) they experience(d) the same attitudes and behavior and 2) they know a SCC or graduate student who has quit the profession or changed their career plans as a result of consistent pressure from sport coaches (in addition to athletic department administrators) to stray from modern training principles. This situation is similar in nature to that which is often reported by sport medicine staff (Wolverton, 2013a; Wolverton, 2013b), but perhaps more prevalent.

In the summer of 2015 we observed an overdue NCAA rule change, which was approved and voted to be effective August 1, 2015. Proposal 2013–18 stated that D-I collegiate weight-rooms were to be supervised by certified strength and conditioning professionals that have and maintain a certification through a nationally accredited strength and conditioning certification program. An approved certification was defined as: 1) accredited by a third party organization that accredits professional certification programs (e.g., National Commission for Certifying Agencies), 2) requires an undergraduate college degree, 3) requires a continuing education component, and 4) requires current first aid, CPR, and AED certification. At the time (and currently), only two U.S. certifications fit this description: the National Strength and Conditioning Association's Certified Strength and Conditioning Specialist (CSCS) and the Collegiate Strength and Conditioning Coaches Association's Strength and Conditioning Coach Certified (SCCC). In a late change before the rule became effective, the NCAA informed college compliance officers that each institution can determine what nationally accredited strength and conditioning certification programs best meet their institutional needs, indicating that the NCAA will not be an enforcement body for this legislation and they are only providing recommendations to institutions.

Apparently, this proposal deals with liability and attempts to assure that the SCC has educational and practical training that ensures a reasonable knowledge of their profession. However, this proposal perhaps ignores the realities of job requirements for the SCC. It is the authors' contention that collegiate SCCs are largely being hired for their willingness to comply with the wishes of the head sport coach more than for their knowledge and experience of good SC practices. Indeed, this current situation brings into question the ethics of the best hiring practices by athletic departments and the primary responsibility of SCCs. At this time very little study is available that evaluates the hiring patterns of SCCs, particularly in recent

years. Many experienced SCCs have proposed that the SCC should report directly to a senior athletics administrator that is directly responsible for the well-being and performance of the athletes (Gleason & Stone, 2014). Several studies detail the educational backgrounds, pay, and subjective importance of certain skills or experiences on the job in the collegiate context (Dorgo, 2009; Martinez, 2004; Pullo 1992). For example, in his evaluation of the common factors of D-I head SCCs (n = 212), Martinez (2004) indicated that graduate education in a relevant field [not clearly defined], SCC certification, on-the job experience (1.5–3+ years as an assistant SCC), and adequate computer skills appear to be essential for job performance. Haggerty (2005) found that D-II and D-III SCCs often do not have assistant coaches, which would logically lead to challenges on the job. We were unable to find any study of the work conditions or career preparation of NJCAA or NAIA SCCs.

Dorgo (2009) sought to identify aspects of a "good" SCC in his qualitative analysis of one very well-regarded SCC. He constructed foundational (SCC-specific education and training, planning, knowledge of common injuries and prevention, etc.) and applied (application of contextual coaching skills and professional development) knowledge clusters in his evaluation of this successful coach. Dorgo did not evaluate this coach's practices regarding implementation of current athlete monitoring and testing methods, interactions with sport coaches, or perceived value within the organization. Though some clear trends of preparation pathways may be noted from the survey studies available from NCAA D-I through D-III, our experience suggests that deeper appraisal is necessary when evaluating a SCC's on-the-job performance.

Problems in SCC Job Evaluation

Practical experience in collegiate sport reveals that job performance evaluation of the SCC is frequently tied to a sport coach's won-loss record or a history of complying with whims of the sport coach. It is the opinion of the authors that the SCC's performance should be based primarily on whether they can deliver athletes that are better prepared for sport. This would include appropriate gains in strength, rate of force development, power output, agility, endurance, etc., commensurate with sport requirements. In addition, the SCC should be judged on whether they can deliver regular and substantial monitoring information to the sport coaches so they can make realistic judgments concerning practice and competition. SCCs should also work with both sport coaches and sport medicine personnel to prevent and treat injuries. Furthermore, part of the SCC's responsibility should be to help the sport coaches ascertain potential reasons for athlete performance fluctuation levels and underlying causes for won-loss records.

Interestingly, our perceptions and experience, and that of most SCCs whom the authors have discussed this issue with, are: 1) the strength and conditioning coach is rarely credited with assisting in the creation of a winning season, 2) the strength and conditioning coach is often blamed for a losing season, and 3) and if injuries occur it is often attributed to something taking place in the weight-room. Furthermore, these allegations, stemming from personal experiences and perceptions, are usually made with little or no accompanying evidence. Often they are made in the face of contradicting evidence provided by the strength and conditioning

staff regarding the efficacy of the strength and conditioning program. Subjective claims about an inability to produce toughness in athletes often precede the firing of an SCC. It is also common for sport coaches and administrators to ignore sport practice volume or other stressors that may play a role in bringing about injury, instead crediting incidences of injury to strength training alone.

Because of advances in science and technology, the underpinning reasons for performance may be assessed by a skilled coaching support staff (DeWeese et al., 2013; Stone & Gray, 2010); however, these practices are frequently trivialized or poorly understood by sport coaches at most levels of collegiate sport competition due to lack of minimum levels of specific formal education in preparation pathways of coaches in the U.S. Currently, the most practical solution to this issue is likely for senior athletic administrators to hire and supervise SCCs directly, and treat the SCC as one who serves the organization in a specialist role (Gleason & Stone, 2014). No indicators have yet been published to guide administrators in supervising SCCs. However, the best practices would certainly mirror that of sport coaches: watch them work frequently, review athlete testing data, ensure the SCC is able to provide input to sport coaches' annual plans, and ensure he or she has sufficient social status in the organization via appropriate title and expressed support for their skills.

Is a Disconnection Between Education and Athletics at Fault?

The U.S. is one of the few countries that host major sports and sporting events at institutions of higher learning (Stephens, 2014). Athletics are an important and valuable factor in the overall nature and culture of most colleges and universities. This, in itself, should not be that controversial as it reflects the idea of *mens sana in corpore sano*—a sound mind in a sound body. This philosophical concept implies that athletics and academics go hand-in-hand. However, it is quite debatable as to the degree that this concept is encouraged or even occurs in high school or particularly collegiate sports (Baker, 2013; Branch, 2011; Durrell, Pujol, & Barnes, 2003). The authors argue that the general perception among the populace is that athletics, particularly football and basketball, and academics are not compatible and are, in reality, two separate entities within the Collegiate System. Thelin (2008) observed that despite the reality that much of this opinion may be fueled by exposure of scandal to the public, athletic departments do tend to operate under a separate set of rules than the university at large. Sperber (2001) unleashed a particularly scathing critique of college sports, suggesting that the athletic department corrupts the academic institution. These sentiments are not new, and were perhaps foreshadowed a century ago by university administrators who grew concerned following the increased competitiveness, commercialization, and popularity of college football in the early 1900s (Smith, 2000). While much of this perspective does surround revenue sports, scandal is not exclusive to them and has extended to D-II and D-III universities as well, chronicled in Schulman and Bowen's 2001 book *The Game of Life* (as cited in Ridpath, 2008), and Bowen and Levin's 2003 book *Reclaiming the Game* (as cited in Ridpath, 2008). Recent cases of academic fraud among athletes, administrators, and academic departments (Ganim & Sayers, 2014) have occurred

alongside increasing athletic expenditures and decreasing academic funding at many universities (Salzburg, 2012; Salzburg, 2015); this suggests that athletic departments may not be part of the academic culture, especially at D-I universities. It is the authors' belief that there is some truth to this viewpoint. At least part of the reasoning for our opinion deals with the formal education and training of coaches in the U.S. (Salzburg, 2014).

Problems in Coach Education

Formal instruction deals with higher education courses and large-scale coach certification programs developed by national governing bodies (Cushion et al., 2010; Nelson, Cushion, & Potrac, 2006). Formal learning environments are chronologically graded and have a hierarchically structured educational system (Nelson et al., 2006). Nonformal learning has been defined as any organized, systematic educational program outside of the formal system to provide select types of training to particular subgroups in the population, as seen with coaching organizations such as the NSCA (Cushion et al. 2010). Informal learning typically deals with semistructured or nonstructured direct interaction with athletes or coaches, including apprenticeships and internships (Cushion et al. 2010). In the past, there has been little or no formal U.S. coach education program that adequately addresses the needs of coaches (Chiu, 2010; Cushion et al. 2010; Kimiecik, 1988; Sellers & Stone, 2005; Stone, Sands & Stone, 2004). Although some progress has been made in recent years, formal coaching programs and nonformal opportunities are largely deficient in a variety of factors including construction of the training process, monitoring programs, strength and conditioning principles, and how to understand and interpret research (Cushion et al. 2010; Durrell et al., 2003; Reade, Rodger, & Hall, 2008; Sellers & Stone, 2005). It is unknown as to what degree informal coaching education fills this void (Cushion et al., 2010).

Furthermore, coach education programs in the U.S. have been geared primarily toward participation rather than performance. Based on survey data, coaches (including SCCs) largely rely on sources of information that may not be defined as scientific, as evidenced by the low priority given to peer-reviewed literature and formal education (Durrell et al. 2003; Reade et al. 2008). Survey respondents indicated that they tended to employ the methods used on them while they were athletes or they use methods they learned as graduate assistants (Durrell et al., 2003). U.S. coaches rely upon an informal apprentice-type program and work their way through the ranks—a situation much like the medical profession before the advent of the Flexner report (Flexner, 1910). Reliance on these sources of methods and apprentice-type programs assuredly does not take advantage of advances made through scientific research in sport physiology, biomechanics, and SC (Durrell et al., 2003). In addition, some coaches reject and even disdain formal learning environments (Cushion et al. 2010) and are discouraged from reading about or using evidence based training methods (Somerset, 2011). It may be argued that the lack of scientific background, scientific knowledge, and the lack of interest displayed by many coaches concerning sport science has created a disconnect between coaches and the academic-scientific world; a disconnection that is not reflected to the same extent in other countries. Conversely, cooperative academic/sport science/coaching efforts are much more the norm in many countries such as Germany, Finland, and

Australia (Bishop et al., 2006; Bishop, 2008; Bloomfield, 2002; International Council for Coaching Excellence, 2013; Stone, Sands, & Stone, 2004). It is paramount to note that evidence based training entails two important aspects:

1. An ability to find, read, and critically analyze scientific and coaching literature to ascertain which modes and methods are likely to produce the most valuable and useful training outcomes. Although coaching literature is available, it is arguable as to the extent to which most of this literature reflects valid and reliable scientific information leading to best practice.
2. Development and initiation of a sound monitoring program.

Responsibilities of a Coach

In most university athletic departments, a coach's worth is typically assessed by their won-loss record or, in some sports such as track and field, by their ability to improve the competitive rank of the athletes under their supervision (Cote et al., 2007). Similarly, the SCC's worth is often associated with that sport's won-loss record. This method of assessment is commonly referred to as "performance-based" coaching where an improvement in the competitive arena largely determines the success of the program and the training practices used along the way. However, in reality, this assessment method is largely a "black-box" approach in which the input is the finish from last year(s) and the output is the finish from this year (DeWeese et al., 2013). It is our contention (and to instill the idea) that the coach is responsible for more than simply a won-loss record. The coach is responsible for the multidimensional well-being of the athlete, which, in part, includes their athletic development and a *process* designed to accomplish goals.

The adoption of the black-box method often provides coaches with a false sense of security as to their training methods and strategies. Clearly, the improvement in athletic performance resulting from the training program cannot be readily separated from multiple confounding factors such as the athlete's genetics, maturation, work ethic, a decrease in external stressors or a decrease/increase in the level of competition. As a result, it is unclear whether the athlete actually realized an improved well-being resulting from physical and physiological adaptations or realized their true competitive abilities, as the training program was likely never optimized.

In contrast, by using a "white-box" approach a coach can better ascertain the adaptive level of their athletes and increase their insight and understanding of the training process (DeWeese, et al., 2013). Within this context, the coach understands the input (preseason rank) and output (postseason rank), but through appropriate monitoring they begin to understand both the group and the individual athlete's performance, physiological and psychological responses and adaptations to training. Thus the input/output can be expanded from simple rank and a few largely subjective factors to a multifaceted input/output consisting of a number of different environmental, physical, physiological, and psychological variables. This allows for a far more thorough assessment of the training process. This ongoing reflective process should be part of the evidence-based approach, which allows the coach to be equipped with objective, reliable feedback that can demonstrate the training process' effectiveness and more readily ensure athlete preparedness.

Thus, the overall goal of an evidence-based approach is to 1) acquire an understanding of the scientific literature, 2) be able to apply those findings, and to 3) acquire periodic snapshots of an athlete's adaptations to training which are accurate and reliable and, in turn, apply these findings to future program development. In short, this can be considered the act of optimizing training choices and the training process to meet the needs of the individual athlete, as well as the group. It is the SCC that is formally trained and educated (or should be) in this evidence-based approach to training and it is our hope that the sport coach will appreciate and value this knowledge and experience.

Evaluating the Autonomy of the Head Sport Coach

More so than in many other countries, the U.S. head sport coach (HSC) has nearly unlimited authority to conduct training, practice, and competitions as they see fit. The rationale behind this designated power is that the HSC is responsible and held accountable for the won-loss record of the sport and so should be able to make their own decisions (right or wrong) and pilot their own destiny. This includes making the final decision concerning training practices such as the type of strength training program, what exercises should be performed, how these exercises should be performed, and decisions concerning other types of conditioning (e.g., sprints, distance running, agility, etc.).

At first glance, the creation of an "all-powerful" coach seems reasonable as decisions concerning the sport affect their livelihood. However, this also assumes that the coach is all-knowing or has the resources, education, and wisdom to make appropriate choices. As the HSC is not typically trained or educated in all facets of sport preparedness, a further disconnect between the HSC and the SC staff can be created. From the authors' perspective, this rationale is both illogical and inefficient. In many ways, this amount of autonomy actually involves providing the HSC less support (versus more support) from the athletic administration and the university at large.

We must consider that while the U.S. HSC has some training and experience in the concepts and subtleties of the sport (particularly as it relates to technique and tactics) holistically they are typically untrained or poorly trained in evidence-based SC methods. In addition, sport coaches have little experience training athletes in that context. If most of a sport coach's career experience has been in programs that employ a SCC, a substantial lack of practical experience in physical development would be expected. Often sport coaches either overrule the strength and conditioning coach or simply conduct training on their own without notifying the strength and conditioning coach (Massey, Vincent, & Maneval, 2004; Massey & Vincent, 2013). The end product is a poorly integrated training program in which various types of conditioning and practice are not linked together in the most efficient manner—thereby reducing the efficacy of the entire program. In fact, instead of playing an integral part in designing the training process, the strength and conditioning coach is often reduced to a role of "damage control" in modifying the planned workout due to fatigue, or the enforcer of punishment as a result of spontaneous independent training decisions of the sport coach. This type of approach not only can reduce the performance potential of the athlete, but may expose them to an increased injury

potential. Recent adverse events at universities in Iowa, Ohio, and Oregon point to the hazards of allowing poorly trained coaches to have the final word in training policy—athletes have been exposed to potentially serious injury as a result of an ill-considered approach to training (Jones, 2014; Whitosky, 2011; Dodd, 2017).

It has been demonstrated that a change of approach to training, in which exercise technique, strength gain, and fatigue management are emphasized, can maintain or improve the won-loss record, and decrease the injury rate among D-I collegiate athletes (MacDonald et al., 2013; Sole et al., 2014). Goals of a good coach education and sport science program should be to provide sports with well-trained SSCs who have a scientific background, and good sport scientists with a hands-on background. It is our opinion that all coaches should have a minimum level of education regarding sport science, not simply exercise science (Stone, Sands, & Stone, 2004), so they have a basic understanding of what SCCs are doing with their team's training.

Comparison With Another Specialty Role

The situation in coaching presently can be shown to be somewhat analogous to the medical profession in the U.S. before 1910. Before the Flexner report (Flexner, 1910) was published, medical schools had few common standards; almost all were proprietary and affiliated with no university. Most schools graduated classes in 2 years (or less). Classes were often taught by part-time, often poorly trained faculty, and in some areas of the U.S. (and Canada) one could become a practicing physician simply by serving an apprenticeship. Furthermore, it was noted that the medical school faculty were rarely in charge of any clinical/practical experience; this was largely handled by local hospitals and their staff (also poorly trained) and often was an observational experience as opposed to being hands-on.

Presently, a good medical doctor goes to an accredited medical school and acquires a scientific background as well as supervised practical experience so that they can better practice the art of medicine. Most people today would be very reluctant to go to a physician that had not attended medical school and developed a scientific background. However, this does not appear to be the case for coaching. Considering the responsibilities of coaching concerning athlete performance enhancement and general well-being, it would seem logical that a coach would attend school to acquire appropriate knowledge and well-supervised practical experience so they can better practice the art of coaching. However, in the U.S. formal coach (including SCCs) education with a scientific underpinning and the use of evidence-based training methods and sport science is uncommon (Durrell et al., 2003; Sellers & Stone, 2005).

A Conceptual Solution

It is our opinion that creative integration of athletic and academic programs (sport science) should be designed to address this disconnect. Unique to this arrangement would be the integration of academic programming (sport science) along with opportunity to work directly with sport teams in terms of sport science and strength and conditioning. Thus, as with the medical profession, a sound scientific/

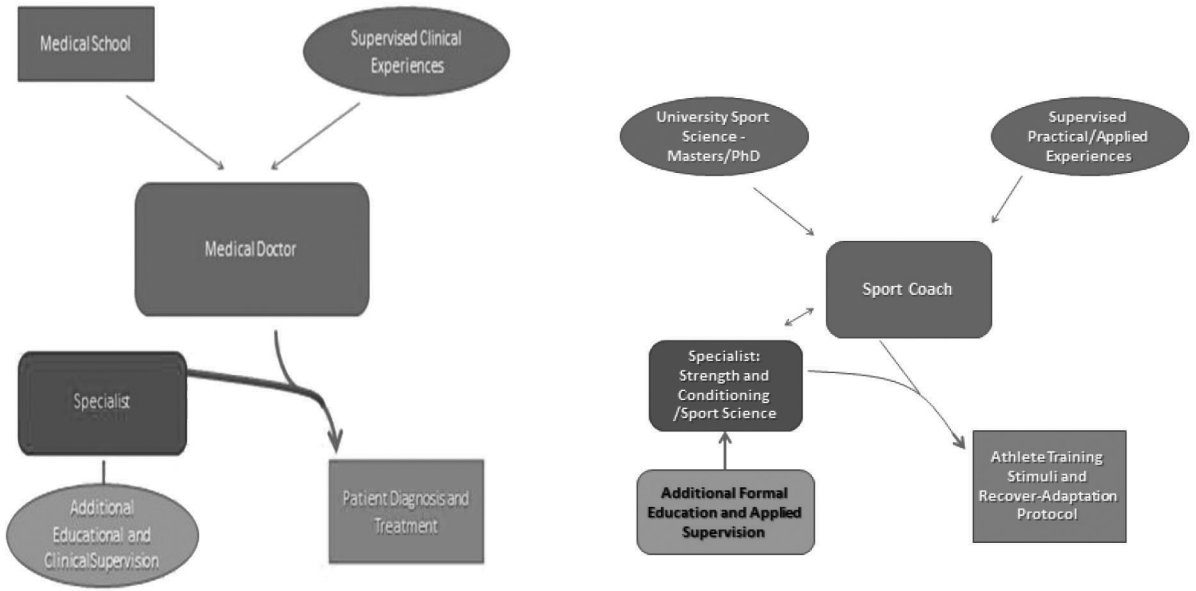
academic background is coupled with practical application in a hands-on manner. Therefore, a result of this program would be the development of SCC and sport coaches that are better trained and have a better potential for success than SCCs and sport coaches of the past. The authors suggest the following as logical and unique resolutions to this problem: *Coaches, particularly the SCC, should strive to become better educated in areas that support their craft*. The authors offer the following paradigms to provide logical steps to enter the coaching profession (see Figure 1).

In the U.S., medical doctors are currently well trained in their profession. However, family practice physicians often defer to a specialist (MDs with additional specialized training, PhD nutritionist, etc.) when confronted with difficult diagnoses or conditions beyond their training. The authors believe that coaching should adopt a similar model in which the SCC represents the specialist. Fundamentally, SCCs should be trained such that they are coach-sport scientists. In most cases the sport coach should defer physical conditioning to the SCC. This is not unlike the coaching models being used in much of Europe (ICCE, 2013). Most assuredly, the rest of the world is recognizing the responsibility that coaches have to consistently expand their capabilities to more fully meet the needs of the athletes they serve. "Athlete centered coaching" is a concept that describes and highlights the coach's responsibilities to the athlete (Cote & Gilbert, 2009; ICCE, 2013). These responsibilities deal with the well-being of the athlete which includes assisting the athlete to achieve the highest possible performance, offering training programs that are efficient, efficacious and, within the bounds of the sport, not overly injurious. Most importantly, the concept of "athlete centered coaching" indicates a commitment by the coach to lifelong education and learning. This concept also emphasizes the responsibility of sport/coaching organizations, including university athletic departments, to ensure that educational commitment—formal, nonformal, and informal—takes place (Cote & Gilbert, 2009; ICCE, 2013; South African Sports Confederation and Olympic Committee, 2012).

Thus, academics (sport science departments) and athletics should work together in formulating the creation of educational/practical experiences for the development of coaches. Indeed, regular educational meetings should be encouraged between the two programs, which could foster cooperative programs.

Summary

There is currently a profound disconnect between athletics and academics, especially as it concerns the use of sport science. The disconnection results from years of tradition in which evidence-based coaching is largely absent and even criticized. The result of this disconnection has been: 1) the notion that the sport coach is perceived as "all knowing" about every facet of their sport when, in fact, they typically are not formally educated or well-trained as coaches in all facets of performance enhancement, 2) often SCCs are tied directly (both financially and administratively) to the sport coach, which has led to a subservient role dictated by the wishes of the HSC, and 3) this has unfortunately resulted in the well-being of the athlete not being the primary objective. Conceptually, a resolution to this problem will entail a complete reevaluation of the coach's role and responsibility (both SC and sport coaches) and development of sound educational programs with



Paradigm 1: Medical Doctor and Specialist. Paradigm 2: Sport Coach and Specialist (Strength Coach/Sport Scientists).

Figure 1 — Analogous Paradigms—Medical Doctor and Specialist Compared with Sport Coach and Specialist (SCC/Sport Scientist)

incentives for coach participation. The authors believe that the SCC should be hired separately, be evaluated using a different set of criteria than the sport coach, and never be directly supervised by the sport coach.

Acknowledgments

The authors would like to acknowledge several coaches and sport scientists whom through their supportive conversation and sharing of experiences helped shaped the content of this article: Damon Davis, Ryan Feek, Ashley Kavanagh, Tom Myslinski, Michael Ramsey, John Taylor, Chris Taber, and Chad Workman.

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