1.1 Six Physical Performance Qualities

When considering the speed and full-contact nature of the game, as well as the game length and the size of the field, it becomes clear there are multiple aspects within the sport of lacrosse that must be specifically trained for [2]. In order to compete at the highest levels of lacrosse every athlete requires each of the six physical performance qualities to be in a highly trained level. As described above, each individual position within the sport of lacrosse requires a slightly different set of skills. However, every position will require the six physical performance qualities. These six physical performance qualities are implemented throughout the Triphasic Lacrosse Training Model described throughout this manual. To the majority of performance coaches, the training of these qualities are not new concepts by any means. However, their importance cannot be overlooked in training.

When broken down scientifically, the six physical performance qualities include the three energy systems (Oxidative, Glycolytic, and ATP/Cr-P), Strength, Repeat-Power, and Speed. Each of these physical performance qualities are shown, along with a brief description, in Figure 1.2. Now, many performance, as well as lacrosse coaches may look at this and say “of course there are more physical qualities that are required in lacrosse than just these six.” Yes, there are many more performance factors and skills that must be considered and trained in the sport of lacrosse. However, each of those skills fits into one of the six physical performance qualities. The ability to repeatedly sprint for the entire sixty minutes of a game is determined upon the training and conditioning of the three energy systems as well as the repeat-power quality. Skills such as change of direction and agility fall within the strength and speed physical performance qualities. The more force an athlete is able to absorb and re-direct or “load and explode” the quicker they will be able to change direction on the playing field. Each of these skills will be explained to a greater extent in later sections, but ultimately it is important every coach understands the importance of these six physical performance qualities and the effects they have on lacrosse performance. Figure 1.3 and below is a visual representation of the six physical performance qualities for an elite level lacrosse athlete to reach optimal performance.

6 Physical Performance Qualities of Lacrosse	
Physical Performance Quality	**Functions During Performance**
ATP/Cr-P Energy System	Short burst, high-intensity activities of less than 10 seconds in duration
	Sprinting towards the goal, dodging a defender, face-off wing play
Glycolytic Energy System	High-intensity activities that occur for greater than 10 seconds
	Extended shift on either offense or defense, longer sprint series in competition, running out the clock at the end of a game
Oxidative Energy System	Allows long distances to be covered, improves recovery ability when properly trained, forms foundation of all other qualities trainability
	Sometimes multiple miles covered in a game, ability to recover and play at high speeds even at the end of a game, recovery between competitions
Speed	The ability to move at a high velocity, usually for a brief amount of time
	Sprinting towards the goal, dodging a defender, getting back on defense after a turnover, clearing the ball
Repeat-Power	Increases ability to produce high forces for extended amounts of time
	Sprinting at high speeds even at the end of a long game, playing at a high level with multiple games per weekend, face-off athletes
Strength	Increases force production, basis of repeat-power and speed qualitites
	Body checking and other body contact, picking up a ground ball in a scrum, face-off athletes, dodging with pressure, play near the crease

Figure 1.2 - The Six Physical Performance Qualities of Lacrosse

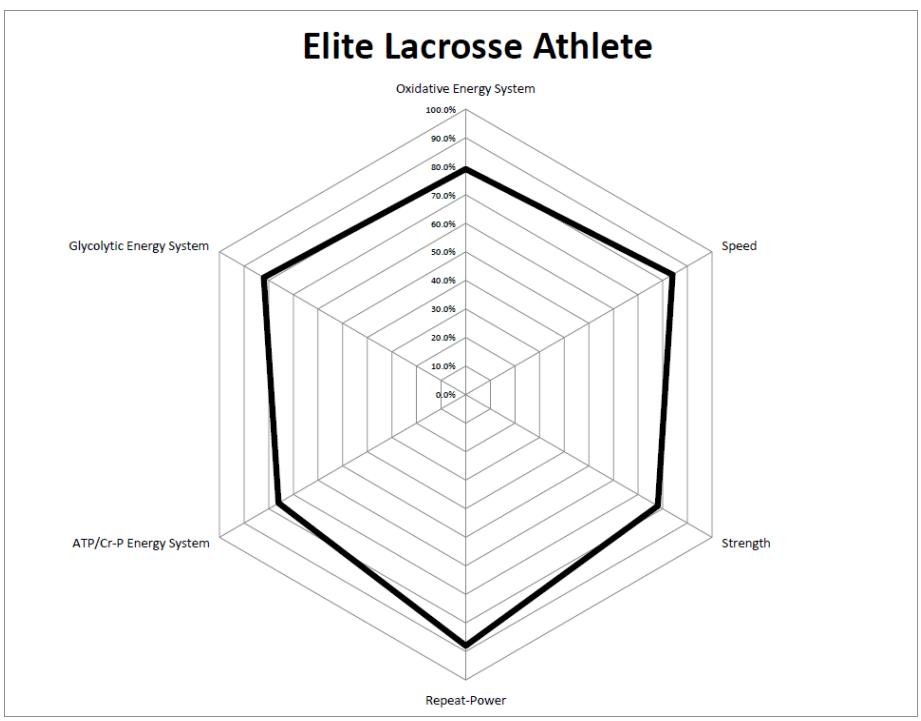

Figure 1.3 - Six Physical Performance Qualities of an Elite Lacrosse Athlete

1.2 High-Quality and Work Capacity Training

Each of the six physical performance qualities can be further broken down into two components, *high-quality* and *work capacity*. When these two components are accounted for in training appropriately, optimal results are seen in each performance quality [3-5]. High-quality training improves the ability of the performance quality to function at the highest intensities possible. Work capacity training, on the other hand, focuses on improving the performance quality's ability to be used for an extended period of time. By training these components at specific times within a workout and/or training block, the greatest improvements possible to each performance quality have the potential to occur.

High-quality training requires greater rest times since maximal intensities are required to improve this aspect of a performance quality. Work capacity is increased when shorter rest times are used in training, as the goal of training becomes improving the length of time the physical performance quality can continue to be used by an athlete [3-5].

An example of this work-capacity training in lacrosse is the ability to run repeated sprints in a specific amount of time with little to no rest time in between. Most coaches, in general, tend to excel in work capacity training, or the ability to continue to push their athlete's to the brink of exhaustion. Most athletes would agree they have endured grueling conditioning drills where, by the end, there is nothing left in the tank. It is important to note this manual is not stating difficult training sessions, aimed at improving work-capacity, are not vital for lacrosse performance. However, these workouts should not be the only method implemented in a program, as the glycolytic energy system becomes disproportionately elevated. The importance of each of the energy systems and the high-quality training required to specifically improve them cannot be overlooked. Figure 1.11 below depicts the work and rest durations for both the high-quality and work capacity component of all three energy systems.

Comparing High-Quality and Work Capacity Energy System Training				
ATP/Cr-P Energy System				
High-Quality Training			Work Capacity Training	
Work Duration	Rest Duration		Work Duration	Rest Duration
3-10 sec.	1:30-5:00 min.		3-10 sec.	30-45 sec.
Glycolytic Energy System				
High-Quality Training			Work Capacity Training	
Work Duration	Rest Duration		Work Duration	Rest Duration
20-30 sec.	2:30-8:00 min.		40 sec.-1:30 min.	2:00-6:00 min.
Oxidative Energy System				
High-Quality Training			Work Capacity Training	
Work Duration	Rest Duration		Work Duration	Rest Duration
1:30-6:00 min.	1:00-3:00 min.		3:00-8:00 min.	1:00 min. and below
			20-120 min.	Continuous

Figure 1.11 - Comparing High-Quality versus Working Capacity Training

A simple example of high-quality versus work capacity training is the difference between training for maximal speed versus conditioning. Maximal speed training is a high-quality component, and thus requires increased recovery times as the athlete must truly run at maximal speeds in order to improve this physical performance quality. Athletes are only capable of running at maximal speeds if they are fully recovered between sprints. If a coach reduces the recovery time between repetitions, training shifts to a work capacity, rather than a high-quality training session, just like the skating example above. This returns to the simple idea that specific improvements in each performance quality must remain the goal of training. Every coach must understand the high-quality and work capacity components must be specifically stressed in training at certain times within the annual cycle.

1.3 Injury Prevention and Reduction

The gluteus maximus, or glute, is likely the most discussed muscle in the body, particularly in the world of athletics. As a performance coach or any other professional that works to understand the human body, this is likely one of the most fascinating muscles as it is also the most commonly dysfunctional muscle found in athletes. There have been many methods and techniques introduced to assist with dysfunctional glutes, ranging from hip bridge, to banded clamshell, and other exercises to increase the glute firing. These are all useful exercises to some extent, however they do not apply the required stress to increase glute activation to the highest extent. Before these specific methods to maximize glute activation and function in dynamic movements, the basics of the glute muscles must be entirely understood.

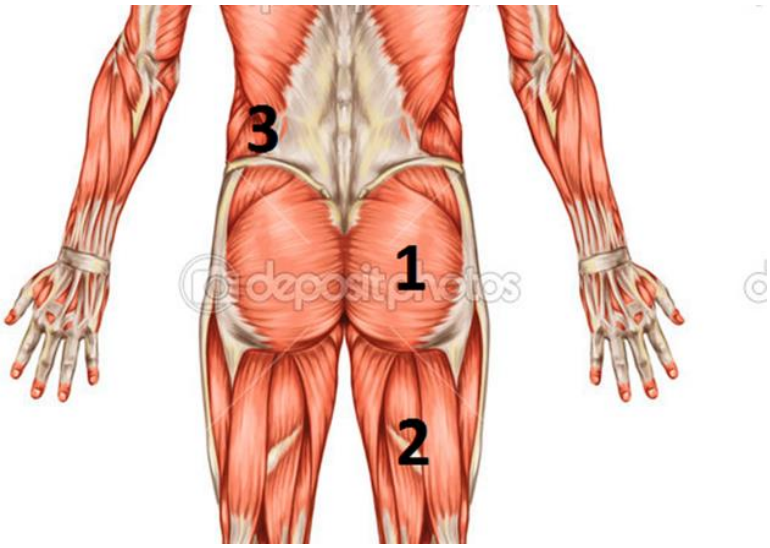

Figure 1.21 - Appropriate firing of the hip extension musculature firing

There are multiple reasons why these changes in firing patterns occur. These reasons include an athlete that is structurally “off”, they have learned compensation patterns, or are in a chronically sympathetic state. Ultimately your glutes function by the “use it or lose it” mentality. Unfortunately, and amazingly, your body is so efficient, intelligent, and aware of its need for hip extension in movement that it will find other ways to complete this required hip action. These compensation patterns, such as the hamstring being recruited as the primary mover rather than the glute, occur due to the vast musculature

surrounding the hips. Once again the “use it or lose it” approach is taken, if for some reason the body cannot fire the glute, it will find a secondary, although sub-optimal firing pattern for hip extension.

Regardless of the reasoning it is vital a coach is capable of creating optimal, functional firing patterns within the hip with the glute as the primary mover. This will reduce injury likelihood and also improve power output from an athlete. The following will provide, what we feel, a scientific, research based, layered system to “reset” your athletes per se into their appropriate, optimal hip extension firing pattern. These methods will be laid out in a pyramid fashion ranging from pure volume with correct coaching and cueing, isometric activation protocols, manual activation techniques, up to structural adjustment principles to ensure appropriate patterning. The glute layering pyramid, demonstrated below in Figure 1.22. This layered system begins with a foundation that all coaches should be capable of providing their athletes, and then progresses to other methods that become more selective in their utilization. At the very least coaches should be providing glute isometric work and then the 3-D contralateral circuit. Ultimately, this system is based on availability, with the most readily available systems forming the foundation of performance.

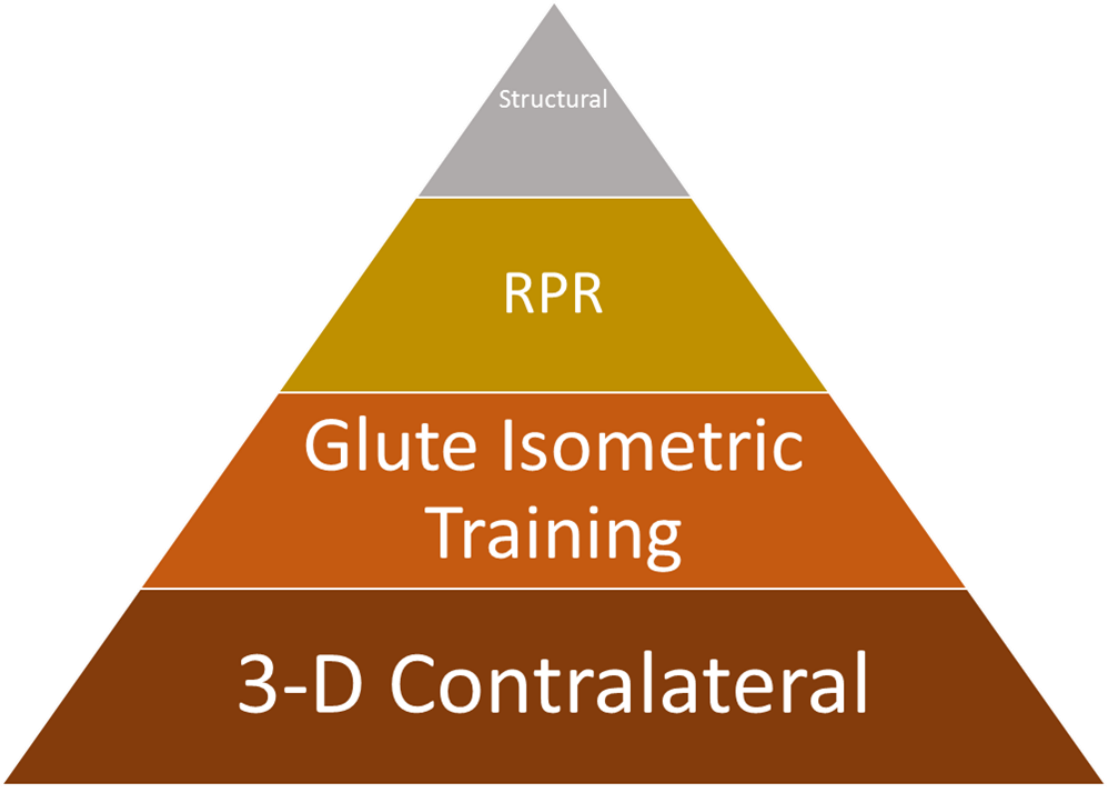

Figure 1.22 - The Glute Layered Pyramid

After seeing this figure, some coaches may feel they already incorporate the majority of these. Which in all honesty is entirely possible that components of this protocol are implemented. However, as each layer is explained on a deeper level, every coach will begin to realize the physiological importance of the individual components involved in this glute training process.

To create a simple analogy for this glute layering process, we can treat the glutes like a circuit breaker. If an athlete's structure, hip or foot function is off, it's as if the power to the breaker is off. Regardless of how well the circuits function there is no change as there is no power input to the breaker. Once the power is on, or the athlete's structure is appropriate, RPR methods can be applied to ensure the circuit to the glutes is closed, or able to conduct electricity. If this activation technique is not applied, an athlete will lack neural drive to the glutes, as a result the circuit will be left open, or be "switched off". Once the circuit breaker has been closed, or "flipped on" through RPR, the glute isometric training protocols are implemented to increase the strength and capacity of the "glute circuit". Finally, the 3-D contralateral is implemented to repetitively send the stronger signal to the glutes, which increases the body's ability to function at the highest possible level and begin to add strength appropriately.

Every one of these layers within the functioning of the glute revealed in this section play a specific role. At the very least coaches must be capable of completing the basics prior to completing any others. Once again, when viewing the pyramid presented in Figure 1.22 a coach should begin from the highest level they are capable of completing all layers below. For example, if a coach is not trained in the RPR technique the glute isometric and 3-D contralateral protocols would be implemented. A chiropractor that has been trained in RPR would be capable of utilizing all four methods of the layered glute protocol provided. Only when each of these layers of the glute are considered and implemented appropriately will the glute regain its full function as a primary mover. Once this has been completed the body will utilize the appropriate, optimal pattern of glute, hamstring, and opposite QL, leading to vastly reduced injury likelihood and increased performance and power output.

The 3-D contralateral program described above for glute functioning represents one method in whch multi-dimensional training can be implemented to continue to reduce injury likelihood. Multi-dimensional training can be applied throughout the entire body to ensure optimal functioning and performance to occur. The methods of multi-dimensional training and the potential benefits will be demonstrated throughout the following section.

Before these strategies are covered in greater detail, it is necessary every coach understand the value of all three planes of motion in even basic movements. A skill as simple as walking or running straight ahead is viewed as a primarily sagittal movement by many. However, upon closer look, the application of a joint by joint approach, or the view of the function of each joint in a multi-joint movement, reveals the importance of 3-D training in even the most "sagittal" of movements completed. The task of walking or running is completed by nearly every person/athlete on a daily basis. During normal gait, all three planes of motion are present and are required for efficient movement. As the foot strikes the ground, the subtalar joint experiences eversion, which leads to a pronation at the foot. This pronation of the ankle leads to tibial medial rotation, femur medial rotation, and eventually hip internal rotation. Finally, ankle dorsiflexion is required throughout gait to achieve appropriate toe-off through the big toe. These movements are all required and summate to create eccentric loading of the glute, which should be the primary driver of all hip extension.

Each of these joints is required to function to a high-extent if appropriate movement is to occur. This mechanism, termed tri-planar loading, clearly demonstrates the importance of all three planes of motion in everyday tasks. The subtalar joint experiences a frontal plane of motion change (eversion), the tibia experiences transverse plane of motion change (medial rotation), and the ankle experiences sagittal plane change (dorsiflexion). Figure 1.25 below depicts this tri-planar loading, which should occur

in every stride taken. As this loading pattern occurs the glute is able to experience eccentric loading and an athlete experiences efficient movement.

It is important to note this pronation and tibial rotation occurring with every step, although extremely important for appropriate and efficient movement, does not function on the “more is better” approach. Every athlete must attain the proprioceptive control over their arch to ensure excessive pronation and tibial medial rotation do not occur, as this will lead to valgus stress placed upon the knee. In fact, many professionals measure this “medial-drift” occurring at the foot to determine potential pathologies.

Figure 1.25 - Tri-planar loading within the foot and lower leg in gait

Besides the improved efficiency of movement through appropriate joint articulation and tri-planar loading, 3-D training also leads to a reduction in the likelihood of injury. 3-D training, when programmed appropriately, leads to improved motor patterning, a reduction in biomechanical deficiencies, increased range of motion, the creation of tissue tolerance, force absorption capabilities, and improved strength in extreme, or abnormally utilized tissue lengths. Ultimately, the implementation of 3-D training leads to the ability of an athlete to create proprioceptive control and strategies to move in and out of disadvantageous positions which occur in athletics.

Just as performance coaches implement stress to cause a specific adaptation, disadvantageous positions can be applied in training in order to further reduce injury likelihood. By placing an athlete in these positions the ability to develop proprioceptive control is provided. This ultimately gives an athlete a strategy to maneuver in and out of disadvantageous positions experienced during competition and reduces the likelihood of sustaining an injury.

Figure 1.30 - Disadvantageous Positions Experienced in Competition

Figure 1.30 demonstrates an example of an “awkward position” commonly experienced in a lacrosse game. As the player plants his foot to execute a roll-back dodge, adduction, or valgus at the knee occurs. This is a position most performance coaches avoid entirely in the weight room. However, if an athlete is never given a strategy to move in and out of this position in training, motor patterning and tissue tolerance will never be learned.

1.4 Peaking Athletes Optimally

The final aspect to consider for lacrosse athletes is the peaking of the six physical performance qualities at specific, desired times throughout the annual calendar. In the world of athletics, before the focus of a specific stressor or physical performance quality can be chosen within the training cycle, the competition dates must first be determined. The knowledge of when athletes must be peaked will allow a coach to set up a plan that will complete all phases of training within the allotted time frame. When an athlete approaches a game or match, they have prepared for competition knowing the date and exact specifications of the event. This allows a systematic training protocol to be implemented with the end date and objective to be known long before the competition occurs. Ideally athletes should be physically prepared just prior to beginning pre-season camp, as these camps primarily focus on technique, skills, and tactics rather than physical performance quality development.

1.5 Understanding the Energy System Requirements of Lacrosse

Prior to the implementation of specific energy system training to maximize performance in a repeat-sprint sport such as lacrosse, more detailed knowledge of the sport must be attained by the coach. These knowledge points include the sprint duration, sprint number, and the recovery time allowed prior to the subsequent sprint, or high-intensity scenario, experienced in both competition as well as practice by an athlete. Each of these considerations will influence the energy system contribution during repeat-sprint exercise [(24)].

2.7 The Combination of the Three Energy Systems

When the three energy systems are each adapted to the highest level, performance in the sport of lacrosse, which requires the ability to repeatedly produce sprint efforts, can be optimized. Any athlete training and competing in a repeat-sprint sport must have the ability to both produce high-power outputs, while also recovering from them in the most rapid fashion.

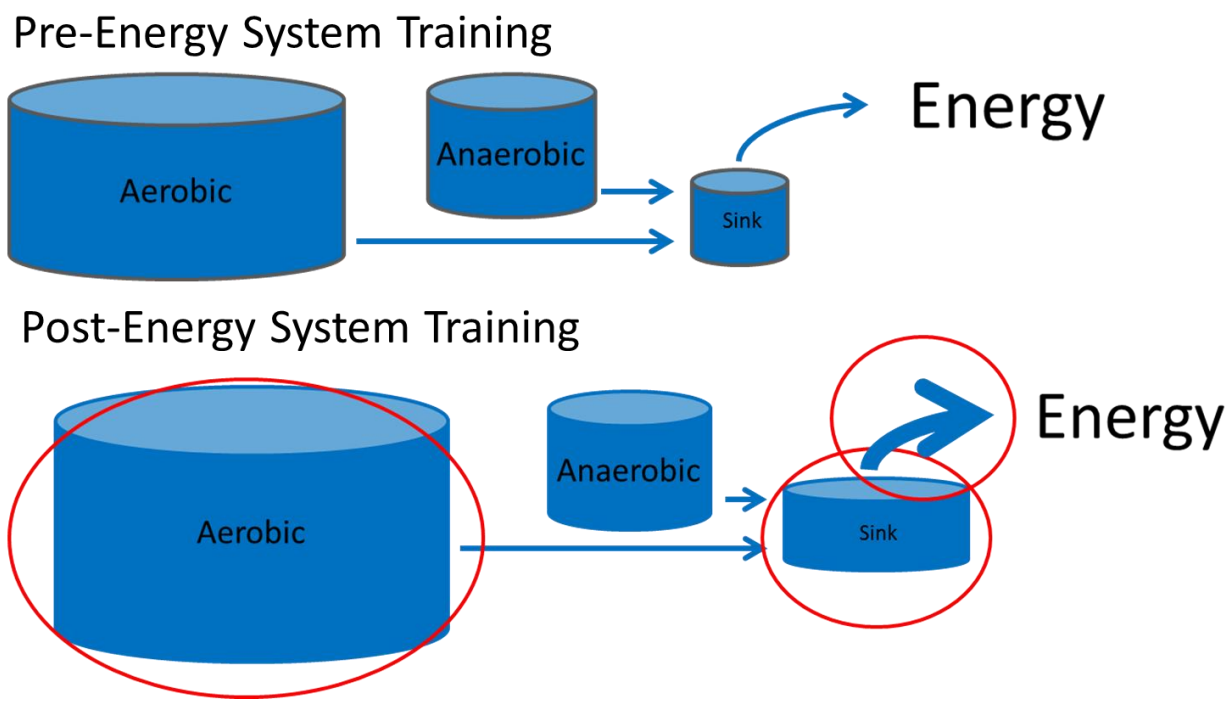

Figure 2.4 - The Effects of the Triphasic Lacrosse Training Model on Energy System Development

2.8 Biomechanical Requirements of Lacrosse

As a performance coach, the goal remains to prepare every athlete for the sport being completed, in this case lacrosse. The specific requirements of lacrosse have been considered in regards to energy system development, which must be completed first, as an athlete must be capable of providing the body with the energy required to be successful in sport. This is a requirement of any repeat-sprint sport. However, lacrosse also has biomechanical requirements that must be trained for and improved in a highly specific manner. These biomechanical requirements include acceleration and sprinting, along with the skills of shooting, passing, and checking must all be maintained at a high-level, as they are the most specific skills to the sport. Each of these skills will be broken down into their basic components and described according to how they are trained in the Triphasic Lacrosse Training Model.

2.11 The Combination of Energy System and Biomechanical Training to Create the Triphasic Lacrosse Training Model

Although there are differences in the requirements of each position, it should be noted that the individualized training based on position requires significant planning and proficient execution. For this

reason, the programming presented in section four will represent a model that all lacrosse athletes, playing any position, will achieve performance improvements from. The program demonstrated follows the Triphasic Lacrosse Training Model, which considers each of the six physical performance qualities required of elite performance in lacrosse.

Ultimately, the job of the performance coach is to prepare athletes for the rigors experienced in the sport of lacrosse. This can be completed by carefully considering and implementing the stress applied, sound injury reduction protocols, and creating a high-level of transfer of training. Each of these principles are discussed in section one of this manual. However, these can only be accomplished when the energy system and biomechanical demands of the sport of lacrosse, and even those of each position, are understood to the highest extent.

By considering each of the energy system's roles in a repeat-sprint sport, such as lacrosse, the number of sprints, their duration, and typical rest time a protocol can be created to maximize these specific energy systems. Once these needs have been met, biomechanical requirements including sprinting, shooting, passing, and checking can all be maximized to the greatest levels through programs completed in training. The Triphasic Lacrosse Training Model considers each of these requirements specific to lacrosse to create the most systematic training program available. The Triphasic Lacrosse Training Model takes into account multiple programming aspects and is designed to train each of the six physical performance qualities to the highest extent without negatively affecting any of the other five. Application of these principles allows optimal performance to be attained and maintained by every athlete. Each of these applied principles of training will be described in the upcoming section.

3.1 The Triphasic Lacrosse Training Model Components

The Triphasic Lacrosse Training Model is created based on the application of specific stress. At the elite lacrosse level each of the six physical performance qualities, along with the biomechanical considerations specific to the sport must be accounted for to the highest extent. The concept of appropriate stress within this training model was already covered in the opening section of this manual, it will not be covered again here. However, it is vital every coach understands this idea and how specific stress must be applied to each of the six physical performance qualities. Once again, stress is the signal to the body that something has to change; something must adapt to reduce the amount of stress exerted by that stressor on the body if it were to ever come across it a second time. It must be applied specifically and systematically for optimal performance to occur. The goal of training remains to create the graphic shown in Figure 3.1 below for each of the six physical performance qualities. This is achieved through training philosophies such as the block training model, modified weekly undulation training, and specific muscle action training. The training philosophies and programs implemented to create the Triphasic Lacrosse Training Model consider the specific stressors required to cause a physiological adaptation to each of the physical performance qualities. Only when this method is utilized can an appropriate annual cycle that leads to optimal performance in the sport of lacrosse be created.

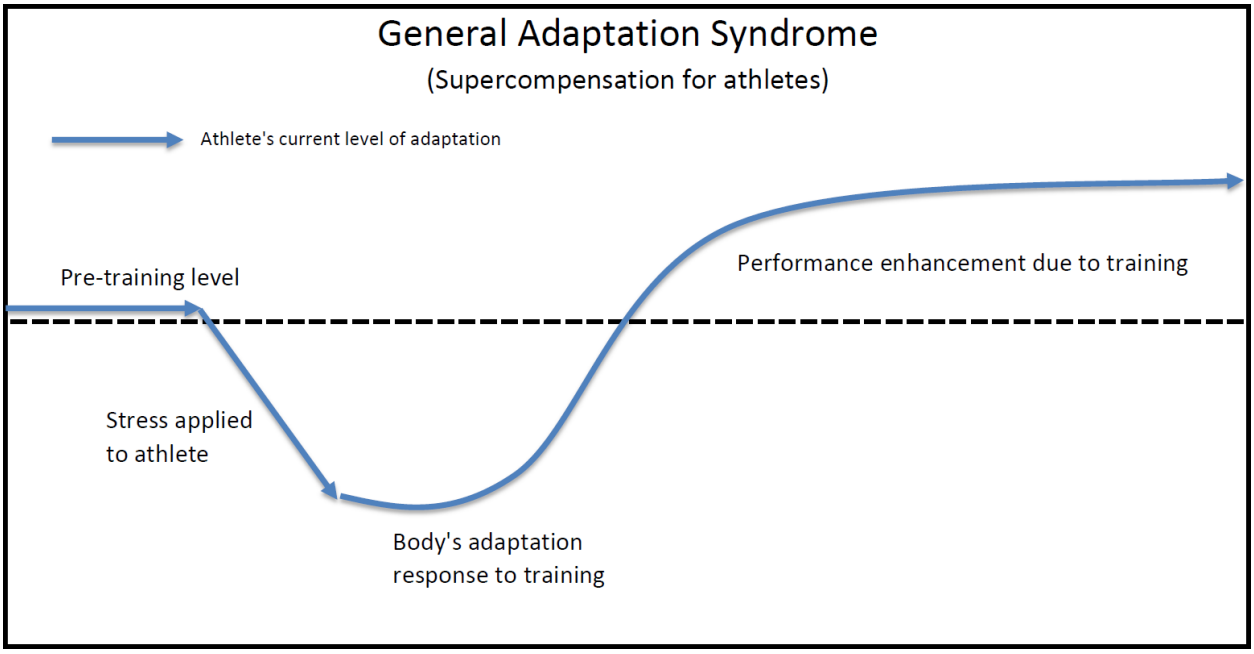

Figure 3.1 - Adaptation Response with Appropriate Stress in Training (Desired Adaptation)

3.2 Block Training Model

These specific stressors required in training to improve each of the six physical performance qualities (three energy systems, strength, repeat-power, and speed) must be completed in a systematic fashion. The block training model allows for the systematic training laid out in this manual to be completed in the most efficient and effective method possible. Only when specific stress through the block training model is applied to each of the six physical performance qualities can optimal performance be achieved at the desired times of the annual plan.

3.21 Residual Training Effects

Specific stress is one of the two primary concepts implemented in the Block Training Model. The other concept applied strategically within this model is the implementation of stress according to the residuals, or retention length, of each physical performance qualities. This concept of residuals allows a systematic approach to the training of each physical quality based on the duration at which the adaptation remains in a trained state, once training is ceased for that specific quality.

DURATION OF RESIDUAL TRAINING EFFECTS (RTE) ON MOTOR ABILITIES			
MESOCYCLE	MOTOR ABILITY	RTE (DAYS)	PHYSIOLOGICAL BACKGROUND
ACCUMULATION	OXIDATIVE ENERGY SYSTEM	30±5	INCREASED NUMBER OF AEROBIC ENZYMES, MITOCHONDRIA, CAPILLARY DENSITY, HEMOGLOBIN CAPACITY, GLYCOGEN STORAGE, HIGHER RATE OF FAT METABOLISM
	STRENGTH	30±5	IMPROVEMENT OF NEURAL MECHANISM MUSCLE HYPERTROPHY
TRANSMUTATION	GLYCOLYTIC ENERGY SYSTEM	18±4	INCREASED ANAEROBIC ENZYMES, BUFFERING CAPACITY, AND GLYCOGEN STORAGE, HIGHER POSSIBILITY OF LACTATE ACCUMULATION
	REPEAT-POWER	15±5	IMPROVED AEROBIC/ANAEROBIC ENZYMES, IMPROVED LOCAL BLOOD CIRCULATION AND LACTATE TOLERANCE, REPEAT SPRINT ABILITY
REALIZATION	ATP/CR-P	5±3	ENHANCED RESYNTHESIS OF CR-P
	SPEED	5±3	IMPROVED NEUROMUSCULAR INTERACTIONS AND MOTOR CONTROL, INCREASED ANAEROBIC POWER

Figure 3.4 - Residual Lengths of the Six Physical Performance Qualities [38,47]

3.22 Accumulation, Transmutation, & Realization

The consideration of residuals allows the Block Training Model to be broken down into three specialized training phases. These three phases have been termed accumulation, transmutation, and realization. Each phase is designed to build upon the adaptions from the previous phase and ultimately leads to the simultaneous peaking of all physical performance qualities as each progresses from general to specific training adaptations. Returning to Figure 3.4 above, the six physical performance qualities and how they fit into these three training phases can be seen. When applied to the sport of lacrosse, this progression allows an athlete to progress through the off-season training protocol beginning with more generalized training and finishing with the most-specific training just prior the competition season.

3.23 The Adaptations Realized in the Block Training Model

The adaptations to RFD realized by athletes through the implementation of these three phases of the Block Training Model are demonstrated below in Figure 3.9. The three lines depicted represent the RFD displayed as an average by a group of 40 athletes through a vertical jump test after different training phases. The time axis in this figure is intentionally cut at 250 ms, as virtually all lacrosse movements are completed in under this amount of time. By ending the axis at this time, the true performance ability of the RFD can be measured for a large group of athletes.

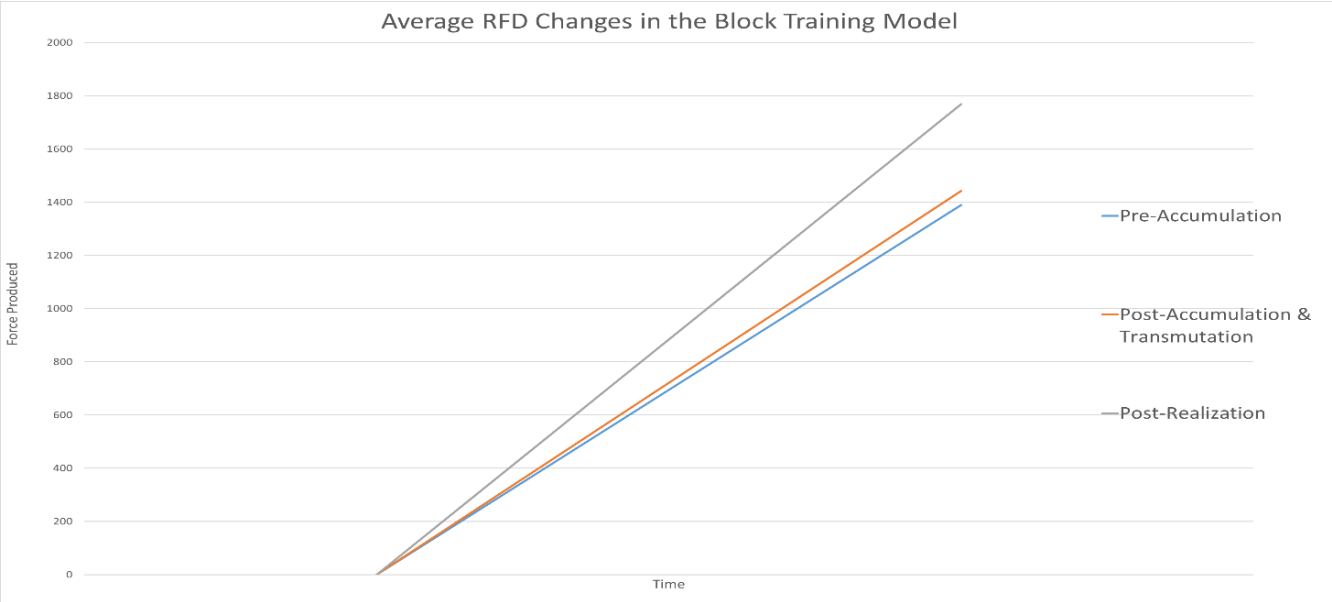

Figure 3.9 - RFD Adaptations Due to the Three Phases of the Block Training Model

3.3 Modified Undulated Training Model

The Modified Undulated Training Model represents a smaller scale of the Block Training Model. The Block Training Model considered training completed based on specific desired adaptations on a large-scale basis. This model builds from The Block Training Model in that it focuses on providing a specific stimulus, or stress, on a daily basis. The Modified Undulated Training Model takes the stressors placed on each athlete in training on a daily basis into account based on the intensity and volume. By considering these factors an athlete experiences, an optimal weekly training model can be created and implemented.

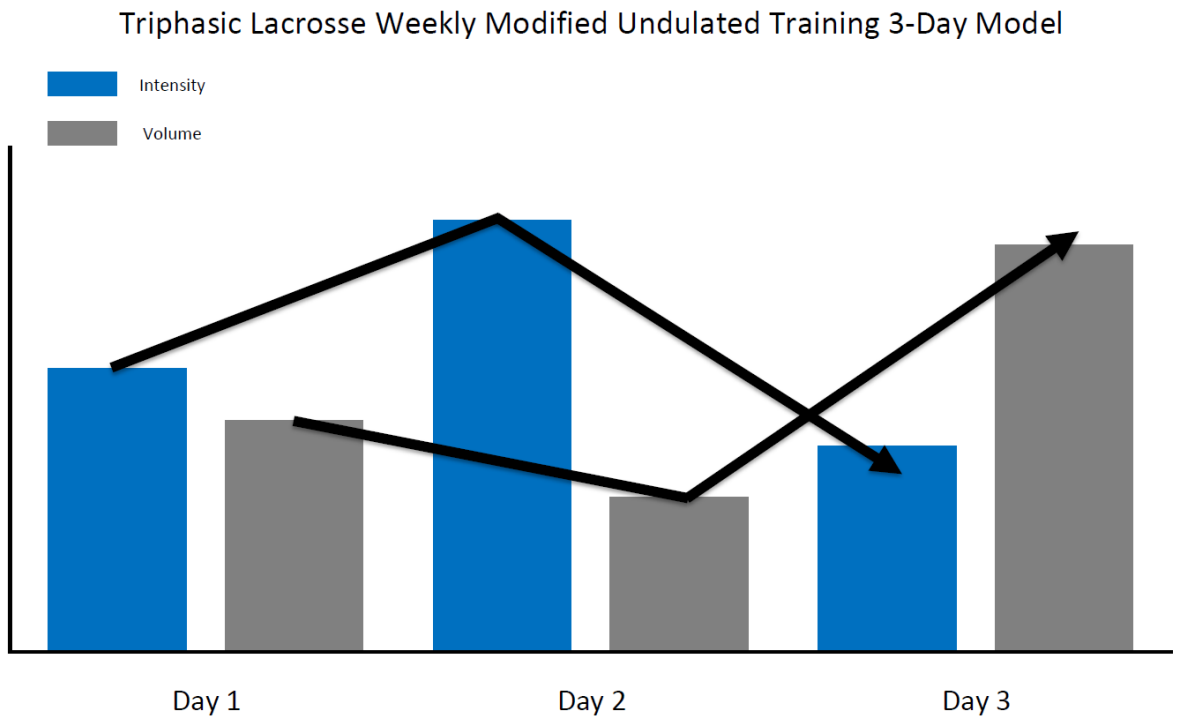

Figure 3.11 - The Modified Undulated 3-Day Training Model

3.4 High-Quality Training Model

Based on the requirements of the sport of lacrosse described in sections one and two, all performance coaches should understand the importance of both capacity and quality training. Every athlete must be capable of producing repeated bouts of high-intensity of work in order to improve their odds of being successful in competition. Much of the energy system training implemented in the Triphasic Lacrosse Training Model is executed to improve the capacity of the athlete. This can be seen in the fact that athletes, upon completion of this block, have the ability to complete a greater number of repetitions before great performance decrements are seen. However, the ability of that athlete to produce higher power levels, or quality, has not been improved to a great extent. Once training of the energy systems has been completed, the majority of training should be implemented to improve the quality an athlete is capable of producing. Ultimately, the energy system training has improved the efficiency of the athlete, but the remainder of training must be focused on improving the power output of the athlete. Only when these are both considered individually, as the Block Training Model allows, can optimal performance in lacrosse be possible.

3.5 Triphasic Muscle Action Training Model

The final training model implemented in the Triphasic Lacrosse Training Model is the individual training of the three muscle actions. These three phases form the origination of the term “Triphasic”. These muscle action phases, the eccentric, isometric, and concentric, are present in all dynamic movements. This means that every action completed in the sport of lacrosse requires each of these three movements to some extent. This concept was demonstrated back in section one of this manual in the multi-dimensional training section. With every stride taken, whether that is completed in a walking or running

fashion, the glute should experience eccentric loading, an isometric transition, and then a concentric push-off. The ability to utilize each of these muscle action phases becomes even more critical in high-speed movements, as seen in lacrosse. When each of these movements are utilized, they create the SSC. The SSC, which was described earlier in the shooting portion of section two, is utilized during every movement in lacrosse and is one of the most important abilities any athlete can improve. This skill is critical as it is both a source of power production, and also efficiency for the lacrosse athlete. For this reason, one of the primary goals of Triphasic Training is to optimize the SSC through the individualized training and improvement to each of the three muscle actions.

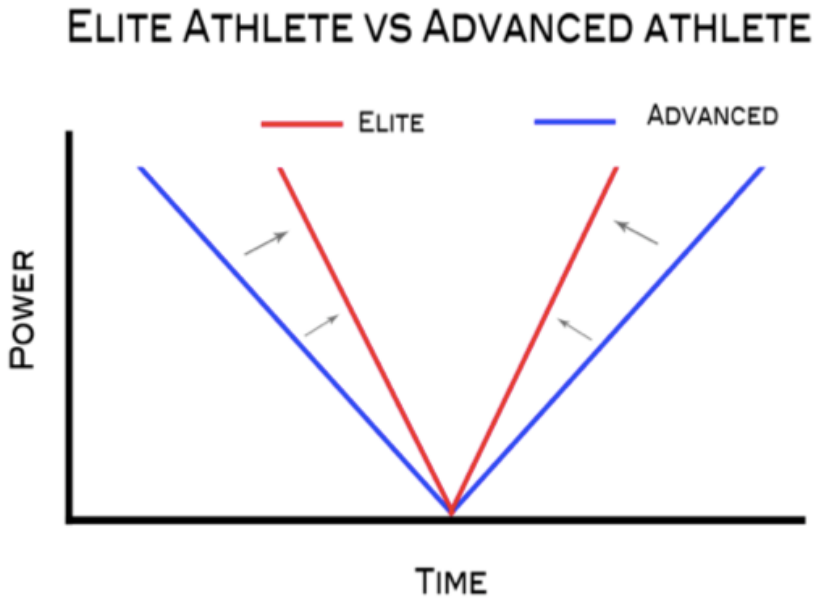

Figure 3.13 - Force Absorbing and Producing Capabilities of an Elite and Advanced Athlete

3.6 Adaptations Realized Due to the Triphasic Lacrosse Training Model

When each of the four training models described above are implemented into a system, such as the Triphasic Lacrosse Training Model, the adaptations and results speak for themselves. Below is a vertical jump completed on a force plate for a single athlete as they progress through the training model presented in this manual. In Figures 3.17-3.19 below the phases of training and the adaptations they create become clearly visible. Each of these adaptations will be described throughout the remainder of this section.

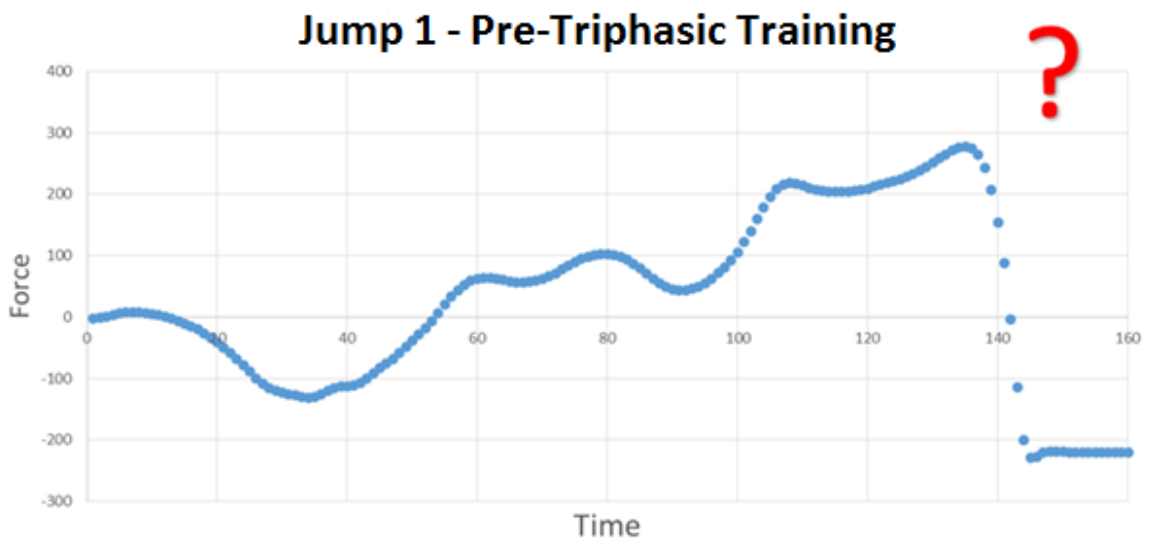

Figure 3.17 - Pre-Triphasic Training

Figure 3.17 above depicts the athlete's RFD pre-training. Based on the amount of force produced, as well as the time it takes for the athlete to produce it, this athlete would be considered extremely weak and slow. The "?" represents the fact that this athlete never produces 300 lbs of force during a single impulse. Any explosive athlete will generate much higher levels of force than this. Ultimately. this athlete requires training in multiple physical performance qualities.

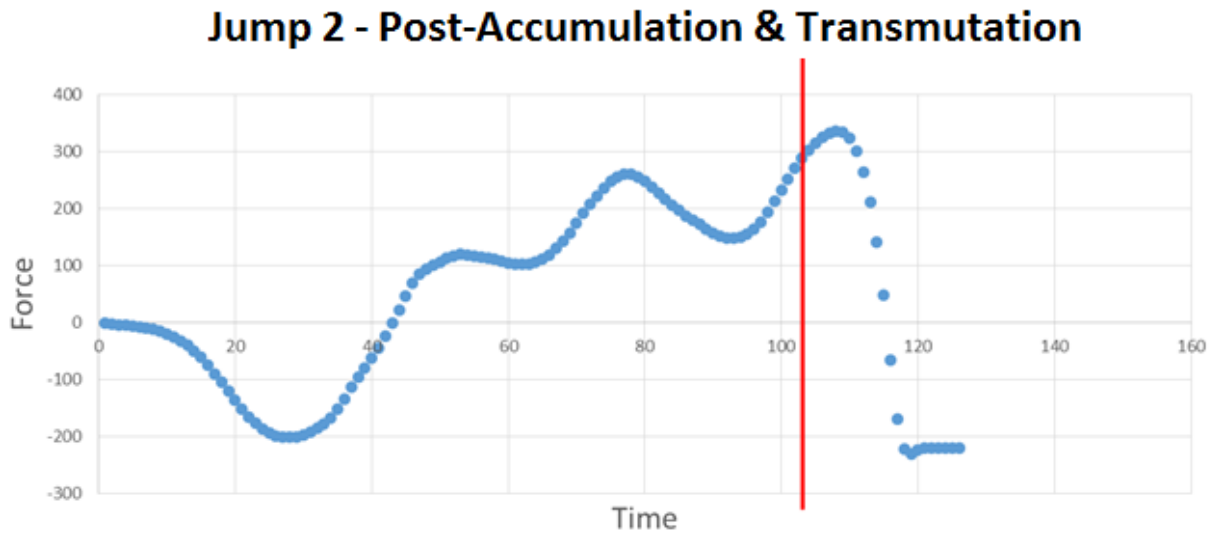

Figure 3.18 - Post-Accumulation and Transmutation Training (12 Total Weeks, 9 High-Intensity & 3 Downloads)

Figure 3.18 above demonstrates an athlete that has completed the accumulation and transmutation phases of training. Meaning the muscle action phases described above, along with the Repeat-Power Training Block have been implemented for this athlete. There are noticeable differences in this athlete now compared to him just twelve weeks before (Figure 3.17). First of all, this athlete now achieves the 300 lbs of force through a single impulse while jumping. This is a critical adaptation, as strength lays the

foundation for all other force producing physical performance qualities. Secondly, and more commonly missed, there is a significant adaptation to the athlete's jump in the early stages. This early phase represents the eccentric and isometric phases of the athlete jumping, as they must lower themselves in prior to completing the jump. The athlete now reaches the -200 lbs of force in a single impulse during the jump in Figure 3.18. In their first jump, Figure 3.17, they only reach about -120 lbs of force. This decrease in force represents an active "pulling" of the jumping athlete. This athlete has learned to utilize their SSC to a higher extent and can now absorb and then re-apply much higher levels of force. They have created the "V" of an elite athlete, one who can absorb, transfer, and re-apply the highest levels of force. This skill not only improves power production, but also movement efficiency. Although these adaptations are excellent and exactly what every athlete's goal should be for these phases, there is one issue. This athlete still takes about 1.05 seconds to achieve their 300 lbs of force threshold. Ultimately, this athlete would be considered strong, but slow. They have made considerable improvements to their force production They must continue to improve their early phase of RFD to maximize performance on the lacrosse field.

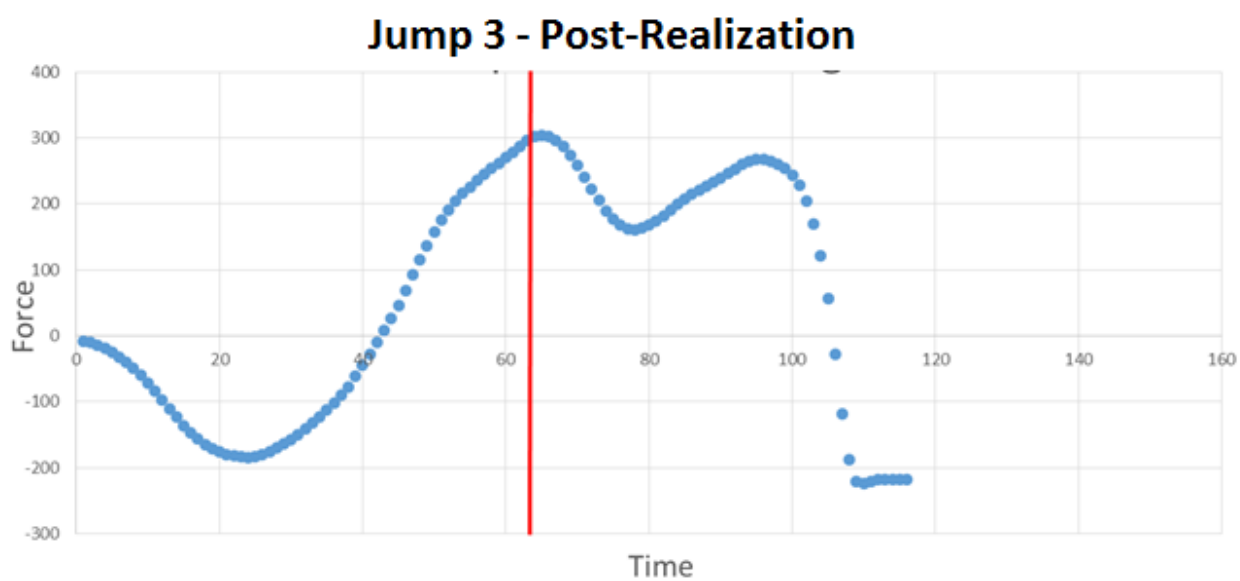

Figure 3.19 - Post-Realization Training (3 Total Weeks, 3 High-Velocity & 1 Download)

Finally, Figure 3.19 above represents the adaptations experienced in the realization training phase, or the speed training block. This jump was executed a mere four weeks after jump two shown in Figure 3.18. By training with high-velocities and low-loads this athlete has increased their neural drive, which is critical for the early phase of RFD. The jumping athlete still produces high-levels of force, as 300 lbs of force is achieved in a single impulse. However, this athlete is now producing that force level in 0.65 seconds. Just four weeks before this test that feat required 1.05 seconds, almost double the amount of time. The athlete that has progressed through each of the phases of the Triphasic Lacrosse Training Model is now not only strong, but also fast. Optimal athletic performance on the lacrosse field is now possible with the addition of appropriate on-field skills due to their physical preparation.

4.2 Triphasic Lacrosse Training Model Annual Plan

Figure 4.1 below represents the annual plan design for the Elite Triphasic Lacrosse Training Model. This annual plan displays the calendar and week number. It is this week number that is utilized throughout this section as different blocks are demonstrated. Use these week numbers provided to follow the progression throughout the year as the exact order shown in Figure 4.1 is followed in this section.

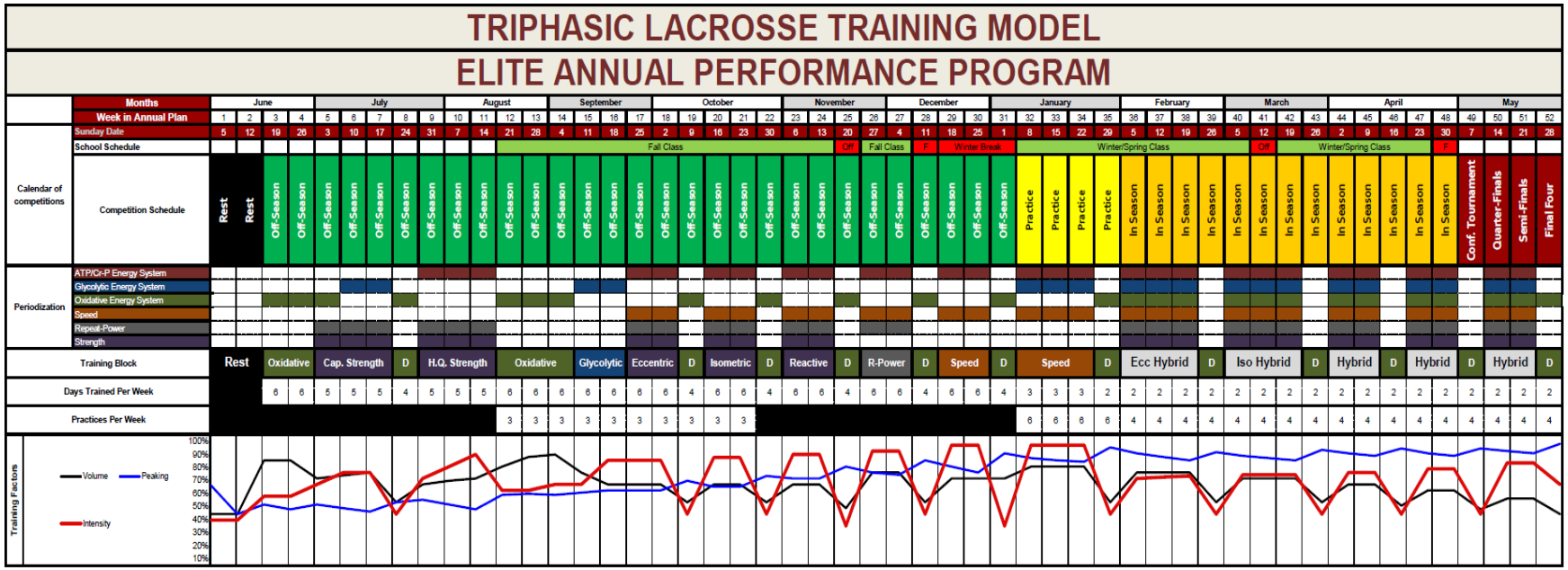

Figure 4.1 - The Annual Plan of the Triphasic Lacrosse Training Model

4.36 Conclusion of the Triphasic Lacrosse Training Model

All coaches have the goal of winning the championship of their league at the start of each and every year. The training and conditioning of a team plays a large role in this goal. Only when stress is applied to each of the six physical performance qualities appropriately, along with injury reduction training and maximized transfer of training is elite-level lacrosse performance possible. If a program does not consider each of these primary principles athletes are likely to break down at some point. Injured athletes, regardless of their skill level, are not able to assist with the ultimate goal of winning a championship.

The Triphasic Lacrosse Training Model considers each of these training principles and applies them in a systematic training program. This program begins with the consideration of the requirements of lacrosse specifically. The Triphasic Lacrosse Training Model then adapts every athlete's energy systems to the fullest extent, according to their individual needs in the sport. After an athlete has improved their ability to complete repeat-sprint efforts, they are then trained to improve their general strength levels. These increased force producing abilities are then translated to each of the three muscle action phases in order to maximize the power and efficiency of the SSC. Athletes are then trained in specific power production and speed to maximize RFD, which allows transfer of training to be realized to the highest possible extent. Finally, in-season training is programmed with each of the physical performance qualities and their residual training effects in mind, along with the neural preparation of athletes for competition.

Only when each of these factors are considered, implemented, and executed appropriately is optimal performance possible for an elite-level athlete throughout the duration of the grueling, physical lacrosse season.