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The Impact of Aerobic and Anaerobic Conditioning on Small College Soccer Programs

A Thesis Presented In Partial Fulfillment of the

Requirement for the Degree Master's of Education

In Graduate School at Marietta College

By

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Marietta College

2005

Master's Examination Committee

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Abstract

This study examines the relationship between fitness and success in the sport of soccer at the Division III level. A questionnaire was devised to assess the importance of conditioning and what types of aerobic and anaerobic fitness was necessary or a combination of both of these elements incorporated in the program. The questionnaire was broken into two parts and was distributed to soccer teams and their coaches. This sample includes 25 Division III soccer coaches in Ohio and Pennsylvania. The research shows that the conditioning performed during preseason reflects the success of the program. Future studies will be needed to analysis the correlation between conditioning in preseason and the success of a program.

DEDICATION

Dedicated in honor of my parents, Jesus Mario Gonzalez and Maria Luisa Gonzalez.

ACKNOWLEDGMENTS

The success of my completion of this thesis requirement is due to the support many friends, family, and coworkers. They all have my respect and admiration. I thank my Department Head, Dr. Sue DeWine, for the direction she has taken this program.

Bill Bauer without his guidance and leadership I would not be finishing this program. I also express gratitude to Tim Catalano for helping me correct my thesis project, because of his sacrifice at the end of the semester, I would have not finished my thesis project.

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CHAPTER I
INTRODUCTION

This study examines the correlation between fitness and success in the sport of soccer at the Division III level. This study gathered research in the field of soccer conditioning for young coaches. Readers will be able to learn from other coaches programs and their successes or failures. This paper is a detailed study on the effects of fitness on soccer programs in the state of Ohio and Pennsylvania. Also reports the differences in conditioning between aerobic and anaerobic, and the coach's preferences and attitude toward conditioning during preseason.

The components of this study show the tendencies of English style coaches that like a very quick style of play, which in turn encourage a higher level of fitness coming into soccer season. By obtaining this data, the researcher was able to determine a correlation between fitness and success, and factors that contribute to each coach's philosophy, players' belief in the program, and the program of exercise.

Background

This researcher has an extensive background in both soccer and fitness. The researcher graduated from the University of Houston with a degree in Fitness and Human Performance, and has participated in all phases of soccer from amateur to professional. The undisputed origins of the birth of soccer are associated in England. The aspect of fitness and conditioning for soccer has been ongoing since the early 19th century.

With all the research today on fitness and conditioning in sports, there is much more to be discovered. Using the data collected from the coaches and players, the researcher analyzed the relationships between the variables of fitness and success in programs.

Statement of the Problem

The purpose of this study was to determine what type of training works best for preparing a Men's Division III soccer team for season. This information can be utilized to help new coaches determine what type of fitness his/her team will need to compete at high levels.

Scope of Study

Different types of teams and coaches were selected from the state of Ohio and Pennsylvania for this study (N=25). For example, the teams are different in style from the point Ohio teams are very physical and fit, while Pennsylvania teams are less physical and more technical teams. The questionnaire was sent out to all the participants selected. The coaches were responsible for delivering and gathering this survey. The teams were selected based the differences in areas and conferences. The researcher believes that every coach has a different mentality about fitness and its effects on the game.

Basic Assumptions

The following were basic assumption of the study:

1. The programs listed in Ohio and Pennsylvania for this study were current and accurate.
2. The questionnaire was answered honestly and accurately.
3. The distribution of the survey through the coaching staff by email and mail, was more effective and less time consuming.

4. The questionnaire found a relationship between the coach, and his philosophy on conditioning.
5. The different style programs were assessed and evaluated by the questionnaire.

Limitations of Study

The following were possible limitations affecting the results of the study:

1. The study was very specific to the states of Ohio and Pennsylvania, so the results can not be generalized nationally.
2. This study was gender specific and did not represent the female athletes. The results may not have significance or the same effects on women's programs.
3. The questionnaire was given in a voluntary manner, and resulted in less than 100% participation from the sample group.

Definition of Terms

1. NSCA- National Strength and Conditioning Association
2. NCSAA- National Coaching Soccer Association of America
3. OAC- Ohio Athletic Conference
4. NCAC- North Coast Athletic Conference
5. Aerobic- (with oxygen) Refers to an activity in which demands of the muscle for oxygen are met by the circulation of oxygen in the blood.
6. Anaerobic- the process of energy production in which the oxygen, supply cannot keep pace with tissue demands.

Significance of the Study

The study was only specific to the Division III programs in Ohio and Pennsylvania. The researcher acknowledges that there has not been much research done on this topic. This study showed that the relationship between coaches and players determines the effectiveness of the program. The study shows the different types of coaching styles and their commitment to fitness. The significance of the study was to show what methods work best and which do not work at all. This study shows how coaches use different methods for an effective preseason workout.

CHAPTER 2

LITERATURE REVIEW

In the articles that follow, the authors state that conditioning has different elements that contribute to the overall success of the athlete. The authors point out that the exercises done need to be specific to the sport. The sport of soccer combines the overall short term muscle groups for sprints which are anaerobic and long term muscle groups for longer distance running, which are aerobic. The combination of both styles of conditioning is essential to success in the game of soccer. The research provided an overall understanding of the different conditioning programs.

The other important factor that is being considered in the research is the term "specificity of training". The term is defined as "Training adaptations specific to the nature of the exercise stimulus" (The Team Physician, 2004). In soccer, the position played determines the type and amount of running needed to condition the athlete.

Dalleck and Kraltz (2001) introduced the term short term intensity, and long term intensity. "During vigorous exercise bouts such as sprinting, short burst interval training, and high intensity resistance exercise, continued muscle contractions is dependent on the formation of adenosine triphoshate (ATP) for demanding energy needs"(Dalleck & Kraltz, 2001). Anaerobic is the type of training a forward or a defender would benefit from. Long term intensity is defined differently. This type of training does not use ATP, but the reserves in the body as carbohydrates, fats, and proteins. This type of training is used by midfielders and defenders. This article does not state the fact that forwards, midfielders, and defenders all need a different type of training for their specific positions; however, they would still need aerobic and anaerobic training.

The objective of the article, The Team Physician and Conditioning of Athletes for Sports: A Consensus Statement (2001), is for the team physician to keep the team in shape year round with different types of goals. The physician's goal was set up in four different types of training year round. These steps are general conditioning principles, pre-season issues, in-season issues, and off-season issues.

The section of general conditioning further divided into specificity, progressive overload, prioritization, and periodization. Specificity means "athletes are subject to specific demands in the performance of sport. Therefore, performance is dependant upon the individual athlete's ability to meet the demands" (The Physician, 2001, 2). The progressive overload trains the individual to his/her level and increases the intensity and volume to accomplish goals the individual or physician has set. Prioritization is to place the most important objectives of training needed to succeed in the sport. Periodization training is broken down into macrocylces, mesocycles, and microcycles. Macrocycles are broken down as a year round for training program set for the season. Mesocycles are the type of trainings that involve 3 to 6 months, and Microcylces involve a week. (The Physician, 2001).

The physician instructed and educated during pre-season. His players understood the cycles listed in the section above. In addition to the cycles, the players set realistic goals to strive for during the season. In this cycle, the team physician monitors and tracks all progress.

During the In-Season phase not much is changed from the Pre-Season phase, except the intensity of workload. The difference in the program is that the pre-season is aimed at improving conditioning, and in-season maintains the condition of the athlete and

helps prevents injury. Sustaining aerobic conditioning is crucial for preventing and monitoring injuries during the season. The physician's role was to help maintain the level of play for the athletes. The physician was in charge of the injury risks that come with conditioning during the season and the modification of the program (The Physician, 2001).

Off-Season issues that the physician faced determined if the work done before and during the season were successful. The physician's role was to coordinate the following cycle of off-season training. "The physician implemented an active recovery phase followed by the proper, periodization, sport-specific off-season conditioning program" (The Physician, 2001).

The *Physician* article expressed the types of cycles a player will need in order to stay in shape year round and the role of the physician. However, with college athletics the coach has to incorporate strength and conditioning with the other roles he plays throughout the year. In addition, this research can help coaches understand what type of training their players will need to compete at their highest level.

David Lamb's, (1995) Basic Principle for Improving Sport Performance, states that sports performance is improved by reducing drag. "Drag is a special case of resistance in which friction of air or water around a competitor retards forward motion" (Lamb, 1995). This article discussed all types of sports and how the reduction of drag helped increase positive results. Examples of different types of drag are air, water, and body reduction. The reduction of drag on the body surface helped athletes become faster due to less friction on the athlete.

Drag is used in sports like cycling, skating, soccer, football, sprinting and swimming. The effects of drag can contribute to winning and losing in sports like swimming and racing. Some of the ways athletes helped to reduce their drag are; shaving their head, shaving body hair, and buying aerodynamic equipment. In soccer, the effects of having your head and body hair are not relevant to the sport. An interesting technique used to decrease drag in soccer is reducing body composition and misdirection. The effects of reducing body weight are very important; a smaller person will have less drag. Misdirection is a technique used by players to help reduce drag while passing their opponents with as little contact as possible. This type of drag is very important in the sport of soccer. The research shows the incorporation of effects of drag into the conditioning portion of the paper. One importance of drag in many sports can create advantages that will cause an athlete to win or lose an event. The techniques of drag are relevant to cycling, car racing, and other high end sports. The article does state reducing drag can improve athletic performance, but in the sport of soccer drag does not contribute as much as it does to other sports.

Carroll and Mendoza (1998), studied youth soccer in the United States and the requirements for training in the sport. The authors showed that the different elements of soccer are; conditioning, repetitive training, intensity of training, flexibility, and a period of endurance training. Types of injury can be avoided by reducing the number of consecutive high intensity training sessions that cause danger to muscle tissues. Proper hydration and nutrition help with the aspect of injury prevention. (Carroll and Mendoza, 1998).

The authors believed there are six different elements to the game of soccer. First, the athlete should be motivated to participate in the game of soccer by showing some sort of enjoyment. The second characteristic is the physical fitness side, the ability to play 90 minutes and have the essentials of endurance, flexibility, body composition and respiratory endurance. Third, discipline is important to the coach and fellow teammates to know what type of commitment one can expect from an athlete. Fourth, the athlete needs to learn new skills or have the ability to understand instruction or take criticism. Fifth, athlete must be team players and cooperate other with teammates toward common goals. Lastly, the player needs to read the game and anticipate helping the team obtain advantages over the opposing team (Carroll and Mendoza, 1998).

Carroll and Mendoza (1998) state in the next section involved the structure and specific needs to run an intense practice session. An important aspect of a training session is aerobic and anaerobic conditioning. The team should meet for training sessions 2 to 3 times weekly. The warm-up involves stretching after running to loosen up the muscles. The cool down sequence involves stretching after practice to help maintain flexibility and prevent injury according to the article. The training session should have enough time to condition the players to peak, and this might take 2 to 3 weeks of training. Soccer is a sport that incorporates aerobic and anaerobic endurance. Aerobic endurance is a huge part of the sport of soccer because it is in every facet of the game. Anaerobic endurance involves short intense intervals of

work without the body using oxygen; a great example is sprinting (Carroll & Mendoza, 1998).

The proper level of fluids is crucial to maintain a high performance level. Improper levels of fluid intake can cause problems like kidney damage, muscle and tissue damage, and heat exhaustion. This study lacked more depth in the sections of aerobic and anaerobic training as a soccer player (Carroll & Mendoza, 1998).

Carey and Richardson, (2003), stated the purpose of the study was to assess the measurement of aerobic and anaerobic power in 60 seconds or 75 seconds. The following tests were performed: 1) 60 max maximal exertion test; 2) standard incremental workload VO2 max test; 3) Wingate anaerobic power test; 4) VO 2 max measured during 60 second maximal exertion test; and 5) VO2 max measured during 75 second maximal exertion test. Body fat percentage test was performed on all participants.

The information gathered from the 60 second and 75 second measurement showed maximal exertion of aerobic and anaerobic capacity. The researchers used different types of tests to come to a conclusion about the aerobic and anaerobic power. The types of equipment used to measure aerobic and anaerobic power were stair climber, running, and cycling. The article tried to conclude that one of these tests can be eliminated. The researchers tried to save time and costs by eliminating one of the maximal exertion tests (Carey&Richardson, 2003).

The researchers in the study, used 15 participants (13 men and 2 females) and the standard age was 32 years. All subjects accomplished 2 of 3 of the following criteria: “1) attainment of 90% of maximal heart rate: 2) plateau of oxygen consumption; 3) respiratory quotient greater than 1.1 maximal oxygen consumption was determined to be the highest VO2 attained during a 30 second interval” (Carey & Richardson, 2003). The conclusion of this study did not reach 100% maximal exertion or VO2 max. The article

showed that in a 30 second interval the subject reached 87% of their VO2 max. The research also showed that after 30 seconds a plateau is reached and VO2 max does not increase within the 60 second or 75 second tests. The research could not conclude a true VO2 max by any measure. The understanding that a future study can find a true VO2 max in a similar test or a different type of test will help bring a conclusion to this study.

The Gatorade Sports Science Institute study (1999) is about assisting athletes survive two-a-day practices. The major points before an athlete arrives at training camp are those general requirements: 1) Prior to training camp, athletes should be encouraged to undergo strength training and conditioning to help them begin to acclimate to weather conditions; 2) Require adequate fluid and mineral replacement during practice and at meals because sweat rates in athletes such as football players can result in rates of fluid turnover in excess of 10 quarts each day; 3) Adequate rest, proper nutrition, and ample ingestion of fluid before, during, and after training because the risk of musculoskeletal injuries, heat illness, and upper-respiratory tract infections during training camp. These are the same requirements we have for preseason soccer before coming into training camp (Helping Athletes Survive Two-A-Day Practice, 1999).

Types of stress placed on athletes in training camp can be crucial to preventing injuries and health ailments. The participant is warned to present himself in peak performance. With the new rules placed on players with elongated seasons, the player's recovery time in the off-season becomes shorter and they become less motivated to train to peak performance. This caused stress on the coach who then needs to improve his player coming into season. The coach was willing to push the participants to the next level and possibly cause injury to some of the participants. This is a very crucial point in

the season in understanding players' commitment and willingness to compete for a starting position (Helping Athletes Survive Two-A-Day Practices, 1999).

Maintaining energy and lean mass during pre-season training is very important to the athletes and the coaching staff. During two-a-day practices an athlete can lose up to 10 to 12 lbs of fluid in one day. The two key points in this section are to hydrate and consume meals that are easily digestible. Participants kept a high level of energy with the prevention of fluid loss and weight loss (Helping Athletes Survive Two-A-Day Practices, 1999).

Preparation for two-a-day practices is crucial to improving aerobic and anaerobic conditioning. This preparation includes setting goals during the off-season to reach a peak coming into the weeks of pre-season. With proper conditioning the two-a-day practice will enhance a team coming into season instead of injure players that are not fit. There was less risk of injury with proper training, rehydration, and calorie intake (Helping Athletes Survive Two-A-Day Practices, 1999).

This research showed the information collected can relate to any sport, not just football. The methods of preparing for the upcoming season were closely related to athletics in general. The missing element to this topic was lack of examples of conditioning sessions. The aspect of aerobic and anaerobic conditioning was missing from the paper, but it does help one to understand the principles, and what work is needed to participate in two-a-day practices (Helping Athletes Survive Two-A-Day Practices, 1999).

Kravitz Len's study (2004), Aerobic vs. Resistance Training Is This the Battle of the Fitness Titans, showed the strength and weakness to aerobic conditioning and

resistance training in topics as bone mineral density, resting heart rate, and cardio respiratory fitness. In this section the researcher can conclude that resistance training and cardiorespiratory fitness would improve all factors that contribute to higher aerobic and anaerobic conditioning.

In the forming of bone mineral deposits both aerobic conditioning and resistance training play a key role. "It appeared that increases of bone mineral density are site-specific greater increases in bone tissue in upper arm of resistance training subjects as compared to runners, although both groups showed similar changes in the lower body"(Kravitz, 2004). Both types of exercises helped increase bone mineral density, but resistance training helped develop upper body bone mineral density.

Resistance training showed some improvement in resting heart rate, however aerobic conditioning showed a higher improvement. In resistance training the cardiovascular improvements were very minimal increase. "Long term adaptations observed in research show from no change up to an 11% decrease in heart rate. This may be explained by the difference in intensity, volume, rest between sets, use of small vs. large muscle mass, duration of study, and fitness level of the subjects"(Kravitz, 2004). A huge improvement was shown by a decrease of 5 to 25 bpm in resting heart rest. "The lowered resting heart rate from exercise training is proposed to be due to the increase in parasympathetic nervous activity with a minor decrease in sympathetic nervous discharge" (Kravitz, 2004). A lower heart rate increased the chances of a soccer player's ability to work at lower rate before exhaustion.

In cardio respitory fitness tests the effects of aerobic conditioning and resistance training help to understand results. The results for the testing showed an increase in the

aerobic conditioning portion. "A minimum of 20 minutes of aerobic exercise at 50% or more of the individual's VO2 max , on three of more days per week, will produce a 10% to 20% increase in VO2max in most sedentary persons"(Kravitz, 2004). The sport of soccer emphasizes the major importance of conditioning and improving conditioning. Resistance training showed almost no effect on improving a persons' VO2max, though it did help reduce body fat and create lean muscle. This article showed a combination of both resistance training and aerobic conditioning that can help a person reach his or her goal at a faster rate (Kravitz, 2004).

Kravitz's, paper focused on three different important parts to the aspect of soccer. The three sections are split up as follows; what attributes are important in soccer, what type of developmental and conditioning are important in soccer, and what are the most common physical and psychological hazards of soccer. These three factors are very important in soccer and conditioning for the sport. The research collected assisted players learn what factors are needed to contribute to a strength and conditioning program year round (Maximizing Performance and Minimizing Injuries in Soccer, 2000).

The attributes that coaches are looking for in a soccer player are technical speed and tactical speed. The ability to bring a ball down under pressure and make the perfect pass is important to the sport of soccer. Improving players by increasing their level of play is done by challenging players in training sessions. "We train for endurance through progressively longer sessions of high-pressure, small sided games (Maximizing Performance and Minimizing Injuries in Soccer, 2000). This challenge of training in higher intensity and less rest will incorporate the aerobic level for soccer.

The development of a year round conditioning program has been the norm between all these articles. "A high-volume, low intensity training begins at the start of the training year; the volume is gradually reduced and the intensity increased as the season approaches." The incorporation of a supplemental conditioning program should be incorporated with resistance training. The activity that is overseen in all programs is flexibility; without this, all the training in the world would make you the complete players (Maximizing and Minimizing Injuries in Soccer, 2000).

Preventing soccer related injuries was very important to the development of all phases of wellness. "The most common physical injuries are strains, sprains, and contusions affecting the legs, ankles, knees, and hips" (Maximizing and Minimizing Injuries in Soccer, 2000,). The incorporation of quality strength and conditioning program can help improve chances of injury prevention. This is a great article on the aspects of soccer and the qualities needed to become a great soccer player. The author lacked a detailed conditioning program for soccer players and coaches to use and incorporate into their own program (Maximizing and Minimizing Injuries in Soccer, 2000).

Edward's and Macfadyen's study was written to investigate the aerobic and anaerobic conditioning in the training status among soccer players. Participants were subjected to two types of tests: 1) followed 5 weeks of low level activity at the end of the off-season, 2) immediately following conclusion of the competitive season (AT) anaerobic threshold was assessed (Edward & Macfadyen, 2003). The study showed no improvement of VO2 max for either of the two tests. The difference between VO2 max and AT is that VO2max determines the amount of oxygen consumed in one exercise

bout. Aerobic threshold determines the amount of exercise that the body can handle to exhaustion (Edward & Macfadyen, 2003).

The conclusion of this study indicated that both tests were inaccurate in assessing the amount of maximum aerobic power or anaerobic threshold (AT). Anaerobic thresehold means an athlete can work at a high work rate than an athlete with a lower anaerobic thresehold. The research showed that the higher athletes (AT) with higher AT would cover more ground, but there is no conclusion to this idea. VO2max is the best method of determining aerobic capacity, but there is no indication of being very accurate. Researchers needed to develop better methods of monitoring aerobic capacity (Edward & Macfadyen, 2003).

Abrantes, Macas, and Sampaio's study consisted of sprint test performance across different age groups. The study consisted of 146 Portuguese players divided into groups of: 1st national division, 2nd national division, 1st regional division, sub 16 group, sub14 group, and sub12 group. The participants were subjected to seven sprints and were monitored on seven different sprint runs. The results were used to assess talent detection, fitness evaluation, and planning (Abrantes, Macas, and Sampaio, 2004).

The researcher's results showed the 1st group being faster than the 2nd group. "Anaerobic trainability increased with age (from childhood to adulthood with greater increases during puberty)" (Abrantes & Macas & Sampaio, 2004). The player's higher performance has to do with age and level of muscular development. The level of fatigue resulted in all groups between the 5th and 7th sprinting routine. The knowledge of these tests helped future coaches understand sprinting concepts. This information works well

with other research on aerobic and anaerobic conditioning. The researcher helped bring together all phases of conditioning (Abrantes & Macas & Sampaio, 2004).

In conclusion, aerobic and anaerobic conditioning is only one factor that contributes to the overall success of a soccer player. The research collected shows that conditioning can contribute to success in improving conditioning in a soccer player. Combining a year-round conditioning program with an aerobic conditioning program can help develop a proper training program. The information helped coaches understand the level of commitment needed from their players.

CHAPTER 3

METHODOLOGY

Subjects

The subjects were coaches from Division III schools in Ohio and Pennsylvania. The coaches' names are not important in the study since all the participants were subjected to aerobic and anaerobic conditioning philosophy. The coaches responses are kept confidential from their players, and other coaches that participated in this study. The height and weight was also indeterminate because subjects were not tested on beginning and ending weight, but by the ability to increase aerobic capacity. The age of the subjects varied between 17 years of age to 22 years old. There were some exceptions with older transfer students or international students that might be older due to time off from college.

The researcher used convenience sampling for the reason that participants were only available to the study because of the relationships with the coaches. The coaches could participate in the study or not participate by not returning the questionnaire. The sample size was 25 schools. Questionnaires were kept confidential from everybody but the researcher.

The information was not individualized, but evaluated on a school basis. The information was analyzed descriptively by scores of 40 yard sprints, 100meters, 400 meters, and 2 mile times. These times were evaluated by the mean and standard deviation of the team results. The pretest and posttest analyzed the data collected on the SPSS program. The information proves the hypothesis is accurate or proves false.

Design

The study design was Quanatative-qualatative and used the SPSS program to analyze the data. The researcher used a t-test to analyze the data on the SPSS system. The research showed the dependant variable in the study was the winning percentage of the program in Division III soccer in Ohio and Pennsylvania. The independent variable in the study was the aerobic and anaerobic conditioning. The independent variable determined the outcome of winning success. The outcome in the study explained how winning percentage will increase with increased aerobic and anaerobic conditioning. The factors that influenced the outcome were the aerobic and anaerobic conditioning. Team camaraderie is one of the factors that you can't measure but can determine outcome in a game.

Instrumentation

The researcher used a pre-test and post-test to determine the aerobic and anaerobic improvements in the sample population. The participants did not know the studies' independent and dependant variables so the internal validity was accurate. The interaction of setting was similar in all the Division III soccer colleges that participated in the study. The coaches had a questionnaire to establish the same factors that the participants answered on a Likert scale to analyze the data collected. The information collected helped establish the validity of the hypothesis.

Procedures

The questionnaire was mailed to the coaching staffs of 25 different Division III soccer programs in Ohio and Pennsylvania. The coaching staff answered the

questionnaire. The questionnaire contained information that helped determine the philosophy of the coaches and player's during pre-season conditioning. The players did not have a questionnaire to answer. The coaches' responses helped develop information that validated the hypothesis. The coaching staff finished a questionnaire on a Likert scale survey and short answer and essay questions. The additional information the researcher needed were tests times on the 40m, 100m, 400m and 2 mile times. The times recorded on the start of pre-season recorded at the end of pre-season. The essay questionnaire helped develop a picture to determine the validity of the hypothesis.

The subjects were put through a 2 week pre-season workout to help raise the Aerobic and Anaerobic capacity by some of the tests the study used. The subjects were under a year-round weight training program, and regular practice sessions helped improve conditioning.

Some of the problems that the researcher encountered were accurate and honest responses from coaches about their programs and players. Since this study was confidential, results and accuracy were measured from the honesty of the coaches that participated. The confidentiality avoided hurting players' feelings by implying responses from coaches that were negative. The coaching staff might not have responded honestly to the conditioning programs due to lack of an established program. The limitations of the coaching knowledge of aerobic and anaerobic conditioning might limit the return of the survey. The modifications made were to let coaching staff know that the names of the programs were confidential and would not be disclosed beyond only the researcher. There is a list of participating programs that were mailed questionnaires, but will not disclose who returned questionnaires.

The research proved that players highly conditioned by their coaches have a higher success than players that are not highly conditioned in preseason. The understanding of success was tested by the program's success rate by wins and losses. The relationship between the coaching staff and players were closer with programs that have a higher success rate. The camaraderie of players on the team was also reflected at higher level in winning programs. The dependant variable was the winning percentage of the college program in Ohio and Pennsylvania. The independent variable was the Aerobic and Anaerobic conditioning program. The level of conditioning reflected the winning percentage of the program. The information collected on conditioning prove the hypothesis due to the fact there were only a certain amount of variables for the quantitative study. The qualitative study helped narrow the gaps to paint a true picture of the information collected from the study. The mixed method helped prove the hypothesis and reject the null.

Analysis

The statistical technique used was inferential statistics. The study proved the researcher's belief in that conditioning plays an important role in winning programs. The null was that conditioning plays no role in winning percentage in Division III soccer programs in Ohio and Pennsylvania. The test was analyzed by the SPSS system using a T-Test. The information analyzed by the SPSS program.

CHAPTER IV

ANALYSIS OF DATA

This section summarized the information collected from the questionnaires returned from the coaches. The questionnaires were dispersed by mail and via email. The coaches that participated in the study returned the questionnaire by mail and email. The information was collected and input into the SPSS program. The questionnaire was divided into three sections. The first section had open-ended questions on times for preseason and end of preseason in the 40 meters, 100 meters, 400 meters, and 2mile times. Second, these questions were answered on a 1 to 5 point Likert scale. Third three open-ended questions about aerobic and anaerobic conditioning and the coach's feeling and philosophy were included.

Rate of Return

The researcher used Division III schools in the state of Ohio and Pennsylvania. The total number of schools involved in the study where twenty-five men's soccer programs. The researcher received 12 questionnaires back from the coaches. The participation from the chosen schools in the study was nearly 50%, but the researcher felt was enough to confirm the ideas of the study. The schools that participated in the study all have about the same size and number of students. Most Division III schools in Ohio and Pennsylvania are private institutions. The amount of students range from 1,000 to 3,500 students and price range from mid 20's to mid 30's per year. This is one of the main reasons why the researcher settled on the regions of Ohio and Pennsylvania.

Pre-Season Results

Pre-Season 40 m Results

40m Time	Frequency	Percent	Valid Percent	Cumulative %
Valid N/A	10	83.3%	83.3%	83.3%
4.90sec	1	8.3%	8.3%	91.7%
6.00sec	1	8.3%	8.3%	100.0%
Total	12	100.0%	100.0%	

Player's preseason time in the 40m? The researcher showed that most of the coaches do not rely on pre-season 40 times. The research found 10 out of 12 (83.3%) believe 40 m results did need to be timed. The two coaches that believe in timing their players (16.6% of the study) had times that consist of 4.9 sec and 6.0 sec. The research stated that most Division III coaches in the state of Ohio and Pennsylvania do not time their players in the 40 meter during pre-season.

Pre-Season 100m Results

100m Time		Frequency	Percent	Valid Percent	Cumulative %
Valid	N/A	11	91.7%	91.7%	91.7%
	14.00sec	1	8.3%	8.3%	100.0%
	Total	12	100.0%	100.0%	

Players preseason time in the 100m? The research found that during pre-season results from the 100m are very similar to the 40 m. Results found that 91.7% of head soccer coaches believe that the 100 m times are not relevant to pre-season training. The one coach that did time expects his players to maintain under a 14 sec time. The research showed that times in the 100 meters were not important to the coaches.

Pre-Season 400m Results

400m Time		Frequency	Percent	Valid Percent	Cumulative %
Valid	N/A	11	91.7%	91.7%	91.7%
	53.00sec	1	8.3%	8.3%	100.0%
	Total	12	100.0%	100.0%	

Player's preseason time in the 400m? The research stated that (91.7%) of the coaches did not believe in timing the 400 m run. The coach that did believe to keep a time during pre-season for a 400m run was under 53.00. As the research shows, only 8.3% of the groups out of 100% believed to time their players during this period. The information provided shows that coaches did not time their players during pre-season.

Pre-Season 2 Mile Results

2 Mile Time	Frequency	Percent	Valid Percent	Cumulative %
Valid N/A	4	33.3%	33.3%	33.3%
12:00sec	5	41.7%	41.7%	75.0%
12:30sec	2	16.7%	16.7%	91.7%
14:00sec	1	8.3%	8.3%	100.0%
Total	12	100.0%	100.0%	

Player's preseason time in the 2 mile? The results in the pre-season 2 mile times became more relevant to the coaches than previous pre-season tests. The research showed that with the two mile, 66.7% of the coaches placed significant importance during this period of pre-season. According to the research, 33.3% of the coaches found timing their players was not important factor during pre-season. Five of 12 coaches, 41.7%, believed their players need to run under 12 minutes for 2 miles, while 2 coaches, 16.7%, stated that their players need to complete 2 miles less than 12 minutes and 30 seconds. The last coach declared his players need to complete their two mile run in under 14:00 minutes. This 2 mile pre-season test ranks the highest among all pre-season tests with 66.7% of the coaches believing in timing this run.

End of Pre-Season Tests

End of Pre-Season 40 m Tests

40m Time		Frequency	Percent	Valid Percent	Cumulative %
Valid	N/A	11	91.7%	91.7%	91.7%
	5.00	1	8.3%	8.3%	100.0%
	Total	1	100.0%	100.0%	

Player's end of preseason time in the 40? The results for the end of pre-season 40 m tests where as expected. The coaches that did not believe in testing in pre-season did not test at the end of pre-season. One coach believed in testing, which made up 5% of the study showed. He expected his players to complete the 40m in under 5.0secs. The research stated that 95% of the coaches did not believe 40m times where pertinent to aerobic and anaerobic conditioning. The difference between pre-season and end of pre-season was one coach believed in timing in pre-season, but did not time end of pre-season. The other coach dropped his time during pre-season from 6.0sec to 5.0sec. The study showed that the majority of coaches do not time during this period.

End of Pre-Season 100 m Tests

100m Time	Frequency	Percent	Valid Percent	Cumulative %
Valid N/A	11	91.7%	91.7%	91.7%
12.00	1	8.3%	8.3%	100.0%
Total	12	100.0%	100.0%	

Player's end of preseason time in the 100m? The information returned from the coaches shows no change in percentages from pre-season to the end of pre-season data. Ninety-one point seven percent of coaches consider testing for the 100 m at the end of pre-season not applicable to preparing athletes toward the season. The researcher found that one coach did find timing his players. The data collected showed that pre-season time for the 100 m was 14 sec during pre-season, but during the end of pre-season time changed to under 12:00 sec. The importance of timing the 100m during the end of pre-season did not change from pre-season with 91.7% not believing in timing their athletes.

Pre-Season 400m Results

400m Time		Frequency	Percent	Valid Percent	Cumulative %
Valid	N/A	11	91.7%	91.7%	91.7%
	48.00	1	8.3%	8.3%	100.0%
	Total	12	100.0%	100.0%	

Player's end of preseason time in the 400m? The researcher found that the 400m data show that the majority of the coaches (91.7%) do not believe in timing their athletes. Eight point three percent, which is 1 coach out of 12, believed his athletes should finish the 400 m under 48.00secs. This coach timed during pre-season at 53 sec, but at the end of pre-season his athletes need to complete the 400m less than 48.00 sec. The data continued to show that coaches do not place very much significance in timing during or after pre-season.

End of Pre-Season 2 Mile Time

2 Mile Time	Frequency	Percent	Valid Percent	Cumulative %
Valid N/A	6	50%	50%	50%
12.00	6	50%	50%	100%
Total	12	100%	100%	

Player's end of preseason time in the 2 mile? This test showed a difference in a coach's decision between timing during pre-season and end of pre-season. The research showed that during pre-season the percentages ranged from 33.3% N/A, 41.7% under 12min, 16.7% under 12.30min, and 8.3% under 14:00. End of Season data showed 50% of coaches did not test their athletes under time, and 50% did test their athletes. The researcher found that during pre-season 8 coaches believed timing their athletes was important to only 6 coaches at the end of pre-season. Two coaches did not test their athletes in the 2 mile end of pre-season. The only significant find was that the 50% of coaches expect their players to run two miles in under 12min.

Likert Scale Questions (1 – 5) 1= strongly agree to 5=strongly disagree

Question 1: **I conditioned my team for a competitive season?**

Question 1	Frequency	Percent	Valid Percent	Cumulative %
Valid 1(SA)	8	66.7%	66.7%	66.7%
2 (Agree)	4	33.3%	33.3%	100%
Total	12	100%	100%	

The question asked to the coaches was, **I conditioned my team for a competitive season?** The Likert Scale used was a five point scale rating 1 (strongly agree) to 5(Strongly disagree). The researcher discovered that 66.7% of the coaches strongly agreed they condition their athletes during pre-season for a competitive season, while 33.3% of coaches agreed that they condition their athletes for a competitive season. The questionnaire returned showed all college coaches that participated agree they provide enough aerobic and anaerobic for their athletes to have a competitive season.

Question 2: **My pre-season running program helped them perform at maximal level?**

Likert Scale Questions (1 – 5) 1= strongly agree to 5=strongly disagree

Question 2	Frequency	Percent	Valid Percent	Cumulative %
Valid 1 (SA)	3	25%	25%	25%
2 (Agree)	9	75%	75%	100%
Total	12	100%	100%	

Question 2 stated; **Pre-season running program helped them perform at maximal level?** The researcher discovered that 3 of 12 coaches (25%) answered strongly agree, and felt their aerobic and anaerobic program helped their players perform at maximal level during season, while the majority of the coaches (75%) just agreed that their athletes were prepared for maximal level. The information did without a doubt show 100% of coaches agreed that their aerobic and anaerobic programs helped players reach their maximal level.

Question 3: **Did you think sprints helped your team get into better shape in pre-season?**

Likert Scale Questions (1 – 5) 1= strongly agree to 5=strongly disagree

Question 3	Frequency	Percent	Valid Percent	Cumulative %
Valid 1(SA)	5	41.7%	41.7%	41.7%
2 (Agree)	5	41.7%	41.7%	83.3%
3	1	8.3%	8.3%	91.7%
4	1	8.3%	8.3%	100.0%
Total	12	100.0%	100%	

In question three the coaches were asked; **Did you think sprints helped your team get into better shape in pre-season?** The information collected shows that 83.3% of the coaches strongly agreed or agreed to the belief that sprints did help their team reach a higher level with anaerobic activity. The researcher discovered that 16.6% of the coaches were neutral or disagreed that sprints helped during pre-season training to contribute to anaerobic improvement. The research did have the bulk of the coaches at 83.3% trusting that sprints contributed to anaerobic success.

Question 4; **Did you think Long Distance running helped your team get into better shape in pre-season?**

Likert Scale Questions (1 – 5) 1= strongly agree to 5=strongly disagree

Question 4	Frequency	Percent	Valid Percent	Cumulative %
Valid 1 (SA)	4	33.3%	33.3%	33.3%
2 (Agree)	7	58.3%	58.3%	91.7%
4	1	8.3%	8.3%	100%
Total	12	100%	100%	

This question analyzed the benefits to long distance running in pre-season or aerobic benefits. The research proved that 33.3% of the coaches strongly agreed that distance running did improve their aerobic capacity during pre-season leading to the season, while the majority, 58.3%, agreed that distance running during pre-season helped build a foundation for improving aerobic capacity. The researcher did find 8.3% of the coaches disagreed that distance running helped improve aerobic conditioning during pre-season. This section showed that 91.7% of the coaches in Division III schools in Ohio and Pennsylvania accepted that distance running improves aerobic capacity during pre-season.

Question 5; **A combination of sprints and long distance helped your team get into better shape?**

Likert Scale Questions (1 – 5) 1= strongly agree to 5=strongly disagree

Question 5	Frequency	Percent	Valid Percent	Cumulative %
Valid 1 (SA)	11	91.7%	91.7%	91.7%
4	1	8.3%	8.3%	100%
Total	12	100%	100%	

This question asked if a combination of sprints and long distance running helped contribute to fitness improvement. The research continued to prove the majority of coaches (91.7%) strongly agreed that combination of sprints and long distance helped develop a higher fitness level for their athletes. The minority of coaches (8.3%) felt that this combination of running did not help improve his player's aerobic and anaerobic conditioning. The researcher showed the majority of coaches believed that aerobic and anaerobic improvement can occur during pre-season with sprints and long distance running.

The five major themes that arouse out of the qualitative data collected were Interval training, limited time to train, comparable fitness level, fitness level not being a major factor in games, and fitness level being an important factor. The first major theme in the data collected seemed to be coaches thought interval training as an important factor in improving aerobic and anaerobic conditioning. Second, coaches felt that pre-season was not enough time to train their players. The third theme seemed to be comparable fitness level to other teams in their conference. The fourth theme revealed fitness level

not being as important as other factors such as skill. The fifth theme seemed to be fitness level was an important factor in the last ten minutes in support of winning games.

Theme One: Interval Training for Preseason

Coach 1: Again – June and July conditioning forms an aerobic and anaerobic base. He uses both aerobic and anaerobic. We also perform incline and decline sprinting.

Coach 2: Aerobic – short and long distance running. Strength work as light lifting

Coach 3: Interval training, teaching the body to recover from anaerobic exercise as quick as possible.

Coach 4: A combination of both types of distance. Soccer is a game played at all different types of speeds, so the training needs to reflect this.

Coach 5: We do strictly interval training over the summer and throughout the season. We run nothing over 400 meters.

Coach 6: I believe the best way for my players to be in shape is to try and play in 2 competitive games a week along with sprints and long distance workouts as well.

Coach 7: We do a mix of sprints, distance and flexibility exercises. I think a balance is critical.

Coach 8: Depends how they come into camp. Would prefer to do a combination of long and short (more short than long, unless out of shape).

Coach 9: We do not attempt to peak our athletes that early in the year. Distance, middle distance, and medium sprints is the training I prefer going into opening weekend.

Coach 10: I set up my preseason training with three different components in mind. Strength, Endurance, and Speed and I believe that a combination of these components is essential in achieving optimal fitness.

Coach 11: Interval training helps improve our athletes conditioning coming into preseason.

Coach 12: Interval training at the college level, with only two weeks to prepare for the first game, there is no time for "conditioning" – it is up to each player to arrive in shape.

Theme 2: Coaches believe preseason is not enough time to prepare their athletes.

Coach 1: Running must be done in June, July, and August. Preseason is too short to make any major improvements.

Coach 5: We do strictly interval training over the summer and throughout the season. We run nothing over 400 meters.

Coach 8: Depends how they come into camp would prefer to do a combination of long and short (more short tan long, unless out of shape).

Coach 11: Interval training helps improve conditioning due to limited time we have (2 weeks).

Coach 12: Interval training at the college level, with only two weeks to prepare for the first game, there is no time for "conditioning" – it is up to each player to arrive in shape.

Theme 3: How does your team compare fitness level to other teams?

Coach 1: yes

Coach 2: probably – not worse

Coach 3: No and Yes it matters what type of athlete he or she is. If players want to get maximum conditioning it has to come from them, I have a number of players that will give me there all and then some, but then I have player that have that mystery injury during conditioning, but the next day its Gone?

Coach 4: We work hard at fitness, but it can always be better. I do not think that it is higher.

Coach 5: Yes

Coach 6; The past couple of years yes. This year no! This past season I didn't think the boys came in fit enough and we struggled in the beginning of the season with injuries and losses.

Coach 7: Generally, I do not believe fitness is a negative issue for my teams. That is, we don't seem to tire.

Coach 8: No, I feel that we are average, no less, no more.

Coach 9: About the same

Coach 10: I think we are probably more fit than most of our competitors, but I do believe that we could be fit.

Coach 11: Average to most teams.

Theme 4: Fitness not being an important factor in soccer preparation.

Coach 4: Not necessarily, I believe that poor technique will cost us games more than fitness.

Coach 8: It will have an impact, but talent and discipline team work is more valuable.

Coach 9: It will help in some, but the difference at this level is psychological.

Coach 11: I personally believe this makes no difference in winning or losing.

Coach 12: I do not think it will make us lose close games, or win close games. I think it is important factor (especially with the college substitution rules).

Fifth theme: Fitness level seems to be an important factor in the last ten minutes in support of winning games.

Coach 1: yes

Coach 2: an important factor

Coach 3: Yes, if you look at scoring stats in most games the majority of games winning goals are scored in the last 10 to 12 minutes.

Coach 5: yes

Coach 6: Absolutely! Mistakes are made at the end of a half or game due to fatigue. The team that makes the least amount of mistakes will usually win.

Coach 7: Absolutely

Coach 10: Yes

These are the 5 themes that were found in the research collected from the participants of the study.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This section of the paper includes the following: Summary, Conclusion; and Recommendations for future studies.

Summary

This study was designed to analyze the impact of aerobic and anaerobic conditioning in Division III soccer programs in Ohio and Pennsylvania. The study examined 25 coaches on their philosophy of conditioning. The study helps young coaches to understand how aerobic and anaerobic conditioning plays an important factor to creating winning programs. This study reports the differences in preference on the importance of aerobic and anaerobic conditioning. The data collected was analyzed in a Quantitative/qualitative method. The questionnaire was mailed to coaches March 9, 2005. The questionnaire was designed into 4 sections. Part 1 was the designed times for pre-season in the 40m, 100m, 400m, and 2 mile times. Part 2 examined the times for end of pre-season in the 40m, 100m, 400m, and 2 mile times. Part 3 included 5 questions which one could answer from 1 to 5 on a Likert scale, (1 being strongly agree, while 5 being strongly disagree). Part 3 was open ended qualitative questions for the coach to answer about his team and level of conditioning. The questionnaires were returned by mail or by email. The researcher received almost 50% of the questionnaires back from the group of coaches that were selected. The data collected from the questionnaire will be analyzed thru a statistical program SPSS.

Conclusion

The researcher collected the data from the questionnaire, and analyzed the information into four segments. The four segments makes up information that will help prove my hypothesis.

Most of the coaches believed that preseason timing was not an important factor in soccer. In the 40m segment 91.7% answered not applicable to preseason training. The remainder of the group 16.6% believed in their teams being able to run a 40m runs in 4.9 sec or 6.0sec. The 40m does help improve anaerobic conditioning, but only if done in an interval training program with 40m repeats. The 100m preseason segment was very similar in that 91.7% of coaches think timing during preseason training is not pertinent to soccer conditioning. The one coach 8.3% wanted his players to complete their 100m in 14 sec. The 100m run works both aerobic and anaerobic in which after 4 to 5 seconds the anaerobic stops working and aerobic conditioning starts at about 10 to 12 seconds. The 100m run does help improve both aerobic and anaerobic conditioning, but only if put in a balanced running program. The 400m has the similar results as the other groups with 91.7% believing that timing is not valid to conditioning. The reality is that 66.7% of the coaches do believe in timing the 2 mile run. The majority of the coaches expected their player to finish between 12minutes to 14 minutes. The 2 mile run works to improve aerobic conditioning. Soccer is a sport which is difficult because most of the running done is not one specific type aerobic or anaerobic so the coaching staff needs to work on a program that develops both. The information for preseason does show a trend that

coaches do not time their players, but do expect their players to endure both aerobic and anaerobic running during preseason.

The following 3 runs have the same conclusion. Coaches believed that timing the 40m, 100m, and 400m all believed timing for these runs relevant to improving conditioning. Ninety-one point seven percent of coaches do not participate in running these types of sprints for time, but do believe this type of work do improve conditioning for season. Improving conditioning will help teams work more effectively on the field to produce better results.

During the end of preseason the only timed run that coaches do test for is the 2 mile. The two mile plays a crucial role in soccer games. The average player runs about 2 to 3 miles in one game. Fifty percent of the coaches believe their athletes should complete the 2 mile in less than 12 minutes. Completing the two mile in less than 12 minutes does not mean you can play on a Division III soccer team. It does mean that your conditioning level is high enough to endure 12 minutes of anaerobic work at a high level. Soccer game is 90 minutes that revolves around short sprinting and long sprints. The translation means high levels of aerobic and anaerobic work. The other 50% of coaches that do not time their player on the two mile at the end of preseason still improve their conditioning to work for 90 minutes in a game, but just do not measure their athletes on time.

Coaches do believe they condition their athletes for a competitive season. One hundred percent agreed to this question. The game of soccer main ingredient is running. If your team does not have the ability to work for ninety minutes at a high work load; therefore, a better conditioned team will have a higher chance of winning. The factor that

is evident in the questionnaires that conditioning plays a crucial role in the development of preseason workout for coaches. Improving conditioning can lead to better conditioned athletes, more victories, and an improved program. This does not mean that teams that are conditioned better will win 100% of the time, but the researcher believes that their chances do improve to win the closer games.

In the qualitatively study the major themes that transpired became **interval training**, not **enough time with athletes**, and **conditioning** does play an important role. The majority of the coaching staffs believe that interval training is the best method of improving conditioning in two weeks. “Interval training at the college level, with only two weeks to prepare for the first game, there is no time for conditioning – it is up to each player to arrive in shape. This leads the researcher into the next theme which is time limitations. Two weeks is not enough time to train your players tactically, technically and physically. The role of preseason is to improve upon work done in the summer by the athlete. No amount of interval training can help a coach with a team that is not in shape coming into preseason. A strong weight training program needs to be year round to help develop stronger muscles which mean stronger, faster, and more disciplined athletes. When asked if conditioning plays a crucial role in the last ten minutes of the game the majority believed conditioning plays an important role in winning and losing games. Most goals are scored in the last ten minutes of first and second half of the game. This does not mean conditioning is the only factor, but an important one. If your athletes are tired at the end of games players ability physically, mentally and emotional will decrease and chances of the other team scoring within the last ten minutes of each half. The teams that believe in a high level of fitness do have a higher success rate than less conditioned

teams. This all comes down to win and losses in college athletics. Conditioning does play a crucial role in the success in your program. Winning and success will improve relationships of the players and coaches. The information collected showed that coaches do believe in improving aerobic and anaerobic conditioning throughout preseason. Timing is not a factor that is important to preseason training for Division III soccer coaches in Ohio and Pennsylvania. The importance is that conditioning plays an important role in soccer. The fit team will be more successful physically, mentally, and emotionally. These factors will help to build a successful program.

Further Implications

1. Future studies should include the players of these programs and compare results from coaches and players.
2. Future study can be replicated using female athletes in NCAA Division III schools.
3. The Future studies should show what types of training they do during the off-season and summer program.
4. Future studies should include coaching philosophies of coaches and winning percentages.

This thesis attempts to serve as a teaching guide to the successes and failures of different programs. It focuses on the balance between aerobic and anaerobic conditioning. This thesis answered questions about how coaches and players feel about fitness. Do the players feel like they are adequately prepared for the upcoming season? How well do the

coaches feel that they have prepared their team before the season? What can be done better if these issues are not being met?

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