SPEED AND AGILITY TRAINING THE MUSTANG WAY:
THE DEVELOPMENT OF AN INSTRUCTIONAL DVD FOR CAL POLY
ATHLETES' SUMMER TRAINING

A Project
presented to
the Faculty of California Polytechnic State University,
San Luis Obispo

In Partial Fulfillment
of the Requirements for the Degree
Masters of Science in Kinesiology

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June 2013

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WAY: THE DEVELOPMENT OF AN
INSTRUCTIONAL DVD FOR CAL POLY
ATHLETES' SUMMER TRAINING

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ABSTRACT

SPEED AND AGILITY TRAINING THE MUSTANG WAY: THE DEVELOPMENT OF AN INSTRUCTIONAL DVD FOR CAL POLY ATHLETES' SUMMER TRAINING

Gary Douglas Heron

The purpose of this project was to create an instructional DVD of speed and agility training for Cal Poly student-athletes. The DVD is for athletes' use when they are away from campus during summer break and contains information about the same drills and information the strength and conditioning coaches provided while athletes were on campus. The project was filmed and edited by the graduate assistant strength and conditioning coach for Cal Poly intercollegiate athletics. The DVD contains 74 drills that encompass speed techniques, acceleration techniques, plyometrics, footwork, and change of direction. Recommendations for further empirical research in the area of speed and agility training are provided.

*To my Mom and Dad,
the best coaches I ever had.*

*To Corie,
the best part of my Cal Poly experience.*

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Chapter 1

Introduction

Background of the Problem

In the last 100 years the sports landscape has changed quite dramatically in terms of training and the roles that coaches have on increasing performance. Over the last 30 years there has been a major shift in the training landscape with the creation of various strength and conditioning organizations. In 1978 the National Strength and Conditioning Association (NSCA) was created, “to educate, communicate, analyze, promote, and develop the strength and conditioning profession” (NSCA, 2008, <http://www.nsca-lift.org/aboutnsca/history.shtml>). In 1978 there were seventy-six founding members of the NSCA, and with the turn of the century there are now twenty-five thousand members worldwide. The NSCA creates an opportunity for strength and conditioning professionals to share ideas and continue research in the field, and as a result athletes will benefit from the improved knowledge and safety of current training practices (NSCA, 2008, <http://www.nsca-lift.org/aboutnsca/history.shtml>).

California Polytechnic State University San Luis Obispo started a full time strength and conditioning department approximately fifteen years ago. As a NCAA Division I institution, Cal Poly has 20 different intercollegiate varsity sports teams. Every summer athletes receive workouts from the strength and conditioning coaching staff. The staff designs the workouts to prepare the athletes for the fall quarter, as well as allow them to participate in whatever summer activities they may be involved. The reality of the situation, especially with athletes at the collegiate level, is that there are times when the athletes are on their own without the supervision of coaches when

conducting their training. The strength and conditioning coaching staff recognized the need for a better and more efficient manner to convey speed and agility drills to its student athletes during the summer break.

Problem Statement

The problem facing Cal Poly strength and conditioning coaches during the summer break is they have no effective way to communicate and reinforce previously learned skills to prepare athletes for the upcoming fall quarter of training and competition.

Purpose Statement

The purpose of this project was to create a DVD that provides instruction and drills that are specific for the Cal Poly athletic teams. Athletes and coaches could use it as a reference tool for athletes who leave the San Luis Obispo area and are training on their own for summer.

The DVD was developed in conjunction with the Head Strength and Conditioning coach of Cal Poly Athletics, Brett Gerch, and appropriate sport coaches from the Cal Poly athletic department. The DVD contains visual images of drills and their progressions with appropriate coaching cues and set-up information.

This DVD was the first attempt at providing a supplemental instructional tool for Cal Poly student-athletes. Due to the novelty of such a product, several prominent coaches at Cal Poly who are familiar with speed and agility training reviewed the DVD and provided specific feedback on the design and content (See Appendix A for sample questionnaire and responses).

Assumptions

The project was undertaken with the following assumptions. The first assumption was that every athlete would have a basic understanding of every drill that is on the DVD. The second assumption is that the DVD will refresh the athlete's memory and provide sound coaching advice that the Cal Poly strength and conditioning staff has developed during the previous training year.

The video was created in the hopes that by providing access to instruction from the Cal Poly coaching staff to student-athletes performances would then be improved. While the video was made based on the most current available research in the realm of speed and agility training, it in no way can guarantee successful athletic performance.

Justification Statement

The summer break from school can represent a major turning point for collegiate athletes. Chris Holder (2005) was the first full time strength and conditioning coach at Cal Poly and he stated, "The summer could possibly be the most influential time of the year on a team's performance going into the fall" (p. 3). With little or no class load, athletes are able to devote more time to training exclusively for their sport while getting adequate recovery time and minimal stress levels. Summer strength and conditioning programs are a unique problem because many athletes leave San Luis Obispo to return home or to participate in summer leagues. As such, many athletes must conduct their strength and conditioning training on their own or with a coach that is not familiar with the Cal Poly strength and conditioning program. Klinzing (1992) said, "The off-season, including the summer months, provide the time and opportunity to develop an athlete's running speed" (p. 48). The problem for athletes and coaches alike is that there is a lack

of consistency in training and there is always the possibility of unclear instructions and an athlete recalling what each drill or exercise is on their respective summer programs.

What was lacking in the strength and conditioning department is an effective way to instruct athletes when not present with a member of the strength and conditioning staff from Cal Poly.

In previous years at Cal Poly, athletes received packets of workouts with attached conditioning programs, but would have to call or e-mail the coaches for clarification or questions. The problem with calling or e-mailing is that it can be hard for athletes to visualize what a coach is talking about or to provide clear answers as a coach through the use of words alone. With the creation of a DVD athletes have a reference tool at home which could answer many questions without the need to call the strength and conditioning staff, or if there is a need to call or e-mail, the coaching staff can refer the athlete to a particular portion of the video and then provide further explanation or coaching points.

The primary focus of any strength and conditioning department is to enhance speed and agility for every athlete in their respective sports through a variety of training and coaching techniques. “The faster an athlete can run, the greater advantage that athlete has in competition” (Klinzing, 1992, p. 54). The goal of the summer training programs, particularly for fall sports, is to adequately prepare athletes to be the fastest, most agile athletes possible.

The DVD in this project is attempting to fill the previous gap of a visual medium for those athletes that are training on their own during the summer months. Also, the student-athletes utilizing this project have previous information and knowledge of the

skills, but the pre-practice information the DVD can provide can help provide some elaboration in regards to movement reference because a basic level of understanding has been attained (Hodges & Franks, 2002). As practice and time continue to progress, the coach or instructor may then repeat the demonstration of the skill as frequently as necessary (Magill, 2004). The video format of this project will allow the student-athlete to observe the skill as much as they see necessary which allows them to act as their own coach. Also, video feedback has become a popular technology and it can allow student-athletes to observe a more experience athlete to help understand technique and timing (Romack & Valantine, 2005).

Delimitations

Delimitations for this project are:

- The DVD only contains speed and agility drills that the strength and conditioning staff have performed with the athletes.
- Speed and agility is the focus of the DVD and therefore strength training will be part of the program, but not the focus of this project.
- The strength and conditioning staff selected drills and exercises based on importance, ease of execution, and equipment needs.
- The DVD is intended for athletes who have already trained with the Cal Poly strength and conditioning coaching staff and therefore, have some knowledge of the techniques covered in the DVD.
- The DVD is designed for the athletes to answer their own questions, or for a coach to reference particular skills or techniques when questions by athletes do arise.

Limitations

The limitations of the project are:

- Athletes received limited feedback and thus there was no way to measure the effectiveness of the drills and skills presented.
- The DVD contents were largely influenced by the wants and needs of the Head Strength and Conditioning Coach in order to create the highest amount of consistency from the DVD project to the actual programs the strength and conditioning department employ.

Operational Definitions

The following list contains definitions of key terms that are relevant to the purpose of the study.

- Stride frequency refers to the number of strides that are taken in a given time or for a given distance (Lee & Ferrigno, 2005).
- Stride length is the distance covered per stride when measured from the center of mass (Lee & Ferrigno, 2005).
- Acceleration refers to an athlete's ability to maintaining and control the correct body position while quickly changing direction through a series of movements. (Yap, Brown, & Woodman, 2000).
- Velocity/Speed refers to a player's change in distance over time with regards to the direction the player is moving in (Lee & Ferrigno, 2005).

Chapter 2

Review of Literature

Introduction

California Polytechnic State University San Luis Obispo has had a full time strength and conditioning program for approximately 10 years. Since the creation of a strength and conditioning department there has been a problem with inadequate supervision and instruction of athletes during the summer break. The strength and conditioning staff has needed to create an effective way to provide instruction to student-athletes during the summer training period. Many of the student-athletes leave San Luis Obispo for the summer to return home for some much needed relaxation and vacations. While away from San Luis Obispo, the athletes train without the supervision and instruction that is available from the strength and conditioning department at Cal Poly. Therefore, the purpose of this DVD project was to create a reference tool for student-athletes for their summer training to better prepare them for the fall season. This chapter contains information on speed, its components, and various training parameters as well as agility training techniques and the various strategies used to improve lateral speed.

Speed

The Definition of Running Speed

Speed is a quality that is always in high demand in sports. A major aspect of the job of a strength and conditioning coach is the development and enhancement of the speed of players (Cissik, 2004; Young & Pryor, 2001). Kreighbaum and Barthels (1996) define speed as how fast a body is moving or the distance that is covered divided by the time it takes to cover that distance. From a biomechanical perspective speed is only a

state of motion without regards to the direction. In order to be most accurate in terms of a sport setting, this project is concerned with velocity. Velocity encompasses both the speed and the direction that a body is moving (Kreighbaum & Barthels, 1996). Drawing a distinction between speed and velocity is important in the sports setting because it is important for athletes to move in the right direction on the playing field to ensure that the speed is useful in the sport.

The Components of Speed

There are two main factors in running speed, stride length and stride frequency (Cissik, 2004; Cissik, 2005; Lee & Ferrigno, 2005). For every athlete there is a unique balance between these two factors that will allow the athlete to run at the fastest speed possible. When training for speed development, a strength and conditioning coach attempts to manipulate stride length and frequency to develop an athlete's greatest speed potential. Stride frequency is the number of steps an athlete takes per minute or the number of strides taken over a certain distance. Stride length relates to the distance an athlete covers in one stride length, from the center of mass (Lee & Ferrigno, 2005). Optimal stride length at maximum speed is normally 2.3 to 2.5 times an athlete's leg length (Lee & Ferrigno, 2005). Optimal stride length is important because many athletes will overstride, and this leads to less force production (Baechle & Earle, 2000). There is a braking action of the legs which greatly decreases the rate of force production into the ground for forward propulsion. Athletes typically develop their optimal stride length through proper coaching of technique and improvements in strength and power, (Lee & Ferrigno, 2005).

Running Terms and Definitions

Running is not a single movement, but is a sequence of movements that make human locomotion and high speeds possible (Blazeovich, 2000; Cissik, 2004). In order for there to be a thorough understanding of speed, there needs to be an explanation of the different components or phases that occur in an athlete when running.

The first phase in running is the swing phase. During the swing phase hip extension occurs which allows the foot to be contacting the ground and thus being able to apply force backwards into the ground to propel the athlete forward (Blazeovich, 2000). The athlete drives the foot down to the ground by the hip extensors. The ankle is undergoing dorsiflexion with the big toe pointed up towards the knee; this position allows for more storage of elastic energy to help maximize propulsion (Cissik, 2004).

The second phase in running is the recovery phase. During this phase hip flexion occurs which brings the leg forward and prepares it for the next swing phase (Blazeovich, 2000). When the foot leaves the ground, the athlete dorsiflexes the ankle and flexes the knee and quickly brings the heel up towards the hips. As the heel is recovered, the leg will begin to swing forward. The athlete's arms are swung in opposition to the legs to maintain balance and provide additional forward momentum (Cissik, 2004).

There are a few other terms that are important in running. Foot-ground contact refers to the time at which the foot is striking the ground during running (Blazeovich, 2000). The support leg is the leg that is striking the ground, which means it is supporting the body (Blazeovich, 2000).

The Basic Speed Model

When looking at speed, there are two distinct phases that a strength and conditioning coach may train in different ways. The first phase of the basic model is the acceleration phase. Acceleration involves a particular mechanics that involve a falling and recovery action with each movement affected by the previous movement (McFarlane, 1993). Within the acceleration phase there are two subphases, the pure acceleration phase and the transition phase. The pure acceleration phase is approximately the first 15 meters of the run while the athlete is gaining speed. The transition phase last from 15-30 meters. During the transition phase the running mechanics change from a falling and recovery type of action to a more upright posture with a longer leg cycle. Maximum velocity phase runs from 30 meters up to 60 meters approximately where the athlete is moving at their fastest speed possible.

Figure 1. Basic Model of Speed from McFarlane, 1993, p. 57.

Training for Running Speed

The components of running speed are stride length and stride frequency. In order to increase speed, the strength and conditioning coach must learn to alter the components of speed to reach the maximum speed possible. First, the different training for stride frequency methods will be explained.

Stride frequency is trained in a number of ways. First, an increase in overall body strength tends to evoke greater rates of stride frequency. The increase in muscular force capacity allows an athlete to recover their legs more quickly and thus have higher rate of leg turnover. Another way to increase stride frequency is sound running technique. Sound running technique allows for efficient movements which means higher rate of turnover and thus more contacts with the ground (Blazeovich, 2000, Cissik, 2004, McFarlane, 1993). Increasing the number of contacts with the ground is important because that is the only time that the athlete is then, and only then, producing locomotive energy (Lee & Ferrigno, 2005).

Also, a coach may use sprint-assisted training to improve stride frequency. The assisted sprinting allows athletes to gain the feel of running at a faster velocity than they are normally capable of (Klinzing, 1992, McFarlane, 1993). Young (1993) suggests that in order to achieve gains in running speed, the training must occur at a high movement speed which is what the sprint assisted training does. The increased speed allows athletes to develop mechanics at a faster rate than at normal running speed. The overspeed training allows athletes to learn to relax while running at a speed that is faster than their normal, unassisted speed (Cissik, 2005, Lee & Ferrigno, 2005). One point of caution in order to avoid injury is to ensure that athletes are very familiar with proper technique and are adequately warmed up (Baechle & Earle, 2000, Lee & Ferrigno, 2005).

The other variable that a coach can manipulate to improve speed is to increase stride length. Once again, an increase in overall body strength will correspond with an increase in stride length (Klinzing, 1992, p. 49). By being stronger an athlete is able to apply more force to the ground and reduce ground contact time (Blazeovich, 2000). An

increase application of force to the ground means that the athlete can travel further per stride.

Proper sprinting technique is important when striving to improve stride length as well. Proper mechanics ensures that maximum force is directed into the ground and translated into horizontal distance. Within proper technique, there are three main components: posture, arm action, and leg action. Posture relates to the lean of the body during the run and how it changes through the different phases of running. The acceleration phase will create more forward body lean because of the need for the athlete to overcome the body's inertia. Body lean is usually around 45 degrees in acceleration but will straighten out to about 80 degrees as top speed is reached (Baechle & Earle, 2000). A key evaluative tool for determining good running posture is to be able to draw a straight line from the ankle of the support leg through the knee, hip, torso, and head when the leg is fully extended (Lee & Ferrigno, 2005).

The arm action component of running technique refers to the velocity and range of motion of the athlete's arms. The hands should be loose and the arms should swing at the shoulder with a ninety degree bend at the elbow. The hand should move from shoulder height to slightly behind the hips (Klinzing, 1992). The arm swing helps to counteract the rotational forces that the athlete can generate with their legs. The leg forces are immense, and thus vigorous and coordinated arm movements are absolutely necessary to keep the body in proper alignment. While arm movement is important in all phases of running, it is of critical importance in the initial acceleration phase (Lee & Ferrigno, 2005).

The leg action component of running technique looks at the relationship between the hips and legs relative to the torso and the ground. In order to create the most force into the ground to accelerate and run at maximum velocity, there needs to be a coordinated extension of the hip, knee, and ankle. Additionally there needs to be proper recovery mechanics to ensure that optimal stride frequency and stride length are being achieved (Lee & Ferrigno, 2005).

Strength training for stride length improvements can occur through a number of mediums. Classic strength training is probably the most common form of training for improved stride length (Sheppard, 2003), but the use of weighted pants and vests, parachutes and harnesses, and uphill running all provide resistance to build strength and foot contact power (Cissik, 2005; Lee & Ferrigno, 2003; McFarlane, 1993; Zatsiorsky, 2006). There is some caution to resisted run training because too heavy of loads can impair good running mechanics, which would hinder the goal of speed development (Baechle & Earle, 2000; Lee & Ferrigno, 2005).

Coaching and Training Speed Mechanics

There are a variety of modalities that strength and conditioning coaches use to train for speed development. Strength training is extremely popular in the strength and conditioning field for improving speed. Exercise selection is particularly important from a specificity standpoint because the lifts should have similar mechanical components as actual sprinting (Zatsiorsky, 2006, p. 112). Once again however, there needs to be a distinction between lifting for improved acceleration and lifting for improved maximum velocity. The overlying principle in choosing lifts based on their mechanical properties is that there will be increased synchronization of the peripheral nervous system, improved

gross coordination, and increased training of the proprioceptive stabilizing mechanisms (Sheppard, 2003; Zatsiorsky, 2006).

When examining training for acceleration there are a few key components of the movement that need to be addressed. Sheppard (2003) explains that, “During acceleration athletes tend to be moving forward and upward in the sagittal plane with a low center of gravity, with the center of mass ahead of the legs (forward lean)” (p.28). The resulting body position means that the knee joint angle is in a higher degree of flexion compared with the joint angle during the maximum velocity phase (Sheppard, 2003). Lifts that mimic the appropriate joint angles are (Sheppard, 2003; Zatsiorsky, 2003):

- Dead lift
- Squat
- Snatch
- Clean
- Lunges (various positions)
- Cable hip flexes

Muscle groups that are overlooked in acceleration are the hip extensors that provide the explosiveness out of the lower position. Exercises that are selected should involve high levels of force being generated in the lower extremity, but the load is supported through the torso with the spinal extensors (Sheppard, 2003). Some examples of appropriate exercises are the (Sheppard, 2003; Zatsiorsky, 2006):

- Dead lift
- Clean
- Squat

Running is a total body movement and that means the upper body must be strong as well. Sheppard (2003) points out that the chest, shoulders, and upper back muscles play a role in creating propulsive forces upward and forward to help generate lift along with forward momentum. Sheppard (2003) suggests that exercises such as the close-grip bench press and some pulling movements may decrease the time it takes for an athlete to make his or her initial step.

The mechanics used in maximum velocity area of top speed have significant differences when compared to the mechanics used during acceleration. The pumping action of the arms helps to create lift while the back extensors, hip extensors, and plantar flexors provide leg-extension forces. The hip flexor muscles drive the leg up and forward to create the reaching with the leg during each stride. Zatsiorsky (2006) suggests that selecting lifts that allow strength to develop at the weakest points of an athlete's strength curve will yield the best results. Additionally, using the proper body position to most closely reflect the demands of the athletic movement is important to ensure that the strength that is being developed is specific to an athlete's needs (Zatsiorsky, 2006).

Coaches should select lifts that focus on extension and flexion at the hips for the greatest specificity (Sheppard, 2003). Some lifts to consider are (Sheppard, 2003; Zatsiorsky, 2006):

- Romanian dead lifts
- Good mornings
- Reverse hyperextensions
- Snatch
- Clean

Strength training is an important component of any speed program and will be a large determinant of the success of the Cal Poly athletes. However, plyometrics and jump training have become increasingly popular in recent year and therefore it is imperative that this training modality be addressed in this project. Leaders in USA Weightlifting suggest that plyometrics have a high carryover to starting and acceleration during sprinting. Also, they suggest that plyometrics can improve cutting maneuvers, lateral quickness, and many other sports skills where explosiveness and changes in direction are necessary (USA Weightlifting, 2003). Plyometrics are defined as, “a quick, powerful movement that involves the stretch-shortening cycle” (Baechle & Earle, 2000, p. 428). The purpose of plyometric exercises is to increase the power of these quick and powerful movements by enhancing the natural elastic components of the muscle tendon complex, as well as the stretch reflex (Baechle & Earle, 2000; Zatsiorsky, 2006).

Plyometric training is similar to any other kind of resistance training in that it involves a periodization of intensities from low to high as athletes improve their performance and ability (Baechle & Earle, 2000; Zatsiorsky, 2006). Just as loads,

frequency, and intensity varies with resistance training, so does plyometric training. Many of the plyometric movements that strength and conditioning staff use in the summer programs of Cal Poly athletes will be complexed. Complexed means that the plyometric exercise will follow an exercise or be part of a superset for a particular exercise. Complexing is not as common because often it is better to perform plyometrics as a single workout for a day (Baechle & Earle, 2000, p. 436), but due to time and staff constraints a complex system is more effective and efficient. Resistance training and plyometrics will be an important part of the speed development program for Cal Poly.

While strength training does play an important role in the development of speed, there are some other coaching points related to how to conduct speed training sessions that need to emphasis. The following list of guidelines is useful in designing and implementing a speed training program (Baechle & Earle, 2000; Brown & Ferrigno, 2003, p. 21):

1. Speed workouts should be conducted when the athletes are adequately recovered.
2. Proper technique needs to be taught and practiced over time.
3. Each set and repetition of a drill needs to be followed by adequate rest periods and Brown and Ferrigno (2003) recommend a one to four work-to-rest ratio.
4. Speed workouts should vary between hard, medium, and light intensity days.
5. Keep track of the athlete's workload. The total distance for each workout should be recorded.

6. Maximum speed occurs when the athlete runs in the most relaxed, fluid motion possible.
7. Speed endurance can be accomplished by increasing distance or decreasing rest intervals.
8. All speed workouts should be started with a dynamic warm-up to prepare the athletes for maximum efforts.

These guidelines will be the basis for the development of the speed and agility drills that are being covered in the DVD.

Agility

The Definition of Agility

The term agility can have many different definitions. Some consider agility the ability to change direction, while others consider it the ability to react to a stimulus in the appropriate fashion. For the purpose of this paper agility will be defined as “the ability to maintain and control correct body position while quickly changing direction through a series of movements” (Yap, Brown, & Woodman, 2000, p. 10).

Agility Technique

Not unlike linear running, there are technical elements to agility skills that make the skill more or less effective. Young & Farrow (2006) point out that there are technique recommendations in coaching literature, but there is little or biomechanical research that relates to the best technique used for maximizing speed during change of direction. Due to the lack of research on optimal agility technique, there will be a brief discussion of body position and how it influences the ability to change direction. In running, a forward lean is required for acceleration, while a backwards lean is required

for braking. A sideward lean will produce a lateral change of direction. The change in body positions causes changes in the direction of forces being directed into the ground and this in turn allows the necessary change in direction of the athlete (Young & Farrow, 2006).

Brown and Vescovi (2003) have suggested some basic of mechanics for agility. They said that the arm movements can be great contributors to the efficiency of agility movements. They also provided a step-by-step sequence of change of direction movement that is simplified, but does help to illustrate the role the arms play: To begin the change of direction the head is first rotated to face the new direction. From this point the inside arm (e.g. if an athlete plants on the right foot to cut to his or her left, the left arm becomes the inside arm) pulls in a backward direction (shoulder hyper-extension) as the outside (right) arm moves forward (shoulder flexion). This contralateral movement of the arms assists rotation of the body on the longitudinal axis and thus will help channel the movement in the new direction. Arm actions that are too far away from the body will create more resistive forces for the body to overcome and result in lower velocity of movements (as the force-velocity relationship illustrates) (p. 7).

As Brown and Vescovi (2003) point out, the arm movement of an athlete can be very critical to influencing proper body mechanics and thus they recommend rapid, compact arm movements be taught and coached in order to maximize change of direction speed.

Agility Movements

Ian Jeffreys (October 2006) proposes a unique approach to examining and classifying the skill of agility. In the mind of Jeffreys, agility is a serial skill that has

different parts that are designed to achieve certain objectives that will then correlate to the execution of a skill.

The first series of movements that Jeffreys identifies are the initiation movements. Jeffrey's describes initiation movements as being aimed to initiate or change movement. Initiation movements normally involve short, rapid movements that allow athletes to either start or change direction (Jeffreys, October 2006). Typical initiation movements seen in athletics can include cross-steps, first-step starts, dropsteps, and cut steps (Jeffreys, October 2006).

The second classifications of movements are the transition movements. The main concern for an athlete in transition movements is keeping themselves in such a position that they are able to read and react to a stimulus. The aim of the transition movement is often focused on body position to create the optimal position for rapid reaction as opposed to being focused on maintaining maximal speed. Typical transition movements include backpedals, sideshuffles, and chop steps, and all of these are seldom done for long distances (Jeffreys, October 2006).

The final classes of movements are the actualization movements. In the actualization phase of the movement the athlete will have perceived a stimulus and respond by either moving to a point in play or executing a sport skill. The actualization movements typically decide the success of the sequence in performing the skill (Jeffreys, October 2006).

Agility and the Central Nervous System

In order for agility skills to be the most effective, it has to become an almost automatic response to a stimulus. Brown and Ferrigno (2003) suggest that agility training

may be the most effective way to elicit game-like neuromuscular demands. Agility training can resemble actual competition through intensity, duration, and recovery time (Brown & Ferrigno, 2003). To illustrate this automatic response characteristic, a brief explanation of the central nervous system (CNS) and how it functions in agility follows.

When an athlete decides on a movement pattern, the CNS will determine which muscles are needed and how they are to be sequenced to properly execute the movement. Once a basic pattern is developed and put in place the CNS can then begin to make refinements and adjustments by changing the number of fibers in each muscle being used as well as the frequency with which muscles are turned on. By practicing a skill more and more times, the CNS becomes more and more refined at that movement. Improvements in the movement will cease when the feedback of the movement and the intent of the movement are in synch (Craig, 2004).

A problem that occurs with agility training is the idea of anticipation. By knowing the movement pattern ahead of time the athlete can increase the synchronization of movement because of the time to plan. Therefore, it can be more effective if agility drills require responses to commands and thus removes the ability to anticipate and the CNS can become more effective at coordinating the signal and the feedback (Craig, 2004). Young and Farrow (2006) say that there is considerable research that indicates better athletes are able to produce more accurate and faster responses because of an enhanced ability to pick up anticipatory information. Typically the information an athlete needs to make decisions comes from the presence of an opponent. Young and Farrow (2006) also suggest that a training stimulus needs to be as sport-specific as possible in

order to allow the athletes to use their perceptual and anticipatory skills to their advantage.

The practice of planned versus unplanned movements has also gained some attention in recent years. It is not uncommon to see athletes who are great with on-field agility, but test poorly in agility fitness tests. Young and Farrow (2006) cite a study by Besier et al. that showed that unplanned movements produced greater loads on the knee joint in a cutting movement. Therefore it could be of crucial importance to include unplanned agility training to not only enhance performance, but also reduce the risk of injury.

Training for Agility

As I previously stated, there is no single technique that is accepted as the best possible way to execute agility drills and skills. However, there are some recommended components that are considered fundamental for performing changes of direction in the most effective manner. The first component is visual focus. Ideally the athlete's head will be in a neutral position with the eyes looking straight ahead regardless of the movement be executed. There are exceptions to the forward head position, such as the athlete focusing on another athlete or an object. Additionally, the head should be turned and a new focus point should be found to initiate any changes in direction (Brown & Ferrigino, 2003).

The second component goes back to the arm action. In order for changes in direction to be performed the fastest possible, then powerful arm movements are needed during transitions and directional changes. The arm movement is extremely important in reaccelerating to a high rate of speed after a maneuver is made. Inadequate or incorrect

arm movements can result in a loss of not only speed, but also of efficiency (Brown & Ferrigno, 2003).

The last component that Brown and Ferrigno addressed in agility training is recovery time. In order for the drills to be the most effective and realistic to actual competitive settings, the work to rest ratio needs to be consistent with that of the athlete's sport. This ensures adaptations are occurring that will change the appropriate energy systems and therefore make for gains that are truly sport specific.

Agility Strategies

There are two primary strategies or skill sets that are covered in agility training. The first strategy involves running curves. Some sports have more curve patterns in their sports such as running the bases in baseball or softball. Running curves tends to be an easier skill because the change in direction is less abrupt. The downside to curves is that they tend to be performed slower and thus the change in direction takes longer.

The second strategy is called making a cut. A cut is an abrupt change in direction. Cutting tends to be faster, but there is a higher level of complexity associated with performing it. This increased speed in cutting increases the potential for injury purely because of the increased speed and forces at work (Cissik, 2007).

Coaching Guidelines for Agility

Coaching any skill is highly based on the skill level of the athlete. In order to be most effective in providing feedback, it is imperative that coaches understand what type of feedback is most appropriate. Jeffreys (December, 2006) proposes a pyramid model. The pyramid has a foundation level at the bottom, followed by a development level, and finally at the top is the peak level.

The foundation level focuses on developing the fundamental target movement patterns for the skill or sport. Typically, the tasks are novel in nature and the greatest challenge is in conveying the general idea of the skill. The foundation level is the most important level of development because a well learned foundation will correspond to better transfer to the more advanced levels. Jeffreys recommended coaching guidelines for the foundation level can be found in Figure 2.

Figure 2. Coaching Guidelines for Foundation Level Agility Sessions

- Develop the key discrete movements of the sport.
- Focus on movement quality, not movement speed.
- Focus initially on single-task skills.
- Use quality instructions utilizing all 3 communication preferences.
- Perform skills in noncompetitive situations until the movement pattern is developed.
- Break down skills into smaller parts where appropriate.
- Use frequent feedback but without undue precision.
- Target only 1 area during feedback.
- Use distributed practice to minimize fatigue.
- Blocked practice can be used initially, but then introduce random practice methods.

*Adapted from Ian Jeffreys, December 2006

The second level is the development level. At the development level the focus is on combining the target movement patterns learned in the foundation level with more sport-specific movements. There also will be an increase in the fluidity, efficiency, and effectiveness of the movements. Drills at this level begin closed, but then increase in complexity and openness (Jeffreys, December 2006). Recommended coaching guidelines for the development level are presented in Figure 3.

Figure 3. Coaching Guidelines for Development Level Agility Sessions

- Focus on the key transitions and movement patterns of the target skills.
- Initially use closed drills and then gradually move to open drills.
- Increase the speed of drills and introduce competition.
- Increase the variety of drills.
- Reduce the quantity of feedback while increasing its precision.
- Challenge athletes to monitor their performance via questioning in feedback.
- Practices should be randomly distributed and should include variance.
- Drills should increasingly be performed in the target context.

*Adapted from Ian Jeffreys, December 2006

The final level is the peak level. The peak level is the autonomous stage of skill development where skills are largely automatic. Success at the peak level can only be accomplished through success in the previous levels. Drills in this level are highly sport-specific and open in nature, including reaction drills (Jeffreys, December 2006).

Guidelines for coaching at the peak level are outlined in Figure 4.

Figure 4. Coaching Guidelines for Peak Level Agility Sessions

- Use a variety of complex open drills.
- Drills should be highly-sport specific and in the target context.
- Drills should be randomly distributed and include variance.
- Feedback should be infrequent but precise.
- Feedback should enable the athlete to answer movement-related questions.

*Adapted from Ian Jeffreys, December 2006

Motor Learning Concepts in Speed and Agility Training

Motor learning played a vital role in the development, design, and production of this DVD. What follows is a brief discussion of the appropriate motor learning concepts and how they apply to this project.

Magill (2004) defines modeling as “the use of demonstration as a means of conveying information about how to perform a skill (p.249)”. When initially learning a skill a beginner will need to see a demonstration of the skill before attempting it (Magill, 2004). Bandura was credited with noting that most human behavior is learned via

modeling and that during this observation process a person forms rules and uses those in future occasions (Rowland & Stratton, 2007). Hodges and Franks (2002) noted that, “the coach is responsible for teaching the athlete what to do, how to do it, and hopefully, how to do it well (p.793)”. In the modeling process a learner will perceive the invariant features of the movement and use that information to develop their own movement pattern when asked to perform the same skill (Magill, 2004). Magill notes that in observing demonstrations a common principle is that the skill should be performed correctly. Due to the fact that the observer is taking in the invariant features of the movement it is important that skill be performed correctly so the modeling will mirror the correct execution. Additionally, the observer will look at the strategy the demonstrator employs and will tend to try to replicate that in the initial attempts of the skill (Magill, 2004).

It has been argued that the pre-practice information, such as a video segment, will assist the athlete in understanding the expected response through a visual medium and this would aid in the development of a reference pattern that the athlete could compare feedback to (Hodges & Franks, 2002). As practice and time continue to progress, the coach or instructor may then repeat the demonstration of the skill as frequently as necessary (Magill, 2004).

Conclusion

The literature on speed and agility training is extensive. There is also some disagreement as to how best to train to enhance speed and agility. It is difficult enough to train athletes when you, as a coach, are working in a one on one setting. When athletes must train on their own, such as over summer break, it is near impossible to provide

quality instruction to an athlete. After seeing the ins and outs of speed and agility, it was clear that a DVD could be a valuable tool to enhance and improve the speed and agility training of the Cal Poly athletics program.

Chapter 3

Methods

Participants

The main participant in the video was Head Strength and Conditioning Coach for Cal Poly Athletics, Brett Gerch. In addition to the strength and conditioning coaching staff, I enlisted a few athletes from Cal Poly sports teams, a football player and a women's soccer player, who could provide good examples of drills and techniques in the video. It was my belief that having real athletes perform the drills and skills would allow for more complex drills to be performed because there is sometimes a need to have a partner to properly perform a drill. Also, when real athletes provide the demonstration it is more representative of Cal Poly and I wanted to place Cal Poly at the forefront of this DVD.

Prior to filming, participants were required to sign an informed consent form that contained information on the objective of the video, how it would be filmed, and it also noted that participation was completely voluntary in nature. Participants were all familiar with the drills because of their previous training history with the strength and conditioning department at Cal Poly.

I conducted all of the filming of the participants. It was not necessary to leave the camera unattended to allow myself to perform a drill because of the great work by my participants. I was able to do all of the filming and directing of the DVD because I had participants who were willing to be in the DVD and also had Brett Gerch assisting with some of the set-up of drills to have a more efficient operation.

The actual filming of the DVD was done from multiple angles for each drill and skill. Filming was done from a side angle as well as a straight angle and for some of the footwork drills a close up of the feet was done as well to show the patterning required. It was hoped that multiple angles would present the drills in a easier way to understand and also provide more opportunities to present the skill. During the editing process the conversion of footage to slow motion was also done to further enhance the viewing experience and give the viewer an opportunity to see the skill done at a speed that is easier to visualize.

Equipment and Instruments

The majority of the equipment for the drills and techniques contained in the video were located in the Cal Poly Varsity Weight Room and were used with permission from the Head Strength and Conditioning Coach, Brett Gerch and the Cal Poly Athletic Department. The equipment that was used consisted of a variety of cones and domes, as well as speed harnesses, speed sleds, mini-hurdles, agility ladders, medicine balls, and standard Olympic weights.

For the filming component of the project I utilized the Kinesiology Department's JVC video cameras, along with a portable tripod. I consulted with Jack Collins, the Kinesiology Departments Electronic Systems Specialist on the use of the video and audio equipment. For the editing of the video I worked with Cal Poly's Media Distribution Services and Henry France who is in charge of video services. Media Distribution Services provided the computers and software for all of the editing of the video as well as burning copies of the DVD to be contained in the project. Final copies of the DVD were

burned onto Memorex DVD-R 16X with 4.7 gigabytes capacity with an estimated 120 minutes of storage.

Drill and Exercise Selections

The two main areas of the DVD are speed and agility. Within each section the drills and skills were broken down into the various components as they are taught as part of the Cal Poly Strength and Conditioning program. Speed is broken down into the following areas:

- Speed-Technique
- Speed-Acceleration
- Plyometrics

Agility was broken down into the following two subsections:

- Agility-Footwork
- Agility-Change of Direction

There is some carryover and transfer from each section to the others, but typically as the material is presented it is done so from these categories. In the following figures I have listed the drills that were filmed for the two different topic areas, with the appropriate sub-sections for each skill.

Figure 5. Speed Techniques and Drills included in the DVD.

Speed Techniques and Drills		
Technique	Acceleration	Plyometrics
1. Ankling 2. A-skips 3. B-skips 4. Fast leg: every 3 steps 5. Fast leg: continuous 6. Over step run 7. Buttkicks 8. Backwards run 9. Mini hurdles: 1 in each, straight ahead 10. Mini hurdles: 2 in each, straight ahead 11. Sled Pull: Max Velocity	1. 2-point start 2. Speed harness: Acceleration 3. Sled Pull: Acceleration	1. squat jump 2. tuck jumps 3. single leg tuck jump 4. Hurdle hops 5. Russian Hops 6. Side-to-side pushoffs 7. Step Hops 8. Dumbbell squat jump 9. Box jump 10. Single leg box jump 11. Lateral box jump 12. Couture jumps 13. Depth pushup 14. Crossover the box pushups 15. Pierre pushups 16. Plate punch 17. Medball punch 18. Laying Medball shot 19. Bar throws 20. Bounding: Height 21. Bounding: Distance 22. Bounding Lateral

Figure 6. Agility techniques and drills included in the DVD.

Agility Techniques and Drills	
Footwork	Change of Direction
1. Agility ladder: 2 in each, linear 2. Agility ladder: 1 in each, linear 3. Agility ladder: lateral, 2 in each 4. Agility ladder: icky shuffle 5. Agility ladder: in-out shuffle 6. Agility ladder: side right in 7. Agility ladder: side left in 8. Agility ladder: zigzag crossover shuffle-front 9. Agility ladder: zigzag crossover shuffle front 10. Agility ladder: zigzag crossover shuffle combo 11. Agility ladder: Ali shuffle 12. Agility ladder: Backpedal 13. Agility ladder: 2 in, 2 out, touch w/squat 14. Agility ladder: Swizzle 15. Agility ladder: Slalom 16. Agility ladder: Bunny hop 17. Mini-hurdles: lateral, 2 in each 18. Mini-hurdles: backpedal 19. Mini-hurdles: Weave 20. Mini-hurdles: Carioca	1. Pro Agility 2. Star Drill: Sprint Middle 3. Star Drill: Sprint, Backpedal, Shuffle 4. W Drill: Shuffle, Sprint 5. W Drill: Sprint 6. 3 Cone Drill 7. Inverted Triangle 8. Box Drill: Sprint 3 sides 9. Box Drill: Backpedal, shuffle, sprint 10. Box Drill: Sprint, shuffle, backpedal & return 11. N-Movement 12. A-Movement 13. Hour Glass 14. 60-Yard Shuttle 15. DB Drill 16. S-Drill 17. S-Drill w/hip swivel 18. Figure 8

Time Line

The following timeline is the progression of the completion of this project.

Figure 7. Timeline for completion of Gary Heron's Master Project.

Date	Progress
April 4, 2008	Proposed project to committee
April 12, 13, 19, & 20, 2008	Filmed drills for each section of DVD
April 21 st , 2008 to June 1, 2008	Edit Video, format DVD, and prepare final report. Submit updated drafts of report as completed to Chair for review. Finish video, burn copies of DVD. Edit and revise final report. Submit copy of report to committee chair for review as completed..
June 2, 2008	Submitted Final Copy of Project to Committee for review prior to final presentation
June 11 th , 2008	Presented and Turned In Final Project to Committee
August 17 th , 2012	Submitted Revised Final Project Paper to Committee
March 3, 2013	Project Submitted

DVD Design

The DVD format was chosen for a number of reasons. First of all, video productions are becoming much more laymen friendly. Also, the DVD would allow for the presentation of a lot of information as well as fairly easy mass production for the student-athlete population. Additionally, the DVD is small, portable and has a large capacity which allows for all of the drills to be presented in the desired amount of detail for this project.

The design of the DVD is simple and direct to be the most user friendly possible. The initial menu page has two submenu options: 1) Speed Training and 2) Agility Training. Under speed training there are three more submenus for the technique drills, acceleration drills, and the plyometrics. Each of the drill submenus contains links to each drill under that section. The agility training menu is labeled much in the same way. There are two submenus for the footwork and change of direction drills. Under the footwork and change of direction drills there are links to the video portions for each of the specified drills.

Figure 8. Schematic illustrating planned layout of DVD table of contents and menu.

The DVD illustrates the appropriate set-up of the drills, as well as the appropriate techniques to be used. I originally envisioned there being some slow motion footage of each drill to illustrate proper technique and then film at regular speed to show the drill in action. I was able to keep each segment less than 1 minute in length which allowed for plenty of time to cover all of the drills that I wanted to include.

There is a disclaimer at the beginning of the DVD to inform viewers of the intention of the DVD in being a reference tool and not a substitute for a certified coach. The disclaimer also states that the DVD is intended for trained Cal Poly athletes and not

for people who are not healthy enough to participate in the drills. Also, there will be contact information for the Cal Poly strength and conditioning department for questions and additional information.

Evaluation and Feedback

As mentioned in Chapter 1 there was an evaluation survey on the DVD design and content. Overall, four different coaches participated the review of the initial version of the DVD. Two of the coaches were head coaches, in baseball and strength and conditioning, and one was an assistant basketball coach, all of whom worked at the Division I level. The last reviewer was a Cal Poly graduate student who was a certified strength and conditioning specialist through the National Strength and Conditioning Association. Also, the respondent played football at the collegiate level and worked with the St. Louis Rams as a strength and conditioning coach in the National Football League (NFL).

The aim of the survey was to receive feedback on the design and content of the DVD and how it could be improved. The questionnaire was comprised of five questions with an additional area for comments and suggestions. Each of the reviewers received a copy of the DVD along with an accompanying survey with instructions for filling it out. The reviewers were given a week to look over the DVD and fill out and return the survey to myself. Participants responded to questions using a scale of strongly disagree, somewhat disagree, neutral, somewhat agree, or strongly agree.

The first question the reviewers were asked was, “The layout of the DVD is clear and easy to navigate.” The aim of this question was to gain an understanding of how easy the DVD was to use and understand and access the contained information.

The second question asked was, “The DVD effectively presents the drills and skills.” This question was asked to ensure that the actual material contained in the DVD was presented in an effective and understandable fashion that would allow Cal Poly student-athletes to use the DVD.

The third question coaches were asked was, “This DVD could help improve the summer training of Cal Poly Athletes.” This question was designed to gain an understanding of the perceived benefits of the DVD and its use as part of the summer training programs of Cal Poly student-athletes.

The fourth question was, “I will encourage my athletes to refer to this DVD during their summer training.” This question would allow the author to understand the likelihood that Cal Poly coaches would encourage their student-athletes to use the DVD and follow the program.

The fifth question was, “The DVD was clear in its explanations and presentations of the drill and skills.” This question was used to help the author evaluate the content and the presentation of the material. It was important to evaluate the effectiveness of the presentation of the material in the DVD and the viewer’s ability to understand the drills and skills being presented.

The final question was a comments section in which the coaches could provide any additional comments about the DVD, their likes, dislikes, and how it could be improved or altered to better serve the Cal Poly student-athletes.

Chapter 4

Conclusion

Summary of the Project

The purpose of this project was to create a DVD to be used by Cal Poly student-athletes during their summer training. The DVD encompasses the majority of the speed, plyometric, and agility drills that the current strength and conditioning staff uses in the training of Cal Poly's student-athletes. The end product of this project was a DVD that contains the key points of how to set-up and execute the various drills that the Cal Poly strength and conditioning department employs to make faster and more agile athletes.

There were many goals that this project was aimed at achieving. First, it was imperative to have an understanding of the most current research and coaching practices that are used in coaching speed and agility skills. Secondly, the project would create a modern, portable coaching tool that would allow athletes to have a better grasp of how to perform speed and agility training. Finally, by giving athletes information that is easy to access, the strength and conditioning staff can ask athletes to perform more complex movements during the summer months and this ideally leads to better conditioned athletes when they return in the fall. For the fall sports, such as football and soccer, the summer is the preseason training and losing any time because of summer can be truly detrimental. The need for a medium that could bridge the gap between the strength and conditioning staff at Cal Poly and student-athletes at various locations around the country presented the unique opportunity to create this project.

When the DVD was initially conceptualized, it was going to meet a number of needs. The primary need was that of student-athletes who needed a resource to get sound

speed and agility information from the Cal Poly strength and conditioning staff. The second need was a self-serving one, because as a coach I recognized the need to better acquaint myself with the practices and philosophies involved with speed and agility training. As the strength and conditioning field continues to advance it was important to familiarize myself with the literature and provide the best possible information and methods to your athletes.

The creation of this DVD married research and coaching philosophy to create a final product. Initially, as with any research endeavor it was necessary to consult the current research. There are strength and conditioning coaches around the world and the technology of today allowed the sharing of information instantly. The access to articles and research on speed and agility training was amazing and provided a sound base for the project. Armed with the latest information, the project truly began to take shape when there was consultation with the head of the Cal Poly strength and conditioning staff. The strength and conditioning program had changed in the past year and with that change came many changes in the way training was conducted. This project encompassed many of the changes and was very timely in its creation to help reinforce the new methods that have been undertaken.

The DVD was made with the intent to meet the needs of the Cal Poly student-athletes, the Cal Poly sport coaches, and the Cal Poly strength and conditioning department. Cal Poly has put a premium on speed since the creation of a full-time strength and conditioning department in the late 1990's. This DVD was the next step in meeting the demands of the Cal Poly athletic department. As the training evolves at Cal

Poly, so must the ways that the coaching is conducted and this DVD is the evidence of that evolution.

Results of the DVD Survey

The initial design of the DVD was my own creation. As previously stated, it was important to receive feedback from colleagues and peers in the intercollegiate athletic field. Feedback was collected from various Division I coaches in basketball and baseball programs, strength and conditioning, as well as a member of the Cal Poly Kinesiology graduate program who has strength and conditioning experience at the collegiate and professional levels.

The first question asked on the survey was designed to learn about the user's opinion of the layout and usability of the DVD. 75% of the people surveyed rated strongly agreed that the layout was clear and therefore no changes were made to the overall design of the DVD.

The second question asked the viewers to evaluate how effectively the drills and skills were presented in the DVD and 100% of the respondents "strongly agree" with the statement that the DVD was effective in its presentation.

The third question was aimed at garnering the perceived benefits of using the DVD in the training programs of Cal Poly student-athletes. Again, 100% of the respondents strongly agreed with the statement.

The next question wanted to assess how likely the coaches would be to recommend the use of the DVD in their summer training. One respondent answered "Neutral" because he was not a current coach and therefore the question was not

applicable to him. The remaining respondents all answered “strongly agree” and this gave a strong sense that the project has the backing of the coaches going forward.

The last question was used to assess the clarity of the explanations and presentation of the drill and skills. All respondents answered “somewhat agree” or higher which showed that the DVD was meeting its goal of providing quality information in an easy to understand format.

Finally, there was a section at the end for the respondents to provide any further comments or suggestions about the DVD that would be helpful in going forward. The first recommendation was more slow motion footage of all of the drills. After receiving the completed surveys I went back into the video and included at least one angle of slow motion footage on every drill. Many drills have multiple angles of slow motion footage that will hopefully provide a more complete description of the drills. Another point of feedback was the font that was used on the title slides for each drill. The default settings on the editing program added a shadow and 3-dimensional effect to each letter which made the text appear fuzzy. The fuzziness was mentioned by the reviewers and I went back and removed the 3-dimensional effect and the shadow from all of the title slides to make the text easier to read.

Table 1
Coaches' Feedback Survey Responses in Percentages

Question	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The layout of the DVD is clear and easy to navigate.	0	0	0	25%	75%
The DVD effectively presents the drills and skills.	0	0	0	0	100%
This DVD could help improve the summer training of Cal Poly Athletes.	0	0	0	0	100%
I will encourage my athletes to refer to this DVD during their summer training.	0	0	25%	0	75%
The DVD was clear in its explanations and presentation of the drills and skills.	0	0	0	25%	75%

The reviewers of the DVD provided valuable feedback (surveys and feedback in Appendix A) about the design of the DVD and the layout that allowed me to make changes to the final product and put forth the best possible project. All of the surveyors had many years of experience in coaching at various levels, and their feedback allowed the DVD to be the most beneficial for myself, as well as the student-athletes who will be using it.

Strength training is still at the heart of the strength and conditioning program employed at Cal Poly and this project in no way negates a shift from that philosophy. Rather, this project has created a sound building block that allows for the best possible match between strength, plyometric, and speed and agility training possible. The strength and power development has shifted to an Olympic lift based program that is the closest marriage of sports training possible in terms of strength training. Plyometrics have become increasingly popular and effective in use and the DVD includes an entire section with these exercises that meet this need. Speed and agility skills provide the opportunity of the application of strength and power gains and bridge the gap from the weight room

to the playing field. This DVD and the research done to create it provide the bridge between training and performance.

Future Projects

This speed and agility DVD was a stepping stone in the world of technology for the strength and conditioning department at Cal Poly. At the projects original inception it was the latest and greatest technology. As time passes, other mediums come about that offer greater ease and versatility. The next project of this type could be an on-line based format. Many colleges and universities have expanded their use of home websites to include video information and the content of this DVD could be moved to an on-line format. Also, with the emergence of the popular website YouTube, a website that allows user to upload and share their own made videos, it is far easier to get video content to the masses. With the creation of a Cal Poly Strength and Conditioning Channel the need for the DVD format could be removed and a purely on-line based format could take over. With more and more people having access to smartphones and other personal electronics, the on-line format would offer the greatest amount of portability possible at this time.

Additionally, the DVD format is not the only thing that could be added on to. While there are gender disparities in this project, further projects could include sport specific content with gender appropriate demonstrators. With 20 intercollegiate sports programs at Cal Poly that certainly provides a number of opportunities to further refine and add to this project to make it even more comprehensive that it is now. It would also hopefully encourage more student-athletes to stay active over the summer being able to view athletes and coaches for their own sport demonstrating sport specific skills.

The production of the DVD could be another area of improvement. With equipment limitations and software limitations, it would be a major step up in production to get more professional levels of film equipment and editing software and that would add a lot to the presentation to the product. Additional cameras would allow a greater number of angles to be shot and edited into the final product. Also, one inclusion that would enhance the product would be diagrams of the drill along with the descriptions prior to the demonstration. Unfortunately, the software used in the project did not allow an easy or time efficient way to do that and it was unfeasible due to time constraints to do it.

Recommendations for Future Research

Just as this project was a step forward in the strength and conditioning program at Cal Poly, there needs to be further steps forward in the realm of speed agility research. Perhaps the most interesting area of future research is in the realm of movement quality. The Functional Movement Screen developed in the mid-1990's by Lee Burton and Gray Cook has become widely used in the sports world as an assessment tool to try and determine a person's risk of injury due to poor movement patterns. With speed and agility training being the primary movement training that strength and conditioning professionals do it is only fitting that there be further research in the realms of all movement areas. While the Functional Movement Screen is just one option for evaluating movement assessment there is still a void left in terms of the specific sport skills and how best to assess them. By pinpointing proper positioning of the body during different agility and sprinting skills it could allow coaching to advance and mean less reliance on anecdotal evidence and more on research based data. As research continues

there may be recommendations so coaches may better instruct proper angles and body positions that allow athletes to move more efficiently in training and in competition.

Along with quality of movement being a large area of further exploration, there is still no consensus in the strength and conditioning community about how best to perform changes of direction or starts and stops. While many well-known and experienced coaches, such as Mike Boyle and Robert Dos Remedios, have developed their own programs and products for lateral movement skills there is no established procedure or technique for coaching it or evaluating it. While there are a few common ideas there is still a large gap in true research for what is the safest and most efficient way to change direction. Many coaches are still using closed-chain drills when sports is a largely open-chained environment and there is no clear progression for how to teach the skills of stopping, changing direction and accelerating in a closed-chain setting and then transition that to an open-chained environment.

Finally, the link between strength training and speed and power development still provides a blurry picture. Certainly there are limitations in program design and exercise selection in any setting, but the search for the optimal exercises and loads for speed development is still elusive. Understanding the balance between frequency and intensity in strength training and how it correlates to the frequency and intensity of speed and agility training is still not understood fully. While there is much research on the best methods of lifting for improved performance, it would be a great area of study to see how strength training couples with speed and agility training influences various performance measures. A breakthrough in that area could be a game changer in the strength and conditioning field for years to come.

Retrospective

If time was not an issue and equipment and money were not obstacles this project could have taken years. Working with only one camera and not having a crew of any sort besides myself made for limitations in the filming of the DVD. If I were doing this project again, or if I were updating this project, I would be sure to have more drills and much more footage about how each drill is set-up and more participants demonstrating the drills. Due to time constraints I was only able to get a few athletes to participate and could only select the most important drills. There were those drills that were at such an advanced level that it would not have been safe or practical for them to be included in the DVD. As a strength and conditioning program, Cal Poly is still fairly new to the scene, but this project is a step towards its growing maturity. In the future I would hope that a DVD on strength training would be developed and if that is not at Cal Poly then I hope to develop such a project in my professional career. In the perfect world there would be a DVD that contained speed and agility drills, strength training, and plyometrics for each specific team that were sport specific. This DVD was a start and I believe that it will be utilized by many athletes and there will be a great benefit.

Personal Reflection

This project and the development of the DVD proved to be an amazing experience. When I first began to undertake my graduate studies I wanted to make my master's project something tangible and substantial. The DVD came to mind because this will be representative of me as a coach and as a person.

When the initial storyboarding of the DVD and its contents were talked about it was hard to visualize what would be included and how it would all get done. The

literature provided the greatest amount of direction because it provided insight into other strength and conditioning professional's methods and philosophies. It was in the literature that it became evident of what should be the areas of focus for the DVD: speed technique, acceleration technique, plyometrics, agility footwork, and agility change of direction. Many of the strength and conditioning professionals whose work I read reinforced my belief that summer training could be the most crucial part of the training year.

Strength training receives a lot of attention because it is easily quantifiable and it is very impressive to see a bar loaded up with weight being lifted with perfect technique. The student-athletes now have the opportunity to execute perfectly in the speed and agility training by having a resource that provides information and examples of drills and the proper technique for their execution. The DVD allowed for personal growth as well. By having to verbalize and design how to film various drills I became much more aware about how I present information to athletes. When faced with the task of creating directions for drills it became a lot harder than I originally thought because you want to be clear enough that you do not need a visual. It was a difficult task, but a rewarding process and I know I am a better coach for having done it.

In the time since I left Cal Poly in June of 2008 so much has changed for me. I have become a better coach, increasingly curious about the field of strength and conditioning, and I have gained a lot of perspective on the field that only comes with experience and the day to day grind of being in the trenches of coaching. I have worked at the Division I level as well as in the private sector and seen all the various challenges of both. What I have learned most is that you can never stop learning in this line of work.

There are always new challenges and new ideas that propel the field forward and to be the best you have to continue to be a student. I am so grateful for all that I have learned and I am also proud to be the coach that I am today. I left Cal Poly as a bright eyed master's candidate and now I am so much more. I am a son, a husband, and a coach, and that is what the university experience has come to mean to me. Thank you Cal Poly for making me not only, "Learn by doing", but now I "Live by doing".

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Appendix A

DVD Survey

Name _____

Organization Men's Basketball

Speed and Agility Training the Mustang Way

Survey on DVD Design and Effectiveness

Please answer each of the following questions by circling the response that you most closely agree with. Please feel free to provide any additional comments and/or suggestions.

1. The layout of the DVD is clear and easy to navigate.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

2. The DVD effectively presents the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

3. This DVD could help improve the summer training of Cal Poly Athletes.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

4. I will encourage my athletes to refer to this DVD during their summer training.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

5. The DVD was clear in its explanations and presentation of the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

6. Please provide any additional comments about the DVD, what you liked and how it may be improved or altered to better meet the needs of the Cal Poly Student-Athletes.

Comments .....

Maybe it's my vision, but the writing that ~~used~~ was used on the video was a bit hard to read. It looked a bit fuzzy.

I also thought you could have had more replays of the exercises or even some in slow-motion. Some of the demonstrations were kind of quick.

Overall, I thought it was good. It will be a good tool for our athletes.

Name _____

 Organization CAL POLY KINESIOLOGY DEPT.
 Speed and Agility Training the Mustang Way

Survey on DVD Design and Effectiveness

Please answer each of the following questions by circling the response that you most closely agree with. Please feel free to provide any additional comments and/or suggestions.

1. The layout of the DVD is clear and easy to navigate.

 Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

2. The DVD effectively presents the drills and skills.

 Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

3. This DVD could help improve the summer training of Cal Poly Athletes.

 Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

4. I will encourage my athletes to refer to this DVD during their summer training.

 Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree
NOT APPLICABLE

5. The DVD was clear in its explanations and presentation of the drills and skills.

 Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

6. Please provide any additional comments about the DVD, what you liked and how it may be improved or altered to better meet the needs of the Cal Poly Student-Athletes.

Comments .....

OUTSTANDING SYNCHRONIZATION BETWEEN DEMONSTRATED VIDEO FOOTAGE AND VERBAL INSTRUCTIONAL CUES FOR EACH EXERCISE ... SHOULD INCLUDE A SUGGESTION ABOUT PERFORMING SPEED BUILDING, BOUNDING DRILLS ON A MORE OPTIMUM (AND FORGIVING) SURFACE THAN ASPHALT... MIGHT BE BENEFICIAL ON A FEW OF THE LADDER DRILLS TO HAVE THE SKILLED PERFORMER GO AT A SLIGHTLY SLOWER TEMPO IF THE RECIPIENTS OF THE DVD HAVE NEVER PERFORMED THE AGILITY LADDER DRILL VARIATION... OUTSTANDING PRODUCT, GARY!

Name _____

Organization Cal Poly Baseball
Speed and Agility Training the Mustang Way

Survey on DVD Design and Effectiveness

Please answer each of the following questions by circling the response that you most closely agree with. Please feel free to provide any additional comments and/or suggestions.

1. The layout of the DVD is clear and easy to navigate.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

2. The DVD effectively presents the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

3. This DVD could help improve the summer training of Cal Poly Athletes.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

4. I will encourage my athletes to refer to this DVD during their summer training.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

5. The DVD was clear in its explanations and presentation of the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

6. Please provide any additional comments about the DVD, what you liked and how it may be improved or altered to better meet the needs of the Cal Poly Student-Athletes.

Comments .....

Great DVD with great speed training and Plyometric emphasis! Definitely a great tool for any player or coach trying to improve their fellow athlete's overall skills.

67

Name _____

Organization Cal Poly weight room
Speed and Agility Training the Mustang Way

Survey on DVD Design and Effectiveness

Please answer each of the following questions by circling the response that you most closely agree with. Please feel free to provide any additional comments and/or suggestions.

1. The layout of the DVD is clear and easy to navigate.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

2. The DVD effectively presents the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

3. This DVD could help improve the summer training of Cal Poly Athletes.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

4. I will encourage my athletes to refer to this DVD during their summer training.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

5. The DVD was clear in its explanations and presentation of the drills and skills.

Strongly Disagree   Somewhat Disagree   Neutral   Somewhat Agree   Strongly Agree

6. Please provide any additional comments about the DVD, what you liked and how it may be improved or altered to better meet the needs of the Cal Poly Student-Athletes.

Comments .....

- Positives:

- Featured male and female athletes
- Featured multi-angles of drill
- Demos and verbal explanation were helpful and allow ~~to be~~ for athletes to easily follow and perform drills correctly
- Flows well => easy to search for the specific drill that I was looking for

Appendix B
Informed Consent Form

INFORMED CONSENT TO PARTICIPATE IN: Speed and Agility Training the Mustang Way: The Development of a DVD for Cal Poly Athletes Summer Training

A research project on speed and agility training for collegiate athletes is being conducted by Gary Heron in the Department of Kinesiology at Cal Poly, San Luis Obispo. The purpose of the study is to develop a speed and agility DVD for Cal Poly athletes to use during their summer workout programs.

You are being asked to take part in this study by demonstrating selected speed and agility drills that will be filmed for the DVD project for Cal Poly Athletics. Your participation will take approximately 3 hours total spread out over 3 days. Please be aware that you are not required to participate in this demonstration and you may discontinue your participation at any time without penalty. You may also omit any drills you prefer not to participate in.

The possible risks associated with participation in this study include fatigue, minor muscle strains, possible sprains in the lower extremities, and in severe cases ligament and cartilage damage. If you should experience any muscle strains, sprains, or other injuries, please be aware that you may contact the Cal Poly Athletic Training Room or the Campus Health Center at (805)756-6065 or (805)756-1211, respectively.

Your confidentiality will be protected by keeping any personal information private and only accessible to the project leader and will not be released to any other party without the participants consent. Potential benefits associated with the study include one-on-one instruction with Certified Strength and Conditioning Specialists on advanced speed and agility techniques.

If you have questions regarding this study or would like to be informed of the results when the study is completed, please feel free to contact Gary Heron, Assistant Strength and Conditioning Coach or Head Strength and Conditioning Coach, Brett Gerch at (805)756-5288). If you have questions or concerns regarding the manner in which the study is conducted, you may contact Steve Davis, Chair of the Cal Poly Human Subjects Committee, at (805) 756-2754, sdavis@calpoly.edu, or Susan Opava, Dean of Research and Graduate Programs, at (805) 756-1508, sopava@calpoly.edu.

If you agree to voluntarily participate in this research project as described, please indicate your agreement by signing below. Please keep one copy of this form for your reference, and thank you for your participation in this research.

Signature of Volunteer

Date

Signature of Researcher

Date

Appendix C

DVD Script Transcripts

Speed Technique
Ankling Ankling is trying to build increased foot speed and increased elastic ankle strength. You are going to jog with some very short steps, really emphasizing the flexion part of the ground strike with the foot. You are going to keep your feet quiet, but they are going to be fast. You are going to explode off, really trying to get minimal ground contact time, but the maximum number of contacts as you cover the ground.
A-Skips Now A-skips we are looking for good hip extension, building strength at the hip joint as you flex and keeping that ankle nice and stiff as you strike the ground. Now you are going to skip as you drive the knee up and then fire the foot down. Don't let the heel slam into the ground and just keep up on the toes. Be nice and explosive.
B-Skips In B-skips, we are performing an A-skip but we are going to allow the recovery leg to extend out in front of us after that high knee raise then we are going to extend it out and paw down. There is a really aggressive pawing motion as you pull yourself forward off the ground. Remember keep the heels up just as the foot strikes.
Fast leg: Every 3 steps In the fast leg we are performing an ankling movement with a B-skip. We are trying to increase the stride frequency and work on that lower body ambidexterity. So you can see this is every three steps, its ankling and then a quick firing of the leg with a B-skip kind of a motion.
Fast leg: Continuous Fast leg continuous is very similar to the fast leg every 3 steps except now instead of having a couple of steps in between the fast leg, it is every step as you ankle along you have that quick firing motion of the opposite leg. So it's just quick fire, quick fire, every step as you drive up and forward.
Over Step Run The over step run is really like an a-skip, just with really pronounced mechanics. So we're performing the a-skip but really having the overextended mechanics with the running. It's a lot very high pace, a lot of repetitions as you cover the distance.
Buttkicks Buttkicks are all about increasing foot speed. So as you're running you're going to pull the heel of the lower leg up and bounce it off your butt. As the leg bends, the knee should come forward and up. Don't just flip your heels towards your butt. It should be very quick, a lot of repetitions and of course the upper stays nice and square, so do the arms.
Backwards Run The backwards run, we're using pretty much the same mechanics as you would if you ran forward just backwards. Really working on that good punch of the knee up to the chest and extend it nice and far out as you move backwards and pull yourself. Remember keep that heel up, good forward body lean.

Mini hurdles: 1 in each, straight ahead

This is mini-hurdles, 1 in each, moving straight ahead. You've got two sets of six hurdles, they are five yards apart and have a 3 to 5 yard lead up and finish. Really emphasize a good quick knee up and toe up action, real quick heel to gluteus recovery. Really accelerate out of the sprint in transition from the hurdles and through the finish.

Mini hurdles: 2 in each, straight ahead

This is mini-hurdles, 2 in each, straight ahead. And like all the other ones, 2 sets of 6 hurdles 5 yards apart with that 3 to 5 yard lead up and finish. Make sure you get both feet down and you alternate which foot goes first in each hurdle. And again the quick knee up and toe up action, the heel comes up to the glute as you are firing through the hurdle. Think of it as like an overstep run slash A-skip.

Sled Pull: Max Velocity

Alright this is a light sled pull for maximum velocity. We are really working on increasing our running strength and power and improving stride length. Don't use a heavy sled; it makes you use acceleration mechanics. Should be nice and light, start out slightly accelerating and then quickly transition into the good max velocity, leg cycling mechanics.

Speed-Acceleration
2-point start   The 2-point start, place your toes of the front foot on the starting line. Place the back foot in line with the front foot's heel about 3 inches to the side. Keep your hips down, chest up, slightly forward lean, your back heel is about a credit card width's off the ground. You're going to push equally off of both feet, your arms are opposite of your feet as you push down and drive off to accelerate.
Speed harness: Acceleration   This is the speed harness for acceleration. So one partner has the harness on, the other holds the attached handle. So start in that 2-point stance that we've talked about. The cord will be nice and tight as you lean out. Use a good punching action, the heel shouldn't go back beyond the hips. Really pump the arms, keep the chest up, the head down. Think about creating a straight line from your head to your shoulders, hips knees and heels.
Sled Pull-Acceleration   This is a heavy sled pull for acceleration. Get a heavy sled and attach it to yourself. You're going to drag for 15 to 20 yards. Emphasize an explosive start and good acceleration mechanics with a knee punching up to the chest firing the foot back down to the ground. Stay up on the toes; don't let the heel slam into the ground. Get a lot of repetitions, especially when you first start so you can get up to max speed as soon as possible.

Plyometrics
squat jump Squat jump, you're going to start in your squat stance, feet shoulder width apart interlocking your fingers and placing your hands behind your head. Explosively jump to maximum height getting maximum extension at the hip, knee and ankle. Make sure you pause in between jumps and reset your feet so each jump is maximum effort. Make sure you aren't jumping forwards or backwards. You should be landing almost exactly where you took off from. Here's a picture from the side, you're going to see maximum extension at the hip, knee and the ankle. He's jumping and landing in exactly the same spot he took off from.
tuck jumps For the tuck jump you're going to start in your squat stance and load the lower body as you swing the arms back while flexing the hips and knees. You're going to rapidly extend the hips and knees and as you jump up bring the knees up to the chest. You're still going to try and get maximum height. There's no pause on the ground, immediately go into the next jump.
single leg tuck jump For single leg tuck jump you're going to start in a one-legged squat stance. Load the lower body like a regular tuck jump and as you jump you're going to get good extension and tuck the leg that was on the ground to the chest. Don't pause on the ground, immediately go into the next jump. We're looking for quickness here and rapid extension.
Hurdle hops For hurdle hops you're going to use a mini-hurdle or a small cone. Stand to one side of the barrier with your feet shoulder width apart. Quickly jump up and over the barrier getting hip and knee flexion. Don't pause on the ground, immediately go into the next jump.
Russian Hops For Russian hops you're going to start in a narrow lunge position with one foot slightly forward and the other just behind the hips. Using the arms in unison, dip and jump explosively off the ground and switch the position of the legs while in the air. Don't pause on the ground, go into the next jump immediately and make sure the knee never contacts to the ground. Get maximum extension and think about being explosive off the ground.
Side-to-side pushoffs For side to side pushoffs you're going to stand to one side of a plyo box with one foot on the ground and one foot on the box. Using the arms in unison you're going to jump up and over the box, using the foot on the box to propel yourself up. Again, getting maximum extension, quickly off the ground, don't pause, go immediately into the next jump.

Step Hops

For step hops you're going to face a plyo box with one foot on the box and one foot on the ground behind it. The heel of the foot on the box should be near the box's closest edge. Jump using the foot on the box to drive yourself up, using the arms in unison to get maximum extension as you propel yourself up. Now we'll take a look from the side and you can see more on the position of the box. The heel of the foot is on the edge and you're exploding up quickly off the ground.

Dumbbell squat jump

For dumbbell squat jumps you're going to start in your squat stance with your feet shoulder width apart. Hold a dumbbell in each hand. The weight of the dumbbells shouldn't be more than 10-15% of your total body weight. Just like a squat jump you're jumping explosively up, maintaining good posture, jumping vertically and getting good extension at the hips, knee and ankles. Pause and reset between jumps.

Box jump

For the box jump, start by facing a plyo box in an upright position. Start with a countermovement and then jump up and slightly forward onto the box. You want to make sure you land with both feet on the box and it should be nice and controlled into a half-squat position when you catch yourself. Don't thump on the box, land gently controlling the movement the whole time.

Single leg box jump

For the single leg box jump, you're going to start by facing a plyo box with one foot off the ground. Have a slight countermovement and then jump explosively up and onto the box. You're going to land in that half squat position just like we did on a regular box jump.

Lateral box jump

For the lateral box jump, you're going to start to one side of the plyo box in a comfortable and upright position. Start with a countermovement and jump up and slightly to the side onto the top of the box, landing in a half-squat position with both feet on the box. It should be a nice soft landing, not a big thud. Again, always maintain control, step down from the box and reset to make every jump explosive.

Couture jumps

For the couture jumps you're going to set up 5 12-inch plyo boxes about 3 feet apart on a nice level surface. You're going to start perpendicular to the boxes and begin by first jumping up on top of the box down in between the first gap, then back to the top of the box, and back to the start. Then jump all the way over the box to the first gap and start the sequence again for the second box. Repeat this sequence all the way down the line of boxes and repeat in the opposite direction.

Depth pushup

For the depth pushup you're going to use 2 plyo boxes about a yard apart slightly in front of you. Assume a pushup position with your hand on the boxes with your hands on the boxes, quickly move your hands and drop into a pushup and fire quickly off the ground and catch yourself extended up on the box.

Crossover the box pushups

The crossover the box pushup. Get in a pushup position with one hand on a plyo box and the other on the ground. Quickly push off the ground and the box at the same time and switch sides on the box. You land on the opposite side with the hand that was on the ground is now on the box. Be quick and explosive off the ground and get good extension.

Pierre pushups

For the Pierre pushup you're going to use a soft medicine ball and really grab it on the side firmly and get into a pushup position. Lower yourself into a pushup and then quickly push yourself off the ground and pull the ball to your chest and rapidly fire back down into the ground. Make sure you are quick and explosive with this.

Plate punch

For the plate punch, you're going to get a partner and set up a bench with a fairly upright angle, about 50 degrees and get a 45 pound plate and a soft medicine ball. The partner will toss the medicine ball towards your chest or chin and you're going to punch it back using the plate. Try to keep your back in contact with the pad.

Medball punch

For the medball punch, you're going to be sitting on a bench with about a 50 degree angle. Get a soft medicine ball and have your partner throw the medball to you on the bench and you're going to reach out and catch the ball with a punching action. The arms should be extended when you catch. Keep your back on the pad. Catch it and toss the ball back to your partner. Repeat for the appropriate number of repetitions.

Laying Medball shot

For laying medball shot, you're going to lay on your back with your head near a plyo box. Have a partner stand on the box holding a ball over your chest. He will then drop the ball and you will quickly catch the ball and then fire it up to your partner. He will then guide it and drop it back to your chest for the appropriate number of reps.

Bar throws

For bar throws you're going to set up a bench with a moderate amount of weight. Make sure you have a spotter on each end of the bar. You'll lower the bar to your chest and then fire it off the chest quickly extending your arms. It should get above your hands a few inches as you'll see here. You really need the spotters in case the bar should slip. Be explosive and it shouldn't be so heavy you aren't getting air off the hands.

Bounding: Height

This is bounding for height. You're going to use a running action and drive the knee up so the thigh is parallel to the ground. Jump a little each step and try to get maximum height each repetition. You should get a lot of repetitions as you cover the distance, it shouldn't be very far. Make sure you are keeping the ankle nice and stiff. Stay up on the toes as you bound down the distance. Use the arms really aggressively. It should be very explosive off of the ground just like you were running, just a little bouncier.

Bounding: Distance

Alright bounding distance. This is very similar to bounding for height. You're using a running motion while you drive the thigh up to parallel. Try to cover as much distance as possible, stay on the toes, really aggressive with the arms, stay square. Jump up and forward, really cover as much distance as possible. Shouldn't be very many steps as you cover the distance.

Bounding Lateral

For lateral bounding you're going to stand perpendicular to your start line. Keeping everything, shoulders, knees, hips, and toes are nice and square. Toes are going to stay up as you bound. The front leg crosses over, cover as much distance as possible.

Agility-Footwork
Agility ladder: 2 in each, linear This is the agility ladder, linear, 2 in each. You're going to run through an agility ladder touching both feet down between each rung. Alternate which foot starts in the ladder. Focus on a good high knee lift and good quick ground contact. We're working on teaching quick turnover so it's got to be quick.
Agility ladder: 1 in each, linear This is the agility ladder, linear 1 in each. Run through the agility ladder with one foot between each rung, alternating which foot starts first in the ladder. Keep the good upright posture, good mechanics, Again we are working on timing and quick turnover.
Agility ladder: lateral, 2 in each This is the agility ladder, lateral 2 in each. Stand parallel to the rungs of the ladder. You're going to laterally shuffle with 2 feet between each rung. Really good quick footwork, use the arms, stay nice and square to the ladder and don't sway.
Agility ladder: icky shuffle For the icky shuffle you're going to start on the left side of the ladder, step laterally with the right foot into the ladder, then the left foot, then right foot out of the ladder on the right side, left foot into the square and then repeat that on the opposite side. We are working on improved coordination and improved quickness of the lower body.
Agility ladder: in-out shuffle This is in and out shuffle. Start sideways to the ladder, step with the left foot into the first square, then the right. Step diagonally and back with the left foot, the right foot will follow, then repeat this sequence and make sure to hit every box.
Agility ladder: side right in Side right in. You're going to start sideways to the ladder; the right foot will go into the first square, then the left foot will crisscross the ladder as you slide down and step laterally with the right foot. You'll repeat this coming back the opposite way. Here's a good close up view of it.
Agility ladder: side left in Side left in is very similar to side right in, except the left foot initially steps in the ladder while the right foot steps over and crisscrosses the ladder. You can see it here, the right foot is moving across while the left foot stays in the ladder. You can't repeat this coming back in the opposite direction too.
Agility ladder: zigzag crossover shuffle-front This is agility ladder, zigzag crossover shuffle to the front. You're going to start on the left side, crossover the left foot and then the right foot will come across, It is kind of a hip swivel action, but it's the front foot is always using a crossover.
Agility ladder: zigzag crossover shuffle back This is agility ladder, zigzag crossover shuffle to the back. You're going to start on the left side of the ladder, the left foot will cross behind the right foot into the box and the right foot will do the same when it comes back in the other direction. You can see it here, both feet do exit the ladder, but crossover the back.

Agility ladder: zigzag crossover shuffle combo

In the zigzag crossover shuffle combo you are going to first start with a zigzag crossover shuffle to the front and then it will be the next step with a crossover to the back. The left foot is always in the lead on this one and you're going to want to switch and repeat in the opposite direction where the right foot would be in the lead.

Agility ladder: Ali shuffle

The Ali shuffle you are going to start sideways to the ladder. You're going to jump with the left foot going into the first square and the right foot going back. Jump again, the feet will switch places as you move down the ladder. We're going to get a close up look here as it alternates. Right, left, right, left all the way down.

Agility ladder: Backpedal

This is the agility ladder: backpedal. You're going to start sideways to the ladder, run forward with 2 feet in the first square, step out of the ladder on the opposite side, then backpedal with both feet in the ladder through the next square. It's a weaving motion up and down the ladder all the way through. In the ladder, 2 out, 2 back, all the way down.

Agility ladder: 2 in, 2 out, touch w/squat

This is the 2 in, 2 out touch with a squat. Start with both feet out on the left side of the ladder and step laterally with the right foot first into the ladder, followed by the left and then repeat that on the outside and step out of the ladder completely. When you're out of the ladder you're going to squat down and touch with the outside hand. So you can see he's 2 out, 2 in and touch with each side.

Agility ladder: Swizzle

This is the agility ladder: swizzle. You're going to start facing the ladder and then step with the right foot and the left foot into the first rung. Then step laterally out with the right, then left. It's kind of a hop scotch pattern. So we'll see from the front its right, left in, right left out.

Agility ladder: Slalom

This is the agility ladder slalom. You're going to start straddling the side of the first square of the ladder with the right foot inside the square. You're going to jump forward and diagonally to the next square and land on the opposite side straddling the side. Be very quick off the ground as you're firing up and out.

Agility ladder: Bunny hop

This is the bunny hop. You're starting on the left of the ladder. You're going to jump laterally into the first square and quickly jump diagonally to the outside of the second square and then jump from there into the second square. We're all on one side, so you repeat on both sides. Here it is, he jumps lateral diagonal, lateral diagonal all the way up the ladder.

Mini-hurdles: lateral, 2 in each

This is the mini-hurdles, lateral 2 in each. You've got 2 sets of 6 hurdles about 5 yards apart with a 3 to 5 yard lead up and finish, about a yard between each hurdle. You're going to sprint hard to the first set of hurdles, then laterally shuffle between with 2 feet in each. Then sprint and turn and shuffle in the opposite direction on the second set of hurdles after the gap and then sprint all the way through.

Mini-hurdles: backpedal

This is mini-hurdles: backpedal. You've got 2 sets of 6 hurdles 5 yards apart with a 3 to 5 yard lead up and finish. You're going to sprint from the start to the hurdles and then backpedal in a weaving motion, backpedaling down and around similar to what we do on the agility ladder. Then as you sprint out go hard through the finish. You'll be facing opposite directions on each set of the hurdles.

Mini-hurdles: Weave

This is mini hurdles, the weave. You've got your 2 sets of 6 hurdles, 5 yards apart with that 3 to 5 yard lead up and finish. You're going to sprint hard to the first set of hurdles and then using quick side to side steps similar to an icky shuffle on the agility ladder. Weave in and out of the hurdles and then sprint through the finish. Here's a good look at the footwork, there's no crossover steps, it is all side to side.

Mini-hurdles: Carioca

This is mini-hurdles carioca. You're only using one set of hurdles. You'll sprint hard to the hurdles, then carioca over the hurdles with 2 feet touching down between each of the hurdles. It should be quick, really get the knees up fast.

Agility-Change of Direction
Pro Agility   Alright, pro agility you got 3 cones 5 yards apart. You're going to start in a 2-point stance straddling the starting line. Turn to the left, sprint and touch with the outside hand, sprint to the far side, touch with the outside hand there, sprint through the middle to finish.
Star Drill: Sprint Middle   This is the star drill: sprint middle. You're going to set up a ten yard by ten yard box with cones every 5 yards and one cone right in the middle of the box. Start at the top cone in the middle of the side, sprint to the middle and touch with the outside hand. Then sprint to the next cone in a diagonal. You're going to repeat this pattern as you work way all the way around the box, always touching with the outside hand. Repeat it in the opposite direction.
Star Drill: Sprint, Backpedal, Shuffle   This is the star drill; sprint, backpedal to shuffle. You're going to set up a ten yard by ten yard box with one cone in the middle. Start at one corner, you're going to sprint hard to the middle, drop the hips and backpedal back to the cone you started and then shuffle to the next cone on the corner, sprint and backpedal. You're going to repeat this all the way around the box. You're also going to want to alternate directions that you shuffle. In this case she's shuffling right, you'd also want to do it so you're shuffling left.
W Drill: Shuffle, Sprint   Alright this is W-drill, shuffle to sprint. You got 5 cones, 10 yards apart in a W-shape. Start at one end of the W, shuffle to second cone, sprint to the middle cone, shuffle to the 4th cone, and then sprint through the final cone. Shuffle past the cones, drive off the outside, make sure you have good forward body lean as you accelerate to the next cone.
W Drill: Sprint   This is W-Drill:sprint. So you got 5 cones, 10 yards apart in a W-shape. You're goin to start at one end of the W and sprint to and around each cone all the way through the W. Make sure it's good quick turns, drive off the outside foot.
3-Cone Drill   3-cone drill, 3 cones 5 yards apart in an L-shape. Sprint from the first cone to the second cone and touch with the hand. Return to the start and touch with the opposite hand. Turn and sprint all the way around the second cone and around the third, and then return back along that path and sprint through the line to finish. Here he is around that outside cone and then sprints through the finish. You can have that other cone to finish through if you want.
Inverted Triangle   The inverted triangle, you have 3 cones 5 yards apart, all equal sides. Start in a 2-point stance and sprint the edges of the triangle, when you get back to the cone you started at you're going to touch it with the outside hand and then return the same path you came, sprinting hard through the final cone. You are going to stay as close to the edges of the triangle as possible using quick choppy steps and make sure you repeat this in both directions.

Box Drill: Sprint 3 sides   This is the box drill; you have a ten yard by ten yard box with cones. You are to start at one cone in a 2-point stance and sprint the three sides of it. Sprint through the final cone. We are not using one side of the box.
Box Drill: Backpedal, shuffle, sprint   This is the box drill: backpedal, shuffle, to sprint. With a ten yard by ten yard box, start in a 2-point stance facing away from the box. Backpedal to the second cone, shuffle to the third, sprint through the last. Make sure you repeat this in both directions.
Box Drill: Sprint, shuffle, backpedal & return   This is the box drill: sprint, shuffle, backpedal, and return in the opposite. So you have a ten yard by ten yard box like usual. You're going to sprint hard from the starting cone, shuffle across, and backpedal. Immediately from the backpedal sprint out hard, and then shuffle in the opposite direction and backpedal through the starting line.
N-Movement   The N-movement you have 4 cones in a 7 by 1 yard rectangle, with 1 cone off to the side in the middle of one side at a 45 degree angle. You're going to sprint hard through all the cones, through the N, once you get to the top cone you're going to backpedal out and hit the back cone and sprint through the cone off to the side. Here it is from the side. Stay real nice and tight to the cones, accelerate hard, quick, choppy steps on the turns, really use a real quick fire step out of the backpedal.
A-Movement   This is the A-movement so you're going to have 5 cones in an A-shape. Ten yards wide at the base, the A will be ten yards tall, and the middle cones are 5 yards apart. You're going to sprint hard to the middle cones, shuffle both directions, sprint up to the top of the A and then backpedal all the way down the other side through the finish.
Hour Glass   The hour glass has a ten yard box with a cone at each corner and one cone in the middle of the box. You're going to start at one corner and sprint to the middle cone and around it and then turn and go to the other corner. Then across to the other corner back to the middle cone, around the far corner and then sprint back through the start. Here's a good view of it from the top. He sprints to the middle and around it, goes to the top corner, the opposite corner of the start, around the middle, and sprints hard through.
60-Yard Shuttle   The 60 yard shuttle you have 4 cones 5 yards apart in a straight line. You're going to sprint from the start to the first cone that is 5 yards away, touch it and return back to the starting line and touch. Then sprint to the cone 10 yards away, come back and touch, then finally sprint to the very far cone and come back. Overall you will cover 60 yards of distance. Make sure you get all the way to the cones, touch with both hands, push off, accelerate and have good forward body lean and sprint hard through the finish.
DB Drill   In the defensive backs drill you have 4 cone box 7 yards apart and then one cone in line with the front edge of the box 7 yards away. You're going to react to your partner or coach pushing a ball or pointing and they are going to direct you where to go.

S-Drill

The S-drill you have 4 cones in a an s-shape. Cone 1 and Cone 3 are in line and 10 yards apart. Cone 2 is five yards in front of cone 1 and to the right 5 yards. You're going to sprint through really trying to maintain the speed. Nice and fluid the whole time.

S-Drill w/hip swivel

The S-Drill with hip swivel you have cones for 20 yards every $\frac{1}{2}$ yard at a diagonal to each. Using a crossover step you are going to rotate and swivel the hips quickly around the cones, both feet will get around each set of cones. Use the hips to create the movement and get the feet on both sides.

Figure 8

For the figure 8 you're going to set up 3 cones in a line; they are going to be 5 yards apart. Start at one end on the right side of the cones, sprint around the middle, go to the end, make a sharp turn, sprint back through the middle, around the cone where you started and sprint back through on the same path you started. Make sure you stay tight to the end cones and quick through the middle.