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Speed Training Considerations for Non-Track Athletes

The Development of Speed Throughout the Annual Plan

James Smith

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By

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The development of short sprint speed (less then 30m) is a function of starting strength, explosive strength, and acceleration speed. The ability for the sportsman to repeatedly demonstrate this type of effort throughout a contest is a function of developing this specific endurance component of the special work capacity.

It is these components of speed development which are most useful for non-track athletes. For this reason, many coaches and trainers, of non-track athletes, will delay the training of direct speed work until very late in the prepatory phase.

If marked gains in speed are achieved by delaying the training of direct speed work to later in the year, then what might be gained by including direct speed work throughout the annual plan?

Coaches/trainers would be wise to recognize certain fundamental characteristics of speed development prior to planning the training.

1. Specific Speed Development

Sprint training should underlie the initial and long term development of virtually every athlete. Team sports such as hockey, basketball, football, soccer, lacrosse make heavy demands on one's sprint capabilities. The truly great team players are able to accelerate explosively both in defensive and offensive maneuvers. (Francis 1997).

Nearly all non-track athletes whose sport demands some component of sprint speed development participate in a team sport.

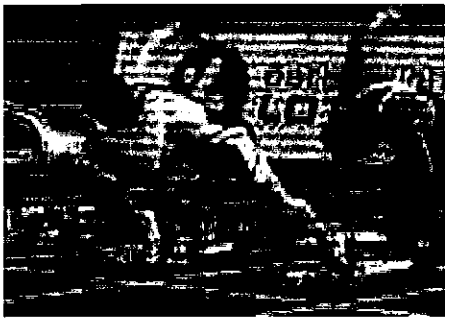
In regards to most team sports, the most significant developments along the speed continuum are an explosive start and rapid acceleration. These two abilities, when highly developed, have a profound impact on linear speed as well as change of direction speed/agility.

2. The Physiological Considerations of the Sprint

During the acceleration phase of a short sprint the ground contact time (GCT) is longer then when at maximal velocity (max V/top speed). This is a function of the sprinter accelerating out of a motionless position. During

acceleration each successive ground contact is slightly shorter in duration then the previous one.

During initial acceleration the sprinter maintains a steep forward lean as this position offers the greatest mechanical advantage from which to accelerate, yet also requires great strength to maintain. The increased GCT associated with the acceleration phase presents an interesting dichotomy: 1. a greater opportunity, and 2. a greater demand for the sprinter to exert their relative and explosive strength.



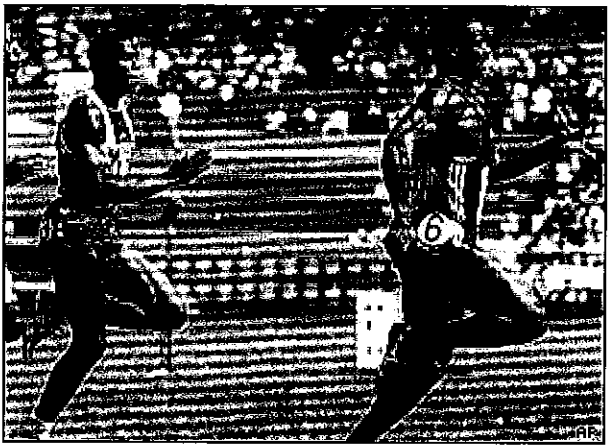
(Observe the steep forward lean the sprinter maintains when accelerating out of the blocks)

In regards to Newton's 1st Law, great starting strength, relative strength and explosive strength is required to rapidly accelerate a large mass from a motionless position. This is why many world class weightlifters and throwers are very fast over very

short distances despite their greater bodymass relative to their 100m sprinter counterparts. These athletes are very strong and powerful relative to their body weight which provides for and explosive start and acceleration.

As the runner approaches max V, however, the sprinter will assume an erect posture which is recognized as the 'sprint position'.

The higher the velocity, the lower the rate of acceleration until acceleration becomes zero at maximum speed and obviates the need for any lean. At this point the upright runner has the advantage since the hips can move most freely in the upright position. (Francis)



(Observe the vertical orientation of the sprinters posture at max V)

The bodymass of the sprinter has a profound effect on the development and realization of speed potential (the majority of world class 60 and 100m sprinters weigh less then 85 kilos). As the length of the sprint extends beyond the shortest of distances the pull of gravity exponentially increases the challenge of the runner accelerating rapidly, attaining and maintaining the greatest max V. The larger the mass the greater the requirement of maximal force, relative to bodyweight, which must be generated during ground contact.

3. The Value of Explosive Strength towards Realizing the Limit Strength Potential for Speed Development

The demonstration of limit strength requires a relatively long duration to manifest itself in relation to the incredibly short ground contact times associated with short sprints (RE the location of various tasks on the Force-Time [F(t)] curve, sprinting being farthest to the left). Herein lies the value of the development of explosive strength which allows for a greater amount of force to be generated in minimal time.

It has been shown that the F(t) curve of explosive effort has three components (Y.V. Verkhoshanski, 1963,

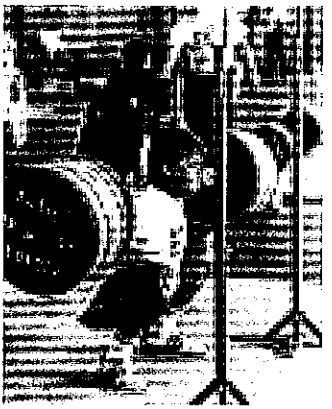
1970) and is determined by such qualities of the neuro-muscular apparatus as: absolute-strength, the ability to quickly generate external force at the beginning of working-tension (starting-strength) and the ability to intensify working-force at the beginning of movement, i.e., muscle contraction (acceleration-strength). (Verkhoshanski 1985)

In essence, and specifically in regards to speed development, the sportsman's strength potential is only as useful as his ability to manifest it in minimal time.

In regards to activities which demand great explosive strength such as weightlifting, throws, sprints, gymnastics as well as all team and combat sports, if the athlete is simply maximally strong, but not explosive, then the Explosive Strength Deficit (i.e., the difference between maximum strength and the force values generated during a sport movement at takeoff, delivery phase, etc. Zatsiorsky 1995) becomes too great and the athlete is unable to realize their strength potential via sport skill.

Certain strength/power development athletes possess great limit and explosive strength. For example: This is why a large, strong, and explosive

athlete can run a relatively fast 40yd dash. Make no mistake; however, despite the great strength and explosiveness of many strength/power development athletes there is no athlete on the planet who can compete with a world class 100m sprinter for more then a few steps out of the blocks (e.g. Charlie Francis recorded Ben Johnson's 40yd dash time out of the blocks at 3.76 seconds).



(Despite the great strength and power of Olympic weightlifters and throwers, no athlete on the planet is as fast over short distances as an Olympic 100m sprinter)

4. Unfavorable Conditions of the Conventional Approach to Team Sport Speed Training

Regarding 'fast' athletes, max V is rarely achieved during non-track related disciplines. The reason for this is that a fast non-track athlete (sub 4.4s electronic 40yd dash) is unlikely to reach max V in less then 30-40 meters (many world class 100m sprinters will accelerate up to the 60-70 meter mark). Additionally, a linear path of travel is required to achieve max V. Non-track related activities rarely present an opportunity for the athlete to run in a straight line for over 30 meters. For this reason, it becomes evident that max V is a component of speed development which is secondary to most non-track athletes.

As previously stated, an explosive start and rapid acceleration are the components of speed development which are most useful for non-track athletes. As we now know, these components of speed development are largely a function of the sportsman's relative strength and explosive strength. This

is why many strength coaches will forgo allotting a greater percentage of the training load, if any, to direct speed training until later in the annual plan.

In such instances an unfavorable condition is presented. As the sportsman experiences developments in strength, power, and growth in muscle cross-section, his/her leverages will change. In the absence of direct speed work the motor patterns which have developed via strength/power training may significantly alter previously trained/developed sprint/movement mechanics. For this reason, the coach is wise to ensure a harmonious development in strength, power, muscle cross-section and speed throughout the annual plan.

It must be remembered that this is an extremely dynamic process. As you develop physical qualities to new levels, the neural motor patterns dictating correct sprinting technique must be updated to properly use the new levels of ability to run faster. (Francis 1997)

Additionally, the development of strength, power, speed alone is insufficient towards preparing and heightening the sportsman's ability to repeatedly demonstrate these efforts

throughout contests. This specifically applies to those athletes who compete in team and combat sport disciplines.

5. Work Capacity

Work capacity refers to the general ability of the body as a machine to produce work of different intensity and duration using the appropriate energy systems of the body. (Siff 2000)

The sportsman's work capacity will define his/her ability to realize their strength, power, speed potential repeatedly during contests. The development of the work capacity towards the specific demands of the sport discipline requires any trainer of athlete's most special attention.

In regards to developing explosive starts, accelerations, change of directions etc, this is a component of the training which must be developed throughout the annual plan. In this instance the vast majority of the work will be executed in an alactic environment in which efforts are high in intensity, brief in duration, and followed by complete recoveries.

While this type of training does not address the specific endurance component of the special work capacity

element of team and combat sports, the development of the abilities to the left of the F(t) serve as the fundamental motor forms towards the perfectioning of sport form, via GS and S training, during the training blocks to follow.

The athlete's enhanced motor potential and the ability to display powerful, explosive effort within a specific time frame is the foremost condition contributing to the improvement of the biodynamic structure and an increase in the working-effect of a sport act. (Verkhoshanski 1985)

Additionally, for many athletes, increasing muscle cross-sectional diameter is a goal at some point during the developmental or prepatory/off-season processes. The increased caloric expenditure associated with lactic and oxidative energy system training may be counterproductive for the sportsman who is seeking to increase bodymass during the portion of the annual plan in which they have the opportunity to delay specific endurance related training.

The training of the work capacity-the energy systems which heighten the sportsman's ability to resist fatigue and generate repeated explosive efforts may then be delayed until later in the

year and be consistent with the specific demands of sport form as it exists during contests (via special conditioning training and SPP practice itself).

Speed-strength preparedness plays a decisive role in the perfectioning of technical mastery of other types of sports requiring the display of explosive-force... So, technical mastery, in those sports requiring the display of explosive-force, is determined first and foremost by speed-strength preparedness and the athlete's skill to fully utilize it. (Verkhoshanski 1985)

The trainer of athletes must consider this data very carefully and remain objective as to the specific requirements of the sport discipline which dictate what abilities must be developed, to what magnitude, and at which point in the annual plan.

The training of strength, power, speed, agility, etc NOT under conditions of fatigue must be initiated early in the annual plan if the strength/power/speed development athlete desires the highest attainable performance during the competitive phase. The development of sprint speed, most notably, is one of the most time consuming and complex endeavors for a

sportsman.

While delaying direct speed training to later in the year has proven to be effective by many coaches of non-track athletes, it is the author's opinion that the multi-faceted development of abilities throughout the training year is a more optimal methodology from a global training perspective.

6. The Multi-Faceted Development of Abilities- Speed Training Throughout the Annual Plan

The sports training process (STP) of team and combat sports is a multi-faceted process in and of itself. These disciplines require the development and perfectioning of numerous motor abilities. Many would agree that a fundamental rule of motor learning, in general, is such that the frequency with which a motor skill is trained is largely related to the rate at which the skill may be perfected.

Training research first published in the former Soviet Union and Soviet-Bloc countries indicates that the development of the special physical preparedness (SPP) is a long term and highly complex endeavor. The SPP is comprised of the training of the special exercise(s) and the motor

abilities which most specifically contribute to the execution and demonstration of sport form. If one accepts this actuality then one must also accept that if the development of speed is one of these primary abilities then its exclusion from the training (for any significant duration) presents an unfavorable condition.

It has been noted repeatedly in works dealing with the methodological questions of the intercorrelation of physical qualities that training consisting of exercises requiring speed, strength and endurance, develops each of these qualities collectively, better than training each of them individually even with an increase in the load (N.G. Ozolin, 1949, 1970). The development of each quality has a positive influence on the development of the others, and vice-versa, a lag in the development of one or several qualities limits the development of others (A.N. Krestovnikov, 1951; S.V. Kaledin, 1961). For example, the development of strength and speed conditions the development of the ability to display speed-strength (A.V. Korobkov, 1953; N.V. Zimkin, 1956; V.V. Kuznetsov, 1970). (Verkhoshanski 1977)

*It must be noted that this data primarily reflects the multi-lateral heightening of abilities in lower class

athletes; however, further context must be provided in order to validate the comparison between speed and strength potential of lower class Olympic sport athletes and collegiate or professional team sport athletes.

Nearly the entirety of the data presented in the Russian texts is in reference to Olympic athletes (most notably from the disciplines of weightlifting and track and field). Well then, one may then draw a closer comparison between the speed and strength preparedness of lower class weightlifters, sprinters, jumpers, throwers, etc and professional team sport athletes then one may think.

A close examination of 100m sprinters, for instance, will reveal that an athlete well below the elite level is still likely to possess speed capabilities which are well in excess of nearly any collegiate or professional team sport athlete. For example: The IAAF World Championships in Athletics, Osaka 2007 - Standards for 100m sprinters (men) indicates a 10.21 qualification time in order to compete in the A group and a 10.28 for the B group. Accordingly, a 10.3. 10.4, or 10.5 second 100m sprinter will not qualify for the world championships in Osaka and does not posses the speed necessary to win a world class

competition, yet will still be a great deal faster then the overwhelming majority of any collegiate or professional team sport athlete.

For these reasons, one may then state that the training methodologies which have proven to be most effective for lower class Olympic athletes are also highly effective towards developing the speed and strength potential of team sport athletes as high as the professional level.

Ironically, the methodics which lesser qualified sportsmen utilize in training are often not entirely distant from those used by their higher qualified counterparts. The most significant distinction in many cases is the intensity of the training load. There are, of course, certain training means which are unsuitable for low qualified trainees; therefore, specific context must be introduced in order to carry this thought process any further.

In order to remain consistent with the subject matter of this text i.e., speed development, we may then consider the training of the sportsmen whose sole directive is the increase in max V (100m sprinters). These sportsmen, from very low levels of qualification all the way up to the world class level, will typically utilize the exact

same training means (e.g. strength exercises, jumps, bounds, form drills, sprints, tempo runs, and so forth), only at different volumes and intensities. This characteristic holds true for the training of many non-track athletes. Where the distinctions may become evident is either at very early stages of development or in the use of special training apparatus or methods (e.g. flex bands attached to a barbell, or maximal effort training) which may be unsuitable for low qualified trainees.

Remaining mindful of the fact that the intensity of the training load is the primary distinction between the characteristics of the training of low and high qualified athletes, one may then draw a comparative reference. If the highest attainable results are desired by the sportsman and coach then both would do well to consider the characteristics of the training of world class athletes. If one considers the quadrennial training cycle of Olympic weightlifters, throwers, sprinters, etc there are specific facets of training which undeniably lead to world class performances.

The training of world class athletes provides useful information for their lesser qualified counterparts. While training

methodologies will differ from athlete to athlete at different stages of qualification it is the factors which remain consistent at the highest levels which deserve our special attention.

When comparing the training of world class athletes the most significant trend, specifically in regards to this material, is that continued improvements in already world class performances are a function of the sportsman's increase in special physical preparedness. The process of achieving this result is highly complex, never the less the significance of this characteristic is that as time goes on and as contests approach the sportsman must devote a greater percentage of the training load towards the perfectioning of the sport skill itself at varied intensities.

Acyclic disciplines (e.g. American football, football/soccer, rugby, ice hockey, lacrosse, etc) present the coach/trainer with a great challenge, with respect to constructing the training so as to ensure the perfectioning of sports form during the most vital contest periods.

The multi-faceted development of abilities, required to excel in acyclic team sport disciplines, inherently demands that the training load be

carefully appropriated towards the development of various motor tasks at different times of the training year.

Here the theoretical premise is based on the so-called "united" physical mechanism (the conditioned reflex), which underlies muscular activity. Training leads to the formation of a "vast background" of temporary connections, on the foundation of which (thanks to the "plasticity" of the nervous system) various combinations of the qualitative aspects of the motor activities can arise, depending upon the emphasis of training. (Verkhoshanski 1977)

In the case of the author's methodology, and in regards to his training of American Football players, there is only one training irritant whose presence in the training is introduced later in the year: general specific (GS) conditioning. The GS conditioning bridges the gap between the non-specific training which has occurred earlier in the training year and the contact/collision and specific endurance aspect of the activities which occur during SPP practice and contests.

***(RE the Authors article entitled 'The Classification of the Means' to gain an understanding of G, GS, and S means)**

The GS training exists as special strength/conditioning means which realize the previously developed strength, power, speed, agility of the sportsmen towards the perfectioning of sports form. The GS means qualify as those which match the energy system demands (speed of muscle contraction, duration of effort, etc) of the sport skill and some or all of the active musculature yet do not match the amplitude and direction of the sport skill. This is the foundations of the training of the special work capacity which is most specifically developed during SPP practice.

The training of strength, power, speed, and agility is ever present leading up to the competition phase, as developments in these qualities serves to further enhance the functional perfectioning of the sports form via GS and S means. As stated earlier, the development of sprint speed is a much more complex and long term endeavor then the development of many other abilities such as strength and endurance. For this reason, speed training is present throughout the annual plan.

7. Regulating the Training Load

In order to effectively develop multiple motor tasks throughout the training year the training load must be carefully manipulated.

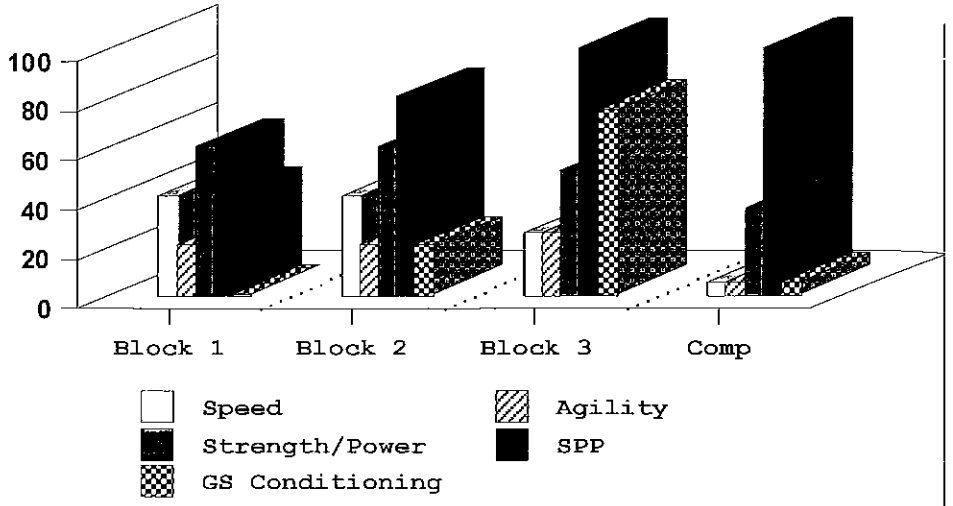
The sequencing of various components of the training load may be illustrated as a bar graph. Each bar of the graph exists as a fundamental ability. From one training block to the next each bar will differ in size, thereby, constituting a certain percentage of the training load.

Careful manipulation of the training load throughout successive training blocks is fundamental towards yielding a powerful cumulative training effect

Training Model 1 illustrates a possible annual plan for high school American football players:

Training Model 1

Block Sequence and Training Load Distribution



From this graph we may observe the following:

- Consider the division of the training load in terms of the volume of training spent on the development of any singular, or complex, of abilities

- Strength/Power remains primary emphasis for blocks 1 and 2 and then gradually reduce there consumption of the training load through block 3 and comp

- Linear speed occupies a greater percentage of the training load then agility throughout block 1 and block 2, then shares an equal percentage of the training load during block 3

- Speed/Agility increase their consumption of the weekly training load during block 3 (pre comp) and then greatly diminish during comp as SPP practice and contests integrate, and inherently demand the training of speed and agility consistent with sport form

- SPP experiences a step-like increase throughout the annual plan

- GS conditioning is introduced late in block 2 in order to prepare the sportsmen for the contact/collision and specific endurance requirement for Spring Ball practice

- GS conditioning is re-introduced after Spring Ball during block 3 in high concentration in order to facilitate the realization of the previously developed non-specific irritants towards the transition into the

contact/collision and specific endurance aspect of the sport practice and games

- Most importantly, in regards to this material, is that the training of direct speed work is present throughout the entire training year

Again, specifically in reference to Training Model 1, the depiction of the division of the training load is per unit volume. Accordingly, it must be understood that just because a greater volume of the training load is spent on the development of a certain primary ability does not mean that a significant training effect will not be yielded to other ancillary abilities.

- For example: during the competition phase the author administers strength/power training workouts twice per training week in comparison to three and four days during previous blocks. The evaluation of data collected over the past two seasons, however, indicates that the athletes continue to increase maximal strength deep into comp block, often increasing limit strength during playoffs, despite

the reduction in training time allotted to strength development.

It is the opinion of the author that this phenomenon is a function of the organism's positive adaptation to the increased stressors associated with comp phase SPP and contests. It is hypothesized by the author that the strength increases typically demonstrated during playoffs are a result of two distinct factors:

1. The initial 'shock' of comp season taxes adaptive reserves. As the comp weeks progress the organism then adapts to the increased demand and reserves begin to climb; ultimately reaching a pinnacle during playoffs when other teams are typically at their weakest in terms of physical preparedness. This effect is ultimately realized as a heightened state of readiness.

2. The resultant stimulus yielded by the CNS intensive aspects of SPP practice. Herein lies the value of maintaining a global perspective of the training. The nature of various SPP drills inherently demands

maximal dynamic and isometric contractions (e.g. hitting/tackling drills, sled work, game simulation, etc). Accordingly, special strengths are developed via SPP practice alone. This in conjunction with GPP training yields developments on both ends; each training regime positively affecting the other.

Important to note is that the training of SPP is relatively consistent from week to week during comp phases. The training of GPP, however, is waved and regulated in observance of the stress yielded by SPP. Accordingly, by making every effort to 'stay in tune' with the athletes readiness: preparedness curve the author is then able to regulate the GPP portion of the training load as carefully as possible and ultimately have the athlete's peaking during the most vital contest period.

For two successive seasons the author has recorded this exact same phenomenon with his high school athletes. The author attributes this circumstance as being a function of the superior level of preparedness which his athletes reach prior to competition block. This is the significance of

optimally planning the training throughout the annual plan. One may state that a higher level of pre-season preparedness provides for a more durable and trainable athlete in the comp block to follow.

While the argument may be made that this phenomenon is more likely to be experienced by younger athletes (due to their lesser evolved neuromuscular apparatus and greater musculo-tendonous plasticity) it is the opinion of the author that this methodology is concrete regardless of stage of qualification.

Surely the training load must be regulated according to preparedness of the sportsman and other factors. In order to effectively utilize similar methodology for higher level athletes one must not discount the similar or dissimilar physiological peculiarities between low and high qualified sportsmen; but rather, acknowledge the hindering logistical and other challenges surrounding the training of collegiate and professional athletes.

8. Restrictions on the Regulation of Training

Professional athletes in particular, such as those in the National Football League, are only

under the supervision of the coaching staff for a portion of the calendar year. For this reason, the regulation and manipulation of the training load becomes greatly hindered as the degree to which the athletes maintain or develop their abilities in the off-season is widely varying and solely a function of their own accountability to themselves.

For these reasons, many athletes who compete at a high level, ironically and much to the surprise of those who are unfamiliar, represent an interesting dichotomy; a high development of SPP and a low development of GPP. Accordingly, as time goes on the athletes' GPP diminishes and the athletes ultimately decondition their ability to perform at the highest attainable level. The result is often manifested as:

- a short lived competitive career that may have otherwise been greatly extended
- the sportsman's inability to fully realize their potential
- a competitive career hindered by injuries
- Etc...

This incongruent training process compounds upon itself from its early beginnings, which in the United States often commences before the athlete reaches high school.

As the athlete matures their perfectioning of sport form continues until the point in which any further development is inhibited by a lack of supporting motor forms (general physical preparedness).

This lack of a unified system of training is the Achilles heel of the preparation of western athletes.

Current circumstances, in the western hemisphere, then suggest that the training of the school age and high school athlete offers the most optimal and conducive situation for true long term and consistent planning. If this were to be accomplished at the national level then perhaps the planning strategies which may now seem unreasonable for collegiate and professional athletes would then become most optimal.

9. Speed Training Considerations

It is up to the coach/trainer to determine which method of programming the training is most optimal. The result of this decision, along with the

following variables will then impact the manner in which the speed development component of the training load is regulated:

- The preparedness, biological maturity, and sex of the athlete
- The time of the training year
- The sport being trained for
- The positional requirements of the sport
- Training time and environment

10. The Preparedness, Biological Maturity, and Sex of the Athlete

The preparedness of the athlete will determine the qualitative effect of the direct training of speed. For example: If the sportsman possesses a lack of muscular coordination and single leg strength then any performance of sprints is unlikely to perfect the sprinting action by any significant margin. In contrast, the trainee would be likely to retard the perfectioning of speed mechanics. Such a trainee would then more greatly benefit from performing lower intensity tempo runs, form drills, and

strength/strength endurance training means for the trunk and limbs.

Biological maturation and physical preparedness are closely related as the training load must be regulated in accordance with the state of the biological maturity. Accordingly, coaches must have an intimate knowledge of how to manipulate the training load, and of which means are appropriate, for pre-adolescent and young teen age athletes.

The rate of biological maturation in pre-adolescents is varied over time. There are distinct stages of the development of physical characteristics which generally coincide with calendar age.

In the fifth year of life height is usually twice that of the height at birth and the weight is five times the weight at birth (Bodanowicz 1968). Intermediate school age (7-11) is characterized by a slowdown of the pace of growth in favor of changes in the structure of the body and its general strengthening. Increases in weight become greater than increases in height. This creates opportunities for increasing a child's physical activity. (Drabik 1996)

The training load must be carefully regulated depending on the stage of biological maturation.

The magnitude of the load, its volume and intensity, is of secondary importance so long as the magnitude does not drop below the threshold of effectiveness. The threshold of effectiveness of training loads is lower for children and beginners of any age. In both cases training loads are already effective at 50% of their maximal potential, whereas for advanced athletes with many years of training the loads must exceed 80-90% of their potential. (Drabik 1996)

Speed of reaction and frequency of movements are abilities that are initially developed very early on, generally at the pre-school age, and very dynamically between 7 to 11 or 12 years of age. The basic reason for this is the fact that the parts of the nervous system concerned with speed and reactions are most formed during puberty. After this optimal growth period, the central nervous system is changed very little, and so the possibilities to influence speed of reaction and frequency of movement are very small. (Koprivica 2003)

The sex of the athlete is of great importance regarding the regulation of the training load, specifically with respect to youths, as females reach puberty earlier then males.

The pace of physical development reaches its maximum around 11 or 12 years for girls and 13 or 14 for boys. It is associated with the so-called pubertal growth spurt. At this stage increases in height are again proportionately greater than increases in weight. Yearly increase of height reaches 8-10cm (3-4in). At the next stage, after age 13 for girls and 15 for boys, the height increases become smaller but weight increases more intensively. (Drabik 1996)

The development of speed, in particular, must not only be addressed throughout the annual plan but from a young age.

Speed of each single movement, acceleration ability, and maximum speed should be developed very early, since the conditions for that are mutual and the same. (Koprivica 2003)

Enough power-related work must be done during the early years (ages 13-17) to:

- Maintain genetically determined levels of white power-related muscle fibre
- Promote the shift of transitional or intermediate fibre to white, power-related muscle fibre (Francis 1997)

11. The Time of the Training Year

The sportsman's place in the yearly cycle will determine which component of the training occupies a certain volume of the training load. Concerning the development of speed, this is a process which is optimally initiated early in the training year.

It has already been stated that the speed development process is a complex and long term endeavor. In keeping with this characteristic we may then state that the longer the direct training of speed is delayed the less one may reasonably expect to experience as significant a development in speed during the competition phase.

There are training texts already available which provide very useful information in regards to developing an athlete's 40yd dash time. These texts

are largely aimed at American football players preparing for combines. Very often, American football players will train to develop their abilities to score well on the combine in somewhat of a truncated time period. For this reason, many facilities around the US offer special combine training programs the weeks prior to national combine testing.

Many of these training facilities produce athletes who score exceptionally well on the combine and run impressive 40yd dash times. Well then, if such marked developments may be obtained in a relative brief time frame then one must logically question to what degree speed may be developed over the course of an entire training year.

12. The Sport and Positional Requirements

The sport being trained for will largely determine the speed requirement of the athlete. The actual position the athlete plays will serve as the most defining characteristic in the planning process and selection of the means. In regards to the sport of American Football, each positional requirement has greatly differing characteristics.

- For example: Down linemen cover very small distances during contests (e.g. 5-10yds). Big skill players such as linebackers and ends cover medium distances during contests (e.g. 5-20yds). Small skill players such as backs, receivers, and secondary will potentially cover the greatest distances on the field. The majority of the speed training distances ran in workouts must correspond with the positional requirements of the sportsman.

There is no logic in having a lineman spend any significant amount of training time sprinting farther then 20yds in training. Alternatively, if a back or receiver is limited to less then 10yd repetitions during training then their capabilities will be limited during contests. Exceptions must be made, however, regarding the preparedness of the sportsmen. For example: early high school age athletes, and youths, must not be compared to their collegiate and professional counterparts. These younger athletes often do not possess the bodymass of college and professional sportsmen. Accordingly, distances ran during speed training, for instance, may be moderately extended as the structural stress of

sprinting is much less on their lighter frames.

Coaches and athletes of various sport disciplines must consider the positional requirements of sport form in order to construct the most optimal distances for speed work. 'Look at the players and not the game' in order to gather the necessary data. Observe the distances over which the sportsmen sprint during contests and make note of the variations between specific positions. A coach is mistaken to have all positions engage in the same speed and conditioning drills during practice as each position, on any given team sport, possesses specific peculiarities unto itself.

If a certain position player tends to sprint no farther then 10 meters during contests then speed training must prepare that sportsman for that particular requirement, not 30, 40, or 50 meters. Alternatively, if a certain position player tends to sprint regularly up to 30 meters then speed training must prepare that sportsman for that particular requirement.

These recommendations reflect the distances which would constitute the 'majority' of the speed training volume, not the entirety. Certainly the coach/athlete may deviate to a greater

or lesser distance then the 'common' distance covered during contests by any particular sportsman. Any deviation, however, must still be somewhat consistent with the positional requirements of the sportsman.

In view of these considerations coaches and trainers must isolate the positional requirements and preparedness of their respective athletes in order to most optimally prepare the sportsmen for their chosen discipline.

'Look at the players, not the game'

13. Training Time and Environment

It is these specific factors which most significantly impact the training.

The time which the coach/trainer has with the athletes will influence nearly all facets of training (e.g. programming, regulation of the training load, management of workout time, etc). If the coach/trainer has limited time with the athletes then the training must be adjusted accordingly.

High school and college athletes have class schedules to work around, whereas professional athletes have no other commitment then perfecting their

abilities. These factors will effect the planning of the training.

The environment is one of the most significant factors impacting speed training. Areas in which the winter months prohibit outdoor training must have indoor facilities. If indoor facilities are not readily available to the athletes then speed training becomes greatly inhibited until the weather improves.

In such instances the coach/trainer must maximize the results which may be obtained through the utilization of various speed-strength/explosive strength protocols in lieu of the absence of direct speed work.

14. Constructing the Annual Plan

The following training models were constructed in consideration of the inclusion of speed training throughout the yearly plan.

The training models illustrate the regulation of the training load for the preparation of High School age American Football players.

Note-

- Speed, Agility, Conditioning (**G**)
- Muscle Cross-Section (**G**)
- Limit Strength/Strength-Speed (**G**)
- Power/Speed-Strength (**G**)
- Dynamic/Static Flexibility/Mobility/General Conditioning (**G**)
- General Specific Conditioning (**G**)
- Sport Skill practice, S means-Drills which serve to specifically heighten expression of Sport Form (**S**)

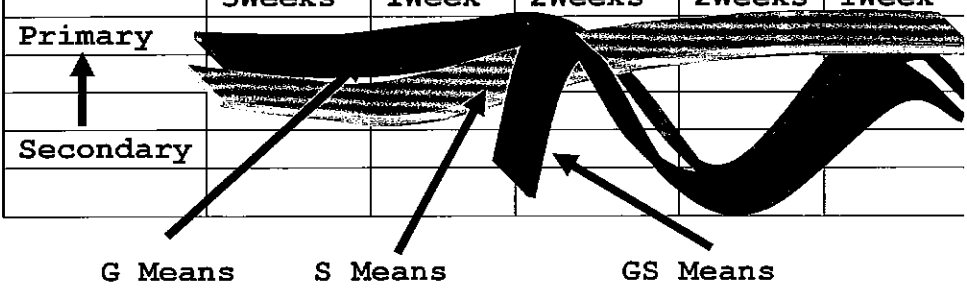
Model 2

Block 1 Prepatory Phase

Training Load Volume	Jan	Jan-Feb	Feb	Feb-Mar	March
	GPP	Loading	Deload	Loading	Deload
	3Weeks	3Weeks	1Week	3Weeks	1Week
Primary					
Secondary					

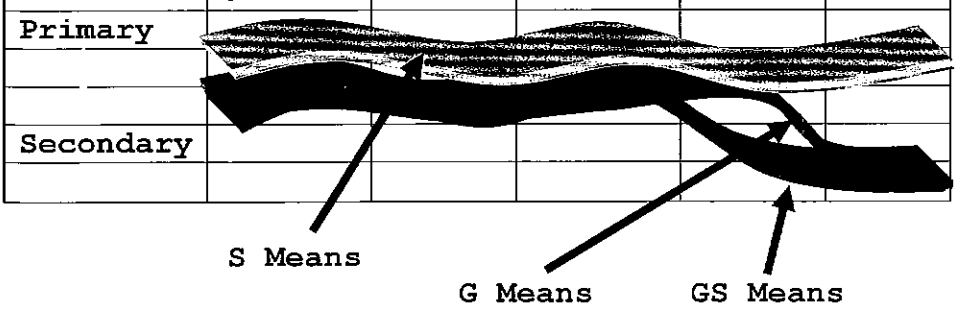
Block 2 Prepatory Phase

Training Load Volume	Mar-Apr	April	Apr-May	May	May
	Loading	Deload	Loading	Spring Ball	Deload
	3Weeks	1Week	2Weeks	2Weeks	1Week
Primary					
Secondary					

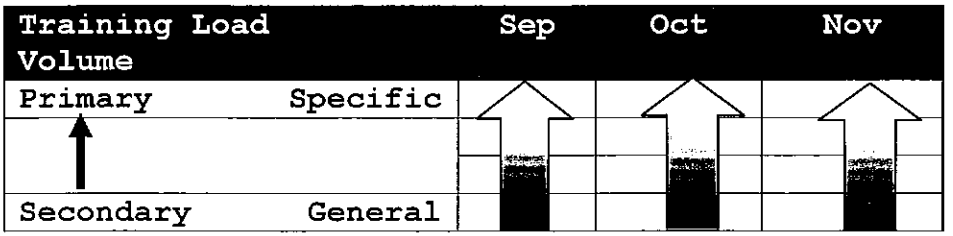


Block 3 Pre Comp

Training Load Volume	June	June	July	July	Aug
	Loading	Deload	Loading	Deload	Camp
	3Weeks	1Weeks	3Weeks	1Week	1Week
Primary					
Secondary					



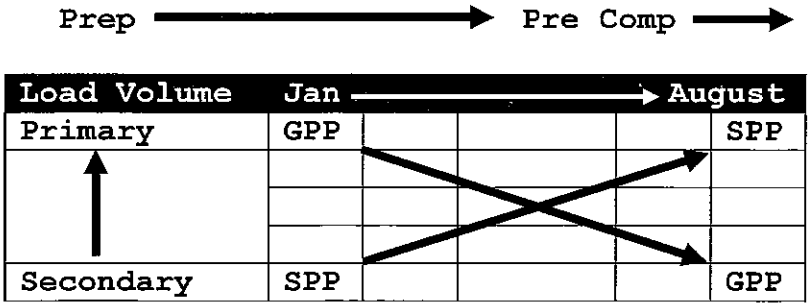
Comp Phase



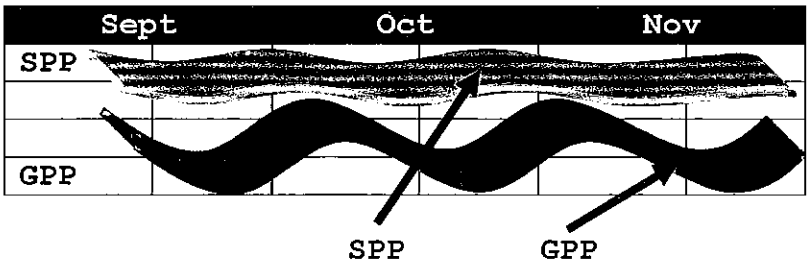
Model 2 Summary

- Throughout block 1 the only training means performed are those which qualify as G or S
- G means comprise a greater percentage of the training load volume then S means
- Maintenance and continued development of non-specific motor abilities
- Emphasis given to development of Sport Form

Model 3



Comp Phase



Model 3 Summary

- An inverse relationship between GPP and SPP until late prepatory phase

- As competition phase approaches the volume of SPP training begins to climb ultimately reaching a pinnacle during the month of August when camp commences

- SPP component of training load undergoes minor fluctuations in volume/intensity

- GPP component of training load undergoes greater fluctuations in volume/intensity

- Maintenance/development of non-specific motor abilities- Giving priority to the perfectioning of Sport Form

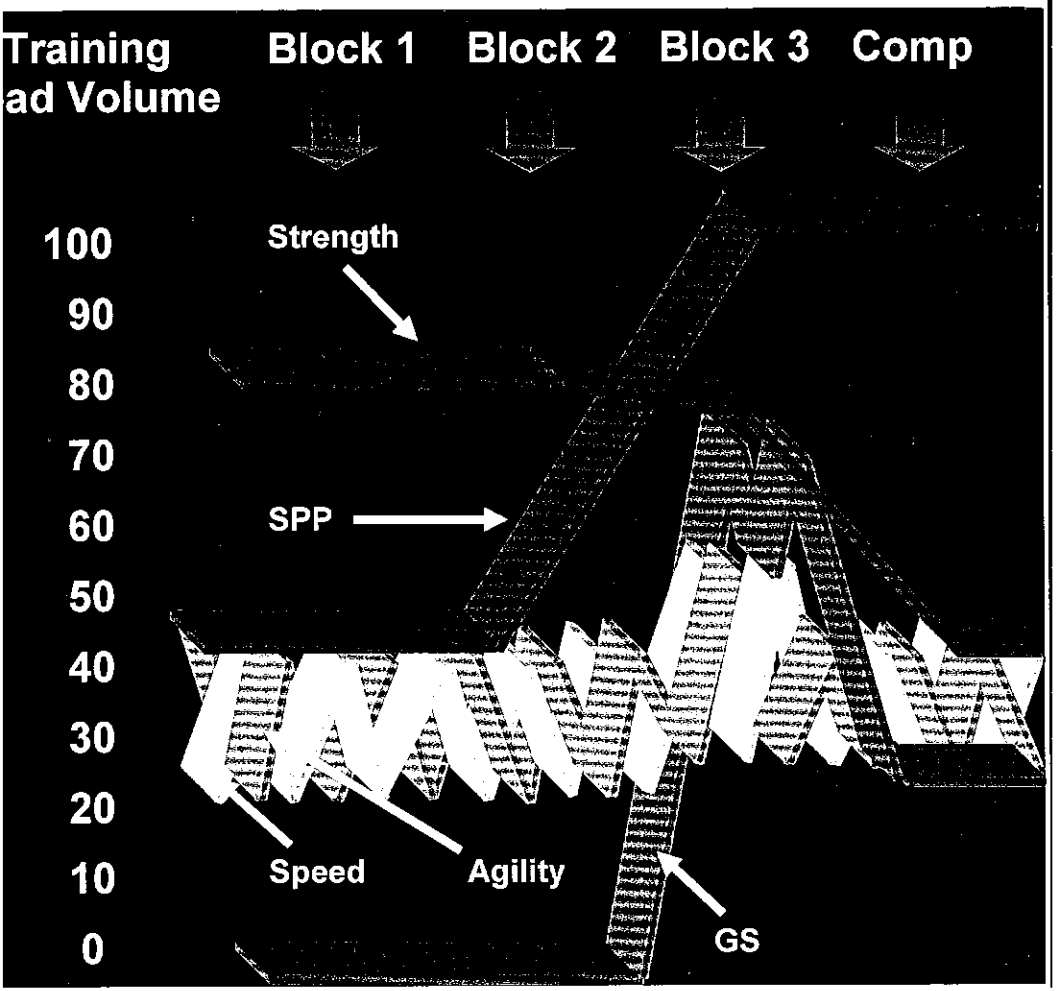
- %1RM and Volume are adjusted according to competition schedule. In some instances volume may be reduced by up to 50% while intensity is maintained. Alternatively, intensity may be reduced while maintaining volume.

Perhaps the distribution of the training load volume requires greater clarification.

Specifically in regards to the presented training models, the various motor tasks consumption of the training load is illustrated in terms of workouts/frequency of training during the training week. The graphic representations are a function of training frequency and volume, not necessarily intensity.

- For example: during blocks 1 and 2 strength training occurs 4 out of 5 training days of a 5 day training week. This constitutes 80% of the load volume out of a possible 100%. Whereas SPP training occurs 2 out of 5 days, thereby, constituting 40% of the load volume.

Model 4
Regulation of Training Load in Block Sequence



Model 4 Summary

- Similar to models 1, 2, and 3 the training load volume of SPP increases throughout the annual cycle

- Strength, speed, and agility training comprise a fairly consistent volume of the training load throughout block 2

- GS conditioning experiences a sharp increase leading into and throughout block 3

- Strength training gradually drops off decreasing its proportion of the training load by approximately 50% throughout comp

15. Sample Annual Plan

The following annual plan is a near direct example of the authors chosen programming and organizational model for his high school American Football players.

The varsity players come in 45 minutes prior to their 1st period weight training class, on M-W-F, in order to perform speed, agility, and intensive SPP work. Arriving at 6:45AM provides for 1hr45min workouts. Workout time is

terminated at 8:30AM at which time the players transition to their second period class

During the summer months the varsity trains from 6-8PM Monday through Thursday while the freshmen and JV train from 4-6PM. Fridays are off in order to accommodate long weekend vacations and so forth which commonly occur during the summer.

January through May features a High/Low split in which M-W-F is CNS intensive and T-TH is low intensive. June, July, and August also feature a High/Low split although the training week is reduced to Mon through Thursday. Accordingly, the split becomes High-Low-Low High.

This is the general template. Training is always subject to modification in accordance with athlete feedback, responsiveness, and readiness.

The training process is considered by the author to exist as a living organism unto itself. It is, therefore, a directive of the author to foster the growth of the training organism at the most accelerated rate. In so doing, careful steps must be taken in regulating the training load.

January

The months training is largely directed towards re-establishing any components of GPP which may have diminished throughout the competitive phase.

- 3-4 week days devoted towards sub-maximal and repeated effort weight training and flexibility/mobility
- Mon, and Fri Short accelerations 10-20yds prior to weight training
- Wed- low volume agility drills (4-10 seconds in duration) prior to weights
- T, TH low intensive SPP drills, high repetition abdominal and neck work

February

- Same organization approach to month plan as January with gradual increase in weight training intensity on Mon, Wed, Fri
- Speed on Mon and Fri and agility on Wed
- Intensive SPP drills introduced on

Wed, prior to agility work

- Low intensive SPP continues on T and TH with abdominals, neck, and ancillary weight work

- 3 weeks loading in which the primary lifts increase in intensity followed by 1 week deload in which intensity primary lifts is reduced to sub-maximal or repeated effort methods

March

- Virtually the same weekly and monthly organization of training as Feb.

- Agility drills are moved to the M and F training prior to linear speed work in order to spend a greater amount of time W morning, before weights, training intensive SPP

*It must be noted that intensive SPP inherently incorporates a speed and agility demand as they relate to sport form

- Introduction of additional agility drills on T and TH at walk through pace in order to accelerate technical learning

- Distances of speed repetitions increase (up to 30yd for down lineman and big skill, up to 40yd for little skill)

April

- Same weekly and monthly organization of training as March

- Speed training is intensified during the weight training deload week (as time moves forward the sprints, although same in distance, become inherently more intensive due to the resultant increases in speed and power obtained by the sportsmen)

- Intensive weight training and speed training compete with one another for CNS reserves. When weights are emphasized speed training is reduced in volume, when weights are deloaded speed training is increased in volume

- GS conditioning introduced at the end of the month in preparation for spring ball at the end of May

- GS conditioning takes the place of the Fri weight work and consists of varied intensity drills which

match the energy system demand of sport form. 6-10 second efforts. Efforts for down lineman and big skill are more strength-speed/endurance oriented and efforts for little skill are more speed-strength/endurance oriented.

- GS drills for conditioning do not provide for complete recoveries

May

- Frequency of GS training increases

- GS training is now performed both as absolute means of transitioning to sport form and as conditioning means. The workouts which feature absolute/GS training provide for complete recoveries between repetitions

- If absolute/GS training is performed on M and W then it follows a shortened weight workout in order that all training may be completed in the allotted amount of time

- GS conditioning remains on F workout

- Heightened strength, speed, conditioning preparedness provides

for smooth transition to stressors of spring ball

June

- Deload all CNS intensive training irritants for one week following spring ball

- Transition to 4 day training week

- Training weeks are generally structured around the following two templates:

Example 1:

- Mon- Speed/Agility followed by total body ME and DE training with possible inclusion of absolute GS training at end of workout. Intensive SPP (no contact) is integrated into the GS training

- Tues- abdominal, neck, and total body assistance lifts followed by lower volume low intensive GS and S tempo drills

- Wed- higher volume low intensive GS and S tempo drills

- Thurs- Intensive absolute GS OR GS conditioning. If absolute GS then

SE upper body lifts are performed prior and abdominals, neck, and assistance lifts are performed after. If GS conditioning then speed/agility, upper body lifts, abdominals, neck and assistance lifts are performed prior in lower volumes

Example 2:

- Mon- Speed/Agility followed by lower body strength/power training. Absolute GS training may substitute for direct speed/agility training. Intensive SPP (no contact) is integrated into the GS training

- Tues- abdominal, neck, and lower body assistance lifts followed by lower volume low intensive GS and S tempo drills

- Wed- Upper body strength/power training followed by higher volume low intensive GS and S tempo drills

- Thurs- GS conditioning. Speed/agility, abdominals, neck and assistance lifts may be performed in lower volumes first in the workout

* GS training and conditioning inherently develops a certain component of special strength, speed, agility, and work capacity as they relate to sport form

July

- Same weekly and monthly plan as June

- Continue to increase intensiveness of training load while balancing the volumes of intensive stressors in order to promote the most multi-lateral accelerated growth in all abilities and provide sufficient recovery between intensive stressors

August

- Continue with training

- Training flows directly into summer training camp which is one week in duration

- G and GS training is reduced in volume during training camp in order to provide for the increase in SPP training load intensiveness

September through November

- Monday AM- lower body weights
- Monday PM- Intensive SPP, GS, speed/agility (full pads)
- Tuesday AM- neck, abdominals, low intensive SPP (helmet only)
- Tuesday PM- low intensive SPP, GS tempo(full pads)
- Wednesday AM- upper body weights
- Wednesday PM- Intensive SPP, GS, speed/agility (full pads)
- Thurs AM- low volume neck, abdominals, low intensive SPP
- Thurs PM- low intensive SPP walk through (helmet and shoulder pads)
- Friday AM- film
- Friday PM- Game
- Sat- OFF
- Sun- OFF

December

- Optional two weeks of training prior to Christmas break

16. Conclusion

Certainty in the training must be conveyed by the coach to the sportsman in order that the highest possible performance results may be attained. This certainty must come from the confidence which is obtained through the successful construction of training models which yield consistent and reliable results.

Consistent decisions must be made and follow with actions which are congruent with the targeted objective. It is this continuum of action oriented behavior which yields the highest possible result.

In regards to speed training for non-track athletes, this decision making process is initiated by the coach/athlete who has taken the initiative to develop a complete understanding of the training process and a proficiency in the practical application of training methodology.

The development of speed plays a decisive role in the success of any

team sport athlete. Speed training must be included throughout the annual plan in order that the sportsmen may fully realize their speed potential during the competitive phase.

Surely there are multiple methods of achieving the same directive; a fascinating characteristic of the training. Ultimately, the skills of the coach are defined by the results of their athletes.

In regards to speed development, here are some of the authors:

- 20 players on the 2005 team ran under 5 seconds for the 40yd dash

- Based upon recent testing, it is predicted that over 30 players on the 2006 team will run under 5 seconds in the 40yd dash

- Two players from the 2004 team ran 4.43 and 4.53 respectively (synthetic surface/spikes)
- Three players from the 2005 team ran 4.53 (synthetic surface/spikes), 4.53, 4.59 (both on grass) respectively

- During recent testing three outgoing seniors and one junior

ran 4.56, 4.58, 4.44, and 4.48 respectively

- All athletes took three attempts and all times remained within 1-3 hundredths of a second to their best time

- All times are hand timed from first movement initiated from a three point stance

Most importantly the West Valley Eagles of Cottonwood California have competed in the NSCIF Division 1 Championship game three years in a row (two since the author assumed control of the training).

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