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The relationship of performance tests to playing time of college football players

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**THE RELATIONSHIP OF PERFORMANCE TESTS
TO PLAYING TIME OF
COLLEGE FOOTBALL PLAYERS**

A Thesis

Presented to

The Faculty of the Department of Human Performance

San Jose State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts

By

John Joseph Lango

December 1999

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ABSTRACT
THE RELATIONSHIP OF PERFORMANCE TESTS
TO PLAYING TIME OF
COLLEGE FOOTBALL PLAYERS

By John Joseph Lango

The purpose of this study was to determine the relationship of the 40-yard dash and the 20-yard shuttle to playing time of community college football players. Twenty-seven football players from Gavilan Community College were tested in the 40-yard dash and the football 20-yard shuttle test. On day one, all subjects were tested in the 40-yard dash. Each subject completed three trials with a minimum three-minute rest between each trial. Testing order was non-skilled players, semi-skilled players, and skilled players. On day two, the football 20-yard shuttle test was administered with each subject completing three trials with a minimum three-minute rest. Testing order was skilled players, semi-skilled players, and non-skilled players.

Results from the study suggest that there is no relationship between the 40-yard dash and 20-yard shuttle test and playing time. The relationship between the 40-yard dash and the 20-yard shuttle test was statistically significant (.86; $p \leq .05$)

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Although only one individual is ultimately awarded a Master's degree, it is often through the efforts of a number of individuals who give their dedication and support that a thesis project is successfully accomplished. There are so many people who contributed to this thesis, and it is to all of those people that I extend my deepest and sincerest appreciation.

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Finally, I would like to thank my wife Susan, and my children Michael, Timothy, and Lauren. Thanks for putting up with me. Leaving the room so daddy can work really helped out.

DEDICATION

This thesis is dedicated to my wife Susan. I love you and I could not have accomplished this without your support.

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Chapter I

Introduction

In games like football, basketball, soccer, baseball, and tennis, success or failure often comes down to a “moment of truth”, a point in the contest when the offensive player outmaneuvers the defense or the defense shuts down an offensive drive. In most instances, the players’ speed and their ability to apply that speed to crucial game situations determine these moments. When someone thinks of an athlete with extraordinary speed, they may think of someone who has the fastest 40-yard dash or an athlete who competes in the sprinting events on a track team. Although speed is essential in many sport endeavors, agility movements have become more evident in today’s sports. Twist and Benicky (1996) stated that the commonalties of most team sports are the interactive, interdependent, and reactionary characteristics of the game. Players must cooperate with their teammates, moving into position for passes or to block opponents. Each player is partially dependent on the rest of the play, adjusting his or her positioning to meet changes in offensive and defensive strategies. Players must quickly read and react to changes in a play, for example a ball turnover or an opponent cutting toward the net. Athletes must be fast and agile to be competitive or gain an edge in today’s athletics.

Background for the study

Hagerman (1986) defined speed as the rate of motion or velocity. It is the ability to accelerate to achieve maximum velocity in a short period of time. Much has been published over the past 15 years on how athletes can improve their speed. Chu and Korchemny (1989) analyzed and evaluated sprinting stride actions. Pauletto (1991,

1993) investigated training devices to help improve speed. Gambetta (1994) and Darden and Coker (1996) studied components of speed training.

Hagerman (1986) defined agility as an athlete's ability to change directions rapidly while keeping the body under control. He further stated that the key factors influencing agility were balance and coordination. Every sport or activity in which speed is important places a premium on agility. Recent research by Smythe (1994) investigated methods of agility training. He suggested that although this type of training includes the training aspects of strength and power, explosion, agility and reaction, and biomechanics, it was most effective to integrate all of these aspects into conditioning or practice sessions on a daily basis. Smythe (1995) also investigated stages of agility training. He suggested that the four stages of agility are balance, coordination, programmable agility, and random agility. MacLean (1993) investigated lateral movement and lateral stability in movement patterns required by particular sports. He suggested that strength training should develop sport-specific strength and lateral stability in the movement patterns required by the particular sport. Twist and Benicky (1996) researched strength and quickness drills that would condition athletes for lateral movement. They suggested that multiple factors must be developed in concert, first to be able to do these exercises, and second, to be able to transfer the improvement onto the field.

In the specific area of football, speed and agility training has become much more important to today's athletes. Ross and Schulte (1994) reported that football coaches and professional scouts, as a predictor of skill potential, have always used the 40-yard dash. Improvement of this time would improve the value of the player. Cinkovich (1992)

developed a teaching progression to improve speed using the components of stride length and stride frequency. Palmieri (1993) investigated football speed development and stride length. He suggested that an athlete could enhance running ability by improving the length of each stride, or by increasing the frequency or speed at which the legs are turned over.

Barnes and Attaway (1996) stated that from a football perspective, agility was the ability to change direction quickly and easily. Arce (1994) stated that agility and reactive movements were important physical abilities for football athletes. Barnes and Attaway also stated that there was no question that enhancing agility was beneficial to performance in football.

Many college coaches condition their players in many aspects of the game of football. Martinelli and Juraszek (1984), Kramer (1985), Pauletto (1985) and Etcheberry (1985) have developed strength and conditioning programs for their players that cover speed and agility training as well as other components of football.

Altug, Z., Altug, T., and Altug, A. (1987) stated that tests, in general, provide conditioning specialists with a mode for assessing athletic talent, screening for possible health risks due to strenuous exercise, or to reveal a specific weakness, and provide data for outlining individualized exercise prescriptions. Altug et al. and Bridgman (1991) developed guidelines for assessing and evaluating athletes.

A recent review by Ebben (1998) offered concise descriptions as well as practical recommendations for developing football fitness testing programs. Conway and Decker (1992) developed a computerized strength and conditioning testing index for assessment

of collegiate football players. Previously, Allerheiligen et al. (1983) developed goals and objectives of testing football athletes.

Justification of the study

Dos Remedios and Holland (1992) stated that although collegiate football players have been physically characterized and described in terms of size, speed, and strength, the focus has been on football players from four-year institutions. They investigated the physical and performance characteristics of community college football players and compared them to the characteristics of Division I football players. Dos Remedios and Holland suggested that the differences between the Division I players and the community college players may be attributed to several factors such as more quality guidance and more time to adapt to strength programs. This was the most recent study done on community college football players. In addition, none of the studies that were reviewed looked at the correlation between speed, agility, and football playing ability.

Approach to the problem

Junior college football players were tested in the 40-yard dash and the 20-yard shuttle test. Each athlete was allowed three trials at each test. The best of the three trials was recorded. These times were then correlated with each other and the player's playing ability, which was based on criteria developed by the researcher. The criteria was based on the amount of playing time and skill level of the participants.

Purpose of the study

The purpose of this study was to determine the relationship of the 40-yard dash and the football 20-yard shuttle test to football playing time of male community college football players.

Hypotheses

1. There will be no relationship between the 40-yard dash with football playing time of male community college football players.
2. There will be no relationship between the football 20-yard shuttle test with football playing time of male community college football players.
3. There will be no relationship between the 40-yard dash and the football 20-yard shuttle test.
4. There will be no relationship between the 40-yard dash and the football 20-yard shuttle test and football playing time.
5. There will be no difference between the 40-yard dash times of the level I, level II, level III, and level IV players.
6. There will be no difference between the 20-yard shuttle test times of the level I, level II, level III, and level IV players.

Definition of terms

Acceleration. Gambetta (1994) stated that acceleration is the rate of change of velocity that allowed the athlete to reach maximum velocity in a minimum amount of time.

Agility. Hagerman (1986) defined agility as an athlete's ability to change directions rapidly while keeping the body under control.

Biomechanics. Smythe (1998) defined biomechanics as efficient movement of the body during a specific activity. Concentrated work leads to form, technique, and economy of motion

Criteria for playing level. Level I player (sideline player) – a player who played special teams and played in 10 plays or less as a field player. Level II player (field player) – a player who started less than 40% (4 of 10) of the team's games or played one quarter (15 min) or less per game. Level III player (starter) – a player who started 60% (6 of 10) of the teams games or played three-quarters (45 min) or more per game. Level IV player (recruit) – a level III player who made all-conference, all-Northern California, all-state, or all-American.

Change of direction. Moving in one direction, stopping, and moving in a different direction.

Frontal Plane motion. East-to-west motion or lateral motion.

Muscular Endurance. The ability of a muscle or a muscle group to execute repeated contractions for long periods of time.

Muscle Balance. The strength, power, or endurance of one muscle group relative to another.

Muscular Power. The ability to exert force at relatively high speeds.

Non-skilled position player. Non-skilled position players in football consist of the offensive and defensive linemen.

Plyometrics. Smythe (1998) defined plyometrics as resisting and repelling momentum or gravity. Smythe further suggest that it was the effort to reduce time taken for reversing movement, as in landing and jumping.

Sagittal plane motion. North-to-south or front-to-back motion.

Speed, Agility and Quickness (SAQ) training. Smythe (1998) defined SAQ training as a system of developing each aspect of fast motion; separates and improves each part of speed, agility and quickness.

Semi-skilled position player. Semi-skilled position players in football consist of the running backs, linebackers, and tightends.

Skilled position player. Skilled-position players in football consist of the quarterback, wide receivers, and defensive backs.

Speed. Hagerman (1986) defined speed as the rate of motion or velocity. It involves the ability to accelerate to achieve maximum velocity in a short period of time.

Speed Shoot. Ross and Schulte (1994) defined the speed shoot as a lane comprised of 10 side poles, five on each side, plus five top poles. When assembled, it may look somewhat like five doorways of graduated heights. The five top poles, one for each step, were five feet wide to provide a wide lane through which to run. The bases resembled a tripod and could be easily moved to adjust to each athlete's particular stride. The adjustable side poles were marked identically by half-inches to provide accuracy. The purpose of the Speed Shoot was to provide instant feedback to the athlete about the blend of horizontal and vertical rise during the start of the 40-yard dash and out to the fifth step.

Special Teams. The parts of a football team/game which were not an offensive team or a defensive team, also known as the kicking game.

Stride frequency. The rate at which each step was taken.

Stride length. The distance the hip traveled horizontally with each step.

Transverse plane motion. Rotational motion.

Assumptions for the study

It is assumed that all subjects performed their best effort during testing and that the subjects understood all pre-test instructions. Environmental conditions were the same for all testing sessions.

Delimitation's of the study

The following delimitation's existed in the conduction of this research:

1. Participants were Junior College male football players from Gavilan Community College in Gilroy, California.
2. Participants were apparently healthy individuals having passed a physical examination by a doctor for clearance to play football.

Limitations of study

The following limitations existed in this study:

1. No attempt was made to evaluate any previous experience of participants in performing or practicing the tests.
2. The motivation of the participants could not be controlled.

3. All participants wore football shoes, but no attempt was made to have them wear the same type of shoe. No attempt was made to make sure all participants had the same length of cleat on the bottom of their football shoe.
4. In the case of some individuals, fatigue may have been a factor even though no participant was asked to run more than 40 yards at a time.
5. No attempt was made to control or evaluate the physical condition of the participants.
6. No attempt was made to control the activities of the participants outside of the testing periods.

Chapter II

Review of Literature

Introduction

This review of literature consists of four sections. The first section reviewed literature on speed training. The second section reviewed literature on agility training. The third section reviewed literature on testing and evaluating football players. The fourth section reviewed literature on articles that were relevant to this study.

Speed training

Gambetta (1994) reviewed the components of speed training. He stated that the components were the energy and nervous systems, body composition, power, range of motion, and leg speed. He suggested that the primary energy demand for speed comes from high-energy phosphate stores. The anaerobic glycolytic system has very little-if any-effect on speed performance and the aerobic system is not a factor at all in terms of actual speed. He suggested that since sprinting involved primarily the recruitment and innervating of the appropriate, fast-twitch motor units, it was much more important to emphasize the nervous system. Gambetta (1994) developed a training method that facilitates the recruitment of the appropriate motor units to produce the greatest rate of force production in the shortest possible time. He further suggested that care must be taken to design exercises and training sessions that facilitate the recruitment of the appropriate motor units to produce the greatest rate of force production in the shortest possible time.

Chu and Korchemny (1989) reviewed the components of power, range of motion, and leg speed. They analyzed and evaluated the sprinting stride action. They identified two phases of the stride action, the supporting phase and the flying phase. The supporting phase consisted of the braking, amortization and propulsion phases. The flying phase consisted of the rising and falling phases.

For the supporting phase Chu and Korchemny (1989) suggested that the stronger the muscles in the hip, knee, and ankle joints, the more the muscles could prevent a sprinter from sinking down excessively during the amortization phase. This enabled the athlete to quickly raise the center of mass vertically. As soon as the body's center of mass passed the supporting area, the contractions in the leg muscles reversed from eccentric to concentric. From this point, muscles delivered vertical acceleration to the forward moving center of mass. The final action in the supporting phase was the propulsion action, where the ground reaction forces add horizontal drive to the forward moving body. During this propulsion action, the athlete actively plantar flexed the ankle and the hip and the knee joints tended to extend as the leg left the ground, before the knee was completely extended.

For the flying phase, Chu and Korchemny (1989) stated that the first part was characterized by the lift of the center of mass to the level of the highest point in the stride trajectory; the second part was characterized by the descent of the center of mass. They stated that according to the first law of dynamics, the body was moving as a result of the interaction of forces. Therefore, the main source of force during running was the work done to combat gravitational forces, environmental resistance forces, and ground reaction

forces. In addition, the gravitational forces did not affect the horizontal speed, but did affect the direction of the driving actions. Chu and Korchemny suggested that too large of a vertical movement during the supporting phase may increase the time during that phase and decrease the distance of the flying phase. This would reduce the speed of the leg turnover and ultimately the stride length.

Training devices have become a part of speed training. Pauletto (1993) stated that speed-training devices fell into two main categories: resistance running and over-speed running. He suggested three ways to develop speed through resistance running. The first was the use of a sled. The athletes ran while pulling a sled that carried a varying weight. A second device was a harness. The harness required a partner who must run along and apply a constant drag or resistance throughout the run. A third way suggested was not a device but was the most economical: uphill running. Over-speed running can be performed using a harness and by downhill running. The harness required a partner who now would pull the sprinter forcing him or her to run harder than they would without the harness.

Pauletto (1991,1993) suggested a device that combined resistance running and over-speed running: the speed chute, developed by Ben Tabachnik from the former Soviet Union. The mechanics of the speed chute are as follows. The chute is attached around the athlete's waist. The faster the athlete runs, the greater the resistance created by the chute. The resistance is constant, and is not excessive like the harness and sled devices. During the run, the athlete pulls the velcro strap and lets the chute fall to the ground without missing a stride. At this point, the athlete takes off like he or she has

been shot out of a cannon. Because of the resistance work, the muscles overcompensate which enables the athlete to run faster than before.

Oviatt and Hemba (1991) suggested a device that they felt was low cost and had hi-tech results, good endorsements, and good group capabilities; The use of sand or a sandpit for speed development. The endorsements come from Walter Payton who trained in sand, and Ben Tabchnik who trained his Soviet athletes in sand. Oviatt and Hemba suggested that the hi-tech results came from an increase in cardiovascular conditioning and a better balance in the quadriceps to hamstrings ratio. Oviatt and Hemba further suggested that sprinting in the sand exaggerated the stride rate and length.

Speed is a characteristic that many football coaches look for in their players. Cinkovich (1992) stated that the emphasis on speed in the game of football has never been more evident than it is today. Palmieri (1993) supported that statement suggesting that speed had become an important factor in football in recent years.

Ross and Schulte (1994) stated that football coaches and professional scouts have always used the 40-yard dash as a predictor of skill potential. In addition, any method of improving that time can improve an athlete's value in the eyes of football coaches and scouts. Ross and Schulte believed that the practice of immediately popping up from the 3-point stance was inefficient and time-consuming. Ross and Schulte tested 15 Division I-A and 11 Division III college football players. Half of the players trained with a speed shoot for 12 days, taking 15 practice trials each day for a total of 180 timed 10-yard sprints. The players in the control group also performed 180 timed 10-yard sprints over 12 days, but did not use the Speed Shoot. The results were statistically significant.

The average improvement for the Speed Shoot group was .13 sec., and for the control group only .03 sec. They concluded that a player should come out of the stance low, to the point of stumbling, and use the resulting momentum to accelerate out, gradually rising to the fully upright running position.

Cinkovich (1992) developed a simple teaching progression for the development of speed in football. He suggested that stride length and stride frequencies were the two components of speed. He developed his system around stride length since he felt that this was the more important and the more learnable of the two components. As Hall and Huegli stated (as cited in Cinkovich) the improvement of stride length by three inches has been found to improve the 40-yard dash time by 1/10 of a second.

Palmieri (1993) also suggested that stride length and frequency determined running speed. In contrast to the previous study, the primary focus of his discussion was on developing pure horizontal speed, and developing techniques and drills designed to transfer that pure speed into speed on the football field.

In a previous review, Gambetta (1990) went a step further when he stated that the classic image of speed was of a sprinter in full stride; however, football did not demand that same type of speed. He suggested that football was a game of quick starts, acceleration, deceleration and quick stops, all under control. He further suggested that it was important to point out that 100-meter speed was not a liability in football, but it must be adapted to the specific speed requirements of the game.

Summary

Cinkovich (1992) stated that the emphasis on speed in the game of football has never been more evident than it is today. Palmieri (1993) supported that statement suggesting that speed had become an important factor in football in recent years. Cinkovich (1992) suggested that stride length and stride frequencies were the two components of speed. Palmieri (1993) supported that statement and suggested that stride length and frequency determined running speed. Chu and Korchemny (1989) analyzed and evaluated the sprinting stride action.

The importance of speed in football has had coaches looking for ways to improve their players' speed. Training devices have become a part of speed training that coaches use. Pauletto (1993) stated that speed-training devices fell into two main categories: resistance training and over-speed running. For resistance running, Oviatt and Hembra (1991) suggested the use of a sandpit. Pauletto (1993) suggested the use of a weighted sled, a harness, or running uphill. Pauletto (1991, 1993) suggested a device known as the speed chute. The speed chute combined resistance running and over-speed running. Ross and Schulte (1994) used a device that kept the athlete from raising up too soon. The device helped the athlete come out of their stance low, to the point of stumbling, and used the resulting momentum to accelerate out, gradually rising to the fully upright running position.

Agility training

MacLean (1993) stated that although the body can move in any one or combination of the three planes, the sagittal plane, frontal plane, and transverse plane, the

primary movement in sport was done in the frontal plane. He suggested that this movement could make up anywhere from 60% to 90% of the movement. He further suggested that since the majority of movement was done in the frontal plane, we should train the musculature that was used for movements in that plane.

Smythe (1994) supported this previous study. He stated that the type of speed that makes an athlete successful in most team sports, is not linear speed, but rather side-to-side movements. He termed these side-to-side movements as lateral speed, agility, and quickness (SAQ). He listed six standard lateral SAQ patterns of running:

1. Stand facing one direction, then rotate and run at a right angle.
2. Run linear, but keep head and orientation at a right angle.
3. Run linear and change direction (cut) at a sharp angle.
4. Run linear and change to a lateral slide.
5. Slide laterally to the right and change to the left.
6. Jump vertically, land, and change to lateral motion.

Smythe further suggested methods for improving lateral SAQ. These included strength and power, explosion, agility and reaction, and biomechanics. For strength and power, he suggested that resistance training exercises that emphasized using the whole body. For explosion he suggested using plyometrics training. Agility and reactivity training start with basic work on standing balance, then movement coordination, and finally random agility. Smythe suggested that the biomechanical aspect of lateral SAQ be taught to the athlete in a step-by-step manner. The first step was to teach the athlete to move in a slow, efficient, perfect movement. The second step was to teach the athlete from the ground

up, starting with a good full foot plant for direction change, with emphasis on pushing off with the ball of the foot. He also suggested that the knees should not “lock out” at 100 percent extension, as this was very dangerous and also inefficient.

Smythe (1995) suggested some benefits and methods of agility training. He stated that the first benefit of effective agility training was the remarkable change in athleticism it produced in athletes. The primary message agility training taught the athlete was body control, which resulted in an apparent increase in kinesthetic awareness. The second area in which agility training benefited the athlete was injury management. He further divided injury management into three areas: prehabilitation, injury control, and faster rehabilitation. Smythe suggested another benefit was improved velocity of movement. He suggested that agility training induced a sense of control to the task of moving faster. A final benefit was that it was long lasting, and did not seem to evaporate like speed, strength, or stamina training.

According to Smythe (1995), after a solid strength base was developed, there were four stages in learning agility. The first stage was the training of balance, what he termed the foundation of athleticism. The second stage of agility was coordination. In this stage, balance was complicated with an additional stress: coordination. The goal was to master simple skills under a more difficult stress. The third stage of agility training was programmable agility. Programmable agility drills are often characterized by high speeds, but they are learned at low, controlled speeds. The final stage of agility training was random agility. In this stage, the athlete must perform a task in an unknown pattern

and an unknown demand. He suggested that this last stage was very close to the chaos of sport.

In a recent study, Twist and Benicky (1996) developed practical strength and quickness drills that would condition lateral movement for multi-sport athletes. They suggested that coaches must ensure that athletes have a base of athleticism, balance, coordination, strength, flexibility, and the ability to read, react, and adjust their body.

Barnes and Attaway (1996) stated that there was no question that enhancing agility was beneficial to performance in football. They further stated that when they trained their players for agility, they accomplished two objectives. First, a combination of enhancing power, balance, speed, and coordination, and secondly, enhancing aerobic endurance, or the ability to repeat high intensity work intervals, by challenging the cardiovascular system. In addition, they stated that their goal was to develop the strongest and best-conditioned athletes' possible.

Smythe (1998) stated that to improve football SAQ you need a comprehensive program, starting with a clear objective of improved football play. He suggested that all of the components of SAQ were interconnected. He stated that coaches should not confuse speed with playing football. Many of the lessons from track coaches are counter productive for football SAQ. For example, direction change happens from a lower hip elevation in football than in sprinting. In addition, he stated that since football involved accelerative speed, many drills were needed to teach acceleration from a deep body lean. He suggested that agility, or body control, was the very basis of an effective football player. Unfortunately, he believed that coaches do not consistently develop agility. He

stated that quickness training is football training. He believed that it improved speed and agility, and improved a player's ability to read and react.

Past studies (Etcheberry, 1985; Kramer, 1985; Marks, 1983; Martinelli & Juraszek, 1984; Pauletto, 1985) have developed strength and conditioning programs that incorporated the areas of balance, strength and power, coordination, and flexibility, which enhanced the development of speed and agility. The conditioning programs developed by these researchers were implemented during the off-season for their athletes. The emphasis of these programs was to improve the athletes' overall physical condition.

Summary

Smythe (1994) stated that if you analyzed the type of movement that makes an athlete successful in most team sports, you would find it not to be linear speed, but rather side-to-side movement as lateral speed, agility, and quickness (SAQ). MacLean (1993) suggested that frontal plane movement could makeup anywhere from 60% to 90% of movement. Barnes and Attaway (1996) stated that there was no question that enhancing agility was beneficial to performance in football.

Smythe (1995) stated that the benefits of agility training are an increase in kinesthetic awareness, injury management, improved velocity of movement, and that agility training was long lasting, and did not evaporate like speed, strength, or stamina training. He suggested that after a solid strength base was developed, there were four stages in learning agility: the training of balance, coordination, programmable agility, and random agility.

Twist and Benicky (1996) suggested that coaches must ensure that athletes have a base of athleticism, balance, coordination, strength, flexibility, and the ability to read, react, and adjust their body. Smythe (1994) suggested methods for improving lateral SAQ. These included strength and power, explosion, agility and reaction, and biomechanics. Past studies (Etcheberry, 1985; Kramer, 1985; Marks, 1983; Martinelli & Juraszek, 1984; Pauletto, 1985) have developed strength and conditioning programs that incorporated the areas of balance, strength and power, coordination, and flexibility, which enhanced the development of speed and agility. Smythe (1998) stated that to improve football SAQ you need a comprehensive program, starting with a clear objective of improved football play. He suggested that all of the components of SAQ were interconnected.

Testing and evaluation

Allerheiligen et al. (1983) suggested some goals and objectives in testing football players. They listed the following as possible objectives for testing football players:

1. To evaluate the strengths and weaknesses in a player's physical makeup.
2. To evaluate the effectiveness of present training and conditioning programs.
3. To evaluate an athlete's progress towards goals which have been set.
4. To motivate their players.
5. To develop athletes who are as big, as strong, and as fast as possible.

They stated that for a test to be reliable and valid it must get consistent results from test to test and it must measure what it is supposed to measure. They further suggested that to accurately measure an athlete's level of conditioning, all areas must be tested: upper and

lower body power, agility, muscle endurance, cardiovascular endurance, speed, balance, strength, and flexibility.

Altug et al. (1987) stated that tests, in general, provide conditioning specialists with a mode for assessing athletic talent, screening for possible health risks due to strenuous exercise, reveal specific weakness, and provide data for outlining individualized exercise prescriptions. They defined various test components like cardiorespiratory endurance, muscular strength and muscle endurance, body composition, flexibility, speed, injury assessment and evaluation. In addition, they outlined the individual test components with selected references. They emphasized that comprehensive testing bridges the gap between scientific theory and practical application.

Bridgman (1991) developed a guide to test for athletic attributes. He developed three objectives of testing: to evaluate for position placement and ranking, a means of motivation, and program evaluation. He recommended a testing frequency of three to four times per year. Bridgman suggested that when determining which tests to use, a coach should list the parameters of athletic fitness that are required to perform the activity in a superior fashion and find one test for each. He stated that the testing process required two major elements: organization and consistency. He suggested that the tester organize the time of the test, the order of the athletes to be tested, who is administering the test, location of the test, and equipment needed for the test. Bridgman stated that the element of consistency is mandatory. If consistency is not maintained, the validity and reliability of the test could be adversely affected. He suggested that the results from

testing could be used to determine awards, motivate athletes, evaluate a program, or establish the need for new equipment.

Conway and Decker (1992) incorporated a computerized strength and conditioning testing index for assessment of college football players. The computerized index was comprised of a series of nine tests that aid in evaluating the three energy systems, as well as determining strength, power, and muscular endurance. The nine tests were the squat/hip sled three-repetition maximum test, the bench-press one repetition maximum test, the Margaria-Kalamen stair-step test, the 40-yard dash, the 300-yard shuttle, the pro agility test, the vertical jump test, the 1.5 mile run, and percent body fat. Flexibility was also used as an aid to determine predisposing factors that may lead to sprains and strains, but it was not calculated into the final score of the testing index.

Tests were ranked in order of importance. The ranking order was determined by an assessment of which test most directly related to the qualities emphasized to specifically meet the football goals. This order of importance was developed and agreed upon by the position coaches in consultation with the strength specialist. During a two-day period, the coaching staff administered each of the nine tests to the team. The scores and results were calculated into pre-determined formulas based on percentages of the desired goals (i.e., index percentage) and the varying order of importance for each position. Pre-determined formulas were developed from norms referenced from previous data related to intercollegiate football players. The final results (test indexes) were then added to produce an athlete's total index, which was calculated from a 100 point system.

Results were entered into a spreadsheet using the Microsoft Excel package to provide a hard copy of the testing results. Coaches used the hard copies during individual meetings to assess players, and to motivate players.

In a recent review, Ebben (1998) offered a concise description as well as practical recommendations for developing football fitness testing programs. In his review, he did not recommend a frequency and time of year when testing should occur. He stated that opinions differ regarding optimal times of the year and frequency for testing football athletes. When selecting testing items Semenick (as cited in Ebben) suggested that test items should assess the physical characteristics needed to succeed in a specific sport, and the adaptations that occur in response to the prescribed conditioning program. Ebben (1998) suggested 11 areas that may be tested and made some recommendations in different areas of each:

1. Muscular strength. Muscular strength was defined as the force that a muscle or muscle group can exert against a resistance in one maximal effort. Strength may be evaluated through tests of approximately 1 to 6 – repetition maximums (RM).
2. Speed /Strength. Speed/strength exercises involved fast movements and produce high power outputs. Olympic-style lifts and their variations were occasionally defined as strength tests.
3. Muscle Balance. Muscle balance was defined as the strength, power, or endurance of one muscle group relative to another. Muscle balance may be important for optimal performance and injury prevention.

4. **Muscular Power.** Muscular power was defined as the ability to exert force at relatively high speeds. The long jump or vertical jump typically tested lower body power, while a seated shot or medicine ball throw typically tested upper body power.
5. **Local Muscular Endurance.** Local muscular endurance was defined as the ability to persist in physical activity by resisting fatigue. High repetition tests of muscular endurance to the point of fatigue might have limited importance for football.
6. **Anaerobic Capacity.** Anaerobic capacity was defined as the rate and quantity of work performed using primarily anaerobic energy systems. Football conditioning and testing should include continuous sequence movements lasting between 15 sec and 2 min, separated by a timed relief interval.
7. **Speed.** Speed was defined as the rapidity of movement and is commonly tested with running. Tests should be considered to assess acceleration and change of direction speed.
8. **Aerobic Power.** Aerobic power or cardiovascular endurance was defined as the amount of work a person can perform. It was normally determined by the rate at which oxygen is utilized during exercise. Timed runs or a run-for-maximum distance within a specified time are normally used to test aerobic power.

9. Agility. Agility was defined as the ability to stop, start, and change direction of movement. Shuttle runs, line touch drills, and bench jump tests were used to test agility.
10. Flexibility. Flexibility was defined as the range of motion around a joint. Flexibility development exercises were important for increasing joint range of motion and reducing the risk of injury.
11. Body Composition. Body composition referred to the relative percentage of fat versus fat-free body tissue. Skinfold measurements or hydrostatic weighing were normally used to test body composition.
12. Anthropometrics. Anthropometric measurements included the assessment of height, weight, and circumferences of various body areas.

Ebben (1998) concluded his review by stating that reasons for testing individuals were for assessing athletic ability, determining position placement, ranking athletes, identifying strengths and weaknesses, identifying potential health risks, acquiring information for individual programs, encouraging athlete motivation and program adherence, and evaluating the strength and conditioning program itself.

Summary

There are many reasons coaches test their athletes. Many studies (Altug et al, 1987; Bridgman, 1991; Ebben, 1998; Semenick, as cited in Ebben) offered a description of, as well as practical recommendations for, developing football fitness testing programs. Allerheiligen et al. (1983) suggested some goals and objectives in testing football players, which included the objectives to evaluate the strengths and weaknesses

in a player's physical makeup, to evaluate the effectiveness of present training and conditioning programs, to evaluate an athlete's progress towards goals which have been set, to motivate their players, and to develop athletes who are as big, as strong, and as fast as possible.

Further review of literature

Wojtys, Huston, Taylor, and Bastian (1996) studied neuromuscular adaptations in three training programs. Thirty-two healthy participants, 16 women and 16 men, were placed into one of four groups: isokinetic, isotonic, agility, or control. Each group trained three days per week for six weeks. The isokinetic protocol included knee flexion and extension and ankle plantar flexion and dorsiflexion exercises on an isokinetic dynamometer. The protocol consisted of three sets of 12 repetitions at 60 deg/sec for each exercise. The isotonic protocol consisted of three exercises, the leg press, hamstring muscle curls, and calf muscle raises, using the maximum weight resistance tolerated for 3 sets of 12 repetitions. The agility training protocol consisted of five drills that were regularly used in anterior cruciate ligament (ACL) rehabilitation programs and had been used in a previous pilot study. The drills were as follows: 1) slideboarding (5 sets of 25 crossings), 2) unilateral bounding "box hop" jumps (3 sets of 10 repetitions), 3) carioca (i.e., foot crossover drills, 3 sets of 10 repetitions), 4) figure-of-8 runs (3 sets of 5 circuits in both directions), and 5) backward runs (3 sets of 10 repetitions at 15 feet). The control group participated only in activities of daily living and the recreational sports that they were involved in before the study.

All participants underwent arthrometer anterior tibial translation testing, isokinetic peak torque and endurance tests at 60 and 240 deg/sec for knee flexion and extension, 60 and 180 deg/sec for ankle plantar flexion, and an anterior tibial translation stress test at the knee with surface electromyography (EMG) monitoring. This test was designed to measure anterior tibial translation relative to the femur in response to an anteriorly directed 30-pound step force applied to the posterior aspect of the proximal tibia with the lower extremity muscles.

Wojtys et al. (1996) goal was to determine which exercise regiment could improve the muscle reaction times of the quadriceps, hamstring, and gastrocnemius muscles needed to stabilize the knee joint against anterior tibial translation by joint compression. In addition, the investigation attempted to determine which exercise programs improved the time needed to reach peak muscle torque in muscles that cross the knee joint. The authors concluded that agility training seemed to produce the most desirable effects in muscle reaction time in this model of anterior tibial translation control, but agility and isokinetic training appeared to improve the time to peak muscle torque the most consistently.

A study of football players, dos Remedios and Holland (1992), investigated the physical and performance characteristics of community college football players. The authors originally sent an interest letter to each of the 154 community colleges that participated in intercollegiate football in the United States. Approximately half of all institutions responded (78), with 57 schools agreeing to participate in the survey. Coaches were asked to complete a three-page questionnaire regarding the strength, speed

and size characteristics of their players. A total of 35 schools provided data for compilation of survey results.

Data requested by the investigators included: height, weight, 40-yard sprint time, vertical jump, one repetition maximum bench press, and one repetition maximum parallel squat. Guidelines for testing were given to each participating school. A two-tailed t test was used to determine differences in the size and performance characteristics of community college and Division I players reported from a previous study.

A review of data reflects significant differences in the physical and performance variables between community college and Division I football player populations (dos Remedios and Holland, 1992). When comparing group means, community college football players were 1.9 centimeters shorter, 4.1 kilograms lighter, 22.6 kilograms weaker in the bench press, 31.3 kilograms weaker in the squat, 6.9 centimeters lower in the vertical jump and 0.06 slower in the 40-yard sprint than the Division I players.

Summary

Wojtys et al. (1996) concluded that agility training seemed to produce the most desirable effects in muscle reaction time. A study of football players by dos Remedios and Holland (1992) studied the physical and performance characteristics of community college football players. They concluded that the data reflected significant differences in the physical and performance variables between community college and Division I football player populations.

Summary

In this chapter, speed and agility training and testing and evaluation methods were reviewed. Speed is a characteristic that many football coaches are looking for in their players. Cinkovich (1992) stated that the emphasis on speed in the game of football has never been more evident than it is today. Palmieri (1993) supported that statement suggesting that speed had become an important factor in football in recent years. Ross and Schulte (1994) stated that football coaches and professional scouts have always used the 40-yard dash as a predictor of skill potential.

Gambetta (1990) stated that the classic image of speed was of a sprinter in full stride; however, football did not demand that same type of speed. He suggested that football was a game of quick starts, acceleration, deceleration, and quick stops, all under control. He further suggested that it was important to point out that 100-meter speed was not a liability in football, but it must be adapted to the specific speed requirements of the game.

Smythe (1994) stated that if the type of speed that makes an athlete successful in most team sports was analyzed, it would not be found to be linear speed, but rather side-to-side movements. MacLean (1993) stated that the primary movement in sport was done in the frontal plane. He suggested that this movement could make up anywhere from 60% to 90% of the movement. Smythe (1995) stated that the first benefit of effective agility training was the remarkable changes in athleticism it produced in athletes. Smythe (1998) suggested that agility, or body control, was the very basis of an effective football player.

Testing these attributes is important for coaches. Altug et al. (1987) stated that tests, in general, provide conditioning specialists with a mode for assessing athletic talent, screening for possible health risks due to strenuous exercise, reveal specific weakness, and provide data for outlining individual exercise programs. Bridgman (1991) developed three objectives of testing: to evaluate for position placement and ranking, a means of motivation, and program evaluation.

Using these tests to evaluate position placement and position ranking is important to coaches and professional scouts. Being able to use a test as a predictor for another test may help coaches and scouts in their assessment of players. In addition, using tests to determine the playing ability of football players will limit the guesswork in the players' assessment. Coaches will be able to review data from testing and use that information as a predictor of the athlete's playing ability. Furthermore, community college football players as subjects have not been widely used.

Chapter III

Methods

Introduction

This chapter provides information on the subjects, the study design and procedures, and the statistical analysis used for interpretation of the data.

Subjects

Twenty-seven healthy community college football players from Gavilan Community College in Gilroy California were tested for the study. Participants had previously passed a physical exam for participation in football. All participants signed an informed consent form approved by the Human Subjects Institutional Review Board of San Jose State University (Appendix A).

Instrumentation

All participants were timed with a hand held stopwatch from Cronus called the Pro Survivor model #601x. Times were recorded to the nearest hundredth of a second on a spreadsheet developed by the investigator.

Kirby (1991) suggested that the running test used for this study usually has high objectivity and reliability ($r = .86-.95$). The running test had face validity. Kirby further suggested that the agility test used for this study had the potential for high objectivity and reliability depending on the number of trials attempted. The agility test had face validity.

Procedures

On day one of testing, all athletes were tested in the 40-yard dash only. The testing took place at the football practice fields at Gavilan Community College. Each

participant was allowed three trials with a minimum three-minute rest between each trial. The best time of the three trials was recorded. The order of testing was non-skilled players, semi-skilled players, and skilled-players. On day two of testing, the football 20-yard shuttle test was administered. Each participant was allowed three trials with a minimum three-minute rest between trials. The best time of the three trials was recorded. The order for testing was skilled players, semi-skilled players, and non-skilled players. There was one full day between day one testing and day two testing. The criteria for determining playing level was: Level I player (sideline player) – a player who played special teams and played in 10 plays or less as a field player. Level II player (field player) – a player who started less than 40% (4 of 10) of the team's games or played one quarter (15 min) or less per game. Level III player (starter) – a player who started 60% (6 of 10) of the teams games or played three-quarters (45 min) or more per game. Level IV player (recruit) – a level III player who made all-conference, all-Northern California, all-state, or all-American.

Test Directions

For the 40-yard dash, the participant took a three-point stance with the down hand behind the line. When ready, the participant initiated forward movement sprinting 40 yards. The tester started the stopwatch on the initial movement of the down hand and stopped the stopwatch when the participant crossed the line 40 yards away from the starting position.

For the football 20-yard shuttle test, the participant took a three-point stance, with the down hand on and the feet straddling the middle line. When ready, the participant

moved laterally to touch an outside line, reversed direction, ran past the middle to touch the other outside line, reversed direction and ran past the middle line. The participant initially moved right or left, but during the second trial, he initially moved in the opposite direction taken in the first trial. The tester started the stopwatch on the initial movement of the down hand and stopped the stopwatch when the participant crossed the middle line the second time after having touched both outside lines.

Statistical Analysis

Pearson product moment correlations were used to determine the relationship between the 40-yard dash and the football 20-yard shuttle test time as well as the relationships between 40-yard dash time and football playing ability and the football 20-yard shuttle test time and football playing ability. Descriptive statistics of age, height, and body weight were taken on all participants prior to day one of testing. A one-way ANOVA with a Tukey post hoc test was done for each of the two tests comparing the times of the level I, level II, level III, and level IV players. A stepwise multiple regression analysis was used to determine the relationship of 40-yard dash and the football 20-yard shuttle test to football playing time.

Chapter IV

Data Analysis

Introduction

This chapter presents the results of data analysis and discussion for this study. Data from this study were analyzed to determine the relationship between the 40-yard dash and the 20-yard shuttle run to playing time of community college football players.

Results of Data Analysis

The mean baseline descriptive characteristics for all 27 subjects are summarized in Table 1. The mean ($\pm$ SD) height was 73.23 inches (± 2.66), mean weight was 214.00 pounds (± 43.58), mean age was 19.48 years old ($\pm .99$).

Table 1

Descriptive Characteristics

<u>N</u> = 27	<u>Mean</u>	<u>Range</u>		<u>SD</u>
		<u>Min</u>	<u>Max</u>	
Height (inches)	73.23	69	78	2.66
Weight (pounds)	214.00	165	325	43.58
Age (years)	19.48	17	21	.99

Of the 27 subjects, 11 subjects were defined as skilled position players, 7 were defined as semi-skilled position players, and 9 were defined as non-skilled position players.

Table 2 summarizes the mean and standard deviation for the 40-yard dash time, and 20-yard shuttle time. The mean ($\pm$ SD) 40-yard dash time was 5.27 sec ($\pm$.32), and mean ($\pm$ SD) 20-yard shuttle time was 4.62 sec ($\pm$.28).

Table 2

Mean and SD for 40-yard dash and 20-yard shuttle

<u>N</u> = 27	Mean	Range		<u>SD</u>
		Min	Max	
40-yard dash	5.27	4.63	5.99	.32
20-yard shuttle	4.62	4.23	5.30	.28

Table 3 summarizes the mean and standard deviation for the 40-yard dash time and each level, and the 20-yard shuttle time and each level. For the 40-yard dash the mean ($\pm$ SD) for level 1 was 5.11 sec ($\pm$ 0.09), 5.28 sec ($\pm$ 0.29) for level 2, 5.37 sec ($\pm$ 0.31) for level 3, and 5.28 sec ($\pm$ 0.58) for level 4. For the 20-yard shuttle the mean ($\pm$ SD) for level 1 was 4.57 sec ($\pm$ 0.18), 4.57 sec ($\pm$ 0.21) for level 2, 4.66 sec ($\pm$ 0.33) for level 3, and 4.69 sec ($\pm$ 0.44) for level 4.

Pearson product moment correlations were done comparing the 40-yard dash time and the 20-yard shuttle time, the 40-yard dash and playing level, and the 20-yard shuttle and playing level. The correlation coefficient for the 40-yard dash and the 20-yard shuttle was .86 ($p \leq .05$), .21 for the 40-yard dash and playing level, .16 for the 20-yard shuttle and playing level. Table 4 summarizes the results in a correlational matrix.

Table 3

Mean and SD for 40-yard dash and the 20-yard shuttle and each level

<u>N</u> = 27	Mean	Range		<u>SD</u>
		Min	Max	
<hr/>				
<u>40-yard dash</u>				
Level 1	5.11	5.00	5.21	.09
Level 2	5.28	4.85	5.72	.29
Level 3	5.37	4.99	5.88	.31
Level 4	5.28	4.63	5.99	.58
<u>20-yard shuttle</u>				
Level 1	4.57	4.27	4.84	.18
Level 2	4.57	4.30	4.86	.21
Level 3	4.66	4.24	5.30	.33
Level 4	4.69	4.23	5.25	.44

Table 4

Zero-order Correlational Matrix for the 40-yard dash, 20-yard shuttle, and Playing Level

	<u>40-yard dash</u>	<u>20-yard shuttle</u>	<u>Playing level</u>
40-yard dash			
20-yard shuttle	.86*		
Playing level	.21	.16	1.00

* $p \leq .05$

Table 5 shows the results from the one way Anovas done with the 40-yard dash time and playing level, and the 20-yard shuttle time and playing level. No significant differences ($p \geq .05$) were found between levels in either the 40-yard dash time or the 20-yard shuttle time.

Table 5

Analysis of Variance for the 40-yard dash

<u>Source of Variation</u>	<u>df</u>	<u>f</u>
Between	3	0.71
Within	23	

Analysis of Variance for the 20-yard shuttle

<u>Source of Variation</u>	<u>df</u>	<u>f</u>
Between	3	0.26
Within	23	

The stepwise multiple regression was not run because there was no significant correlation between the 40-yard dash and playing level, and there was no significant correlation between the 20-yard shuttle and playing level. This was shown in the Pearson product moment correlation. The results are summarized in Table 4.

Reliability of testing

When collecting data, each subject was allowed three trials with a minimum of three minutes between each trial. The best time of the three trials was used for data analysis. Kirby (1991) suggested that the running test used for this study usually has high reliability (0.95).

Discussion

In discussing the results of this study, it is important to note that studies comparing the 40-yard dash and the 20-yard shuttle run were very limited. Smythe (1994) and Barnes and Attaway (1996) stated that agility is essential in sports and football, but none of the studies in the review of literature discussed the 20-yard shuttle run specifically. When the 40-yard dash was discussed, the majority of the literature was on how to improve an athlete's time. In addition, the majority of the studies reviewed were qualitative in nature and did not test subjects for a comparison of physical skills. Furthermore, in the review of literature, only dos Remedios and Holland (1992) reviewed characteristics of community college football players.

20-yard Shuttle Run

The mean of the shuttle run was 4.62 sec (± 0.28) for all of the subjects. Of the 27 subjects, 17 (63%) were equal to or above the mean, while 10 (37%) were below the

mean. Of the 17 that were above the mean, only two were from the non-skilled position players. The skilled position players (10) made up 59% of the subjects above the mean.

When comparing the means of each playing level, level 1 (4.57 sec) and level 2 (4.57 sec) had the lowest mean, while level 4 (4.69 sec) had the highest mean. Over half of the subjects from level 1 and level 2 (66% and 63%) were above the mean. Level 3 (4.66 sec) had the widest range (4.24 sec to 5.30 sec) of all the levels, yet over half of the subjects (77%) were below the mean. The data suggests that many of the subjects were close to the study mean (4.62 sec). This was evident in level 3's group mean of 4.66 sec. Level 4 had the highest mean (4.69 sec) of all the levels. Level 4 had the fewest number of subjects (4), and half of the group was above the mean. The two subjects above the mean were the second and seventh highest of all subjects. In addition, the two subjects are from the non-skilled position players, where the majority (7 of 9) are below the study mean.

The results of the study also indicated that 20 (74%) of the subjects recorded their best times in their third trial. It is important to note that, as was previously mentioned in the limitations of the study, no attempt was made to evaluate any previous experience of the participants in performing or practicing the tests. The data suggests that many of the subjects had no previous experience, and that as their trials continued, they learned the technique that produced the best results. In addition, on the third trial, the majority of the subjects began the test moving in the same direction as they had on their first trial.

40-yard dash

The mean of the 40-yard dash was 5.27 sec (± 0.32). Of the 27 subjects, 16 (59%) were equal to or below the mean, while 11 (41%) were above the mean. Of the 16 subjects that were below the mean, one came from the non-skilled position players. All of the skilled position players (11) were below the mean, and comprised 69% of the subjects below the mean.

When comparing the means of each playing level, level 1 (5.11 sec) had the lowest mean, while level 3 (5.37 sec) had the highest mean. All of the subjects (6) in level 1 were below the mean. This would account for this level having the lowest mean. Level 3 had the majority of their group (5 of 9) above the mean. This would account for level 3 having the highest mean. Level 4 had the widest range (4.63 sec to 5.99 sec) which also accounted for the lowest and highest times in the study.

The results of the study also indicated that 16 (59%) of the subjects recorded their best times in their second trial. This suggests that the subjects possibly used the first trial as a warm-up. It must be noted, as was previously mention in the assumptions for the study, that it was assumed all subjects performed their best efforts during testing.

Conclusions

The data suggest that the relationship between the 40-yard dash and the 20-yard shuttle test was statistically significant. The stepwise multiple regression statistical procedure was not run because there would have been no relationship between the 40-yard dash and the 20-yard shuttle test to playing time. This is evident from the Pearson

product moment correlation run for the 40-yard dash and playing time ($r = .21$) and the 20-yard shuttle test and playing time ($r = .16$) were not statistically significant ($p \geq .05$).

The null hypothesis that there would be no relationship between the 40-yard dash and the football 20-yard shuttle test was rejected because a significant relationship was found. Data from a Pearson product-moment correlation between the two variables resulted in a $r = .86$ ($p \geq .05$). The fact that these two variables were significantly related raises some questions because one variable deals with straight linear speed (40-yard dash), while the other variable deals with agility (20-yard shuttle test). These two variables both have explosive power aspects, but each movement is vastly different.

The null hypothesis that there will be no difference between the 40-yard dash times of level I, level II, level III, and level IV players was accepted as there was no statistical significant differences between any of the levels. In addition, the null hypothesis that there will be no difference between the 20-yard shuttle test times of level I, level II, level III, and level IV players was accepted as there was no statistical significant differences between any of the levels.

Ross and Schulte (1994) stated that football coaches and professional scouts have always used the 40-yard dash as a predictor of skill potential. Results from this study suggest that using raw data scores may not be a good predictor of skill potential. Data indicate that in the 40-yard dash, level I had the lowest time ($\bar{m} = 5.11$ sec) of all the levels. In addition, level I was the only level to be below the mean for the study.

Barnes and Attaway (1996) stated that there was no question that enhancing agility was beneficial to performance in football. Results from this study would suggest

differently. Data indicate that level I and level II had the lowest times ($\bar{m} = 4.57$ sec) in the 20-yard shuttle test. Level IV had the highest ($\bar{m} = 4.69$ sec) time in the shuttle test.

Recommendations

Based on the results presented in this study, the following recommendations are suggested for future research studies.

1. Future research should investigate the 40-yard dash and the 20-yard shuttle test in relation to the positions that the football players play. Test all offensive and defensive linemen together, running backs, tight ends, and linebackers together, and the wide receivers, quarterbacks, and defensive backs together.
2. Future research should investigate the relationship of the 40-yard dash and the 20-yard shuttle test. Data from this study suggested a high correlation between the two variables.
3. It is recommended that a better system be developed to determine the playing levels of each player.
4. Future research should investigate different levels of football (high school, Junior college, four-year colleges, and Professional football) and the relationship of the 40-yard dash and the 20-yard shuttle test.
5. It is recommended that each subject practice the shuttle run prior to testing for time.

Chapter V

Summary

Introduction

This chapter presents a summary, the conclusions, and the recommendations for this study.

Summary

The purpose of this study was to determine the relationship of the 40-yard dash and the football 20-yard shuttle test to football playing time of male community college football players. Twenty-seven football players from Gavilan Community College were tested in the 40-yard dash and the football 20-yard shuttle test. On day one, all subjects were tested in the 40-yard dash. Each subject completed three trials with a minimum three-minute rest between each trial. Testing order was non-skilled players, semi-skilled players, and skilled players. On day two, the football 20-yard shuttle test was administered with each subject completing three trials with a minimum three-minute rest between trials. Testing order was skilled players, semi-skilled players, and non-skilled players.

The best of the three trials was recorded. These times were then correlated with each other and the players' playing ability, which was based on criteria developed by the researcher. The criteria was based on the amount of playing time and skill level of the participants.

Pearson product moment correlations were used to determine the relationship between the 40-yard dash and the football 20-yard shuttle test time as well as the

relationship between 40-yard dash time and football playing ability and the football 20-yard shuttle test time and football playing ability. Descriptive statistics of age, height, and body weight were taken on all participants prior to day one of testing. A one-way ANOVA with a Tukey post hoc test was done for each of the two tests comparing the times of the level I, level II, level III, and level IV players. The stepwise multiple regression statistical procedure was not run because there would have been no relationship between the 40-yard dash and the 20-yard shuttle test to playing time. This is evident from the Pearson product moment correlation run for the 40-yard dash and playing time ($r = .21$) and the 20-yard shuttle test and playing time ($r = .16$) which were not statistically significant ($p \geq .05$).

Conclusions

Results from the study suggest that there is no relationship between the 40-yard dash and 20-yard shuttle test and playing time. The relationship between the 40-yard dash and the 20-yard shuttle test was statistically significant ($r = .86$; $p \leq .05$). Hence the null hypothesis that there would be no relationship between the 40-yard dash and the football 20-yard shuttle test was rejected because a significant relationship was found. The null hypothesis that there will be no difference between the 40-yard dash times of level I, level II, level III, and level IV players was accepted as there was no statistical significant differences between any of the levels. In addition, the null hypothesis that there will be no difference between the 20-yard shuttle test times of level I, level II, level III, and level IV players was accepted as there was no statistical significant differences between any of the levels.

Recommendations

Based on the results presented in this study, the following recommendations are suggested for this and/or future studies and research.

1. Future research should investigate the 40-yard dash and the 20-yard shuttle test in relation to the positions that the football players play. Test all offensive and defensive linemen together, running backs, tight ends, and linebackers together, and the wide receivers, quarterbacks, and defensive backs together.
2. Future research should investigate the relationship of the 40-yard dash and the 20-yard shuttle test. Data from this study suggested a high correlation between the two variables.
3. It is recommended that a better system be developed to determine the playing levels of each player.
4. Future research should investigate different levels of football (high school, Junior college, four year colleges, and Professional football) and the relationship of the 40-yard dash and the 20-yard shuttle test
5. It is recommended that each subject practice the shuttle run prior to testing for time.

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APPENDIX A

**Subject Informed Consent in Accordance with the
San Jose State University Institutional Review Board
For the Protection of Human Subjects**

San José State
UNIVERSITY

**College of Applied
Sciences and Arts**
*Department of Human
Performance*

One Washington Square
San Jose, CA 95192-0054
Voice: 408-924-3010
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**THE RELATIONSHIP OF PERFORMANCE TESTS
TO PLAYING TIME OF
COLLEGE FOOTBALL PLAYERS**

**STATEMENT OF INFORMED CONSENT
FOR THE 40-YARD DASH AND
THE FOOTBALL 20-YARD SHUTTLE TEST**

Invitation to Participate

You are invited to participate in a study of the 40-yard dash and the football 20-yard shuttle test. The study will be conducted at Gavilan Community College campus.

Basis for Selection

You have been selected as a participant because you are a football player at Gavilan Community College. Should you decide to participate, you will be asked to participate in the tests described below.

Initials _____

The California State University:
Chancellor's Office
Bakersfield, Chico, Dominguez Hills,
Fresno, Fullerton, Hayward, Humboldt,
Long Beach, Los Angeles, Maritime Academy,
Monterey Bay, Northridge, Pomona,
Sacramento, San Bernardino, San Diego,
San Francisco, San José, San Luis Obispo,
San Marcos, Sonoma, Stanislaus

Purpose of the Study

The purpose of the study will be to determine the relationship of the 40-yard dash and the football 20-yard shuttle test to playing time of community college football players.

Explanation of Procedures

Prior to Testing Methodology

Prior to testing you will complete and sign a consent form to be approved by the Human Subjects Institutional Review Board of San Jose State University. After approval by the Human Subjects Institutional Review Board of San Jose State University, your body height, weight, and age will be recorded.

Testing Methodology

For the testing, you will wear a pair of socks, football shoes, and appropriate exercise clothing.

40-yard dash

You will take a three-point stance with the down hand behind a line. When you are ready, you will run 40-yards at a full sprint. Time will begin on the initial movement of your down hand, and will end when you cross the line 40-yards away from the starting line. You will do three trials with a minimum of three-minute rest between each trial. The best of the three trials will be recorded.

Initials _____

The football 20-yard shuttle test

You will take a three-point stance, with your down hand on and your feet straddling the middle line. When you are ready, you will move laterally, touch an outside line, reverse direction, run past the middle to touch the other outside line, reverse direction and run past the middle line. Time will begin on the initial movement of the down hand, and will end when you cross the middle line for the second time after having touched both outside lines. You may initially move right or left, but during your second trial, you must initially move in the opposite direction taken in the first trial. You will do three trials with a minimum of three-minute rest between each trial. The best of the three trials will be recorded.

Discomforts and Risks

You will be at no major risks while performing these tests. Discomfort may occur if you pull a muscle. Another possible discomfort may occur from stumbling while doing the tests. This may result in scrapes on the legs and arms. You may also experience discomforts commonly associated with exercise: sweating, increased heart rate, breathing rate, and body temperature.

Benefits from Participation in the Study

You will benefit from the testing by receiving an accurate assessment of your running time in the 40-yard dash and the football 20-yard shuttle test. The information from these tests may be used to fill out questionnaires for football recruitment.

Initials _____

Compensation for Participation in the Study

There will be no compensation for participation in the study.

Assurance of Confidentiality

Your test data will be coded by number, not by subject name, to ensure maximum confidentiality. Your data will be kept in a locked file cabinet by the primary investigator until completion of the study, and will then be destroyed. The results of the investigation may be used for research publication and presentation; however, your right to confidentiality and anonymity will be protected.

Withdrawal from the Study

Your participation in this study is completely voluntary. You may withdraw your consent and discontinue participation at any time (including during the testing) without prejudice.

If you have questions about the investigation now or during the testing, please feel free to ask. If additional questions come up later, or in case of emergency, call John Lango at 831-636-0966, Dr. Craig Cisar at 408-924-3018, or Dr. Carol L. Christensen at 408-924-3035 and they will respond. In case of any complaints during or after the testing, you may contact Dr. Nabil Ibrahim, Associate Academic Vice President of Graduate Studies and Research 408-924-2480.

Initials_____

Consent

By signing this form, you are agreeing that:

- (a) you have decided to participate in this study having read
having read the information provided above;
- (b) you understand the discomforts and risks involved;
- (c) you understand that you can withdraw anytime; and
- (d) you understand that your name will be kept confidential
except with your expressed consent.

You will be given a copy of this consent form for your personal records.

Signature of Test Subject _____ Date _____

Print Name _____

Signature of Test Director _____ Date _____