MARIETTA COLLEGE’S STRENGTH TRAINING PROGRAM

A Thesis
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The Degree Masters of Education in the
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DEDICATION

I would like to dedicate this paper to my family and to my fiancée. They have all been very supportive in everything I have done. They have allowed me to pursue a profession that I am very passionate about. Thank you for all your time and patience you have given me.
ACKNOWLEDGEMENT

Again, I want to thank my family and Mary who have been very supportive through all my experiences at Marietta College. It has been a long journey.

I would also like to thank my co-workers, Erik Pedersen and Denny Ziegler for all of their help in assisting me with the strength program at Marietta College. It is a thankless job that reaps great benefits in the end!

Lastly, I want to thank the rest of the coaching staff at Marietta College who have allowed me to be part of the program at Marietta College. They have been patient with me and supportive of getting a Masters Degree from Marietta College.
ABSTRACT

Coaches are always looking for ways to improve their athletes’ performance and win more games. Possibly the greatest factor to a team is the strength and conditioning aspect of gaining an upper hand on the opponent. It two years ago, in 2005, the Marietta College Football team switched from the “wave cycle” to *The Stiggens Computerized Strength Training Program*. This study was designed to investigate the differences in strength gains throughout the process of weight lifting between the two programs. In this research, the researcher looked at several outcomes. Data from squat, bench and power clean will be used to determine the value of the two programs. The statistical tests that were administered were paired-sample *t* tests and a descriptive analysis. The researcher has analyzed the change in score for the power clean, squat and bench press exercises examining the changes from the “wave cycle” to *The Stiggens Computerized Strength Training Program*. The two programs have been evaluated by comparing the strength increased for the athletes in the two programs.
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Chapter I

Introduction

In 1835 Marietta College received its charter from the State of Ohio to offer college-level degrees. The U.S. News and World Report (2006) consistently ranks the school among one of the best liberal arts colleges in the midwest. However, it wasn’t until 1892 that Marietta College established its first football team, one that went 1-1-1; its win was a forfeit against Ohio Athletic Conference (OAC) foe Otterbein (May, 2006).

Marietta College’s football team has been known for some great achievements. It took the team just three years to earn its first winning season. The Pioneers remained strong in the early years as MC recorded twenty-three winning seasons in the first thirty-two years. Also, in that time, on November 29, 1906, Petey Gilman threw a 52-yard pass; this is one of the first, if not the first, official forward passes in football history. It came in a 12-2 defeat of Ohio University.

Unfortunately, it is the unpleasant streaks for which Marietta College is now recognized. It was in 1981 that the nation’s longest losing streak began with a 24-0 loss to Capital to open the season. Marietta College went 0-9 in 1981, ’82, and ’83 then opened the 1984 season 0-7. The Pioneers did not end the streak until a 3-3 tie against Ohio Northern in the eighth week of the season in 1984 on homecoming and picked up their first win in nearly four years with a 15-12 victory against Wooster. With losing being a common theme for the Pioneers, it was in 1983, Sports Illustrated visited the MC campus and did a story on Marietta College Football entitled “A Losing Proposition” (May, 2006).
Marietta College competes in the OAC, which is home to the best D-III football in the nation. OAC teams hold ownership to eight of the last thirteen National Championships (OAC, 2006). Currently, three out of the ten teams in the conference are ranked in the top 25 in the nation (d3football.com, 2006).

So how does Marietta College start to compete nationally? A school that is 393-503-36 with an overall winning percentage of .421 (1892-2005) must find a competitive edge (May, 2006). Marietta College’s competitive edge exists in their rigorous off-season programs. Strength and conditioning is an important asset to the football team at Marietta College. Workouts are intentionally made arduous for a number of reasons. One, it creates mental toughness for the players. Mental toughness is a necessity, because it can be the difference in a win or a loss. When times get tough, athletes must know how to go hard and how to stay disciplined. Also, when engaging in workouts, the players will push one another. They make sure their teammates are achieving to their fullest, and if they are not, they must encourage and motivate one another. This is just one way to develop great team camaraderie.

Coaches are always looking for ways to improve their athletes’ performance and win more games. Possibly the greatest factor to all teams are the strength and conditioning aspect of gaining an upper hand on the opponents. With strength training being made a necessity in competitive athletics, last year with an innovative approach and an open mind, the Marietta College football staff held a meeting and examined how to better the strength and conditioning program. As a result, the football program purchased and is currently utilizing The Stiggens Computerized Strength Training Program. The decision to take this risk was based on the prior experiences some of the coaches on the
staff had had at previous colleges and universities. The former strength-training program that was utilized was a “wave cycle.” This program was thought out and implemented by the strength and conditioning coach using no computer, other than to store data.

The off-season is the most effective time to develop or improve strength, explosive power and speed. Dr. Chuck Stiggens, former head strength and conditioning coach at Brigham Young University (BYU) and renowned authority in his field, recently developed a simple and easy to use computerized strength-training program. It is individualized and tailored to meet the needs of each and every athlete on a personal level. It is based upon the latest research in the field of strength training and incorporates concepts such as periodization and cycling (Stiggens, 1994).

*The Stiggens Computerized Strength Training Program* is used at Mountview High School, located in Mesa, Arizona by Coach Jerry Wheeler. Wheeler, the strength and conditioning coach at the high school has been able to produce even greater results from an already prominent high school football program by implementing the program. After starting the computer program the football team has gone from winning 86 percent of its games to a whopping 93 percent (Finley, 2004).

*The Stiggens Computerized Strength Training Program* is designed to maximize strength and power. This is done by incorporating the concept of periodization (cycling), which involves the manipulation of three key variables throughout the athletes training cycle.

(1) volume – sets x repetitions
(2) load – training weight or poundage
(3) intensity – referring to a heavy, medium, or light training session determined by the volume and/or load utilized in the strength training routine (Stiggens, 1994)
Periodization allows for a variety of training, peaking for competition and working on technique and strength. Periodization maximizes the effect of Selye’s general adaptation syndrome (GAS) theory, which argues that the effect of exercise is fatigue, followed by adaptation (Marshall, 2006).

The researcher examined and analyzed the Marietta College football team’s weight lifting numbers and make a conclusion on which program produced the better results for the athletes.

Statement of Problem

Past research showed continuous improvement in the athlete’s gains in strength. However, with trying to get the best possible program available for the players, did the football coaching staff make the correct decision in going away from the “wave cycle” to implement a whole new program in The Stiggens Computerized Strength Training Program?

In weight training, no program or cycle has been proven to be the best. Upon the analysis of the data to compare the two programs, it will be revealed if the decision was a successful one.

Purpose of Study

Quantitative research will reveal the truth in whether the Marietta College football staff made the correct judgment in changing from the “wave cycle” to periodization. The research will create an opportunity to reveal new thoughts and ideas to improve and be that much better to compete nationally with teams who are of a bigger and more muscular build than that of the athletes at Marietta College. As a staff, it is the job of the coaches, to figure out a way to win with who we have playing for us.
Null Hypothesis and Alternative Hypothesis

Null Hypothesis

It is hypothesized by the researcher that there is no significant difference between The Stiggens Computerized Strength Training Program and the “wave cycle” programs as measured by increased strength in the exercises of power clean, bench press and back squat.

Alternative

It is hypothesized by the researcher that there is a significant difference between The Stiggens Computerized Strength Training Program and the “wave cycle” program as measured by increased strength in the exercises of power clean, bench press and back squat. The researcher’s initial thought is the correct decision was made to change. Based on the improvements in strength, the researcher has seen without any in depth study, the feeling is positive. However, biased opinion will be out ruled when the numbers and overall team strength are analyzed and the two programs are compared using quantitative research.
Definition of Terms

Strength and Conditioning – Weight, speed, and endurance training to enable an athlete to compete at maximum performance.

OAC – Ohio Athletic Conference

Core Lift – An exercise that utilizes a large muscle group

Power Clean – An Olympic lift in which the athlete lifts starts with the knees bent and then utilizes an explosive jump up with the bar enabling them to get the bar up to their chest and shooting their elbows through

Bench Press – Exercise in which the lifter lies down on a bench, and with their arms extended, brings the bar down to their chest and back up to the starting position

Back Squat – Lift in which the lifter has the bar lying across the back of their shoulders and they bend at the knees to a 90° angle and back up to the upright position

The Stiggens Computerized Strength Training Program – A computerized strength program developed by Dr. Chuck Stiggens in which periodization is utilized

Wave Cycle – Weight lifting cycle developed using percentages and fluctuating sets

Periodization – A more specific workout used to increase strength and power.

Carbohydrate – Any of a group of organic compounds that includes sugars, starches, cellulososes, and gums and serves as a major energy source in the diet

Protein – Are essential in the diet for the growth and repair of tissue and can be obtained from foods such as meat, fish, eggs and milk

Cardiovascular – involving the heart and blood vessels
Limitations of Study

Delimitations to this study are the researcher and strength coach serve as one. Also, it is thought that the correct decision was made in the purchase of *The Stiggen's Computerized Strength Training Program*. It will be the data analysis that reveals the truth to eliminate any biased opinion.

Limitations to the study are a training program is only as good as the coach and the athletes allow it to become. The athlete must have a desire and commitment to follow through and adhere to the workouts. The coach’s job is to create an intense, yet safe atmosphere for the athletes to train. At Marietta College we do not coach effort, if an athlete does not take it upon himself to improve, he will find negative results or very little increases in his numbers; however, that is a very small number of athletes on the football team.

Also the athlete’s diet can affect the training and weight gains of the athlete. Research shows that athletes benefit from a high carbohydrate diet. For an athlete who trains daily and consumes a low carbohydrate diet puts themselves at risk for reduced muscle glycogen levels that could have a negative effect on training and performance (Grandjean, 1994).
Chapter II

Review of Literature

Being an athlete is a role that consumes a substantial amount of time and effort. A college student/athlete has to deal with taking classes and playing his/her respective sport, along with training in the off-season, which is extremely time consuming and vigorous. So how does a coach go about making sure his/her athletes are stronger and better conditioned more so than that of the other team? Lifting weights effectively is one way a coach can prepare his/her team to be a top competitor. Weight training in the off-season is a very important part of the football program at Marietta College.

Strength training has come a long way from the time when coaches used a small group of standard exercises and lifts to help develop stronger athletes. Now, strength programs are designed for each sport and often for different positions within a sport. Historically, the football team has utilized several different programs. The staff has shifted from one weight training program to another. The football team now utilizes The Stiggens Computerized Strength Training Program, which implements periodization (Judge, 2006).

Beyond hard work, coaches must look in the past to different theories of lifting programs. Early theories of scheduling suggested that training periods should only last weeks in length. However, in the late 1940s – 50s athletes began to realize that yearlong training had a potent effect on them. This led to a need to better organize the training plan. It was Letunov who suggested that the scheduling of training periods should be weighted heavily on the physiological state (Wilson, 2005). In this context, Matvejev, who is considered by many to be the true father of scientific periodization, suggested that
Periodization was not simply a plan, but an objective set of laws that govern the training process. Four adaptation models were presented which attempt to explain these laws (Wilson, 2005). The first was the General Adaptation Theory, which proposes that the organism cycles through three stages of adaptation. Gamble also says this model is the first phase of response of an organism to a stressor that is characterized as shock or alarm (Gamble, 2006). The second was the One Factor Theory, which views adaptation as the effect, with depletion of a biochemical substance as the cause. The third model was the Fitness Fatigue Theory, which views readiness as the difference between fitness and fatigue. The fourth model presented was the Sequencing Theory based on specificity of fatigue and successive potentiation (Wilson, 2005).

Periodization is the term derived from Eastern European principles. It allows for a variety of training, peaking for competition as well as working on technique and strength. The traditional approach to weight lifting is to move from high volume/low intensity to low volume/high intensity work. The main problem with the traditional weight lifter has proven to be fatigue. If training occurs within the fatigue window, that creates more fatigue, leading to performance decrements, causing overtraining and possible injury (Marshall, 2006).

According to strength and conditioning coaches, working in a multitude of team sports at various levels report adopting a periodized approach to their program design, much like that of Marietta College. The use of periodization was indicated by the vast majority of Division I collegiate strength and conditioning coaches responding to a survey of their methods (Gamble, 2006). Similar surveys of professional North American team sports reported comparable use of periodized training designs. These
included the National Basketball Association (90% of respondents using periodized programs) (Gamble, 2006), National Hockey League (91.3% using periodization) (Gamble, 2006), and Major League Baseball (83.4%) (Gamble, 2006). National Football League coaches reported by far the lowest use of periodized models at 69% (Gamble, 2006).

**Figure 1** – Professional teams and the usage of periodization.

(Gamble, 2006)

However, with football being a contact and rough nature sport, one coach said, “Weight training in football is different than any other sport. When you have them healthy you train them” (Gamble, 2006). Keeping everyone healthy is hard to do considering an NFL team has the ability to play a total of twenty-four games throughout the year (Steelers, 2006). This includes preseason through post-season. There has been a lot of controversy on this alarming number due to the amount of punishment playing this many games can do to a person’s body.
At Marietta College in 2006 the season lasted a total of fourteen weeks. With the season being much shorter than that of the NFL, the periodized program worked out quite well. But, if coaches were to follow the classic model, training would taper considerably for the duration of the competition phase. This is clearly counterproductive for most teams, who play in the longer traditional seasons. It has been shown that following such a restrictive competition-phase repetition scheme may lead to excessive losses in lean body mass during the season, which is unfavorable for most sports (Gamble, 2006). With trying to maintain all strength possible, the Marietta College football team lifts three days during the season. In those three days the team does not lift heavy due to soreness and fatigue. The goal of in-season lifting is to maintain all strength by doing more repetitions with low volume.

There are several benefits to a periodization cycle, not overtraining, is just one. In weight lifting, there comes a time when more is not better. This is seen in bodybuilders and strength athletes as they often push themselves to the limits, probably too much. There are two overtraining scenarios: (1) overtraining a muscle group and (2) overtraining the body by increased volume. It is important to not over train because generally by the time the symptoms have developed; the lifter has already done too
much and is not making any gains. Symptoms of overtraining include:

- Increased resting diastolic blood pressure
- Increased resting heart rate
- Sleep disturbance
- Decrease in lean body mass
- Decreased appetite
- Not being able to overcome a common cold
- Flu-like symptoms

( Pearson, 1998).

The Stiggens Computerized Strength Training Program acknowledges the importance of not overtraining and giving the athlete the proper amount of recovery time. Stiggens notes recovery periods between exercises for the student/athlete is important because it allows him/her to recover not only physically, but mentally as well. Good recuperation time allows the athlete to obtain a higher quality training session but also achieve greater overall strength gains. The length of the recovery period will vary depending on the phase in which the individual is training (Stiggens, 1994).

In a high-level strength training period recovery times are as follows for The Stiggens Computerized Strength Training Program:

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<tr>
<th>Phase</th>
<th>Recovery Time</th>
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<tr>
<td>Phase 1</td>
<td>2-3 Minutes</td>
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<tr>
<td>Phase 2</td>
<td>2-4 Minutes</td>
</tr>
<tr>
<td>Phase 3</td>
<td>2-5 Minutes</td>
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(Stiggens, 1994)

As mentioned before there are three phases within each cycle; the first phase is the strength endurance or the hypertrophy phase, which involves a high volume/low intensity training routine. It is important to keep an eye on the athletes during this phase due to the volume being a high number. In phase 1 the volume is 12, 12, 8, 8, 8 for repetitions and the recovery time is 2 minutes in between sets. Some athletes have difficulty completing the high number of repetitions of the heavy intense training sessions
in this phase as they are not specifically trained in this area. In this particular phase it is important for these athletes because it develops a solid base of muscles for which to build upon, yet, they must not overtrain (Stiggens, 1994). According to Wilson, the muscle building phase, hypertrophy, increases peripheral (muscle cross sectional and contractile ability) factors (Wilson, 2005).

During the hypertrophy phase it has been recommended to use multiple sets, which *The Stiggens Computerized Strength Training Program* does, per exercise, with a moderately high number of repetitions (8-12), which as previously mentioned, is parallel to what the Marietta College football program does. The rest times for this phase are between 60-120 seconds, also, which is also accurate. Short rest periods between sets are used within moderate resistance to achieve a longer duration of time under tension along with great anabolic hormonal response to induce increases in muscular hypertrophy (Ahtiainen, Juha, Pakarinen, Alen, Kraemer, Kahhinen, 2005).

Phase two is the basic “strength/power phase.” In this phase, the intensity increases while the volume decreases. The third and final stage in *The Stiggens Computerized Strength Training Program* is the peaking phase. In this phase the volume is decreased even more while the load or intensity is increased.

It is after the peaking stage that all athletes max out to determine a new poundage and repetition for each exercise. Once the max out has been concluded and the new max is determined, the athlete will start again at the hypertrophy phase. This is the progression the athletes will do during all of the off-season to ensure that no overtraining is done.
In the peaking phase with the repetitions decreasing and the intensity increasing, it is important to monitor rest and recovery in between sets. During a heavy resistance exercise it has been shown that hormonal responses are induced, thus creating strength. However, this is dependant on the type of exercise protocol, i.e., intensity (load) of exercise, number of sets, and repetitions per set, length of rest period between sets, and muscle mass involved. In 1977 Gotshalk found that the acute growth hormone and testosterone responses were greater after a total-body resistance-exercise protocol performed with 3 sets per exercise that after single-set exercise. These studies suggest that the greatest exercise-induced stimulus to the endocrine system is produced when the resistance exercise is performed with multiple sets per exercise and short rest periods between sets. This is because fewer repetitions are completed and the muscles have already been taken through the hypertrophy stage, not needing as much recovery time (Ahtiainen, Juha, Pakarinen, Alen, Kraemer, Kahhinen, 2005).

There are multiple sets in The Stiggens Computerized Strength Training Program. According to Gary Lavin this is good because there are several cons that go with single-set theories. The first is beginners, which would be comparable to the freshman on the Marietta College football team, and even some advanced athletes can not tolerate the pain levels associated with single sets due to the large load. Secondly, single-set programs typically do not involve enough muscle mass or involve total work to achieve the hormonal responses associated with the strength gains in the hypertrophy stage. Also, with any workout the athlete must have a warm-up to ensure that the muscles and body are ready and loose to prevent injuries. So with a single-set program there is a warm-up
as well as a breakdown set, thus, technically, leading to a multiple set workout (Lavin, 2000).

Studies designed to compare single-set versus multiple-set workouts have shown that multiple-set protocols are superior for developing strength, building lean body mass, and enhancing various elements of athletic performance. Multiple-set programs also involve higher workloads, which are necessary to stimulate the hormonal responses associated with muscular adaptation. Not to say that single-sets are useless, they do have some value. Single-sets are beneficial when for untrained athletes in the first 8-12 weeks of a resistance training program, but for maximal results, nothing is better that a periodized, multiple-set program (Lavin, 2000), like that of The Stiggens Computerized Strength Training Program.

With this amount of recovery time, if the lifts are too heavy to meet, then the athlete must decrease weight. According to Pearson, when a lifter does too many sets, too many repetitions, and too many exercises, they stop making gains, or when they see their lifts going down, they tend to increase the training volume, but this only makes matters worse. In competitive college sports this is called a taper. Increased training volume has a detrimental effect on the body in general. The male hormone, testosterone, which men would like to have naturally in large amounts, begins to actually decline when training volume increases, while cortisol, a stress hormone increases, as it tries to counter the work of testosterone (Pearson 1998). To ensure the quality of the program among our athletes after each 8-week cycle the following week is taken off. This enables him to be prepared mentally and physically for the next training cycle. Mental toughness is just as essential as the physical aspect of training.
Mental toughness is a necessity, it can be the difference between a win or a loss. When times get tough, athletes must know how to go hard and how to stay disciplined. At the end of each lift, two times a week, the Marietta College football team goes through some sort of a mental toughness exercise. Whether the team performs wall-sits or just holds dumbbells for as long as they can. Aaron Wellman, the Director of Strength & Conditioning at Ball State University implements the same type of toughness to develop good characteristics in athletes, as does Marietta. An athlete in good physical shape will find it easier to get through these types of exercises than a person who is not in shape or is physically weak. The point of the exercise is to get the weaker people to do the exercise at a higher level and compete with the physically advantaged group.

With football being such an intense and physical game, played by tough people, a talented athlete that lacks mental and physical toughness will eventually be exposed, in a negative way. At Marietta College and Ball State, no athletes are allowed to lean over with their hands on their knees. They are instructed to stand tall whether it is during a rest period or even a water break. They are not allowed to place their hands on their knees, or lean on anyone when they are fatigued. This is more of a mental test, than it is a physical test and if a player bends over it will create bad habits that will leave them vulnerable. Encouraging players to stand tall is critical, because when fatigue is sensed by an opponent it is encouraging for them to attack the tired player and the effect can be demoralizing to the whole team (Wellman, 2006).

At both Marietta College and Ball State University every drill performed, whether it is speed or agility, has a clearly marked starting and finishing point. Athletes are always instructed to start with their hand behind the line, this means, not even a fingertip
can be over the starting line. Players view this, as a minor detail, what they do not understand, is that this instills the discipline that each player will come across when they are fatigued during competition. It does not require any athletic ability, just discipline, hard work and focus. Finishing all drills full speed is demanded, players must run full speed through the finish line, slowing up before the line displays weakness and laziness (Wellman, 2006).

During workouts, competition is imperative and players must be self driven to learn to succeed. Athletes will either compete against each other or a given time. When performing agility drills or a weight lifting activity, two identical drills are always set up to promote competition. Players are often divided into teams to develop camaraderie and a feeling of accountability for one another. This creates the mindset of mental toughness proving to athletes they will be able to perform when competing against an opponent on the field (Wellman, 2006).

Another intangible task, which is very essential to the development of an athlete, is that person’s diet. Some media hype and poorly interpreted research by supplement companies have promoted misinformation in proper nutritional guidance to athletes. Most athletes are poorly educated about proper nutrition; for instance, many mistakenly believe that large amounts of protein and vitamins are needed for competition. In one-study athletes scored less than 50 percent on a nutrition questionnaire, 64 percent could not identify the function of fat, 67 percent could not list carbohydrates as the best source of energy, and fewer than 33 percent could identify fat-soluble vitamins (Jacobson and Gemmel, 1991).
At Marietta College athletes are encouraged to maintain a healthy body throughout the training process. Each athlete is advised to intake the following; for each pound that a person weighs, they are asked to intake that many grams of protein, and two times that many grams of carbohydrates, per day.

Studies show that the recommended consumption of a predetermined gram amount of carbohydrate per kilogram of body weight times two, usually in the range of six to twelve g/kg body-weight. Thus, the total amount of carbohydrate recommended per day ranges from 300 to 1000 grams as determined for individuals by their body weight (Edwards, 1999).

In a similar article relating to nutrition, in a study of cardiovascular (CVD) risk factors in college football linemen, nutritional knowledge, food practice and CVD risk factor recognition are assessed through an objective test. The nutrition knowledge of college football linemen and of a male college student control group differed significantly. While both groups differed, they still demonstrated some healthy understanding of nutrition practices; however, responses to individual questions, highlighted poor knowledge of dietary cholesterol sources. The football linemen also performed poorly on questions about weight loss and the role of vitamins and minerals in their diets. For example, more than 80 percent of the linemen believed that vitamins were good sources of energy; and more than 70 percent believed that bread and potatoes should be avoided when attempting to lose weight. Dietary assessment of the linemen confirmed a relatively low carbohydrate intake, which is contrary to current dietary guidelines. When all of this is considered, these findings could signify that athletes continue to be targets of misinformation. If such misinformed nutrition and dietary
patterns were to be continued long term, CVD risk factors in these athletes would be worsened (Herdeen and Fellers, 1999).

Unfortunately, the sources on which athletes depend are not always the most qualified. Several studies have indicated that athletes receive most nutritional information from their parents. Another highly rated source of information is popular magazines. Promotions and advertisements have resulted in hundreds of millions of dollars in retail sales by nutritional supplement companies in the United States. Some supplement manufacturers even guaranteed added muscular weight and enhanced physical benefits. Claims by many manufacturers are for the most part false and unfound (Jacobson and Gemmel, 1991).
The following graph is one that shows the percentage where college varsity athletes obtain their nutritional information.

Figure 2 – Where athletes obtain knowledge on nutrition.

(Jacobson and Gemmel, 1991)

Not only is the athlete misinformed, but the athletic coach, one of the most convenient and more reasonable nutritional sources, has been found dismally lacking in nutrition knowledge. Sixty-one percent of coaches have had no formal nutritional education or training. In a study performed by Bedgood, eighty-five percent of coaches scored below the seventieth percentile on a nutrition knowledge questionnaire, although eighty-six percent dispensed some nutrition information monthly to their athletes. In a study by Wolf, he found that sixty-nine percent of college coaches rarely read nutritional information as applied to their profession (Jacobson and Gemmel, 1991).

With all of the trendy strength training approaches available these days, it becomes easy to lose sight of the single most important premise of all – hard work.
Regardless of one’s basic beliefs and training philosophy, we all know that there are occasions – primarily in the off season – when it is advantageous from both physical and mental perspectives to insert highly challenging workout scripts. These are workouts that exceed the norm by several notches on the intensity scale. The rationale for different implementations can vary; they may fit well with the current training style, the athletes and coaches are ready for a turn off of the beaten path to provide a different stimulus, or one simply may want to generate some enthusiasm and emphasize the carry-over benefits of good old fashioned hard work (Mannie, 2006).
Chapter III

Research Design and Methodology

This chapter presents the sample population, the instrument used and the procedures that were used to investigate the research questions presented in this study to determine if the strength of the Marietta College football team has increased with the new computerized program compared to the old cycle developed and implemented by the previous strength training coaches.

Subjects

The subjects used for this study consist of Marietta College football players. They will be selected from intact groups depending on their year of school and when they maxed out. This is because these are the only players that have been a part of the “wave cycle” program and The Stiggens Computerized Strength Training Program. The subjects consisted of Marietta College Football players who participated in the off-season weight lifting programs in both the spring - summer 2005 and spring - summer 2006. The researcher used three of our main lifts to determine the outcome of the study, which is - did the "wave cycle" or The Stiggens Computerized Weight Training Program produce the greatest results in strength. The lifts the players maxed out in are back squat, bench press and power clean. The number of subjects for the bench press was 23, 9 for the back squat and 16 for the power clean.

Instrumentation

The increases in weight were determined by comparing data from two different lifting cycles. The previous cycle, “wave,” was a broad workout plan that was devised by, Steve Murray, the strength coach at the time. Murray’s workout was a percentage
based workout that was developed for the whole team and was written on the dry erase board when they came in. Numbers were a mere guess as to how much they could do; however, the repetitions were always specified.

*The Stiggens Computerized Strength Training Program* is one that excels in expressing each person individually. Each player gets his own sheet, with how much weight he will do and how many times. Everything is in black and white and no guess work takes place. It tailors around each player's special needs, whether they have an injury or can only lift three days a week due to a busy class schedule.

The overall purpose of lifting weights is to gain strength. It is the philosophy of the Strength and Conditioning Coordinator at Marietta College that if an athlete practices he gets better. That carries over to the weight room as well. As athletes lift weights they will see increases, but just how much? The data will show which program better suits the athletes.

**Method**

The data the researcher analyzed had already been collected, as it is a standard part of the off-season training program for the football team. The researcher compared the athletes' strength increased in 2005 to the strength increased in 2006, to determine which produced the greatest results. Then a statistical computer program, called SPSS was used to analyze the data in the study. When entering data into this program no names appear, each subject was given a number to ensure that confidentiality is being kept.
Research Design

This study was designed to investigate the differences in strength gains throughout the process of weight lifting. The causal-comparative research design was selected to compare the two strength training methods. The independent variables are The Stiggens Computerized Strength Training Program and the “wave cycle.” The dependent variable is the change score in the lifts. In this research design, the researcher looked at several outcomes. Data from squat, bench and power clean was used to determine the value of the two programs. The statistical tests that will be used are paired-sample $t$-tests and descriptive analysis. A paired-sample $t$ test evaluates whether the mean of the difference between the two variables is significantly different from zero (Green and Salkind, 2003). While a descriptive analysis was used to produce a situational analysis. The goal of descriptive analysis is to provide a quantitative specification of the important sensory aspects of a product. It deals with perceptions not with ingredients, causes or implications. It seeks to answer questions about how products differ on specific sensory bases (Lawless, 2000).

Data Analysis

The researcher compared the athletes strength increased in 2005 to the strength increased in 2006, to determine which produced the greatest results for the Marietta College football program. Processing the data was used by configuring the average increases by the different individuals in the three different lifts. One sample was “wave” and the other will be “Stiggens.” Also, to go along with the average increase comparisons the researcher also ran paired-sample $t$ tests as well as a descriptive analysis.
By comparing the numbers and analyzing the data, the researcher determined which program was the better fit in the Marietta College weight lifting program.
Chapter IV

Data Analysis

Data Analysis

The data collected for the comparative study consisting of the “wave cycle” and The Stiggens Computerized Strength Training Program was collected in the spring of 2005, summer of 2005, spring 2006 and summer 2006. In both weight lifting programs, the subjects lifted four days a week (Monday, Tuesday, Thursday, and Friday). Also, the student-athletes were in the weight room for about 60 - 80 minutes in both weight training programs. Again, the researcher analyzed data that had already been collected, as it is a standard part of the off-season training program for the football team. Therefore, the football team did not go through any additional testing where new data had to be collected. The researcher compared the athlete’s strength increase in 2005 to the strength increase in 2006, to determine which weight lifting program produced the greatest results. The variables the researcher examined are Independent - The Stiggens Computerized Strength Training Program and the “wave cycle.” The Dependent variable of the experiment is the increase in the student-athletes strength as determined by the increase or decrease in scores from 2005 to 2006.

The researcher used three of the football teams main lifts to determine the outcome of the study, which is - did the "wave cycle" or The Stiggens Computerized Strength Training Program produce the greatest results in strength. The lifts the players maxed out in are back squat, bench press and power clean. The number of subjects for the bench press was 23, 9 for the back squat and 16 for the power clean.
No names were used in the researcher’s analysis and interpretation of the data. SPSS assigned numbers to the subjects rather than using their names to keep confidentiality. Each subject is part of the Marietta College Football Team and understands that their weightlifting files are kept updated. The researcher used the computer program SPSS to run the statistical data. Reports were generated in the form of a descriptive analysis and paired-sample $t$ tests were ran as well.

The reason for the lack of numbers is the back squat exercise is a difficult lift and can cause severe injury when not done correctly. With this being said, in the summer of 2005 and 2006, the student-athletes lifted right before camp started. It was the judgment of the coaching staff to keep the top returnees and upperclassmen out of this activity due to the risk of injury. At the latter part of an athlete’s career, the football staff knows who will be competing for playing time, making the results of the lifts not that imperative for some. Those were the ones selected to not participate in the back squat. Listed below is the descriptive data chart for all three lifts.

<table>
<thead>
<tr>
<th>Program</th>
<th>Lift</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave Cycle</td>
<td>powercleanw</td>
<td>16</td>
<td>2.8</td>
<td>9.8</td>
</tr>
<tr>
<td></td>
<td>benchw</td>
<td>23</td>
<td>4.3</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>squatw</td>
<td>9</td>
<td>18.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Stiggens</td>
<td>powercleans</td>
<td>16</td>
<td>19.6</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>benches</td>
<td>23</td>
<td>17.3</td>
<td>13.9</td>
</tr>
<tr>
<td></td>
<td>squats</td>
<td>9</td>
<td>40.0</td>
<td>29.1</td>
</tr>
</tbody>
</table>
There was a significant change in score from bench “wave” to bench “Stiggens”, 
$t (22) = -3.39, p = .003$. The change in back squat is also a significant change, 
$t (8) = -2.10, p = .068$. Finally, in the last test, the power clean, yet again, the researcher 
saw a significant change, $t (15) = -5.03, p = .000$.

The following, Table – 3, is a bar graph that shows the overall average increase of each lift. This makes interpreting the data easier and shows there is a significant difference in the two weight lifting programs.

**Figure – 3:** Overall average increase of each lift
Chapter V

Summary and Recommendations

Summary

The results both showed significant increases for the student-athletes; however, all three studies favor the use of *The Stiggens Computerized Strength Training Program*. The back squat was the lift that showed the most increase. With an average increase of forty pounds, there were two outliers in the study. According to the researcher this is not common, however, it is possible.

The back squat exercise uses the biggest muscles on the body, the legs. As strength and stamina increase and the legs get substantially stronger, making the chance for strength increases very high. At this point, the athlete can make large increases depending on how hard they work. Secondly, another factor that can aid in creating outliers is age. Sometimes, freshmen see larger weight increases than upper classmen. Due to an upperclassman being more mature they also saw large weight increases in their freshman year. The final factor that can play a role is the past lifting experiences. In most cases, the student-athletes at Marietta College played more than one sport in high school. This caused him to be not as strong as he possibly could when he came to Marietta College due to time and the commitment due to the other sports in high school. The result of this is a large weight increase in weight lifting when they lift all year, their first year.

Both *The Stiggens Computerized Strength Training Program* and the “wave cycle” proved to be good workout programs. Yet, when Marietta College football staff held a meeting and examined how to better the strength and conditioning program, they
made the right decision when contemplating the purchase of *The Stiggens Computerized Strength Training Program*.

**Recommendations**

The researcher’s recommendations to the programs would first be to the “wave cycle.” The “wave cycle” is a good program; however, it lacks rest time. Rest time is the major factor that put *The Stiggens Computerized Strength Training Program* a top the “wave cycle.” With the proper amount of recovery time, the athletes are better prepared for the sets they are taking part in and have a better chance of getting the desired amount of repetitions.

The researcher would recommend to *The Stiggens Computerized Strength Training Program* to do various lifts. When the computer program generates the workout, the same lifts appear for Monday and Tuesday as they do for Thursday and Friday. Doing different lifts, for the same muscle groups is highly recommended. This helps in the development of the whole muscle as well as cutting down on the monotony of weight lifting.

For anyone wanting to replicate this study, recommendations would be made to gather the results by class. For instance compare the overall averages for freshman and freshman. For example, comparing freshman to freshman would give a researcher a better idea than comparing a freshman to a senior. Usually a freshman will have larger gains than a senior due to the maturity level.

Another recommendation the researcher would suggest is implement the “wave cycle” and *The Stiggens Computerized Strength Training Program* at the same time by making half the team to while the other half does the other. This will give a clear and
straightforward analysis of the two different programs while they are being utilized in the same timeframe.

The final recommendation the researcher would suggest would be to take the weight lifting results from the winter weight lifting season. This would be January to May. Due to the weight lifters being under a coach’s supervision this entire time, the weight room would be ran identical for each and every athlete.

In closing, the researcher would like to recommend the use of *The Stiggens Computerized Strength Training Program* over the “wave cycle.” It has been proven in reports that were generated in the form of a descriptive analysis and paired-sample *t* tests that were ran using the statistical computer program, called SPSS. As these tests have proven, *The Stiggens Computerized Strength Training Program* is the most effective program for what the Marietta College football team was trying to accomplish in improving strength.
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APPENDIX A

Marietta College
Human Subjects Consent Form
Dear Student-Athlete:

This letter is to inform you that I will be conducting research for my thesis. As an active participant in the Marietta College Football program, you have met the criteria needed for me to assess our weight lifting programs. In order to be eligible for this research, you must have completed the full lifting cycles of the Spring – Summer 2005 and Spring – Summer 2006, which you have done. As the researcher, I will conduct a paired sample t-test, using SPSS. The increase in your maxes from bench, squat, and power cleans from Spring - Summer 2005 will be compared to Spring - Summer 2006, to give feedback on the increase of strength. In the Spring - Summer 2005 the football players were using a “wave cycle,” whereas in the Spring - Summer 2006 the team was using The Stiggens Computerized Strength Training Program.

There are no potential risks being involved in the study, as your weight training has already been completed and the data has already been stored. I feel the opportunity to conduct this research is worthwhile and beneficial, not only to me, but to Marietta College as an institution. However, you do reserve the right to have your information withdrawn from the research at any time throughout the process.

As you know, your weight lifting was voluntarily completed, and if you decline to accept this offer, no penalties exist. Also, to safeguard your privacy, participants will not be identified by name, but rather by a number that will be assigned at the beginning of the study. All of the data will be treated as confidential and used only for the purpose of running paired samples t-test.

If you have any questions please contact Dr. Skouzes at (740) 376-4796 or mowrerc@marietta.edu, or myself at (740) 376-4890 or hainesb@marietta.edu. If you have any questions or concerns regarding the research participants rights, please contact Dr. McCabe at (740) 376-4795 or jam002@marietta.edu I appreciate your help with this research and I hope the study will prove helpful and useful information for the Pioneer Football program.

Sincerely,

Brian Haines
I have read and understand this consent form.

Date __________ Age ______

Print Participants Name _________________________________________

Sign Participants Name _________________________________________

_____ I give permission for my information to be used

_____ I do not give permission for my information to be used
APPENDIX B

Marietta College
Human Subjects Committee Approval Form
Marietta College
Human Subjects Committee

PROPOSAL APPROVAL FORM

Principal Investigator(s): Brian Haines

HSC # 07-010c
Form Submitted: Short

Materials Needed. Identify materials that were not received, but are necessary for evaluation.
- Informed consent form
- Letters of permission
- Tests/surveys/questionnaires
- Recruiting ads
- Training certificate(s)
- Additional items (specify)

Additional criteria for approval:

1. The appropriate review form is used (i.e., short vs. long).
2. All information requested on the review form is complete and clearly stated.
3. The submission date is at least two weeks prior to the proposed start of data collection.
4. For student projects, an email stating support for the research was received from the faculty advisor.
5. The risks and benefits of the study are judged to be acceptable in relation to the study’s goals, and are clearly stated in the consent form.
6. If deception will be used, the type and level is acceptable for the research, and is adequately justified by the investigator(s).
7. The informed consent form contains all required information. If no consent form is provided, a request for a waiver is included.
8. The review form and supplemental materials (consent form, etc.) are free of spelling and grammatical errors that interfere with comprehension.
9. Recruiting advertisements are appropriate and indicate that the project was approved by the Marietta College Human Subjects Committee.

Approval Decision:
- The proposed research is approved. The investigator(s) may proceed with data collection. This approval expires on 7/1/07 (3 months past the projected end of data collection).
- The proposed research is denied. Reason(s) for denial are listed below. The investigator(s) may not begin data collection until a revised and resubmitted HSC proposal is approved.

Comments:
Good luck with your research!

HSC Member Name(s): Jennifer McCabe & Miranda Collins
Date: 3/1/07
Signature: ____________________  ____________________