8-2014

Coach and Athlete Perceptions of an Athlete Monitoring and Strength and Conditioning Program

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A dissertation

presented to

The faculty of the Department of the Department of Exercise and Sport Science

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy in Sport Physiology and Performance

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by

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August 2014

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Keywords: Questionnaire, Strength, Performance, Jumping

ABSTRACT

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Purpose: The purpose of this investigation was to assess athlete perceptions of an athlete monitoring program throughout an academic year and coach perceptions throughout a competitive season. The secondary purpose was to develop a questionnaire designed to assess coach and athlete perceptions of the monitoring program. **Methods:** Athletes and coaches participating in the athlete monitoring program at East Tennessee State University's (ETSU) Sport Performance Enhancement Consortium (SPEC) were invited to participate. Reliability for the coach and athlete questionnaires and principle components analysis (PCA) of the athlete questionnaire was completed after initial development of the questionnaire (11 questions for athletes and 20 for coaches) in the spring of 2013. To analyze changes throughout the academic year, 4 additional questionnaires were administered at the beginning and end of the fall 2013 and spring 2014 semesters. **Results:** Both athlete and coach questionnaires were considered reliable (athletes = 0.842, coaches = 0.919). PCA revealed a 3 component model (KMO = 0.798, Bartlett's test of Sphericity = $p < 0.001$) with eigenvalues over one explaining 68.88% of total variance. Statistical differences between the pre and all other time points were noted for athlete's perceptions of the SPEC programs influence on overall performance, skill, strength, speed, power, and understanding of the SPEC monitoring protocols. Coachs' perceptions were statistically different from pre-to postseason only for skill. **Conclusion:** The questionnaire was shown reliable and can be considered for future use. The first component of the PCA revealed that perceptions of overall performance are influenced by perceptions of strength, skill, and power and agreement that testing data reflects performance, while the second showed that

aerobic and anaerobic endurance as well as speed are all highly correlated and, finally, the third revealed that athletes' understanding of the SPEC program monitoring increased with return of data. Overall, perceptions of the SPEC programs ability to influence the components assessed by the questionnaire were positive ranging from no different to much better for coaches and athletes. In conclusion, the SPEC athlete monitoring program seems to be a beneficial model for enhancing athletes' and coaches' perceptions of certain aspects of performance.

DEDICATION

First, I would like to dedicate this dissertation to my grandfather, Maurice Allen Reed. Though you may be gone not a day goes by that I do not think of one of your anecdotes, especially “It’s just another learning lesson”.

Second, to my mother and father. As is expected from good parents, without your support I would likely not be where I am today. Many thanks to you both.

Finally, to my wife, Katie. Your hard work and dedication to pursuing your craft helped me complete the final year of my PhD more than you know. You are an inspiration and I am lucky to call you my wife.

ACKNOWLEDGEMENTS

I would like to thank the following people for their help with the completion of this dissertation:

Dr. Mauro Palmero for being the guide I needed throughout the whole process.

Dr. Michael Stone for providing his expertise.

Dr. Kimitake Sato for answering any question, big or small, at a moment's notice.

Dr. ChengTu Hsieh for his insight.

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CHAPTER 1

INTRODUCTION

Sport is one of the most discussed aspects in society. This is evidenced by the topics of a typical newscast for any area: news, weather, and sports (Stone, Stone, & Sands, 2007). The driving force behind sport is the athlete, without whom sport would not exist. Integral to the athlete's development is the head coach and staff (Jowett & Ntoumanis, 2004; Kenow & Williams, 1999; Short & Short, 2005). While the coaching staff as a whole plays an important role in the continued success of the athlete, in America the head coach ultimately steers the program and athletes toward their goal. In order to accomplish the goals of the organization, the head coach must be proficient in many different aspects of the coaching experience.

It has been postulated that the coach has to fulfill five roles: teacher, organizer, competitor, learner, and mentor (Short & Short, 2005). For an individual this can be quite a large undertaking, especially for a coach who may not have a formal education in areas directly relating to sport (nutrition, physiology, injury prevention, rehabilitation, etc.). In part because of the imposing responsibilities placed on the coach as well as the need to provide coaches with an education that encompasses performance, the Center for Excellence in Sport Science and Coach Education (CESSCE) at East Tennessee State University (ETSU) was created. Specifically, the goal of the center is to provide sport scientists and coaches with a model whose purpose is to continually enhance performance and prevent injury. At ETSU this is known as the Sport Performance Enhancement Consortium program (SPEC). The main goal of the SPEC program is to provide athlete monitoring and coach feedback as to the impact that training practices can have on recovery, adaptation, and overall performance. The goal of the program is to positively influence athletic performance and an athlete's career longevity as well as improving coach

performance by alleviating some of the figurative load from the coach (Center of Excellence for Sport Science and Coach Education: About, 2011).

The SPEC program attempts to:

1. Improve performance through an evaluation process that includes administering a battery of tests aimed at assessing variables that have been deemed important to competitive success (Kraska et al., 2009). Through years of practical experience, scientific inquiry and continued education, the personnel of SPEC program developed testing batteries designed to assess the most important and readily testable technical and sport specific fitness abilities related to a specific sport: For example: maximum strength via isometric peak force (IPF) and one repetition maximum , rate of force development (RFD), countermovement and static jump abilities with various loads, hydration status, and the relative amount of fat mass to fat free mass for each athlete (Kraska et al., 2009).
2. Provide innovative ways of assessing work and work rate. Promoting good fatigue management during training such as monitoring HR, perceived exertion (RPE), and training impulse following specific blood markers and relating these to alterations in training volume, intensity, outside stressors, and measures of fatigue.
3. Work with coaches to provide answers to specific questions driven by problems encountered within the sport (e.g. ideal training methods, what nutritional strategies are appropriate before training or competition, do ice plunges work to enhance recovery and adaptation, etc.).
4. Work with the coach(s) to provide systematic annual plans as a guideline for the training process.

In terms of testing, the goal is to assess individual performance characteristics of those involved within the SPEC program. Generally these tests are undertaken semiannually, provide an accurate assessment of the athletes' performance, and allow the coaching staff to determine where alterations in the annual plan need to be made. It is this aspect (testing) that most athletes (and coaches) appear to relate to the SPEC. While in theory the SPEC appears to offer superior results, it is important to assess the value and perceptions the athletes' and coaches' places in the whole program.

Statement of the Problem

Although we know that performance testing accounts for a large amount of individual performance and can possibly predict performance, in the grand scheme of wins and losses it does not matter what these tests find if the results are "left on the mail room floor". Since its inception, the SPEC program has been incorporated within several sports at ETSU to varying degrees of involvement. This involvement begins as performance testing and can continue into a full monitoring program incorporated into the sport conditioning, practice, and daily living activities of the athletes, all of which is overseen by the Sport Performance Enhancement Group (SPEG), which is made up of coaches, medical staff, and sport scientists. Involvement to this scale is a novel approach to sport in America and could provide a template for optimum performance enhancement and injury prevention. While anecdotally performance on the field of play seems to have improved, no other evaluation has been undertaken to measure the effectiveness of the SPEC program as a whole. More specifically, I intend to assess participating athletes' and coaches' perception of the SPEC program as an effective tool to enhancing performance, if coaches alter practice and training schedules based on information obtained from athlete monitoring, and if alterations in training schedules derived from SPEC data

result in enhanced performance Ultimately, this knowledge would provide support for the SPEC program methods as well as providing valuable insight as to how the SPEC program can make changes that strengthen the bond between coach, athlete, and sport scientist.

Research Questions

- Is the SPEC questionnaire a reliable instrument for measuring and monitoring performance?

In order to assess the effectiveness of the SPEC program, survey questionnaires address the following aspects of the SPEC program:

- What are the athletes' perceptions of the SPEC as an instrument to assess and alter specific components of individual performance?
- What are coaches' perceptions of the SPEC as an instrument to assess and alter athlete and team performance?
- What are the athletes' perceptions of the SPEC as a potential mechanism to change performance?
- What are the coach's perceptions on how the SPEC data affects training and practice?

Significance of the study

In order for the SPEC program to create a more complete assessment of its relative success or failure, perceptions of the program must be evaluated across the various sports participating in the program. For this assessment to be completed, an evaluative method is needed. The administration of questionnaires can provide this evaluation. Questionnaires administered to coaches and athletes could give indication as to the extent the SPEC program is

achieving its goals, its ability to provide insight on athletic performance, and where improvements could be made to enhance the development of practice schedules. Therefore, the purposes of this study were to 1) verify that the instrument is reliable and 2) evaluate perceptions of the SPEC program through a performance and overall program questionnaire administered throughout an academic year, including the competitive season. The results of this investigation could provide support for the SPEC program as a method of performance enhancement.

This investigation is justifiable on three levels. First, the results of this investigation could help the SPEC program to increase its integration within the sports at ETSU. Also, the results of this investigation could allow for further improvement of the SPEC program. Another benefit of this investigation is to the fields of strength and conditioning and sport science in general. With more evidence, it is possible that the implementation of SPEC programs would gain momentum as a standard means of performance enhancement. Finally, both the coach and athlete could benefit from the outcome of these results. The data obtained from SPEC testing could to be readily available and easy for coaches to apply when programming training and practice schedules with implementation of the data derived from this investigation.

Operational Definitions

1.) Strength: The ability to produce force

2.) Skill: degree to which a movement can be properly executed

3.) Power: A measure of work rate. The product of force and velocity.

4.) Speed: Running speed.

5.) Aerobic endurance: The ability to sustain low power outputs.

6.) Anaerobic endurance: The ability to sustain high power outputs.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this literature review is to provide a brief history of modern sport and sport conditioning as well as a background on sport science practices, centers similar to the CESSCE both within the United States of America and overseas, as well as the current questionnaires available to sport. In regards to the questionnaires, those that pertain to adolescents or recreationally active individuals are not included. This is because the SPEC is incorporated with athletes competing at the collegiate, national, international, and Olympic levels.

History of Sport Conditioning

Sport conditioning is used to enhance athletic abilities with the goal of increasing the probability of victory. This goal is evident from studying the first historically reported forms of sport conditioning in 3600 BC China (Siff, 2003). The evolution of training methods continued in ancient China as well as Greece and other countries through the current era (Siff, 2003). In the modern era training with weights became more popular and led to the development of texts focused solely on weight training. Eventually, athletes and their coaches developed specific training protocols designed to enhance performance within individual sporting events.

Sport Science

In the modern sport era training for performance has become a specialized science, termed sport science (Haff, 2010; Stone, Sands, & Stone, 2004). The field of sport science has led to the development of specialized institutions throughout the world that use scientific

methods to enhance sport performance (Stone et al., 2004). In countries such as Australia and New Zealand the study of sport science is common and focused on the enhancement of sport performance. Enhancing performance through sport science is accomplished via the combined effort of a group of professionals, all with higher education in some aspect of sport. What is often found within a sport science team are sport psychologists, strength and conditioning coaches, sport nutritionists, sports medicine professionals, biomechanists and sport physiologists, as well as the head coach and staff. Each of these professionals provides a specific quality that the others cannot, in the end resulting in a complete enhancement of athletic performance.

Coaching Knowledge

Quite possibly the most important aspect of coaching is where and how coaches obtain knowledge. This is the basis of coaching, the level in which the coaching occurs (recreational, youth, high school, collegiate, professional, or Olympic caliber) and the location that a coach works (e.g. collegiate Division I vs. Division II). Interestingly, although coaches are essentially teachers of sport, minimal, if any, education is required to become a coach. However, academic teachers are required to earn a degree in higher education before they are allowed to teach at any level (Gilbert & Trudel, 1999). The typical education provided to coaches is short (generally encompassing a 3-day weekend), continuously undergoing developmental and content changes, and in some cases is having its efficacy questioned whilst assuming the coach has some formal or previous education in the area (Gilbert & Trudel, 1999). All in all, this begs the question as to where coaching knowledge is obtained. Typically coaching knowledge is obtained through two means: practical experience and knowledge through formal education.

Practical experience is the most widely noted source for coaching knowledge (Gilbert & Trudel, 1999; Nash & Sproule, 2009). Generally, this experience occurs in two forms, that gained from competing in athletics and also that which occurs from coaching "through the ranks", regardless of the level, most commonly beginning as an intern or graduate assistant, moving to an assistant of some sort, and ending as a head coach. What these two forms of practical experience have in common with each other is where they are obtained, the mentor coach. Coaches consider these experiences the most important to their knowledge, with the second being trial and error (Irwin, Hanton, & Kerwin, 2004).

The other common form of coaching knowledge, besides experiential, is education from coaching courses often leading to a certification. Through these courses instructors attempt to provide coaches with information on various aspects of coaching, learning theory, motivational strategies, an understanding of technique, and how to express their knowledge in the most efficient manner so that the athletes can produce the desired results (Nash & Sproule, 2009). Most often what one will find is that a basic level of certification provides the bare minimum necessary to coach, as is evidenced by the commonly observed method of using levels to provide ranking of coaches' ability. However, rarely is it required for a coach to advance to the next level, unless advanced athletic coaching is desired, leaving progression strictly up to the coach (Nash & Sproule, 2009). While this does allow for some coaches to work on a part-time basis, no advancement of formal education is required outside of continuing education credits. Even though the use of continuing education is beneficial to enhancing coaching knowledge, it is still miniscule compared to what coaches should be required to complete as noted by Stone et al. (2004), NCAA task force paper on sudden death (Casa et al. 2012), and the decision by the NCAA to require accredited certification of all strength and conditioning staff by August 2015.

Coaching knowledge comes from two main sources: practical experience and formal education. While some of the information gathered from practical experience is undoubtedly invaluable, one problem does arise. The mentor coach often learns from a mentor coach, who learned from another mentor coach, and so on and so forth, thus the information expressed from one coach to the other has a high potential for lacking the scientific knowledge provided from formal education courses. Although the education courses do provide coaches with scientific information on how to coach, this information is sometimes limited in scope and simply not sufficient to adequately coach. Furthermore, many coaches do not seek to obtain a higher level of education after the initial certification because it is not required to obtain or maintain coaching status (Gilbert & Trudel, 1999). It is obvious that coaches need a higher level of formal education and certification (Casa et al., 2012; Stone et al. 2004), but until the certification methods and education expectations change, coaches will continue along this path. Fortunately, it is possible for coaches to work with sport scientists, who traditionally have a higher education level in areas associated with sport analyses and often have coaching experience. Indeed, the coaches could use their own practical experience concomitantly with the sport scientists to continue the advancement of their sport.

Unfortunately, in the United States true sport scientists and institutions designed to educate sport scientists are rare and to the author's knowledge exist only at ETSU and the United States Olympic Committee. It must be noted that "sport science" divisions of some universities do exist. However, these divisions do not focus on the enhancement of sport performance. Their focus is primarily on exercise science (Stone et al., 2004). Briefly, exercise science is the study of exercise and how it affects biological systems with a main focus on the relationship of health

and exercise, whereas sport science, as stated earlier, is aimed at enhancing sport performance through scientific means without a focus on general health (Stone et al., 2004).

Sport science continues to differ from exercise science in the type of individual observed. Exercise science primarily recruits from an untrained or recreationally trained population in order to distinguish differences, while sport science aims to recruit from a highly trained or elite athlete population (Stone et al., 2004). This difference in participant pools leads to some difficulties in performing research in the sport sciences. Mainly, the population pool from exercise science studies is readily available and thus large numbers can be obtained. In sport science, all athletes and ideally elite athletes are used for research. Elite athletes are by definition at the top level of performance, which means that they are a rare group. Because of this the number of athletes participating as subjects in sport science research is small, leading to some nontraditional methods of research (such as time series analyses and single subject research design), mainly the focus of hypothesis generating rather than hypothesis testing (Stone et al., 2004).

Hypothesis generating research is exactly as it sounds. Instead of developing a study based on a hypothesis, research is conducted primarily through observation. These observations can lead to the generation of a hypothesis that can eventually be tested. In sport science, where the goal is performance enhancement, these observations occur through the development and implementation of a performance enhancement training program and the concomitant development of a training process (Haff, 2010; Stone et al., 2004). During the training process performance is tested and changes can be made in order to facilitate further adaptation.

Questionnaires in Sport

Performance testing in sport science can be a time consuming and physically demanding process and thus is generally assessed at the beginning and end of a performance enhancement training protocol. Questionnaires are primarily used in the social sciences but when developed harmoniously with sport science testing and monitoring protocols could allow sport scientists a fast and easy assessment of a performance enhancement training protocol and the recovery status of the athletes. The use of questionnaires in social sciences is a common mode of discerning information about a given topic. Specifically, questionnaires are an objective method of discerning others opinions, beliefs, attitudes, and behavior (Boynton & Greenhalgh, 2004). Additionally, perceptions of an athlete's abilities can directly impact field performance (Feltz & Lirgg, 2001). Because of this, the use of questionnaires in sport provides a method of evaluating the enhancement of sport performance.

Questionnaires

As stated previously, questionnaires are mostly used in social science research and are a valid way of obtaining information about a given topic. More specifically, however, and of greater interest to the field of sport science, an instrument was developed by Pace titled the College Student Experiences Questionnaire (CSE-Q) (Pace, 1984). This instrument was developed to assess undergraduate experiences and what those students believed led to the attainment of their goals, IE: learning (Pace, 1984). In order to accomplish its goal, the CSE-Q set out to examine which events students partook in and how those events relate to enhancing student learning (Pace, 1984). The events examined by the CSE-Q can be described as opportunities provided by the university or inherent in the nature of attending a university whose

objectives are to enhance student learning, events such as classroom activities, library use, involvement in clubs and organizations, interactions with faculty members, friendship, etc. (Pace, 1984). After the initial instrument was developed, it was used, and is still in use, in many university and community college settings and has helped those institutions provide an atmosphere that is more conducive to student learning (Pace, 2007a; Pace, 2007b). In sport the general idea of providing a method for program assessment and effectiveness, to the author's knowledge has not been published. The areas of perception-based assessment in sport include but are not limited to achievement strategies, the coach-athlete relationship, coping strategies, burnout, recovery, and performance. For example:

Questionnaires: Achievement

Athletic achievement can be influenced by perceptions of ability (Nicholls, 1984). These perceptions of ability have been differentiated into two areas of achievement orientation, task and ego. An abundance of research exists on task and ego orientation, while this review will briefly discuss the implications of task and ego orientation in sport as well as its validity and reliability, it is not the scope of this investigation to discuss the intricate nature of this topic. For more detailed information on task and ego orientation please refer to Duda's chapter in Motivation in Sport Settings: A Goal Perspective Approach (Smith & Bar-Eli, 2007).

In sport how one perceives goal achievement can have an impact on the way an individual behaves when attempting to achieve a goal. These perceptions of achievement have been whittled down to two orientations, task and ego. While athletes can obtain a range of orientation in each category with changes occurring over time, these orientations differ quite drastically (Smith & Bar-Eli, 2007). Task orientation pertains to individuals who use mastery

and learning as a means of obtaining achievement (Duda, Chi, Newton, Walling, & Catley, 1995). Furthermore, task orientation is considered to be related to intrinsic motivation. This type of motivation is generally considered to result from an internal desire to succeed and a general "want" to partake in the event, thus coincides with the task orientation (Duda et al., 1995). Ego orientation on the other hand involves the comparing performance to others in order to obtain success (Pensgaard & Roberts, 2002). Quite opposite of task orientation and internal motivation, ego oriented people are motivated from external factors, not the "want" as is found in task oriented individuals, but more of a way to completion. Delving a little deeper into the comparison, the very nature of ego orientation gives way to performance as a means of self-worth (Ryan, 1982). On the other hand, task oriented individuals will suffer less from a setback because of the internal control they feel they have (Duda et al., 1995). From a practical standpoint the differences between these two orientations can have considerable implications for the coach.

In coaching knowing how players perceive achievement is important. It can influence programming as well as providing foresight as an individual's reaction to specific event. For example a soccer player who is task oriented, who happens to miss a free kick, will most likely respond in a positive manner such as seeking assistance during practice to improve technique. An ego-oriented athlete could view this instance as a complete failure with no way of fixing the situation thus decreasing feelings of self-worth. Providing the coach with the knowledge of how an individual perceives achievement is the focus of task and ego orientation questionnaires. However, these questionnaires are not without their flaws and have had their validity and reliability questioned in recent years (Fogarty, Tenenbaum, & Morrow, 2006).

The main reason questionnaires assessing task and ego orientation are re-examined is because of how they are measured (Fogarty et al., 2006). Specifically, numerous questions are used to assess a number of factors that are important for understanding task and ego orientation (Fogarty et al., 2006). For example, a factor of competitiveness (ego-orientation) would have questions asking a person to rate level of competitiveness, thereby determining the extent to which a person is ego oriented. Because of the various questionnaires designed to assess the same concepts, it is possible that aspects other than task and ego orientation were measured. Through a comparison of four instruments (a total of eight analysis were ran by separating the task and ego components of the instruments), it was determined that the instruments were not highly correlated (Fogarty et al., 2006). Unfortunately, these investigations are not only unreliable in their assessment of goal orientation, they also could not differentiate the extent to which an individual was task or ego oriented (Fogarty et al., 2006). However, it must be noted that the wording of questions was different between questionnaires. As is noted by Fogarty et al. (2006), some questionnaires seem to ask individuals their overall feelings of success, whereas others would ask at what time they feel they are successful. Because of these divergent aspects of the questionnaires designed to assess essentially the same components, it is viable for the questionnaire administrator to understand the underlying components of the instrument so that it is applied during the situation for which it was designed.

Questionnaires: Coping Strategies

When a stressful situation arises, a behavioral reaction occurs. This reaction has led to research in how athletes cope with adverse events occurring on or off the field of play. Similar to achievement strategies, the mode by which an athlete copes varies across individuals but can have a considerable influence on how one reacts to an abnormal situation. It is said that coping

strategies are driven based on two distinct factors, task oriented and emotional oriented coping (Lazarus & Folkman, 1984) with a third, avoidance oriented coping, also existing (Hudek-Knezevic, Kardum, & Vukmirovic, 1999). Not only are task, emotional, and avoidance oriented factors involved in coping strategies, there is also the type of situation to consider, whether it be trait specific or situation specific (Gaudreau & Blondin, 2002). As is evidenced by the combination of these factors, the number of ways in which an individual copes with a situation can be numerous (Gaudreau & Blondin, 2002).

The first two aspects of coping are the task and emotional oriented factors. Task oriented coping involves taking action against the stimulus (Lazarus & Folkman, 1984). Performing this mode of coping can be completed by creating a plan to deal with a situation, preparing in the form of practice or other aspects that would require an individual to take some sort of action to prepare for the event. On the other hand, emotional oriented coping refers to the psychological changes that occur in response to a stressful situation (Lazarus & Folkman, 1984). This would entail athletes purposely forcing themselves to put a positive spin on a negative situation. A perfect example of an individual who employs both task and emotional orientation would be the American football kicker. The weight of an entire game (or season for that matter) on one's shoulders would induce a considerable amount of negative stress. However, these individuals are often able to cope with the situation by practicing a number of potential kicks (task coping) and employing some sort of internal mechanism to alleviate the stress of a game-deciding kick (emotional coping). The third aspect, avoidance oriented, differs considerably from the first two. While the first two generally result in positive outcome or the attempt to better oneself, the third actually represents conscious attempts to avoid specific situations (Hudek-Knezevic et al., 1999). When reaching the point that nothing else seems to work, disengagement from responsibilities,

focusing on irrelevant events or items, and, to an extreme extent, or use of alcohol or drugs may occur (Gaudreau & Blondin, 2002). Of course, it is imperative that the third aspect is avoided at all costs, thus assessing individuals coping strategies could provide a heads up on the potential for the third aspect to occur.

Task, emotional, and avoidance coping are mechanisms by which individuals attempt to overcome emotional disturbance. However, there is also that which causes the coping strategy, trait, and state (or situation) response. It should be noted that these two mechanisms are also considered a separate entity from the above-mentioned coping mechanisms. The basis for these two is that an individual will respond to a situation with a predetermined and preferred, potentially unknowingly, set of responses (Gaudreau & Blondin, 2002). Essentially, the trait responses are those the athlete chooses to use in a given situation, while the state response is the natural response of a given situation. Furthermore, it has generally become accepted that responses to stressful events change over time (Gaudreau & Blondin, 2002).

When it comes down to assessing coping strategies in sport, it has been recently suggested that a five factor model be used (Allen, Greenlees, & Jones, 2011). Using the Coping Function Questionnaire for Sport, Allen et al. (2011) were able to differentiate how athletes of various achievement standards cope in various situations. Their findings supported this five factor model to assess the personality characteristics of athletes and how these individuals cope with various situations (Allen et al., 2011). Knowledge of coping strategies can provide the coaching staff with practical knowledge of how their athletes deal with stress and how to help those athletes to cope in a productive way.

Questionnaires: Group Dynamics

One area of sport that has been investigated using questionnaires is group dynamics. Specifically, the relationship between the athlete and coach has seen some research but is still a relatively new topic. The coach-athlete relationship is special in that it can have a considerable impact on performance and the general mood of both the coach and athletes. Furthermore, as is evidenced above, a large amount of research in sport psychology has been focused on the internal relationships, how athletes cope with certain experiences (Gaudreau & Blondin, 2002) and perceptions of how achievement occurs (Duda et al., 1995). Jowett (2005) noted though that factors other than the internal also impact the athlete and therefore focused on the external relationship of the athlete and coach. The basis for the coach-athlete relationship is not without complete disregard for internal relationships. It is noted that what interpersonal and intrapersonal relationships, especially research in those areas, have in common is the fact that they focus on the individual's self-perception (Jowett & Ntoumanis, 2004). So, the interpersonal relationship between the athlete and coach was deemed a necessary assessment as it can have impacts on the development of each individual. Thus began Jowett's research on the factors that affect or are most important in the coach-athlete relationship.

Leading up to the final instrument, which was the final coach-athlete relationship questionnaire, pilot testing was performed to determine which aspects of the coach-athlete relationship would provide the clearest view of the relationship, specifically how the emotions, behaviors, and thoughts of both parties interact (Jowett & Ntoumanis, 2004). This pilot testing determined that three aspects, closeness, co-orientation, and complementary, encompassed the emotional, behavioral, and interactions of both parties (Jowett & Ntoumanis, 2004). However, after initial validation of the questionnaire, it became clear that co-orientation was not a separate

entity, but what was found was that a construct of commitment existed and therefore lead to the final framework of the instrument being termed "3 C's + 1C" (Jowett & Ntoumanis, 2004). Briefly, the construct of closeness is defined by how emotional closeness the relationship, such as how much one cares about the other, feelings of being liked and trust to name a few, whereas complementary is indicative of how the actions of the coach or athlete affect the other (Jowett & Ntoumanis, 2004). Commitment, the last of the three Cs, refers to the degree to which the athlete or coach intends to maintain the relationship (Adie & Jowett, 2010). Finally, the all-encompassing co-orientation is the aspects of the relationship that pertain to the interactions in which they participate, for example, the total interaction of the three Cs (Jowett & Ntoumanis, 2004). The final instrument included an assessment of the three Cs, closeness, commitment, and complementary with the +1 including the co-oriented relationship of the athlete and coach.

Since its development the coach and athlete relationship questionnaire has been used in varying aspects, but of most importance is the research focused on validation of the instrument (Balduck & Jowett, 2010). This is key to the further use of the instrument because validation ensures that with continued use the instrument is still providing the information it was designed to provide. What is more, not only has validation occurred with a large number of individuals it has also has also been validated across numerous countries (Balduck & Jowett, 2010). Along with the fact that cross cultural validation could further support the reliability of the instrument, its validation across cultures also has practical importance. This is mainly because of the different cultural aspects that may influence the athlete and coach relationship. If it were found that the instrument was valid across cultures then it could be used with confidence across the world to assess the relationship of the athlete and coach. Fortunately, Balduck and Jowett (2010) were able to assess the validity of the instrument across cultures. In order to do so the

questionnaire was administered to 1,363 athletes across seven countries and then analyzed for variability within the model (Balduck & Jowett, 2010). Analysis revealed that the three factor model of the questionnaire (the 3 Cs) produced valid and reliable data across cultures (Balduck & Jowett, 2010). With this cross cultural validation it seems that the factors of closeness, commitment, and complementary area a valid and reliable means of assessing the coach-athlete relationship.

Questionnaires: Overtraining

It is commonly known that in order to induce performance adaptations, a training stimulus greater than one individual is accustomed is needed, known as overreaching. Achieving this stimulus becomes increasingly more important as an athlete increases in ability, potentially up to the elite level. This is because the stimulus that is required, especially for elite athletes, is most often close to their genetic potential and also can go hand in hand with increasing fatigue. Also, highly trained athletes are accustomed to high training loads and volumes, the primary means of overreaching. Acute excessive training, whether planned or unplanned, can result in adaptation; however, if one takes this training too far (little to no recovery both acutely and chronically), an overtrained state could occur (Siff, 2003). Simply put, overtraining is the chronic imbalance of stress and recovery. Furthermore, overtraining can be characterized by a prevalence of injuries (both major and minor), chronic fatigue, diminished desire to train or compete, and a stagnation or a decrease in performance (Siff, 2003). Proper programming of training can minimize overtraining; however, it is still necessary at times to induce a stimulus that will allow the athlete to overreach if it is planned properly, regardless of training status. Because of this, it is often difficult to practically determine the difference between overtraining and overreaching. Especially considering that if an athlete is overtraining, drastic measures (e.g.

complete removal from sport) are needed to facilitate recovery, whereas for overreaching, depending upon the overreaching load, a simple decrease in training volume for as little as 1 week can result the body adapting to a new and higher state of performance. Because of this, questionnaires to assess emotional and physical fatigue are available to help coaches avoid overtraining.

Emotional fatigue is best defined as athlete burnout. Burnout can, however, include physical fatigue as well. Similar to the symptoms of overtraining, burnout can be described as a progressive withdrawal from activity with symptoms such as emotional exhaustion, withdrawal from personal contact, and a decrease in feelings of accomplishment; however, this description is limited to human service workers (Maslach & Jackson, 1984). For athletes, Eades (1990) expanded on the definition of burnout in human service workers to say that the chronic stresses of sport lead to an overall decrease in perceived meaning of the sport and a general devaluation of the individual or sport that could eventually lead to a complete self-removal from sport (Eades, 1990). This indicates that controlling burnout can have a considerable impact on the individual both within and outside of sport. Therefore, Raedeke et al. (2001) developed a questionnaire to assess athlete burnout. In order to demonstrate burnout, three constructs were developed, emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation (Raedeke & Smith, 2001). Through a series of three studies including initial questionnaire validation, a refined questionnaire validation, and a final cross validation, this instrument, called the Athlete Burnout Questionnaire (ABQ), was created (Raedeke & Smith, 2001). Following these initial studies the instrument was shown to have construct validity and reliability and thus could be used with confidence in practical sport settings (Raedeke & Smith, 2001). Since its creation, the ABQ has been shown as a valid and reliable instrument in Spanish

(Arce, de Francisco, Andrade, Arce, & Raedeke, 2010) and French (Isoard-Gautheur, Oger, Guillet, & Martin-Krumm, 2010) athletes.

Overtraining from physical stress occurs from a lack of adequate recovery (Kellmann, 2002). Recovery is actually quite a tough concept to define. Operational definition may seem simple, a removal of activity allowing a return to homeostasis after a stressor. However, there are also physical, psychological, environmental, and behavioral factors to consider, all of which include focusing ones efforts on something that will result in replenishing whatever was depleted back to basal levels (Kellmann, 2002). Also, recovery strategies vary across individuals and within individuals. For example, playing video games could be a way that an athlete relieves psychological stress while simultaneously physically resting. Another athlete could find that video games are stressful and result in a greater psychological stress. The differences between the two athletes make determining standard and effective strategies difficult. Additionally, assessing ones recovery efforts through questionnaires becomes more difficult. Thus, it is imperative that the questions are easy to understand and that the individuals taking the questionnaire understand what activities work for successful recovery for themselves. Some questionnaires do exist that attempt to assess the recovery efforts and status of athletes. One short (seven item) questionnaire, the Recovery-Cue, has been developed to assess the recovery efforts of athletes (Kellmann, 2002). Unfortunately though, the validity and reliability data for this questionnaire are unpublished, although it could be a very useful tool for coaches to monitor the recovery efforts of their athletes (Kellmann, 2002).

The Recovery Stress Questionnaire in Sport posits similar information as the ABQ in that it assumes recovery occurs due a combination of stress and inadequate restoration to homeostasis (Kellmann, 2002). What separates this instrument from the ABQ is that the Recovery Stress

Questionnaire obtains much more information from its 19 factors but is, however, a considerably tedious instrument to complete at 76 questions, although there is a shorter version resting at 52 questions (Kellmann, 2002). However, as tedious the instrument may be, it has been used in a number of professional sporting institutes with considerable success in monitoring recovery and stress within athletes (Davis, Orzeck, & Keelan, 2007; Kellmann, 2002). Although some have questioned the reliability of the instrument (Davis et al., 2007), it does have considerable evidence to support its use (Kellmann, 2002) and, therefore, is still a valid means of assessing recovery and stress in athletes.

Questionnaires: Performance

The final component of assessment via questionnaire is that of performance perceptions. Performance can include a vast array of components but when used in questionnaires it includes constructs of skills, body, aerobic performance, anaerobic performance, mental performance, and actual performance (Marsh, Hey, Johnson, & Perry, 1997) Skills refer to perceptions of skill in a specific sport, body is how well the body suits a specific sport, aerobic fitness refers to the ability to perform long duration endurance events, anaerobic fitness is the ability to perform short yet highly intense bursts of activity, mental refers to an athlete's ability to self-motivate, and performance is the degree to which an individual excels in a specific event (Marsh et al., 1997). As discussed above, all of these aspects require a perception of overall athletic performance. Fortunately, athletes' perceptions of their ability relate to the ability that they exhibit on the field of play (Feltz & Lirgg, 2001). Because of this, one instrument in particular has been developed to assess athletes' perceptions of performance, the Elite Athlete Self-Description Questionnaire (EASD-Q) (Marsh et al., 1997).

In quantifying any measure of an athlete, it is important to understand the level of the group that is being measured, for example comparing elite to recreationally trained to adolescent athletes. This is because as an athlete matures and becomes more advanced with age and ability, the absolute change in performance enhancement decreases. With this being the case, it is important to cover any aspect of performance that may have an impact in elite athletes, hence, the EASD-Q was developed (Marsh et al., 1997). In order to assess self-perceptions of performance the instrument was designed with the six constructs of skill, body, aerobic and anaerobic performance, and finally mental and actual performance, all of which are described above (Marsh et al., 1997). As with any instrument development, first a number of questions were created for each construct, which was then administered to a panel of experts to rate the validity and clarity of the questions. However, for this instrument instead of a reliability of $r = 0.40$, which is considered adequate for question inclusion, the authors went with a $r = 0.80$ reliability instead, which allowed them to keep the questionnaire relatively short, 28 questions, while maintaining a high correlation of the questions to their respective construct (Marsh et al., 1997). Briefly, reliability is the consistency and reproducibility of data with values ranging from zero (none) to one (excellent) (Vincent & Weir, 1999). Following creation of the instrument, it was administered to two groups of highly advanced athletes, one group in high school included adolescents ages 12-15 and the other from the Australian Institute of Sport with a mean age of 21 (Marsh et al., 1997). Analysis revealed that for the two groups the questions loaded on the factors to an equal extent, that it was valid and reliable and thus that it could be used to assess those factors associated with perceptions of performance (Marsh et al., 1997). This is the only investigation, to the author's knowledge, that assesses an athlete's perception of performance characteristics. Because this questionnaire assesses some underlying perception of physiological

abilities that aid in optimal performance, it may provide a basis for assessing various sport-specific fitness characteristics that could be used to predict performance.

Questionnaires: Perception of Performance

In the final analysis, the above mentioned questionnaires and their constructs cannot hold any practical relevance if the data they are obtaining are not directly referring to what is being asked. Fortunately athletes' perceptions are valid and even more importantly can have a direct impact on their actual performance (Feltz & Lirgg, 2001). The importance of this cannot be understated due to the potential implications on individual performance and the competition results obtained from these assessments. Perceptions of performance can be based on many aspects, most importantly are the four areas of mastery experiences (similar to task orientation) and the results an athlete experienced through the process of achieving mastery, watching another perform a specific task and whether or how they succeeded or failed, societal aspects such as positive or negative support from another individual regarding the task, and the physiological state (fitness characteristic) i.e.: perceptions of what the individual is physically capable of doing. An important distinction needs to be made between the first three and last measures (Feltz & Lirgg, 2001). The first three can change drastically in short periods of time, meaning that an athlete can perceive mastery in one area as highly competent one week then, following a poor or unexpected performance, perceive mastery as low thus altering performance (George, 1994). An athlete's physiological state, though, will change minimally during that same time period. However, physiological "state" could play enough of a role to produce an uncharacteristically bad performance of only a few percent. That small percentage could be magnified by the athlete and manifest itself into some behavior. This becomes an important factor in actual performance because with an increase in perception of efficacy an athlete will

perform better, however only within current physiological limits. Fortunately, this is the role that strength and conditioning coaches perform. They have the responsibility to assist in the improvement of athlete fitness. Therefore, it would stand to reason that improving the fitness characteristics of the athlete while simultaneously monitoring performance progress and fatigue levels, while making appropriate alterations to programming, the athlete can perform better than before. It is quite obvious that making a better athlete is the ultimate goal of every coach; however, we have yet to develop a method that would allow the direct quantification of an athletic fitness on a day-to-day or even week-to-week basis.

International Sport Science Programs

It has been noted that the United States has little to no true sport science programs, as is evident through the model present throughout the world (Stone et al. 2004). For example, the Australian Institute of Sport (AIS) has successfully implemented and obtained one of its goals to enhance high-level sport performances. Development of this organization took place as a result of the decline in Australia's competitive edge on the international sport scale. Although the original intent of the AIS was to improve sport competitive performance, the program evolved into one geared toward the improvement of sport and the overall health of the country (Commonwealth of Australia, 2010). Accomplishing this goal was no small feat but with government funding of $1.2 billion Australian dollars over 4 years and an approach of unifying the territories, all with the goal of optimum sport performance across ages and abilities, Australia was able to continue with its plan (Commonwealth of Australia, 2010), Additionally $195.2 million was given to the Australian Sporting Commission (the top national sport agency in Australia) so that it could continue overseeing the goals of the Australian government, some of which include: addressing and enhancing women's participation and leadership, training sport

coaches across all levels with a unified approach, talent identification, providing retired athletes a method of continuing sport participation through mentoring and increasing external monetary support for top level coaches and athletes among other equally important goals (Commonwealth of Australia, 2010). Another example of an international sport science program is that of the Japanese Institute of Sport Science (JISS). Similar to the AIS, the JISS is under the umbrella of the National Agency for Advancement of Sports and Health with its primary goal of enhancing Japanese Sport competition on the international level (Ito, 2010). Regardless of the different locations of these institutions, they both have a similar goal: improving the competitive performance of their athletes on an international level, and they accomplish this goal though similar methods.

What both countries' sport science programs have in common is their use of a sport science team that consists of individuals with varying professions. As is mentioned earlier in the review, this team consists of a variety of professionals in sport such as a head sport scientist, strength coaches, sport nutritionists, sport psychologists, physicians, athletic trainers, head coach, and supporting staff. This group of professionals interacts with one another to produce the common goal of competitive performance. Accomplishing this goal requires teamwork and mutual respect from each team member, as they are all specialized in one area of sport performance. Consider these differences from the typical sport system in the United States. Mainly, the head coach attempts to fulfill all the roles to an extent, with a little help from the support staff. By using a group of professionals, the international sport science programs are able to provide the optimum in knowledge and experience leading to the best possible chance for enhanced sport success. It all comes down to the international sport science programs spreading the work load across a variety of specialized sport professionals allowing them to work

collectively and optimally toward the common goal. Unfortunately, in the United States this approach has not yet caught on, leading many coaches to miss important factors regarding sport performance due to their lack of education in the various fields. If a program similar to the AIS and JISS were implemented in all of competitive sport, the level of competitive international performance could continually rise. Unfortunately the time seems to be coming in which the success of the United States on an international sport level will diminish unless drastic changes are made.

SPEC: Sport Performance Enhancement Consortium

The future for international sporting success in the United States is quite clearly not in immediate danger, but without the creation of sport science programs similar to the AIS and JISS, it seems likely that in the near future the degree of success for the United States in relation to those countries with a strong sport science program will decline. Because of this potential, ETSU and the CESSCE have potentially developed programs that may avoid this result. In order to accomplish this goal (and others) the CESSCE has developed a sport program based on the concepts generated by international sports agencies such as the AIS. Within this program the CESSCE works collaboratively with existing USOC, NCAA, and sport club teams at forming a SPEG. The SPEG works with the existing coaching staff and provides future sport scientists (graduate students supervised by university faculty) avenues to work on a performance enhancement and success plan, also called an annual plan. Ideally, the annual plan consists of the training process including periodized strength and conditioning programs, practice plans, sport medicine involvement, as well as a map of sport science involvement and testing. In essence, the coaching staff and sport scientists meet to formulate a plan in which to achieve peak performance when the coach deems it is necessary. Along with this annual plan the CESSCE

also provides a performance testing and monitoring protocol designed to assess the physiological abilities of each athlete, thus allowing a means of monitoring performance and providing information on where improvements can be made. The efforts from the CESSCE and ETSU have the potential to provide the base for continued success in the United States. It is now a matter of implementing the program across the nation to ensure this United State continual success in international sport.

Conclusion

I would like to end with a quote by Pace, creator of the College Student Experiences Questionnaire, "… we readily agree that some products are inherently better than others…Is it not also true that some processes are inherently better than others, regardless of whether they produce more learning?" (Pace, 1984). This summarizes the drive for which he created his instrument. He makes a point that some educational experiences are inherently better than others, regardless of the results, but at the time there was no way of quantitatively assessing a program, no way of determining what worked, what needed improvement, what should have been eliminated and so on. The above mentioned quote can be directly applied to the field of sport science. Many ideas on how to enhance sport performance exist, whether through strength and conditioning, coaching methods, etc., some based on experience in the field and some on scientific evidence (Siff, 2003). However, when it comes down to assessing a program it is necessary to have a standard that encompasses important factors of sport that are directly quantifiable, such as strength, power, speed, etc. Measuring psychological factors such as achievement, coping, and group dynamics would not provide appropriate information regarding program assessment because of the fluid nature of the mind and the inherent questions regarding the assessment of those variables. Developing a model, similar to that of the College Student

Evaluation Questionnaire, of evaluating a sport science program could aid in assessing said program, such as the SPEC, while providing information as to where to improve.

CHAPTER 3

Title: Coach and Athlete Perceptions of an Athlete Monitoring and Strength and Conditioning Program

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Abstract

Purpose: The purpose of this investigation was to assess athlete and coach perceptions of an athlete monitoring program. **Methods:** Athletes and coaches participating in the athlete monitoring program at East Tennessee State University's (ETSU) Sport Performance Enhancement Consortium (SPEC) were invited to participate. Reliability for the coach and athlete questionnaires and principle components analysis (PCA) of the athlete questionnaire was completed after initial development of the questionnaire (11 questions for athletes and 20 for coaches) in the spring of 2013. To analyze changes throughout the academic year, four additional questionnaires were administered at the beginning and end of the fall 2013 and spring 2014 semesters. **Results:** Both athlete and coach questionnaires were considered reliable (athletes = 0.842, coaches = 0.919). PCA revealed a three component model (KMO = 0.798, Bartlett's Test of Sphericity = $p < 0.001$) with eigenvalues over one explaining 68.88% of total variance. Statistical differences between the pre and later time points were noted for athletes' perceptions of the SPEC programs which influenced on overall performance, skill, strength, speed, power and understanding of the SPEC monitoring protocols. Coach's' perceptions were statistically different from pre to postseason only for skill. **Conclusion:** The questionnaire was shown reliable and can be considered for future use. The first component of the PCA revealed that perceptions of overall performance are influenced by perceptions of strength, skill, power and agreement that testing data reflects performance, while the second showed that aerobic and anaerobic endurance as well as speed are all highly correlated and finally, the third revealed that athletes understanding of the SPEC program monitoring increased with return of data. Overall, perceptions of the SPEC programs ability to influence the components assessed by the questionnaire were positive ranging from no different to much better for coaches and athletes. In

conclusion, the SPEC athlete monitoring program seems to be a beneficial model for enhancing athletes and coaches perceptions of certain aspects of performance.

Introduction

Sport coaches constantly strive for the enhancement of athletic performance. In order to obtain this, coaches must rely on their knowledge and experience. Unfortunately, coach knowledge typically consists of a three day class or coach education courses which are limited in scope (Gilbert & Trudel, 1999; Stone et al., 2004). Additionally, these courses tend to assume that the coach has some sort of education in the area (Gilbert & Trudel, 1999). In the end, a coach's education relies heavily on practical experience and sometimes formal education, with the former encompassing the majority (Gilbert & Trudel, 1999; Nash & Sproule, 2009). While this information is valuable, it typically is built with the experience and leadership of their mentors, whose teachings might not be built on scientific evidence. However, recently many teams and coaches are turning toward other professionals in sport (i.e., sport scientists) for the attainment of this knowledge. Sport scientists are trained professionals usually with an advanced degree in higher education, whether it be a Master's (e.g. Masters or Doctorate). These individuals then provide the coach with scientifically supported information regarding the training of their athletes.

In the United States, many university sport science programs exist. However, these typically focus on exercise science rather than sport science (Stone et al., 2004). Exercise science education focuses on exercise and the biological systems it influences. This information is typically derived from exercise science research that generally uses recreationally trained or untrained individuals (Stone et al., 2004). Sport science education focuses on the enhancement of sport performance and how to accomplish this by using peer-reviewed research, ideally which has been conducted on an athletic or elite population. To the authors' knowledge, the only sport science program in the United States meeting these criteria exists ETSU.

Housed in the department of Exercise and Sports Science (EXSS) and Center of Excellence for Sport Science and Coach Education (CESSCE), this program seeks to develop sport scientists that have education in the enhancement of athletic performance through science as well as practical application of the methods. The graduate program is designed to offer both Master's and doctoral degrees. Doctor of Philosophy (Ph.D.). Students pursuing a Master's degree can choose a track in either research or coaching and sport performance. Although the curriculums core components of the degree are similar, the major difference is the culminating project of a thesis or an internship for research and performance tracks, respectively. According to the Department of EXSS website, students working toward a Ph.D. have the options of a Sport Performance or Sport Physiology track (East Tennessee State University, 2014). The Sport Physiology track provides students with the knowledge of the mechanisms of training for sport and how to manipulate them through physical preparation protocols. Sport performance track deals with improving athletic performance through the areas of strength and conditioning, nutrition, technique and others. What separates ETSU's department of EXSS is that the students can practically apply their education to National Collegiate Athletics Associate Division I athletics. Students in both degree tracks are provided the opportunity to learn and apply sport science in a real world environment.

Within CESSCE, the SPEC is, a group of experienced sport scientists serving as faculty at ETSU. The purpose of this group is to train future sports scientists by forming partnerships with Division I NCAA teams. Via the collaboration between sport scientists, coaches, sports medicine personnel and EXSS faculty, a sport performance enhancement group (SPEG) for each sports team is formed. The goal of each SPEG is to develop the best available route for enhancing each team's performance. One of these ways is through periodic testing of each

individual athlete's biomotor abilities, fitness qualities and other factors, termed 'athlete monitoring'. These tests evaluate athlete's physical abilities (i.e., strength, power, speed, agility, aerobic and anaerobic endurance) as well as each athlete's perceptions of their overall well-being. By assessing these variables, the SPEG can obtain objective and subjective information as to how the training process is influencing the biomotor ability of the athlete.

Because of the unique nature of the SPEG, it is important to determine its perceived effectiveness. Wins and losses can serve to measure the effectiveness of a team's physical preparation. However, it is also crucial to obtain coach and athlete perceptions on individual and team enhancement. Ultimately, without either group viewing the program as a useful and practical source of performance feedback, it is difficult to justify its use. Therefore, the primary purpose of this investigation was to examine the reliability and factor structure of a questionnaire designed to assess athletes' perceptions of an athlete monitoring program. The second purpose was to test coach and athlete perceptions of the SPEC over an academic year.

Methods

Participants

After approval from the university IRB committee, NCAA coaches and athletes were recruited to participate. The final pool included athletes from men's and women's soccer, men's and women's tennis, and women's volleyball, a total of 85 possible participants. Coaches included those from women's basketball and women's volleyball, seven possible participants. Only those participating in the SPEC athlete monitoring program and over the age of 18 were invited to participate.

Instrument

The questionnaire was designed to assess the athlete and coach perceptions of various aspects for the SPEC program. Although the SPEC program collects quantitative data on physiological performance, it is of the interest for those managing the SPEC program to account for these same variables in the eye of athlete and coach as well as gaining insight as to the value that both athletes and coaches place on the SPEC program. The surveys were worded for each respective population, with an additional nine questions directed toward the coaches. A modified version of the Elite Athlete Self-Description Questionnaire was used to determine athlete and coach perceptions of an athlete monitoring program (Marsh et al., 1997). The constructs of skill, aerobic, anaerobic, and performance were included for use within this questionnaire and worded to meet the question requirements. All questions were self-evident meaning that there is no deception in the wording and that the construct represented is stated within.

Athlete Questionnaire

The survey implemented was designed to assess nine constructs that relate to the SPEC program. These constructs included overall performance, skill, anaerobic endurance, aerobic endurance, strength, speed, power, SPEC data reflection of performance, and data administration. The descriptive component asked if the participant was over the age of 18, sport participating, gender, and academic year (freshmen, sophomore, junior, senior). Eleven total items were included in the questionnaire. The questions asked the athletes' perceptions on their overall performance, skill, endurance, repeated sprint ability, physical strength, speed, power, the SPEC data's reflection of their performance, if they understand why they participate in SPEC

testing and monitoring (two separate questions), and if their coach provided them with SPEC collected data throughout the season. The first seven questions used a 5 point Likert-like scale (much worse, worse, no different, better, and much better) to assess the respondents' perception. The final four questions were also measured via a 5 point Likert-like scale, however, the wording was different: strongly disagree, disagree, neutral, agree, and strongly agree.

Coach Questionnaire

For the coaches, an additional nine questions (including the eleven given to athletes) related to the SPEC program were asked to assess: testing and monitoring data were used to alter an athlete's individual strength and conditioning program (2 questions), testing and monitoring data were considered in practice development (2 questions), monitoring data reflected athletes on-field performance, willingness to use the SPEC program if they were to take a job at another institution, the SPEC program helped athletes perform to their greatest potential, SPEC program satisfaction, and the mode which data was returned to athletes. Eight of the nine questions were asked on a 5 point Likert-like scale (strongly disagree to strongly agree), while the last (mode used to report data) asked the actual mode: team meeting, written report, other coaches, SPEC personnel, or casual coach feedback.

Data Collection Procedure

Respondents' answered the questionnaires on six separate occasions. The first two occurred during the spring semester at a time in which little to no variation in perceptions or performance occurred due to day to day stressors (such as an active rest period) for the purposes of reliability. After administration of the first questionnaire, the second was given immediately upon after returning the first and completed within 48 hours. Questionnaires three and four were given

prior to (before the conference schedule) and after (within two weeks) their competitive seasons. Finally, the fifth and sixth questionnaires were given at the beginning and end of each teams' offseason. After completing each questionnaire they were asked to either contact the PI for pick up or return the document to a specified location. A total of 340 responses were possible for athletes throughout assessment across the academic year (excluding reliability) with 179 responses received, leaving a 52.65% response rate. Fourteen total responses were possible for coaches from pre- to postseason with ten responses received ending with a 41.43% response rate.

Statistical Analysis

All row numbers are manually typed in tables for data analysis using SPSS statistical software (SPSS: An IBM Company, New York, NY). For the purposes of reliability and PCA, the questionnaire administered in the spring prior to fall competition was used for athletes and coaches' responses. In order to determine the day to day variation, reliability was assessed via Chronbach's Alpha. PCA with a Varimax rotated component matrix was run to determine the factor structure of the questionnaire. Performing this test allowed for grouping of the questionnaires and aided in the assessment of the SPEC monitoring program. When determining perceptual changes throughout the academic year for the athletes, a Kruskal-Wallis test was used with post-hoc analysis consisting of the Mann-Whitney U test on each question. For assessing coaches' changes in perceptions throughout the competitive season, a Mann-Whitney U test was performed. Statistical significance is set at $p < 0.05$, however, Bonferroni adjusted significance was use for the athletes resulting in a standard of $p < 0.0125$. Effect sizes (r) for all time points are listed in Table 3.5.

Results

Athletes

Reliability analysis and PCA were conducted on the responses of thirty six participants. A Chronbach's Alpha of 0.84 ($p < 0.001$, 95% CI 0.81 – 0.87) showed the athletes questionnaire to be reliable. Results from the PCA revealed a three component model of eigenvalues exceeding one. The model explained 68.88% of the variance (30.56%, 23.29%, and 15.03%, respectively). A Kaiser-Meyer-Oklin value of 0.798 and Bartlett's Test of Sphericity reached statistical significance ($p < 0.001$), indicated a strong correlation matrix. The rotation allowed for better interpretation of the three components which showed that each question only loaded substantially on a single component (see Table 3.1). With the exception of one (test understanding, 0.577), all questions were above 0.600 and loaded on separate components.

Table 3.1
Pattern Matrix

Questions	Component 1	Component 2	Component 3
Skill	0.828		
Strength	0.783		
Overall Performance	0.772		
Data Reflecting Performance	0.705		
Power	0.655		
Anaerobic Endurance		0.888	
Speed		0.778	
Aerobic Endurance		0.668	
Understanding of Monitoring			0.862
Data Return			0.620

One hundred seventy-nine instances were used in the analysis of changes through time (preseason = 36, postseason = 59, early offseason = 45, late offseason = 39). A statistically significant difference between time points was noted through the Kruskal-Wallis test (see Table

3.2). Post-hoc tests revealed statistically significant differences between many of the preseason values and the later dates (see Table 3.3). Measurements of effect size are noted in Table 3.4.

Table 3.2

Results from Kruskal-Wallis Test

Question	p value
Overall Performance	0.00
Skill	0.01
Aerobic Endurance	0.40
Anaerobic Endurance	0.04
Strength	0.02
Speed	0.01
Power	0.00
Data Reflecting Performance	0.08
Understanding of SPEC Testing	0.08
Understanding of Monitoring	0.00
Data Return	0.13

Table 3.3

Mean and Standard Deviation for Each Question and Time Point

Question	Pre	Post	Early Off-Season	Late Off-Season
Overall Performance	4.28 ± 0.61*^$	3.86 ± 0.58	3.84 ± 0.64	3.77 ± 0.57
Skill	3.89 ± 0.85$	3.77 ± 0.71t	3.51 ± 0.66	3.33 ± 0.62
Aerobic Endurance	3.94 ± 0.97	3.86 ± 0.87	3.78 ± 0.82	3.67 ± 0.77
Anaerobic Endurance	4.14 ± 0.76*$	3.72 ± 0.74	3.80 ± 0.76	3.67 ± 0.87
Strength	4.56 ± 0.73*$	4.10 ± 0.78	4.31 ± 0.67	4.26 ± 0.82
Speed	4.03 ± 0.72$	3.67 ± 0.64	3.91t ± 0.70	3.50 ± 0.73
Power	4.39 ± 0.69$	4.14 ± 0.63	4.09 ± 0.60	3.79 ± 0.78
Data Reflecting Performance	3.75 ± 1.00	3.57 ± 0.77	3.76 ± 0.80	3.33 ± 1.01
Understanding of SPEC Testing	4.60 ± 0.69	4.37 ± 0.76	4.40 ± 0.65	4.21 ± 0.80
Understanding of Monitoring	4.78 ± 0.42^$	4.39 ± 0.76	4.37 ± 0.54	4.23 ± 0.87
Data Return	4.44 ± 0.77	4.25 ± 0.81	4.18 ± 0.83	4.05 ± 0.86

Note. Significance set at $p < 0.0125$. * = sig. between pre and post, ^ = sig. between pre and early off-season, $ = sig. between pre and late off-season, t = sig. between post and late off-season.

Table 3.4
Effect Sizes (r) Between Time Points

Question	Pre-Post	Pre - Early Off-Season	Pre - Late Off-Season	Post - Early Off-Season	Post - Late Off-Season	Early - Late Off Season
Overall Performance	0.31	0.33	0.37	0.02	0.06	0.11
Skill	0.08	0.21	0.32	0.18	0.29	0.07
Aerobic Endurance	0.13	0.12	0.19	0.06	0.12	0.12
Anaerobic Endurance	0.27	0.23	0.28	0.04	0.03	0.03
Strength	0.34	0.22	0.22	0.13	0.12	0.03
Speed	0.35	0.07	0.33	0.18	0.11	0.09
Power	0.18	0.25	0.38	0.04	0.22	0.07
Data Reflecting Performance	0.13	0.03	0.23	0.12	0.13	0.17
Understanding of SPEC Testing	0.01	0.20	0.29	0.00	0.11	0.19
Understanding of Monitoring	0.11	0.39	0.39	0.07	0.09	0.10
Data Return	0.02	0.18	0.26	0.04	0.12	0.11

Coaches

Reliability analysis was conducted on the responses of seven participants. A Chronbach's Alpha of 0.92 ($p < 0.001$, 95% CI 0.89 – 0.94) indicated that the coach questionnaire is reliable. Ten separate instances were used to assess changes in perceptions throughout the conference season. Only Skill was statistically different ($Z = -0.239$, $p = 0.02$) from pre- to post- season (see Table 3.5 for other variables).

Table 3.5

Mean, Standard Deviation, Significance, and Effect Size for Coach Questions

Question	Pre	Post	Sig. ($p < 0.05$)	Effect Size
Overall Performance	4.20 ± 0.45	3.80 ± 0.45	0.18	0.42
Skill	4.00 ± 0.00*	3.00 ± 0.71	0.02	0.76
Aerobic Endurance	3.60 ± 0.89	4.00 ± 1.22	0.45	0.24
Anaerobic Endurance	3.60 ± 0.55	3.80 ± 1.10	0.48	0.22
Strength	4.60 ± 0.55	3.60 ± 1.52	0.31	0.32
Speed	4.00 ± 1.00	3.40 ± 1.14	0.38	0.28
Power	4.20 ± 0.84	3.40 ± 1.14	0.23	0.38
Testing Influencing Strength and Conditioning	4.67 ± 0.58	3.80 ± 0.45	0.06	0.67
Monitoring Influencing Strength and Conditioning	4.50 ± 0.58	4.20 ± 0.84	0.59	0.18
Testing Influencing Practice Development	3.75 ± 1.50	3.40 ± 1.52	0.71	0.13
Monitoring Influencing Practice Development	3.50 ± 1.29	3.00 ± 1.22	0.61	0.17
SPEC Testing Understanding	4.40 ± 0.89	4.60 ± 0.55	0.81	0.08
SPEC Monitoring Understanding	4.50 ± 0.71	4.20 ± 0.45	0.46	0.28
SPEC Testing Reflecting Performance	4.00 ± 0.82	3.20 ± 0.84	0.19	0.43
SPEC Monitoring Reflecting Performance	4.00 ± 1.00	3.20 ± 0.84	0.27	0.39
Willingness to Take SPEC Programming to Other Job	4.00 ± 1.00	3.20 ± 1.10	0.26	0.40
SPEC Helping Athletes Perform to Greatest Potential	4.20 ± 0.84	4.20 ± 1.10	0.91	0.04
Satisfaction with SPEC Program	4.20 ± 0.84	3.80 ± 0.84	0.44	0.25
Data Returned to Athletes	4.20 ± 0.45	4.20 ± 0.45	1.00	0.00
Mode Data was Returned to Athletes^	Team Meeting (2) and SPEC Personnel (3)	Team Meeting (2) and SPEC Personnel (3)	1.00	0.00

Note. * = sig. between pre and post season ($p < 0.05$). ^ signifies that the number in paraenthesis is the count of responses

Discussion

This study sought to determine the reliability and factor loadings of a questionnaire as well as determining coach and athlete perceptions of an athlete monitoring program throughout an academic year.

Reliability was assessed during each team's respective offseason. Results for the instrument showed an overall reliability of 0.842 for athletes and 0.919 for coaches, which is above the standard of 0.800. Therefore, this modified instrument was found to be reliable and can be used in further investigations.

Results from the PCA revealed a three factor model. The first and strongest factor consisted of the questions assessing overall performance, skill, strength, power, and performance reflection. The second included questions regarding aerobic and anaerobic endurance as well as speed. Finally, the third included understanding of monitoring and data return.

In the first model, it was not surprising that the factors loaded in the above mentioned manner. The SPEC program places high emphasis on developing strength and power. While this is evident in the training programs, it is also told to the athletes. They will often ask why they are performing certain exercises which the strength coaches then provide evidence based rationale to their programming. In addition, this explanation is in support of becoming a stronger and more powerful athlete. It has often been shown that as an individual increases strength, their jumping, sprinting, and potentially overall performance can increase (Israetel, 2013; Kraska et al., 2009). Based on the data it appears that the athletes do believe that as they become stronger and more powerful, their perception of overall performance increases. This implication has a large influence on an athlete's success in a sport. In a review of research on self-efficacy beliefs

of athletes, it was found that in general, individuals who have high self-efficacy tend to perform better (Feltz & Lirgg, 2001). Component two loaded with all the running questions. This result indicated that as the athletes perform any type of running, whether it be direct spring training, intervals or long distance, their perceptions of running in general, followed suit. The practical implication of this is that by training speed, the SPEC personnel can also improve the athlete's perceptions of endurance and vice versa. Finally, the third component revolved around the athletes' understanding of monitoring in the SPEC program. In a logical result, it showed that when data is returned to athletes, their understanding of the monitoring program increases. This makes it clear that continuation of SPEC monitoring needs to go hand in hand with a rapid return of data.

Change throughout the academic year was greatest for overall performance. The initial perceptions were 4.28 ± 0.61 indicating a positive influence. However, as time progressed, the initial perceptions dropped below 4.0. This difference, while statistically significant, is not too concerning as the overall perception indicated the athletes perceived the SPEC program had a positive influence on their overall performance. The reason for this decline was possibly due to a decreased time spent with the SPEC personnel and possibly a shift in conditioning emphasis during the competitive season. The SPEC personnel and athletes primarily interact in the weight-room and it is traditional that during a competitive season time in the weight-room in decreased to allow for greater time spent on sport practice. Interestingly though, as time shifted into the offseason, their perceptions did not return to the preseason values. This is most likely due to the absolute difference between a 4 (better) and 5 (much better). Additionally, one of the primary limitations of the study is that individual perception changes could not be assessed over time due to technical issues. It is possible then that, the exclusion or removal of certain athletes,

due to their choice to participate at each time point, could influence the values at each time point. Finally, it is entirely possible that the athletes believed that their teams' strength and conditioning plan did not correspond with an improvement in overall performance. However, this could have been the intended nature of the SPEC plan. The strength and conditioning plan is designed to enhance performance over time, which the SPEC program has been successful at accomplishing (Kavanaugh, 2014; Painter et al., 2012; Sole et al., 2013). In the spring, the plan might entail exercises and loads that the athletes do not or cannot easily relate to their performance. It is not within the scope of this study to delve into the specifics of strength and conditioning, for that please refer to Stone, Stone and Sands (Stone et al., 2007). Briefly, the year is separated into various microcyles/mesocycles that range anywhere from one to five or more weeks. Within these mesocycles a specific physical trait is emphasized in the strength and conditioning program. The subsequent mesocycles then build off of the previous mesocycle culminating in, ideally, a planned increase in performance during a team's competitive season. The plan of the SPEC program is to plan for optimal performance, which usually consists of higher training volumes at the beginning of the season and lower at the end. Anecdotally, some athletes appear to perceive higher training volumes to have an immediate and positive influence on their performance, thus the lower perceptions at the end of the season make sense as the training volumes are lower than that in the preseason. While this may be the case, these perceptions do not match performance results obtained from this type of training system found in previous research (Kavanaugh, 2014; Painter et al., 2012; Sole et al., 2013). This hypothesis will serve as a primary explanation for all subsequent questions.

Athletes and coaches perceptions of the strength and conditioning program and the influence it has on skill are very similar. While this is one of the lowest perceived areas of influence for

the athletes, the consensus is that the program's influence on skill ranged from no influence to a positive influence. Athlete's perceptions were statistically different from pre and postseason to the end of the offseason. Coaches, on the other hand, showed a statistically significant decrease in skill from pre to postseason. The perceptions of coaches could be heavily influenced on the outcome of the season and how the SPEC program is explained. In this case, the majority of responders for coaches were from one team, which had just begun their relationship with the SPEC program. It is possible then that while the training program was being described to the coaches, the program's influences were misinterpreted. It is most likely a factor of both because when a new team joins the SPEC program they are all informed as to what the physical and performance characteristics the strength and conditioning program could influence. Specifically, the program can influence the physical qualities of the athletes (strength, power, endurance, etc.). In doing so it is possible that the athlete's skill may improve, especially if the specific skill is heavily influenced by strength characteristics. The misinterpretation of a strength and conditioning program directly and considerably influencing skill could have led to an artificially increased perception of the strength and conditioning programs ability to influence skill. In the future, it would be wise of the strength and conditioning personnel to give a better explanation of the exact factors that can be influenced so the coaches have a clear representation of the programs abilities. This should include information that the physical qualities necessary for success of the athlete can be improved, but execution of skill is still heavily based on the athlete and coach. Finally, it needs to be mentioned that the strength and conditioning program includes little specific sport skill work (i.e., coaching in or out of sport practice) with the athletes; however, by increasing conditioning aspects skill should improve beyond simple practice.

Aerobic endurance perceptions were stable at no different to positive influence throughout the academic year for both athletes and coaches. As with the other questions a down trend is noticeable. However, like skill and overall performance, it is not surprising that this would trend downward towards the end of the offseason. Aerobic endurance should be its best during the season. Once the offseason begins, training typically reverts to a heavier influence on strength training. This would cause the athletes perceptions to decrease as time spent training aerobic endurance may decrease. Coach perceptions increased slightly, though not statistically, from pre to postseason. However, the standard deviation was considerably higher indicating a disagreement amongst the group on as to the extent the strength and conditioning program influenced aerobic endurance.

The athletes and coaches perceived strength and conditioning effects on anaerobic endurance to be no different to positive across all time points. For athletes, the preseason perceptions were statistically higher for anaerobic endurance than the postseason and late offseason. Coaches did not change statistically from pre- to post- season. The pre- and post- season changes in athletes could have occurred because of the decreased time spent with SPEC personnel. It is likely that if the athletes question were worded towards coaches instead of SPEC personnel, perceptions would increase. This is primarily because of the increased time spent with coaches in practice. Practice in itself is both anaerobic and aerobic in nature, typically consisting of drills or games followed by a rest period where coaching takes place. As is stated before, the offseason is spent primarily on training in the weight room. Thus, these perceptions should decrease.

Athletes perceive the strength and conditioning influence on strength to be positive. The coaches' perceptions were positive in the preseason and remained positive in the postseason administration. Perceptions from the athletes are not surprising as developing strength is a

primary goal of the training program. Strength is a primary component of many tasks associated with sport, such as speed, jumping, hitting, etc. (Kraska et al., 2009). By emphasizing strength characteristics the athletes can be better prepared to perform the tasks necessary to their sport, as well as developing a larger work capacity in practice and competition (Aagaard & Andersen, 2010). For the pre- and postseason comparisons a statistical difference is not surprising. The in-season training plan developed by the SPEC personnel revolves around maintenance and fatigue management. It is the ultimate goal to program the absolute minimum training stimulus necessary for strength maintenance while optimizing power. These results indicate that, for the next competitive season, the plans need to be modified to make up for the perceived decrease in influence on strength. What is interesting is the decrease in strength perception values from pre to late offseason. The late offseason is when the training program perceived influence on strength should be the highest. This might indicate that the SPEC programming is not meeting the athlete's expectations on influencing strength. However, the difference between preseason (4.56 ± 0.73) and late offseason (4.26 ± 0.82) is small and shows that the athletes' perception of the strength and conditioning program's influence on strength is still positive. Finally, these results coincide with the results of the factor analysis. As athletes perceive an increase in their strength, perceived overall performance increases as well. Therefore, it would be a good idea for the SPEC personnel to continue placing heavy influence on strength characteristics throughout the academic year.

In general, athletes and coaches perceive the SPEC program to have no influence to a positive influence on speed. The trends throughout the year are slightly different than the other questions. While speed decreased from preseason to late offseason, like many of the others, the athlete's perceptions also decreased from early offseason to late offseason. Even though one of

the main goals of the training program is to improve strength in the offseason, it seems that the athletes had greater expectations out of the program in terms of improving speed. Although this result does not mean that the SPEC program needs to drastically change their programming, it indicates that the athletes believe a greater influence on speed would be beneficial. This could include changing or adding specific programming or simply educating the athletes on how this programming will improve speed. It is known that the limiting factors in sprint time are vertical forces and strength (McBride et al., 2009; Wisloff, Castagna, Helgerud, Jones, & Hoff, 2004). While the SPEC personnel know this factor and the athletes are told of strengths influence on speed, it would be beneficial to reiterate these factors throughout the year. This can be done through education or testing speed at various points.

Perceptions of power were maintained at positive from pre- to early offseason for the athletes. The coaches' perceptions did not change statistically; however, potentially meaningful change was noted from pre- to postseason. The stable nature of the perceptions from pre- to post- and early offseason are expected. In the competitive season power is a primary focus of weight training as it is a rate of performing work and can benefit from the lower training volumes that occur. The quicker the athlete can perform work, the more likely they are to perform better. Observing no statistical change in this variable from pre- to postseason is positive. However, a statistical difference is noted from pre to late offseason as with most other variables. In the offseason, exercises focusing directly on power are not necessarily the emphasis of training. While strength is an underlying component of power and thus increasing strength should increase power, this may not be evident to the athletes. A non-statistically significant but practical difference (effect size = 0.38) was also noted for the coaches from pre to postseason. Like the athletes, it is possible that the underlying mechanics of certain exercises

and their influence on power may not be evident to the coaches. Therefore, like speed, it may be beneficial to further educate the athletes and coaches on the reasons why certain exercises are performed throughout the year.

Overall, the athletes are in agreement that they understand the SPEC testing and monitoring protocols and that their coaches provided them with information regarding their results in the testing and monitoring. Statistical differences were noted for understanding of monitoring from pre to postseason. From a practical standpoint, these differences indicate a slightly decreased understanding. It is possible that the differences from pre to postseason are because the SPEC personnel did not explain the monitoring or that the outcome of the season, whether it be positive or negative, influenced their understanding. For example, if the season did not go as planned they might start to question why some of the monitoring occurs. It is up to the SPEC personnel to reassure the athlete of the rationale behind the monitoring.

Overall, the coaches were in agreement or neutral to the questions regarding performance, strength and conditioning practice and their understanding. No statistical differences were noted on coaches' understanding of SPEC's testing and monitoring, its influence on strength and conditioning and practice, or performance reflection. Similarly, there were no statistical differences concerning coaches' willingness to continue SPEC programming at another institution, their perception of the SPEC program helping their athletes perform to their greatest potential, and the return of data to athletes. Even though this is the case, it should be noted that some practical yet non-statistically significant differences occurred. More specifically, SPEC testing (pre = 4.00 ± 0.82, post = 3.20 ± 0.84, effect size = 0.43) and monitoring (pre = 4.00 ± 1.00, post = 3.20 ± 0.84, effect size = 0.39) reflecting performance and willingness to take the SPEC programming to another job (pre = 4.00 ± 1.00, post = 3.20 ± 1.10, effect size = 0.40)

decreased from pre to postseason. Finally, the mode in which the majority of data was returned was through SPEC personnel. As was stated with the skill question, the coaches' perceptions could be heavily influenced by the outcome of the season. It is important for personnel within the SPEC program to fully understand the potential outcomes of the programming so that, when it comes time to explain these to the coaches, realistic expectations are established.

The limitations within this study are that only one institution was assessed and a limited population of athletes and coaches was surveyed. These limitations can be partially justified by the fact that the SPEC program is unique to ETSU.

Conclusion and Practical Applications

Overall, it seems that the SPEC programming are accepted and viewed as positive by the athletes and coaches. While there seems to be a trend for a decrease in all the perception variables for the athletes over time, this may be because of the nature of the SPEC programming. However, it could also be because the SPEC programming is not meeting the expectations of the athletes in these variables. Further examination of this population for the next academic year could support or refute these claims. Based on the results of the SPEC programming, the program is accomplishing its performance goals (Kavanaugh, 2014; Painter et al., 2012; Sole et al., 2013). The perceptions of the athletes and coaches do differ slightly throughout the year, however, they are positive and reflect the results of the SPEC programming.

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CHAPTER 4

SUMMARY AND FUTURE INVESTIGATIONS

In summary, it can be concluded that despite a slight decline in athlete and coach perceptions, the athlete monitoring program at ETSU has resulted in an overall positive influence on their perceptions of performance. This is reflected in previous studies showing the positive results from the SPEC program (Kavanaugh, 2014; Painter et al., 2012; Sole et al., 2013). Research question 1 regards the reliability of the questionnaires. In developing the questionnaire, the intent was to derive perceptions of athletes and coaches based on factors important to personnel within the SPEC program. This included questions regarding: perceptions of overall performance, skill, aerobic endurance, anaerobic endurance, strength, speed, power, if the testing protocols reflect performance, understanding of SPEC testing, understanding of SPEC monitoring, and if data were returned to the athletes. Coaches questions included all of the above along with questions concerning SPEC testing and monitoring on the development of strength and conditioning protocols, practice, their overall satisfaction, willingness to use the SPEC methods at another job, and if it helps their athletes to perform to their greatest potential. These questionnaires were shown to be reliable and can be used to further assess the perceptions of athletes and coaches on an athlete monitoring programs ability to influence certain aspects of performance.

Research questions 2 and 3 examine the overall perceptions of the athletes and coaches. As a whole the SPEC programs influence on performance and the variables assessed were positive. This is evident in the variables where the SPEC program attempts to have the greatest influence: anaerobic endurance and aerobic endurance, strength, speed, and power. The nature

of the SPEC program is to apply scientific principles to physical preparation in sport. For some athletes and coaches this approach is unique, but it is clear that through the explanation and execution of these principles they believe that it works. In the end the overall positive perceptions indicate the validity of the SPEC programs methods.

Research questions 4 and 5 examine the athletes' perceptions of the SPEC as a potential mechanism to change performance, and coaches' perceptions on how the testing data affects training and practice. Coaches and athletes had positive perceptions for all variables in the preseason but these tended to decline across the season (coaches and athletes) and academic year (athletes). This could be due to two reasons: planned emphasis on certain training variables throughout the academic year due to SPEC programming or that the expectations of the program from coaches and athletes were higher than what the SPEC programming could achieve. In general, going into the preseason the athletes should, and did, have higher expectations of these performance variables as they have been, hopefully, optimized. Going through the competitive season is difficult to maintain the physiological aspects of performance approached by the SPEC personnel due the reduced time spent in the weight room. Therefore, the reduced responses following the season are unfortunate, yet not surprising. Once the offseason begins, teams typically spend more time in the weight room and less time practicing their sport, partly, due to regulations from the NCAA. For the SPEC program, the emphasis in this period is alterations in body composition, particularly increases in lean body mass, enhancing work capacity and gaining strength with less emphasis on power and speed. Although not assessed, it would be interesting to examine the perceptions of those teams in the preseason the following year.

Future investigations could attempt to determine the cause of the differences throughout the academic year. Secondly, it would be beneficial to obtain individual changes over time

rather than group. Obtaining perceptions from more coaches over a longer period of time will provide more evidence to support or refute the claims of this investigation. Thirdly, correlations need to be made between the perceptions of the athletes and coaches with performance data. Finally, while athlete monitoring programs currently are rare in the United States, it is possible that more will arise in the future. Therefore, athlete and coach perceptions at those institutions could be obtained.

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APPENDICES

Appendix A: IRB Approval

East Tennessee State University
Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL – Initial Exempt

April 2, 2013

Jacob Reed

RE: Validity and Reliability of an Athlete Monitoring Program: the Athlete and Coach Perspective
IRB#: c0812.8e
ORSPA#:

On **March 20, 2013**, an exempt approval was granted in accordance with 45 CFR 46. 101(b)(2). It is understood this project will be conducted in full accordance with all applicable sections of the IRB Policies. No continuing review is required. The exempt approval will be reported to the convened board on the next agenda.

- xform new protocol submission, CV, surveys- SPEC Evaluation Survey (Athlete Reliability), SPEC Evaluation Survey (Coach Reliability), SPEC Evaluation Survey (Questionnaire Validity- Faculty and Grad Students)

Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,

Full AAHRPP Accreditation

Accredited Since December 2005

Brian C. Martin, Ph.D., Vice-Chair
ETSU Campus IRB

Cc: Mauro Palmero, PhD

Appendix B: Athlete Reliability Questionnaire

SPEC EVALUATION SURVEY - **NO NAME**

Sport:	Year (freshman, sophomore...):
Gender:	I am 18 years of age or older (circle correct answer): yes no

Place an X in the box best fits your judgment of its quality.

This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. Your answers to these questions are based on the training received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be asked to complete the same questionnaire a second time within 48 hours of completing the first. After completing the first questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. Upon returning the first questionnaire, you will receive the second. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My overall performance during the competitive season, as influenced by the SPEC program, will be _____ as compared to my best.	1	2	3	4	5	0
2. My skill during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best.	1	2	3	4	5	0
3. My endurance during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best.	1	2	3	4	5	0
4. My ability to repeatedly sprint (less than 10 seconds) during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best.	1	2	3	4	5	0
5. My physical strength during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best:	1	2	3	4	5	0
6. My speed (eg: 40 yd dash) during the competitive season, as influenced by the SPEC program, will be _____ as compared to my best:	1	2	3	4	5	0
7. My ability perform powerful movements (eg: cut, kick, jump and/or hit a ball) during the competitive season, as influenced by the SPEC program and without regards to technique, will be_____ as compared to my best:	1	2	3	4	5	0
Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
8. Data obtained from SPEC testing (mid-thigh pull, jumps, body composition, etc.) reflects my on-field performance well.	1	2	3	4	5	0
9. I understand why we participate in SPEC testing (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
10. I understand why we participate in SPEC monitoring (RPE's and heart rate monitors).	1	2	3	4	5	0
11. My coach has provided me with information obtained during SPEC testing and monitoring	1	2	3	4	5	0

For administrative use only: Day 1 _____ Day 2 _____

APPROVED
By the ETSU IRB
MAR 20 2015
By _____
Chair/IRB Coordinator

Appendix C: Preseason Athlete Questionnaire

SPEC EVALUATION SURVEY – **NO NAME**

Sport:	Year (freshman, sophomore…):
Gender:	I am 18 years of age or older (circle correct answer): yes no

Pre-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the first of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My **overall performance** during the competitive season, as influenced by the SPEC program, will be _____ as compared to my best.	1	2	3	4	5	0
2. My **skills** during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best.	1	2	3	4	5	0
3. My **endurance** during the competitive season, as influenced by the SPEC program, will be_____as compared to my best.	1	2	3	4	5	0
4. My **ability to repeatedly sprint (less than 10 seconds)** during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best.	1	2	3	4	5	0
5. My **physical strength** during the competitive season, as influenced by the SPEC program, will be_____ as compared to my best:	1	2	3	4	5	0
6. My **speed (e.g.: 40 yd. dash)** during the competitive season, as influenced by the SPEC program, will be _____ as compared to my best:	1	2	3	4	5	0
7. My **ability to perform powerful movements (e.g.: cut, kick, jump and/or hit a ball)** during the competitive season, as influenced by the SPEC program and without regards to technique, will be_____ as compared to my best:	1	2	3	4	5	0
Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
8. Data obtained from SPEC testing (mid-thigh pull, jumps, body composition, etc.) reflects my on-field performance well.	1	2	3	4	5	0
9. I understand why we participate in SPEC testing (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
10. I understand why we participate in SPEC monitoring (RPE's and heart rate monitors).	1	2	3	4	5	0
11. My coach has provided me with information obtained during SPEC testing and monitoring	1	2	3	4	5	0

Appendix D: Postseason Athlete Questionnaire

SPEC EVALUATION SURVEY – **NO NAME**

Sport:	Year (freshman, sophomore…):
Gender:	I am 18 years of age or older (circle correct answer): yes no

Post-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the third of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My overall performance throughout the season, as influenced by the SPEC program, was ___ than I expected at pre-season.	1	2	3	4	5	0
2. My skill throughout the season, as influenced by the SPEC program, was _____ than I expected at pre-season.	1	2	3	4	5	0
3. My endurance throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
4. My ability to repeatedly sprint (less than 10 seconds) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
5. My physical strength throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
6. My speed (e.g. 40yd dash) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
7. My ability to perform powerful movements (e.g. cut, kick, jump and/or hit a ball) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
8. Data obtained from SPEC testing (mid-thigh pull, jumps, body composition, etc.) reflects my on-field performance well.	1	2	3	4	5	0
9. I understand why we participate in SPEC testing (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
10. I understand why we participate in SPEC monitoring (RPE's and heart rate monitors).	1	2	3	4	5	0
11. My coach provided me with information obtained during SPEC testing and monitoring throughout the season.	1	2	3	4	5	0

APPROVED
By the ETSU IRB
SEP 17 2013
By _____
Chair/IRB Coordinator

Appendix E: Early Offseason Athlete Questionnaire

SPEC EVALUATION SURVEY – **NO NAME**

Sport:	Year (freshman, sophomore…):
Gender:	I am 18 years of age or older (circle correct answer): yes no

Off-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the fourth of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My overall performance throughout the season, as influenced by the SPEC program, was ___ than I expected at pre-season.	1	2	3	4	5	0
2. My skill throughout the season, as influenced by the SPEC program, was _____ than I expected at pre-season.	1	2	3	4	5	0
3. My endurance throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
4. My ability to repeatedly sprint (less than 10 seconds) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
5. My physical strength throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
6. My speed (e.g. 40yd dash) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
7. My ability to perform powerful movements (e.g. cut, kick, jump and/or hit a ball) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
8. Data obtained from SPEC testing (mid-thigh pull, jumps, body composition, etc.) reflects my on-field performance well.	1	2	3	4	5	0
9. I understand why we participate in SPEC testing (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
10. I understand why we participate in SPEC monitoring (RPE's and heart rate monitors).	1	2	3	4	5	0
11. My coach provided me with information obtained during SPEC testing and monitoring throughout the season.	1	2	3	4	5	0

Appendix F: Late Offseason Athlete Questionnaire

SPEC EVALUATION SURVEY – **NO NAME**

Sport:	Year (freshman, sophomore…):
Gender:	I am 18 years of age or older (circle correct answer): yes no

Off-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the sixth of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My overall performance throughout the season, as influenced by the SPEC program, was ___ than I expected at pre-season.	1	2	3	4	5	0
2. My skill throughout the season, as influenced by the SPEC program, was _____ than I expected at pre-season.	1	2	3	4	5	0
3. My endurance throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
4. My ability to repeatedly sprint (less than 10 seconds) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
5. My physical strength throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
6. My speed (e.g. 40yd dash) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
7. My ability to perform powerful movements (e.g. cut, kick, jump and/or hit a ball) throughout the season, as influenced by the SPEC program, was _____ than I expected at the pre-season.	1	2	3	4	5	0
Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
8. Data obtained from SPEC testing (mid-thigh pull, jumps, body composition, etc.) reflects my on-field performance well.	1	2	3	4	5	0
9. I understand why we participate in SPEC testing (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
10. I understand why we participate in SPEC monitoring (RPE's and heart rate monitors).	1	2	3	4	5	0
11. My coach provided me with information obtained during SPEC testing and monitoring throughout the season.	1	2	3	4	5	0

Appendix G: Coach Reliability

SPEC EVALUATION SURVEY

Sport:	NO NAME
I am 18 years of age or older (circle correct answer): yes no	

For each item identified below, circle the number to the right that best fits your judgment of its quality.

This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your performance. Your answers to these questions are based on the training received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be asked to complete the same questionnaire a second time within 48 hours of completing the first. After completing the first questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. Upon returning the first questionnaire, you will receive the second. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My teams competitive performance throughout the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
2. My teams skill during the competitive season, as influenced by the SPEC program will be _____ as compared to their best.	1	2	3	4	5	0
3. My teams' endurance during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
4. My teams ability to repeatedly sprint (less than 10 seconds), as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
5. My teams' physical strength during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
6. My teams' speed (eg: 40 yd dash) during the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
7. My teams' ability perform powerful movements (eg: cut, kick, jump and/or hit a ball) without regards to technique, during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0

APPROVED
By the ETSU IRB
MAR 20 2013
By _____
Chair/IRB Coordinator

SPEC EVALUATION SURVEY

	Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	**SD**	**D**	**N**	**A**	**SA**	**NA**
1.	Data obtained from SPEC testing is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
2.	Data obtained from SPEC monitoring is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
3.	Data obtained from the SPEC testing is considered when practices are being developed.	1	2	3	4	5	0
4.	Data obtained from SPEC monitoring is considered when practices are being developed.	1	2	3	4	5	0
5.	I understand why my athletes participate in SPEC testing in the lab (mid-thigh pull, jumps, body composition, etc).	1	2	3	4	5	0
6.	I understand why my athletes participate in SPEC on field monitoring (RPE's, heart rate monitors, etc.)	1	2	3	4	5	0
7.	Data obtained from SPEC testing reflects my athletes' on-field performance well.	1	2	3	4	5	0
8.	Data obtained from SPEC monitoring reflects my athletes' on-field performance well.	1	2	3	4	5	0
9.	If I were to take a job at another university, I would want to take the SPEC program theory with me.	1	2	3	4	5	0
10.	The SPEC program helps my athletes perform to their greatest potential.	1	2	3	4	5	0
11.	I am satisfied with the SPEC program	1	2	3	4	5	0
	SPEC information obtained throughout the pre-season has been reported to the team.	1	2	3	4	5	0
12.	In response to item 12, the mode I used most often to report the SPEC data was: **A) Team meeting b) Written report c) Other coaches** **D) SPEC personnel E) In passing**						

For administrative use only: Day 1 _____ Day 2 _____

Appendix H: Preseason Coach Questionnaire

SPEC EVALUATION SURVEY

Sport:	**NO NAME**
I am 18 years of age or older (circle correct answer): yes no	

Pre-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your team's performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the first of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My teams' competitive performance throughout the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
2. My teams' skill during the competitive season, as influenced by the SPEC program will be _____ as compared to their best.	1	2	3	4	5	0
3. My teams' endurance during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
4. My teams ability to repeatedly sprint (less than 10 seconds), as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
5. My teams' physical strength during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
6. My teams' speed (e.g. 40 yd. dash) during the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
7. My teams' ability perform powerful movements (e.g. cut, kick, jump and/or hit a ball) without regards to technique, during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0

APPROVED
By the ETSU IRB
SEP 17 2013
By _____
Chair/IRB Coordinator

SPEC EVALUATION SURVEY – **NO NAME**

	Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	SD	D	N	A	SA	NA
8.	Data obtained from SPEC testing was used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
9.	Data obtained from SPEC monitoring was used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
10.	Data obtained from the SPEC testing was considered when practices were being developed.	1	2	3	4	5	0
11.	Data obtained from SPEC monitoring was considered when practices were being developed.	1	2	3	4	5	0
12.	I understand why my athletes participate in SPEC testing in the lab (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
13.	I understand why my athletes participate in SPEC on field monitoring (RPE's, heart rate monitors, etc.)	1	2	3	4	5	0
14.	Data obtained from SPEC testing reflects my athletes' on-field performance well.	1	2	3	4	5	0
15.	Data obtained from SPEC monitoring reflects my athletes' on-field performance well.	1	2	3	4	5	0
16.	If I were to take a job at another university, I would want to take the SPEC program theory with me.	1	2	3	4	5	0
17.	The SPEC program helps my athletes perform to their greatest potential.	1	2	3	4	5	0
18.	I am satisfied with the SPEC program.	1	2	3	4	5	0
19.	SPEC information obtained during the season was reported to the team.	1	2	3	4	5	0
20.	In response to item 12, the mode I used most often to report the SPEC data was: **A) Team meeting b) Written report c) Other coaches** **D) SPEC personnel E) In passing**						

Appendix I: Postseason Coach Questionnaire

SPEC EVALUATION SURVEY – **NO NAME**

Sport:	**NO NAME**
I am 18 years of age or older (circle correct answer): yes no	

Post-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your team's performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the third of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. At the end of the competitive season, my teams' competitive performance, as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0
2. At the end of the competitive season, my teams' skill during the competitive season, as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0
3. At the end of the competitive season, my teams' endurance, as influenced by the SPEC program, was_____ than I expected at the pre-season assessment.	1	2	3	4	5	0
4. At the end of the competitive season, my athletes ability to repeatedly sprint (less than 10 seconds), as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0
5. At the end of the competitive season my teams' physical strength, as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0
6. At the end of the competitive season, my teams' speed (e.g. 40 yd. dash time), as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0
7. At the end of the competitive season, my teams' ability to perform powerful movements (e.g. cut, kick, jump and/or hit a ball) without regards to technique, as influenced by the SPEC program, was _____ than I expected at the pre-season assessment.	1	2	3	4	5	0

SPEC EVALUATION SURVEY – **NO NAME**

	Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	SD	D	N	A	SA	NA
8.	Data obtained from SPEC testing was used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
9.	Data obtained from SPEC monitoring was used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
10.	Data obtained from the SPEC testing was considered when practices were being developed.	1	2	3	4	5	0
11.	Data obtained from SPEC monitoring was considered when practices were being developed.	1	2	3	4	5	0
12.	I understand why my athletes participate in SPEC testing in the lab (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
13.	I understand why my athletes participate in SPEC on field monitoring (RPE's, heart rate monitors, etc.)	1	2	3	4	5	0
14.	Data obtained from SPEC testing reflects my athletes' on-field performance well.	1	2	3	4	5	0
15.	Data obtained from SPEC monitoring reflects my athletes' on-field performance well.	1	2	3	4	5	0
16.	If I were to take a job at another university, I would want to take the SPEC program theory with me.	1	2	3	4	5	0
17.	The SPEC program helps my athletes perform to their greatest potential.	1	2	3	4	5	0
18.	I am satisfied with the SPEC program.	1	2	3	4	5	0
19.	SPEC information obtained during the season was reported to the team.	1	2	3	4	5	0
20.	In response to item 12, the mode I used most often to report the SPEC data was: **A) Team meeting b) Written report c) Other coaches** **D) SPEC personnel E) In passing**						

Appendix J: Early Offseason Coach Questionnaire

SPEC EVALUATION SURVEY

Sport:	NO NAME
I am 18 years of age or older (circle correct answer): yes no	

Off-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your team's performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the fourth of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My teams' competitive performance throughout the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
2. My teams' skill during the competitive season, as influenced by the SPEC program will be _____ as compared to their best.	1	2	3	4	5	0
3. My teams' endurance during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
4. My teams ability to repeatedly sprint (less than 10 seconds), as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
5. My teams' physical strength during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
6. My teams' speed (e.g. 40 yd. dash) during the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
7. My teams' ability perform powerful movements (e.g. cut, kick, jump and/or hit a ball) without regards to technique, during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0

APPROVED
By the ETSU IRB
SEP 17 2013
By _____
Chair/IRB Coordinator

SPEC EVALUATION SURVEY

	Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	SD	D	N	A	SA	NA
1.	Data obtained from SPEC testing is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
2.	Data obtained from SPEC monitoring is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
3.	Data obtained from the SPEC testing is considered when practices are being developed.	1	2	3	4	5	0
4.	Data obtained from SPEC monitoring is considered when practices are being developed.	1	2	3	4	5	0
5.	I understand why my athletes participate in SPEC testing in the lab (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
6.	I understand why my athletes participate in SPEC on field monitoring (RPE's, heart rate monitors, etc.)	1	2	3	4	5	0
7.	Data obtained from SPEC testing reflects my athletes' on-field performance well.	1	2	3	4	5	0
8.	Data obtained from SPEC monitoring reflects my athletes' on-field performance well.	1	2	3	4	5	0
9.	If I were to take a job at another university, I would want to take the SPEC program theory with me.	1	2	3	4	5	0
10.	The SPEC program helps my athletes perform to their greatest potential.	1	2	3	4	5	0
11.	I am satisfied with the SPEC program	1	2	3	4	5	0
12.	SPEC information obtained throughout the pre-season has been reported to the team.	1	2	3	4	5	0
13.	In response to item 12, the mode I used most often to report the SPEC data was: **A) Team meeting b) Written report c) Other coaches D) SPEC personnel E) In passing**						

Appendix K: Late Offseason Coach Questionnaire

SPEC EVALUATION SURVEY

Sport:	**NO NAME**
I am 18 years of age or older (circle correct answer): yes no	

Pre-Season Questions This is a **voluntary** research study in which you will be answering questions regarding the SPEC programs influence on your team's performance. As a part of this study you will be asked to complete a maximum of six surveys over the course of the next year. This is the sixth (last) of six surveys. Your answers to these questions are based on the training and monitoring received DIRECTLY from the SPEC program. Upon completing this questionnaire, you will be given instruction when to complete the next questionnaire. After completing each questionnaire you may contact Jacob Reed for pickup or turn it into the Mini Dome, room 160. If you have any questions please email Jacob Reed at reedjp@goldmail.etsu.edu.	Much Worse	Worse	No Different	Better	Much Better	N/A
1. My teams' competitive performance throughout the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
2. My teams' skill during the competitive season, as influenced by the SPEC program will be _____ as compared to their best.	1	2	3	4	5	0
3. My teams' endurance during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
4. My teams ability to repeatedly sprint (less than 10 seconds), as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
5. My teams' physical strength during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0
6. My teams' speed (e.g. 40 yd. dash) during the competitive season, as influenced by the SPEC program, will be _____ as compared to their best.	1	2	3	4	5	0
7. My teams' ability perform powerful movements (e.g. cut, kick, jump and/or hit a ball) without regards to technique, during the competitive season, as influenced by the SPEC program, will be_____ as compared to their best.	1	2	3	4	5	0

APPROVED
By the ETSU IRB
SEP 17 2013
By _____
Chair IRB Coordinator

SPEC EVALUATION SURVEY

	Answer the following questions using this scale: SD=Strongly Disagree, D = Disagree, N=Neutral, A= Agree, SA = Strongly Agree, NA = Not Applicable	SD	D	N	A	SA	NA
1.	Data obtained from SPEC testing is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
2.	Data obtained from SPEC monitoring is used to alter my athletes' individual strength and conditioning program.	1	2	3	4	5	0
3.	Data obtained from the SPEC testing is considered when practices are being developed.	1	2	3	4	5	0
4.	Data obtained from SPEC monitoring is considered when practices are being developed.	1	2	3	4	5	0
5.	I understand why my athletes participate in SPEC testing in the lab (mid-thigh pull, jumps, body composition, etc.).	1	2	3	4	5	0
6.	I understand why my athletes participate in SPEC on field monitoring (RPE's, heart rate monitors, etc.)	1	2	3	4	5	0
7.	Data obtained from SPEC testing reflects my athletes' on-field performance well.	1	2	3	4	5	0
8.	Data obtained from SPEC monitoring reflects my athletes' on-field performance well.	1	2	3	4	5	0
9.	If I were to take a job at another university, I would want to take the SPEC program theory with me.	1	2	3	4	5	0
10.	The SPEC program helps my athletes perform to their greatest potential.	1	2	3	4	5	0
11.	I am satisfied with the SPEC program	1	2	3	4	5	0
12.	SPEC information obtained throughout the pre-season has been reported to the team.	1	2	3	4	5	0
13.	In response to item 12, the mode I used most often to report the SPEC data was: **A) Team meeting b) Written report c) Other coaches** **D) SPEC personnel E) In passing**						

VITA

JACOB REED

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M.S Health and Sport Science, The University of Memphis, Memphis, Tennessee 2011

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Hoffmann Jr, J. J., Reed, J. P., Leiting, K., Chiang, C. Y., & Stone, M. H. (2013). Repeated Sprints, High Intensity Interval Training, Small Sided Games: Theory and Application to Field Sports. *International journal of sports physiology and performance*.

Reed, J. P., Schilling, B. K., & Murlasits, Z. (2013). Acute neuromuscular and metabolic responses to concurrent endurance and resistance exercise. *The Journal of Strength & Conditioning Research*, *27*(3), 793-801

Murlasits, Z., Reed, J., & Wells, K. (2012). Effect of resistance training frequency on physiological adaptations in older adults. *Journal of Exercise Science & Fitness*, *10*(1), 28-32.

McCarthy, C. G., Canale, R. E., Alleman Jr, R. J., Reed, J. P., & Bloomer, R. J. (2011). Biochemical and anthropometric effects of a weight loss dietary supplement in healthy Men and women. *Nutrition and Metabolic Insights*, 2012(5), 13-22.

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