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The Effects of Strengthening and Rehabilitation Programs for the Collegiate Baseball Player

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Introduction

Today, collegiate baseball players are doing everything that they can in order to excel and perform at their highest level. They are training their bodies through various strength and conditioning programs so that they can be in peak condition when game time arrives (B. Gabriel, personal communication, December 10, 2009). In order to help these athletes, researchers are continually trying to find the next best routine or technique to enhance performance and to reduce injury for all athletes. The studies performed by these researchers have led to the development of many new and effective routine methods. Despite the fact that these new techniques' and routines' efficiency are being confirmed, not all of them are becoming incorporated into current collegiate baseball programs (B. Gabriel, personal communication, December 10, 2009). Formative research at Coastal Carolina University shows that these routines are being read and then, for the most part, tossed aside (B. Gabriel, personal communication, December 10, 2009). But why are they being overlooked?

This study plans to find out the reasons behind the adoption or rejection of these routines, through the Diffusion of Innovations theory, in order to help collegiate athletes advance their careers. Preventing injuries is important in the life of an athlete, not only for their careers, but also for their personal and overall health. In order to take a closer look at these issues, this study will focus on the collegiate baseball team of Coastal Carolina University. This study will interview the baseball coaching staff of Coastal Carolina in order to discover the reasons behind the adoption or rejection of a new routine. If these new routines and techniques are being proven to be efficient in both performance enhancement and injury prevention, why are they not being adopted among

collegiate baseball teams, specifically at Coastal Carolina University? What is it about a routine that captures the attention of a collegiate coaching staff? Overall, this project looks to find out why these potentially beneficial strength and conditioning routines are not being used. Hopefully, this project will be able take the results and find ways to improve the rate of diffusion of techniques that will enhance performance and prevent injuries for collegiate baseball players.

Background

So what exactly is the sport of baseball? Baseball is defined as "a ball game played with a bat and ball between two teams of nine players; teams take turns at bat trying to score runs" (Princeton University, 2010). Like any sport, baseball requires sport-specific training programs so that the athletes may perform the tasks at hand to the best of their ability. Most collegiate baseball programs consist of pre-determined sets of various techniques that are to be executed according to a schedule. The activities to be performed are tailored to fit each player's position, while still covering a range of exercises that will target the entire body. Depending upon the season and the game schedule, these set exercises will vary day-by-day. "Without built-in flexibility on a daily, weekly, and yearly basis, even 'perfect' programs fall short of expectations" (Montes, 2001, p.285). Over the past few decades, these strength and conditioning routines have been developed with the performance and safety of the players in mind.

In the development of these programs, some routines and techniques have been adopted and are widely used among collegiate athletes, such as the use of anaerobic exercises, plyometric training, and even the use of Thera-Bands© (B. Gabriel, personal communication, December 10, 2009). In 1993, a study was performed to test the

effectiveness of using Thera-Bands© as a strengthening technique (Page, Lamberth, Abadie, Boling, Collins, & Linton, 1993). The study focused on strengthening the posterior rotator cuff muscles of collegiate baseball pitchers and found that the Thera-Bands© were effective (Page, Lamberth, Abadie, Boling, Collins, & Linton, 1993). Today, seventeen years later, Thera-Bands© are used widely in strength routines not only for sports but they are used in rehabilitation as well. "Thera-Band© resistance exercise systems are used as tools for rehabilitating and restoring muscle and joint functions and for improving conditioning, balance and building strength" (The Hygenic Corporation, 2008). They had to prove their worth by being tested and proven through various studies. Could the reason that this technique was adopted by so many be attributed to the amount of time that Thera-Bands have been on the market? Could it be due to the way in which Therabands were marketed over the past two decades? Or could the amount of research on the effectiveness of Thera-Bands© be the reasoning behind its adoption?

Just as Thera-Bands© have not always been a part of training programs, anaerobic exercises had to prove their worth as well. Aerobic exercises have been part of collegiate baseball programs for the past seventy years, but anaerobic exercises are just now becoming common (Szymanski, 2009). Coastal Carolina University's baseball team uses only anaerobic exercises instead of aerobic (B. Gabriel, personal communication, December 10, 2009). At Coastal Carolina, baseball is viewed as an entirely anaerobic sport, which is why they do not train using aerobic exercises (B. Gabriel, personal communication, December 10, 2009). The same applies situation applies to the adoption of to plyometric training as well. Plyometric exercises were not always used in training

programs, but continual research on the effects of plyometrics has solidified its use in collegiate programs (Carter, Kaminski, Douex, Knight, Richards, 2007). These exercises were not used by collegiate baseball teams as soon as they were developed and had to go through an adoption process, just like any other new routine would have to go through.

These modifications to collegiate baseball training programs did not happen overnight. Another example can be found when it comes to training for collegiate pitchers. At one time, strength training was considered detrimental to a pitcher's performance, but it is now used widely in training programs for pitchers (Kritz, Mamula, Messey, & Hobbs, 2008). After further research, the effects of strength training on the pitcher were found, on the contrary, to be beneficial to the pitcher's overall performance. This is similar to the example previously mentioned about the change in opinion on anaerobic exercises after its effects were further researched. Evolving technology over past decades has led to the incorporation of these new routines, as well as various others.

More recent advancements have not been as successful as previous advancements have been in the past. Many reasons could be attributed to this but one is that many strength and conditioning coordinators have solidified their programs over a long period of time (B. Gabriel, personal communication, December 10, 2009). The programs strength and conditioning coordinators have developed are successful and they do not feel the need to rearrange their programs with new routines (B. Gabriel, personal communication, December 10, 2009). It is difficult for a new technique to not seem like a gimmick when they have had the same program set for numerous years (B. Gabriel, personal communication, December 10, 2009). Many strength and conditioning coordinators feel that their programs work with their athletes and a new technique is

simply someone trying to sell their latest equipment or even simply their knowledge (B. Gabriel, personal communication, December 10, 2009). For example, in 2007, a study was performed to test the effectiveness of the Fauls modified passive stretching routine when related to throwing mobility in collegiate baseball players (Sauers, August, & Snyder, 2007). The goal was to determine if this routine would help to prevent soft-tissue injury to the dominant shoulder of collegiate pitchers (Sauers, August, & Snyder, 2007). The study found that the stretching routine did in fact increase both the internal and external rotational range of motion and it also decreased tightness of the posterior shoulder in the throwing arm of collegiate pitchers (Sauers, August, & Snyder, 2007). This routine has been proven by researchers to be effective and to produce the desired results, but it has yet to be adopted by the strength and conditioning program here at Coastal Carolina University (B. Gabriel, personal communication, December 10, 2009).

Some routines and techniques are seen at the opposite end of the adoption process. With further technology and newer routines being adopted, some older routines are being thrown out. For example, aerobic exercises, including long slow distance (LSD) training, were once used widely throughout collegiate training programs, and still are in a number of current programs (Szymanski, 2009). However, with the notion of baseball being an entirely anaerobic sport, these exercises are being deemed unnecessary (B. Gabriel, personal communication, December 10, 2009). But their use still may be effective for certain purposes. "LSD, or long slow distance training, is a simple form of low to moderate intensity exercise that can be performed almost anywhere," and can also be used for decreasing body fat (Szymanski, 2009, p. 42). It is also known to "help pitchers build cardiovascular endurance and relieve tenderness and stiffness after a

pitching performance" (Szymanski, 2009, p. 42). So, does it really deserve to be tossed aside?

Diffusion of Innovations Theory

The overall question then, is why certain routines and techniques become adopted while others are overlooked. One way that this can be investigated is through the Diffusion of Innovations theory. Many innovations are very difficult to spread to consumers and they tend to require a long period of time before they are circulated (Rogers, 1983). The goal of the Diffusion of Innovations theory is to determine the best way to speed up the process of diffusion (Rogers, 1983). In this case, the innovation is the strength and conditioning routine.

Taking a look at the adoption of strength and conditioning routines through the Diffusion of Innovations theory can lead to a number of questions. Why are some routines adopted while others are barely given a second glance? Do these new techniques and routines encompass the five favorable characteristics of an innovation? Could the communication method of simply publishing findings in peer-reviewed journals be the reason? Is the low level of persuasion, due to the lack of hands-on practice and a verbal push for these programs to be adopted, be the reasoning? What about the time? Could the short amount of time a collegiate coach has to train their athletes affect the decision to adopt or reject a new program? Or does the system of coaches affect which technique becomes adopted? This theory can help shed some light on the adoption or rejection of routines by explaining the process by which an innovation becomes accepted.

The Diffusions of Innovations theory can be defined and explained by breaking it down into constructs. The theory itself is made up of a few components. The first is

diffusion which is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1983, p. 5). It is specific in the way new ideas are communicated to various different groups (Rogers, 1983). In regards to strength and conditioning routines, they are diffused to coaches through various different channels such as peer-reviewed journals or clinics. This leads to another key component of the theory which is communication. "Communication is a process in which participants create and share information with one another in order to reach a mutual understanding" (Rogers, 1983, p. 5). It requires that new information be exchanged between two or more people or groups so that these groups can either unite or depart on this information (Rogers, 1983). Strength and conditioning routines are communicated by the coaches simply by talking to one another. They may talk to other members of their coaching staff or they may talk to friends that they know in the business. Therefore, in order for new ideas to be diffused among individuals and groups, it must be communicated.

Another component of the theory is the degree of uncertainty that develops because of the newness of the idea or product. People yearn to find out more about the innovation so that they can determine whether or not to accept it (Rogers, 1983). Uncertainty leads to an individual or group wanting to take a closer look at the innovation. For example, when a new strength or conditioning routine or technique is first developed, not a lot is known about it and coaches might want to investigate it before adopting it. Uncertainty also leads to a lack of predictability of information and of structure (Rogers, 1983). Therefore, too much uncertainty may lead strength and conditioning coordinators away from adopting a new routine because they do not know

how it will fit with their athletes and current program. But with the right amount of uncertainty and the proper communication, diffusion can aid in social or behavioral change (Rogers, 1983). Through this theory, new strength and conditioning routines or techniques can become a part of current collegiate programs or thrown aside.

An innovation can be diffused through a certain communication channel, investigated thoroughly due to its level of uncertainty, and then proven to have apparent advantages. However, it still may not become adopted immediately or at all. For example, the keyboard that is used throughout the nation, known as the QWERTY keyboard, is known to be difficult to use. In 1932, August Dvorak invented a new keyboard that creates better typing rhythm (Rogers, 1983). The Dvorak keyboard has been proven to be more efficient than the QWERTY and would be expected to have replaced it (Rogers, 1983). "On the contrary, after more than 40 years, almost all typists are still using the inefficient QWERTY keyboard" (Rogers, 1983, p. 10). The Dvorak keyboard has yet to be adopted by mainstream society despite its proven efficiency. Therefore, there must be other issues that influence a potential adopter.

Diffusion. The example given highlights how there is more to the theory than simply diffusion, communication and uncertainty. More specifically, the component of diffusion can be broken down into four main elements. These elements are the 1) innovation, the 2) communication of the innovation, the 3) time period it takes to be adopted or rejected, and the 4) social system into which it is being introduced (Rogers, 1983). These four elements of diffusion each affect the rate of adoption of an innovation in a different way. Strength and conditioning routines are no exception to the elements of diffusion and their adoption may depend more upon them than the other two components.

Innovation. The first element associated with diffusion is the innovation. "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1983, p. 11). The innovation does not have to be a brand new product; it just has to be new to the consumer (Rogers, 1983). The routine or technique could be one that the strength and conditioning coach has simply never heard of before, no matter how new or old it may be. It also could be something that the consumer is already aware of, but has yet to come to a conclusion on their attitude towards it (Rogers, 1983). The coaching staff may have yet to determine whether the routine or technique will benefit their athletes. There are three steps associated with innovation. They involve becoming aware of the item, being persuaded about the item, and then deciding whether or not to adopt it (Rogers, 1983). The innovation is the first step in spreading a new idea to individuals and groups.

Once someone becomes aware of an innovation, there are five characteristics that they take into account when they are deciding whether or not to adopt it. The first characteristic is the a) relative advantage the innovation will have for the consumer (Rogers, 1983). "Relative advantage is the degree to which an innovation is perceived as better than the idea that it supersedes" (Rogers, 1983, p. 15). The relative advantage of a new routine or technique may be that it replaces a routine or technique currently in the program while improving the athlete's performance and reducing risk of injury. The next characteristic of innovation is the b) compatibility, or "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1983, p. 15). It involves how well the new routine or technique will fit into current training programs and fulfill what they are trying to

achieve. Thirdly, c) "complexity is the degree to which an innovation is perceived as difficult to understand and to use" (Rogers, 1983, p. 15). It is level of difficulty that the new technique or routine poses for implementation into a current training program. Then there is the characteristic of d) trialability. This characteristic involves the level to which an innovation can be tested in a short time period (Rogers, 1983). The new routine or technique may be easily thrown away or not depending upon whether it required the purchase of new equipment. The final characteristic associated with the innovation is its e) observability. "Observability is the degree to which the results of an innovation are visible to others" (Rogers, 1983, p. 16). A strength and conditioning routine or technique will be more readily adopted if the results are visible on the field. Together, these five characteristics can help the strength and conditioning coordinator determine whether the new routine or technique will be beneficial for their athletes.

Besides the five main characteristics of an innovation, there is another factor associated with innovation that may aid in its adoption. It is the possibility of re-invention of the innovation itself. Re-invention is "defined as the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation" (Rogers, 1983, p. 16-17). It can also be defined as how far away that an individual or group uses an idea from its original concept (Eveland, Rogers, Klepper, 1977). In the case of strength and conditioning routines, this could be the modification of a routine to better fit a current program. It could be pulling bits and pieces of the new technique and adapting it to fit into certain workouts such as the warm-up. Re-invention is a factor that could aid in the swift acceptance of a new routine or technique.

Communication. The next element of diffusion is communication. This process of communication is composed of the innovation, the individual or group that has previous knowledge and or experience with the innovation, an individual or group that has not yet received information on the innovation, and the actual channel through which the communication takes place (Rogers, 1983). These forms of communication channels could be anything from mass media to interpersonal relations (Rogers, 1983). The mass media can contact a large audience but has a more difficult time in persuading whereas an interpersonal relation can more easily persuade for adoption but can only reach a few people at a time (Rogers, 1983). Strength and conditioning routines are mainly delivered to coaches and coordinators through peer-reviewed journals. This allows many coaches and strength and conditioning coordinators to have access and to read the materials, but there is a lack of hands on learning. This method may not be good for persuading coaches to implement these routines and techniques into their programs because they may not be able to see if the routine can directly relate to their athletes. There is also no other push for their use because they are simply being read and not being demonstrated by researchers or tested out by collegiate teams, other than the sample from the study. This could be a huge factor behind the lack of adoption of new strength and conditioning routines.

Time. The next element of diffusion is that of time. Time is a component in various different aspects of the Diffusion of Innovations theory. It is a factor in the innovation-decision making process when an individual or group goes through the characteristics of an innovation and ultimately decide whether or not to adopt it (Rogers, 1983). This process involves the knowledge of a new idea, the persuasion which helps to

form an attitude towards the innovation, the decision which leads to the adoption or rejection, the implementation when the innovation is put to use, and finally the confirmation where an individual or group determines if they made the right decision (Rogers, 1983). Time comes into play for collegiate baseball training programs in regards to the actual time a coach has with each athlete. Collegiate coaches only have four, sometimes five, years to train their athletes. The implementation of a program in the third or fourth year may simply not be worth the time and effort.

Time is also a factor on a broader scale when comparing the rate at which people adopt an innovation. It is used to compare those who adopt an innovation earlier than those who adopt an innovation later (Rogers, 1983). Time is one of the main sources of measurement in this theory in that those putting out the innovations want to find the best way for their product to be accepted as quickly as possible (Rogers, 1983). Coaches may be more inclined to adopt a new routine later rather than sooner due to the fact that visible results are gradual. They may need to take the extra time after a new routine is introduced in order to do some more personal research and to take note of results from others using the routine. The time it takes for an innovation to become adopted, as well as the time in an athlete's career, are crucial when it comes to adopting and implementing new routines and techniques.

Social system. The final element of diffusion is the social system. "A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 1983, p. 24). The social system consists of "individuals, informal groups, organizations, and/or subsystems" (Rogers, 1983, p. 24). A baseball team is a society on its own. The coaching system may affect the rate of

diffusion due to the hierarchy of it. One coach may be above another, and therefore have more power over adopting or rejecting a new routine or technique. The social system can affect the rate of diffusion in various different ways. The values and norms also have a strong effect on the diffusion of an innovation (Rogers, 1983). For instance, the coaching staff may not believe in certain methods of strength and conditioning or the new routine may not produce the results that they are looking for. Therefore, the coaching staff would not consider adopting one of those routines. Another factor of the society which will affect the rate of diffusion is the opinion leaders. Those whose opinions are respected and looked to in a society will have a large impact when it comes to the adoption of new practices (Rogers, 1983). A society works together through leadership, structure, and values. In order to diffuse a new idea, all three of these aspects of individual societies must be taken into account.

Methodology

To investigate the answers to these questions, a structured interview was performed with the coaching staff of the baseball team at Coastal Carolina University. The interview consisted of twenty questions based on the constructs of the Diffusion of Innovations Theory. The interview lasted between fifteen to thirty minutes, depending upon the length of answers from the interviewee, and it was completed with four of the eight members of the coaching staff of Coastal Carolina University's baseball team. The purpose of the interview was to understand the reasoning behind the lack of adoption of new routines by the baseball team. The interview was developed in order to shed light on the knowledge, attitudes, and beliefs held by the Coastal Carolina University baseball coaching staff on the adoption of strength and conditioning routines. The interview was

conducted either over the phone or in person and was tape-recorded. In addition to the tape recording, the interviewer took notes according to the interviewee's responses.

Coastal Carolina University is located in Conway, South Carolina. The university is a medium sized, liberal arts school with around eight thousand students currently enrolled. The students come from all across the nation and some are from overseas. Coastal Carolina University offers four year programs and has recently added two year programs. They also offer graduate studies in select fields. Coastal Carolina University has a diverse athletics department and is home to NCAA Division I sports that are part of the Big South Conference (Coastal Carolina Chanticleers, 2010). The baseball program at CCU began in 1975 and since then, the team has won twelve Big South Conference Titles (Coastal Carolina Chanticleers, 2010). The baseball program has produced eleven Big South Players of the Year and has also appeared in nine NCAA Regional Tournaments and one Super Regional Tournament (Coastal Carolina Chanticleers, 2010).

For the purpose of this study, the focus was on the coaching staff of Coastal Carolina University's baseball team. The coaching staff consists of eight men who range from full-time coaches, to volunteers, and there are also two trainers who manage all of the sports at CCU (Coastal Carolina Baseball, 2010). The coaching staff is made up of Head Coach Gary Gilmore, Assistant Coach Kevin Schnall, Assistant Coach Brendan Dougherty, Volunteer Assistant Coach Drew Thomas, Student Assistant Coach Jerry Oakes, Director of Operations Chris Carter, Strength and Conditioning Coordinator Brian Gabriel, and Assistant Athletic Trainer Barry Lippman (Coastal Carolina Baseball, 2010).

The coaching staff is comprised of talented individuals who each bring their own specialties to the team. Some have played in the major leagues, while others have

excelled in coaching at schools around the nation (Coastal Carolina Baseball, 2010). Coach Gilmore is in his fifteenth year as the head coach and has produced twelve consecutive winning seasons (Coastal Carolina Baseball, 2010). He has been named Regional Coach of the Year five times and Conference Coach of the Year six times (Coastal Carolina Baseball, 2010). Assistant Coach Schnall is in his tenth year on the coaching staff and specializes in coaching the catchers as well as hitting coach duties, and is also the coordinator of the recruiting team (Coastal Carolina Baseball, 2010). He was inducted into the Coastal Carolina Buddy Sasser Hall of Fame in 2005 as recognition for not only his coaching success, but also his playing success during his own collegiate career at Coastal Carolina (Coastal Carolina Baseball, 2010). Coach Gabriel has been the Head Strength and Conditioning Coordinator at Coastal Carolina University for three years and is certified by the National Strength and Conditioning Association (Coastal Carolina Baseball, 2010). Coach Lippman has been with the University for three years and is a member of the National Athletic Trainers Association (Coastal Carolina Baseball, 2010). Coach Oakes is currently a student at Coastal Carolina and had previously spent eight years in the major leagues (Coastal Carolina Baseball, 2010). Together, these coaches contribute to the success of the baseball team at Coastal Carolina University and continually improve upon their already significant achievements.

To analyze the data retrieved during the interviews, a 'constant comparison' style of analysis was used. Each question was analyzed for emerging themes and was then compared across the sample. The tapes were played back and more notes were taken from the response of each coach for every question. The notes were then analyzed for recurring or similar responses for each question. After the themes were discovered,

conclusions were able to be made about collegiate baseball's adoption of strength and conditioning routines at Coastal Carolina University.

Results

Only four of the eight members of the coaching staff were available for interviews due to the fact that the study was conducted during baseball season and also due to the actual time constraints of the study. The following data was compiled from those four interviews. The data revealed various different reasons behind the adoption or rejection of a routine.

The data showed that the Coastal Carolina University baseball team recruits a particular kind of athlete and they build their training program based on these athletes. They build their program with a purpose and keep their goals in mind when doing so. Their main goal is to increase speed and explosiveness so their training routines and techniques center on these abilities. However, they also feel that it is important to break up the monotony of a program with new routines in order to keep their athletes from getting bored.

When looking at a new routine compared to another new routine or to a current routine, the coaches take a close look at the overall benefits of it (D. Thomas, personal communication, April 20, 2010). They look to see if it will benefit all of their players or only certain groups such as pitchers (K. Schnall, personal communication, April 16, 2010). They also investigate to see if it worked, for whom it worked for, and also in what manor did it work (B. Gabriel, personal communication, April 21, 2010). The convenience of the routine comes into play when comparing two routines as well as the overall package of the routine. Some new routines are simply old routines that have been

labeled differently in order to be re-marketed to collegiate baseball teams (B. Gabriel, personal communication, April 21, 2010). The coaches will also turn to the players for their input on which routine is working best for them and which one they prefer if they are trying to decide between two routines (G. Gilmore, personal communication, April 22, 2010).

The coaches feel that the overall benefits of a routine, or the innovations relative advantage, have a large impact on whether they are adopted or not (G. Gilmore, personal communication, April 22, 2010). Injury prevention routines are seen as highly beneficial to coaches for their athletes as well as performance enhancement (B. Gabriel, personal communication, April 21, 2010). Routines with benefits such as these will be given more attention when coaches are deciding whether or not to adopt it. The variety of the routine is also a benefit of a routine that is looked at more closely (K. Schnall, personal communication, April 16, 2010). The coaches believe that baseball is a game of routine and monotony but some variety must be injected in the program otherwise the players will become bored (K. Schnall, personal communication, April 16, 2010). If a routine is new to the athletes and achieves the same outcome as another, the coaches may be more inclined to adopt it in order to re-energize their players (K. Schnall, personal communication, April 16, 2010). Time efficient techniques were not seen as important when compared to injury prevention and performance enhancement (G. Gilmore, personal communication, April 22, 2010). The coaches stated that if a routine were to be shorter than another but not produce the desired results in the athletes, it would not be used (G. Gilmore, personal communication, April 22, 2010). The longer routine would be implemented if it produced the best results regardless of how the time frame affected

the overall strength and conditioning program (G. Gilmore, personal communication, April 22, 2010). A routine may not become adopted, according to the data, if the routine is being adopted midseason (K. Schnall, personal communication, April 16, 2010). It may end up causing soreness or causing injury if the players do not know how to perform the technique properly (K. Schnall, personal communication, April 16, 2010). Another possible disadvantage stated by one of the coaches was if the routine was simply being re-packaged (B. Gabriel, personal communication, April 21, 2010). If it is a routine that has already been done in the past, but someone has put a new name on it, the coaches would not take another glance at that routine (B. Gabriel, personal communication, April 21, 2010).

When asked about compatibility, the coaches had a few reasons as to how it would affect the adoption of a routine. The coaches said that if the routine flows with their program, they will be more likely to use it, and that it also depends on the program that is set up by the Coach Gabriel and Coach Lippman (D. Thomas, personal communication, April 20, 2010). The coaching staff leaves a lot of the decisions up to them when it comes to how a new routine will flow into the overall program (G. Gilmore, personal communication, April 22, 2010). They also ask their athletes how things are working out for them (G. Gilmore, personal communication, April 22, 2010). If a routine causes the entire program to be rearranged, but is producing good results, the staff will most likely continue to work it into the program (G. Gilmore, personal communication, April 22, 2010). The coaches believe that in order to be compatible, the routines must be flexible to each individual player, if required (G. Gilmore, personal communication, April 22, 2010). Another factor that makes a new routine compatible with the program,

as shown in the data, is if the new routine is built for what the Coastal Carolina University baseball team wants out of it (B. Gilmore, personal communication, April 21, 2010). If a new routine is built for speed or explosiveness, they will be more likely to look into it and use it (B. Gabriel, personal communication, April 21, 2010).

The question of complexity brought upon apparent replies. If a routine is just that, complex, it would be harder to adopt (K. Schnall, personal communication, April 16, 2010). If it is a new routine that requires mastering a new technique, it may not be implemented because it could increase risk of injury (K. Schnall, personal communication, April 16, 2010). The data also shows that if it takes a lot of time to learn or if it must be tweaked a lot after learning, it would less likely to be adopted (D. Thomas, personal communication, April 20, 2010). If it is something easy that the athletes can pick up on quickly, is flexible to each athlete's needs, and can take it on the road with the team, it will be more likely to become adopted (D. Thomas, personal communication, April 20, 2010). The coaches also stated that if it is a routine that produces the same results as another, but in half the time, it will be more likely to be adopted (G. Gilmore, personal communication, April 22, 2010). Overall, when it comes to complexity, the coaches are concerned with the length of time to learn the routine, if it will work for their athletes and how difficult it is to master.

The coaches revealed in their responses that they test their routines in a few different ways. During the summer months, particularly in August, the coaches try multiple new routines to see where and how they can improve and what works best for their athletes (D. Thomas, personal communication, April 20, 2010). They test different routines for each position because different tasks are required for each (K. Schnall,

personal communication, April 16, 2010). As they test these routines, they ask their athletes if it is working for them or not and they also take their own notes on the results (G. Gilmore, personal communication, April 22, 2010). They want to make sure that what they are getting out of the routine is what they want (B. Gabriel, personal communication, April 21, 2010). Coach Gabriel stated that he also uses himself as the test subject in order to try new routines (B. Gabriel, personal communication, April 21, 2010). If it produces the results in himself that he is looking to apply to his athletes, then he will be more likely to adopt it (B. Gabriel, personal communication, April 21, 2010). If testing a new routine reveals that it is not working for their athletes, even if they purchased new equipment for the routine, it will be tossed aside (B. Gabriel, personal communication, April 21, 2010).

There were mixed responses when the coaches were asked about adopting a routine after seeing the visible results from another university. A few stated that yes, seeing results would urge them to either adopt or reject a routine for their own use (D. Thomas, personal communication, April 20, 2010). Those same coaches stated that they are always looking at other universities and teams to see what they are using and how it is working for them (K. Schnall, personal communication, April 16, 2010). They will try to pull bits and pieces from these universities in order to develop something that works for their athletes (K. Schnall, personal communication, April 16, 2010). Coach Gilmore stated that observable results from other teams is a great reference point to investigate new routines and discuss them with the coaches at other universities, but it ultimately comes down to what kind of athletes it is being used for and how it will affect the athletes at CCU (G. Gilmore, personal communication, April 22, 2010). Coach Gabriel, on the

other hand, feels that seeing results elsewhere is irrelevant to his program (B. Gabriel, personal communication, April 21, 2010). He stated in his response that the athletes at other schools may not be on the same level as his athletes (B. Gabriel, personal communication, April 21, 2010). Coastal Carolina recruits a certain type of athlete and those other programs that are successful elsewhere may not apply to these athletes (B. Gabriel, personal communication, April 21, 2010).

Overall when it comes to learning about new routines, the coaching staff at Coastal Carolina researches routines on their own through peer-reviewed journals. They see themselves as a pro-active staff and they are each individually researching their own specialties (K. Schnall, personal communication, April 16, 2010). They also get ideas from attending clinics, watching DVDs, talking to others that they know in the business, and listening to their athletes (D. Thomas, personal communication, April 20, 2010). If the routine catches their eye, they will do some more research on the routine and possibly apply it to a small test sample (D. Thomas, personal communication, April 20, 2010). Coach Gabriel stated that routines are proven and disproven everyday but if something continually pops up in the literature, he will take a closer look at it (B. Gabriel, personal communication, April 21, 2010). Again, they also look to their athletes to see how they feel about these new routines because the athletes' overall goal is to be the best player they can be (G. Gilmore, personal communication, April 22, 2010).

A few different aspects of a new routine catch the attention of the coaching staff at CCU. If it is a routine that they think their athletes will truly enjoy, they will be more inclined to look into it and possibly adopt it (K. Schnall, personal communication, April 16, 2010). If the routine appears that it will make their athletes and the overall team

better on the field, they will research it more (D. Thomas, personal communication, April 20, 2010). Also, if the new routine talks about increasing speed or reducing injury, it is going to stick out more to the coaching staff (B. Gabriel, personal communication, April 21, 2010). When this happens, they will continue to do research on these routines to see why and how these routines work (B. Gabriel, personal communication, April 21, 2010). A few of the coaches felt that seeing a visual demonstration, either live or digitally recorded, would make them more inclined to adopt a new program because it develops a clearer picture of what the actual routine does and how it works (D. Thomas, personal communication, April 20, 2010). Coach Gabriel, however, felt that visuals did not matter. Overall, each routine in his program has a purpose (B. Gabriel, personal communication, April 21, 2010). If he sees a new routine in a live demonstration, but the routine does not apply to his athletes or his purpose, he will reject the new routine (B. Gabriel, personal communication, April 21, 2010).

Something that would change the attitude of the coaches and persuade them to implement a new routine would be the overall results, facts and benefits of the routine (K. Schnall, personal communication, April 16, 2010). If it is something that they feel will work for their athletes and fit into their program, they will be more inclined to adopt it (D. Thomas, personal communication, April 20, 2010). Also, they listen to the feedback of their athletes (G. Gilmore, personal communication, April 22, 2010). If the athletes do not respond to the routine well, they are not going to continue to use it (G. Gilmore, personal communication, April 22, 2010). If the routine possesses what they are trying to get out of their athletes, i.e. speed and explosiveness, then they will be more open to the idea of adopting the routine (B. Gabriel, personal communication, April 21, 2010). In

order for the coaches to be persuaded into adopting a new routine, it must show beneficial results, the athletes must respond well to the routine, and it must meet the purposes of their program.

When it comes to time, the coaches were pretty consistent with each others' responses. They feel that their athletes are self-motivated so if a routine is something they can perform on their own, it will be more likely to become adopted (K. Schnall, personal communication, April 16, 2010). If it is a technique that does not take a lot of time to learn and to master, it will have a greater chance of becoming implemented (D. Thomas, personal communication, April 20, 2010). Because the time with collegiate athletes is limited, it can be hard to implement new routines at any time but if it is worth it, the coaches will still find the time to implement it (D. Thomas, personal communication, April 20, 2010). The same applies to the actual year of the athlete. Coach Schnall states that adjustments are a part of baseball and even a senior may have to make modifications to his personal routine (K. Schnall, personal communication, April 16, 2010). Coach Gabriel states that the year matters to an extent (B. Gabriel, personal communication, April 21, 2010). He would be more inclined to introduce something new to a freshman simply because he has at least three more years to work with that athlete on that particular routine (B. Gabriel, personal communication, April 21, 2010). Coach Gilmore, on the aspect of the players' feedback, states that he would be more inclined to listen to the feedback of an upper level athlete because that athlete would have more experience with their program and how it works than a freshman (G. Gilmore, personal communication, April 22, 2010).

In the past, the coaches at CCU have adopted new routines early after their development for a number of reasons. If the players were excited about a new routine, they were more inclined to adopt it (G. Gilmore, personal communication, April 22, 2010). If it dealt with injury prevention, after personal research, they would adopt that routine (B. Gabriel, personal communication, April 21, 2010). If it was a routine that was relatable and modifiable to their athletes, they would use it (D. Thomas, personal communication, April 20, 2010). Also, if it came from certain individuals that work in the business, they were more inclined to adopt it immediately because they trusted that individual (B. Gabriel, personal communication, April 21, 2010). If they did not feel that the routine was valid, or if it did not seem to apply to their athletes, they held off on adopting the routine (B. Gabriel, personal communication, April 21, 2010).

When it comes to the overall hierarchy of the coaching staff, it comes down to a team effort. Each coach researches on their own for new routines and techniques, whether they are general to the team or more specific to their particular coaching duties, such as pitching routines for Coach Thomas (K. Schnall, personal communication, April 16, 2010). The coaching staff discusses their findings with one another so that they can bounce ideas off of each other (D. Thomas, personal communication, April 20, 2010). If one staff member feels strongly about a routine, it will be given more attention in order to make a group decision on whether or not to adopt it (D. Thomas, personal communication, April 20, 2010). They open up the possibility of new routines to Coach Gabriel, to each other, and even to their players.

If a player runs across a new routine that he feels may benefit his team members, the coaches are willing to take a look into it to see if it meets their purposes (G. Gilmore,

personal communication, April 22, 2010). They work together to make group decisions on each routine that they use, but the coaches at Coastal Carolina University also have great faith in what Coach Brian Gabriel sets forth for the training program and they rely on him (K. Schnall, personal communication, April 16, 2010). They allow Coach Gabriel to do his job and do not question his decisions unless it is something they feel strongly about (D. Thomas, personal communication, April 20, 2010). Coach Schnall and Coach Thomas stated that Coach Gilmore also has some say in what is used and what is not used, simply because he is the head coach (personal communication, April 2010). Coach Gilmore stated that he allows Coach Gabriel to do his job and vice versa but the coaching staff will work as a whole to get to a final decision (G. Gilmore, personal communication, April 22, 2010). Coach Gabriel had the same response about his freedom to do his job (B. Gabriel, personal communication, April 21, 2010). Overall, each coach investigates new routines and discusses it with the rest of the staff. They do their best to make a group decision but in the end it comes down to Coach Gabriel.

According to the coaches, if a routine produces uncertainty among them, it will most likely not become adopted. If their current routines are working efficiently, then they feel there is no need use something else (K. Schnall, personal communication, April 16, 2010). Coach Gabriel feels that if you doubt something, then it must be wrong (B. Gabriel, personal communication, April 21, 2010). Overall, if they are uncertain about a routine, in order for them to pursue it further, there must be viable interest in the routine (G. Gilmore, personal communication, April 22, 2010). If there is a considerable amount of proof that it works, then they will be more likely to adopt it (G. Gilmore, personal communication, April 22, 2010). It depends upon the correlation between the athletes in

the study and the athletes at CCU. In the end, the athletes are the entire program and if something is not going to work for them, it is not going to be adopted (B. Gabriel, personal communication, April 21, 2010).

Conclusion

During the study, there were various external and internal factors that limited the research but the primary limitation to the study was time. Time was a factor in the actual time period of the study, which was during the collegiate baseball season. Due to the fact that the bulk of the research was conducted during the collegiate baseball season, not all of the Coastal Carolina University coaches were available for interviews. Only four out of the eight coaches were able to be interviewed, which could cause the data to be incomplete. Had the study been performed during the off-season, the results may be different. Also, the answers to the interview questions may be skewed themselves due to the fact that not all of the questions may have been fully understood before being answered. Another factor that may have affected the outcome of the data is the fact that three of the four interviews were conducted over the phone. The answers may have been different or more in depth had they all been conducted in the same manor.

How does this data factor in to whether or not a new routine is adopted into the baseball program at Coastal Carolina University? After analyzing the data, a few themes were continually present throughout the data. The coaching staff trusts Coach Gabriel to do his job and to do his job well. Everything eventually goes through him and if it does not meet his standards, it is not going to be adopted. Another theme lies inside of Coach Gabriel's influence on the adoption of new routines. The decision ultimately comes down to him in one way or another, and in order for the routine to be adoptable to Coach

Gabriel, it must be beneficial to his athletes for speed, explosiveness, and injury prevention. A third theme is the weight that the coaches place upon the feedback of their athletes when making a decision about a new routine. If something is not working out for their players, regardless of its proven benefits, it is not going to be adopted.

So, how do the five favorable characteristics of a routine affect its adoption? The relative advantage, or potential benefits, of the routine have the greatest impact on the adoption of a new routine. A routine that is proven to reduce injury is definitely going to merit more in depth research to see if it truly works and if it will work for their athletes. A routine that is proven to increase flexibility in pitchers will not be used if it ultimately decreases their velocity. The routine may be proven to work for flexibility, but if it negatively affects another aspect of a pitcher's performance, it is not beneficial to the athlete overall. If the routine is proven to reduce the risk of injury, if it produces results without affecting another aspect of training, and if it is beneficial to the team overall, it is more likely to be adopted.

Regarding compatibility and complexity, these characteristics tend to matter only to a certain degree. If the routine is complex or not very compatible with a current program but it produces the best results for what the CCU coaching staff is looking for, they will find a way to implement it into their program, no matter the costs. But if a routine is too complex or incompatible to master and is not going to produce the desired results, the coaching staff will toss it. The same logic applies to the characteristic of trialability. If it appears worthy after their personal research, they will test the routine among their players and maintain its use if it is producing the desired results. When it comes to observability, things begin to differ. Coaches will pull ideas from other

universities if something appears to be working for that team, and they will tweak it so that it applies to the athletes at Coastal Carolina. However, that does not mean it will be approved by Coach Gabriel or Coach Gilmore. The potential routine ultimately must possess the results that the coaching staff is looking to produce.

The communication method of the routines does not have a large impact on the adoption of new routines. Most routines are delivered to coaches through peer-reviewed journals or clinics. Many coaches feel that visual aids help in the persuasion of adopting a new routine but Coach Gabriel feels that those videos do not apply to his athletes. The coaches are persuaded to incorporate a new routine through the players' feedback, the appropriateness to their program purposes, and the benefits the routine will have on their athletes.

The element of time had the least amount of impact on the adoption of a new routine. If the routine is producing the desired results but is taking ten more minutes to perform during the athletes' daily routine, it is going to be used. Also, the coaching staff agrees, to an extent, that a new routine can be implemented to an athlete in any year. The difference will depend upon how easy it will be to teach athletes at different levels the same routine. But ultimately, if the routine is going to be beneficial, it will be incorporated to the athletes, regardless of their year.

The social system of the coaching staff is the bottom line for the adoption of a new routine. Each coach does his own research and brings it to the table for open discussion, but the final decision depends upon Coach Gabriel. The coaching staff trusts him and allows him to perform his job without overstepping him. If the routine does not meet Coach Gabriel's requirements, it is not going to receive a second glance, unless

another coach or athlete feels very strongly about it. The coaching staff works together as a team but still relies on Coach Gabriel when it comes time for the final decision.

The uncertainty about a routine tends to shift the coaches away from its adoption. They feel that if they have doubt in a new routine, then they should not implement it. Unless the routine shows great benefits, it will not be researched any further and it will not be adopted into the program.

When it comes to Coach Gabriel, he is given a lot of room to work with the team and creating the best program he possibly can for the collegiate baseball athletes at Coastal Carolina. His philosophy revolves around his overall purpose of his program. Different schools recruit different players according to what their collegiate baseball program hopes to achieve. At CCU, the overall goal is to develop speed and explosiveness. Therefore, Coach Gabriel is not going to adopt routines that do not aid in achieving these results. He also firmly believes in how well he knows his athletes. A routine may work well for another university, but it does not mean he can apply it to his own athletes because they are different than the athletes at other schools. He also believes that the routines he already has in place work and serve their purpose. He believes that many new routines that are developed are simply old methods wrapped in new packages. If he already has a routine in place that is efficient, he is not going to waste his own time or the players' time with routines that could decrease their performance in one way or ultimately increase the chance of injury. Coach Gabriel is highly respected among the coaching staff and he is willing to listen and discuss new ideas with the athletes and the coaching staff. However, if the routine does not meet the overall purpose of his program, it is not going to be adopted.

Throughout the data, it is apparent that the actual athletes have large impact on whether or not a routine becomes adopted. As Coach Gabriel believes, not all routines that are proven on certain athletes can be applied to the athletes at CCU. The members of the Coastal Carolina baseball team are self-motivated individuals who strive to excel in their positions because they want to be the best and advance in their careers. Therefore, they are honest with their coaches about what is working for them and what is not so that they are able to train using the most beneficial routines. If the current program becomes monotonous, they will tell their coaches. They also inform their coaches, when deciding between two routines, which one works better, even if it is the routine that takes a longer period of time or is harder to perform. The coaching staff of the CCU baseball allows their players to voice their opinions because that is how they, as coaches, will truly know whether a routine is working properly.

In the end, the main reasons why strength and conditioning routines become adopted by the Coastal Carolina University baseball team depend upon the relative advantage of the routine, the social system of the coaching staff, and the communication between the players and the coaching staff.

This case study of the Coastal Carolina University baseball coaching staff has created a lot of room for further research into the topic. Coach Gabriel has a large impact on the adoption of new strength and conditioning routines because he is the strength and conditioning coordinator and is highly respected. Therefore, conducting this research with strength and conditioning coordinators at other schools in the Big South Conference may shed light on whether it is the same at other schools or if it is just the way Coach Gabriel runs his program. Conducting this research further with other Big South

Conference coaching staffs as a whole may also reveal similarities or differences between how routines become adopted. Another way to study this topic further would be to develop a survey based on the data retrieved in this study and implement that survey to the athletes of the Coastal Carolina University's baseball team. Because their feedback plays a key role in the adoption of a routine, a survey based on the knowledge, attitudes and beliefs about certain routines may shed light on how a new routine may become adopted. This study has opened the door to many possible avenues for future research. The continued research may, in time, be able to help the collegiate athletes train using the most beneficial routines and help them to advance their performance and careers as well as keeping them on the field by reducing the risk of injury.

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