

TRIPHASIC TRAINING

WRITTEN BY CAL DIETZ
AND BEN PETERSON



A SYSTEMATIC APPROACH TO
ELITE SPEED AND EXPLOSIVE
STRENGTH PERFORMANCE

TRIPHASIC TRAINING

A Systematic Approach To Elite Speed And
Explosive Strength Performance

Cal Dietz
&
Ben Peterson

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PREFACE

WHAT THIS BOOK IS NOT

Right off the bat, I want to make a huge confession. I want to tell you what this book is not. This book is not the Holy Grail of training! It isn't the only way to train athletes, nor does it promise to turn every athlete who uses these methods into an All-American. Even with the most advanced training methods, scientific knowledge, and vast array of sports supplements the twenty-first century has to offer, sport coaches, athletic directors, general managers, and parents must realize that in order to win, you must have the best athletes. That means you must recruit the best athletes in college and you must pay for the best athletes in the pros. No method in existence currently used by any strength coach can make up the gap between the genetics of a superior athlete to that of an inferior one.

So what does that mean? Are superior genetics the sole factor in determining success? Without getting into any physiology or neurology, let me explain using a real life example of two hockey players I coached several years ago. We will call them Fred and Walter. Fred and Walter grew up playing hockey together in a small town in northern Minnesota. From the very beginning, they were inseparable. To call them rink rats would have been an understatement. If they weren't at the local rink working on their slap shot or playing pick-up games, they were at the rink that Fred's dad made every year in the backyard working on stick handling and skating. Both households even had the same rule—if you were watching television, you had to work on your stick handling at the same time. (Both boys had small plastic sticks they practiced with on the floor during commercial breaks.)

Based on the amount of practice and work the two boys invested since the age of six, it shouldn't be any surprise that they were All-State selections in hockey and that both accepted scholarships to play for the University of Minnesota Golden Gophers (U of M). I remember when Fred and Walter arrived. They were virtually identical. Both stood six feet tall and weighed 175 lbs. During their four-year careers, they both went through the exact same strength and conditioning

routine every off-season. Their one rep max (1RM) for the bench and squat were within 15 pounds of each other. They ate the same meals at the training table, lived in the same house, and even dated the same girl (though not at the same time). I will add, and personally attest, that both Fred and Walter gave 100 percent to everything they did surrounding Gopher hockey. They attacked every workout and skated every shift like it was their last. For all intents and purposes, Fred and Walter were the exact same athlete, the only difference being their genetic makeup—they had different parents.

Here is where the story takes a drastic turn. During their time at the U of M, Walter continued to excel while Fred seemed to struggle at times on the ice. By their senior season, Walter was a pre-season All-American who would eventually go on to play in the NHL. Fred, meanwhile, was an average third line player. Why? How could two essentially identical athletes end up at such different levels?

The answer was genetics. Genetically speaking, Walter had a higher end sympathetic nervous system (SNS) and superior hormonal profile than Fred. The SNS is part of the electrical wiring grid of the body, relaying instructions from the motor cortex to the muscles of an athlete to perform coordinated muscle movements—hand eye coordination, force production, balance, and reactive ability to name a few. In addition, the SNS stimulates the endocrine system and hormonal response of the body under stress, controlling the release of epinephrine and norepinephrine (commonly known as adrenaline) and the mobilization of energy substrates through glucagon secretion as well as levels of other hormones associated with athletic performance such as testosterone (muscle building), T3 and T4 (metabolism), insulin-like growth factor-1 (muscle building), and insulin (anabolic recovery). In short, the SNS is the “fight or flight response,” the most powerful response of the human body. The better the wiring or the quality of the cable used in that wiring, the faster and more efficiently a signal will travel through the grid. Similarly, an athlete’s hormonal profile dictates his ability to respond to the rigors of competition—stress, performance, and recovery. An athlete who can process and respond to

stimuli more quickly as well as orchestrate the body's hormonal response efficiently will have a decisive advantage over other athletes. In Walter's case, both processes were superior.

Think of Fred and Walter as sports cars. Let's be patriotic and go with Ford Mustang GTs. Both rolled off the assembly line as stock models, but over the years, the cars were overhauled and upgraded. All the hours practicing stick handling and skating were like putting on a better air filter and upgraded exhaust. The hours spent in the weight room squatting and jumping on Russian plyometric boxes were like putting in a new engine block chip that allowed the cars to shift faster and accelerate more quickly. In the end, both cars were far superior to what they had been when they originally rolled off the assembly line over twenty years earlier. The only difference—one that I failed to mention at the start—was that when these cars first rolled off the line, Walter had a V-10 turbo engine while Fred had a V-8. From the very start, Walter had greater potential because his engine could inherently generate more horsepower. As long as both cars received the same upgrades, the V-10 turbo would always be the better, faster car.

Getting back to Fred and Walter, this doesn't mean that a person with a superior nervous system and hormonal profile will automatically be a better athlete. If Walter stayed home watching television and playing his Playstation 3 all day while Fred was off working out and practicing, I guarantee only Fred would have been offered a scholarship to play Division I hockey. Being blessed with the genetic gift of a superior nervous system, a V-10 turbo engine, doesn't guarantee a person athletic greatness. It merely gives him a better chance of reaching greatness if he puts forth the effort.

I don't know if you, as a coach, are lucky enough to have an entire weight room full of turbo V-10 engines or a bunch of V-8s. You might not have Mustangs at all but instead are sitting with a lot of Toyota Corollas. The main thing I want you to understand is that this is not a book about turning a Toyota Corolla into a Mustang GT. That is impossible. Every athlete has limited potential, a ceiling defined by his genetics. At the same time, no athlete is confined to a certain level of performance; every athlete can improve.

WHAT THIS BOOK IS

Every strength and conditioning coach is, to an extent, a mechanic. Not to beat the car metaphor to death, but you have to look at every athlete as a complex engine with thousands of moving parts. And you, the coach, are trying to squeeze every single drop of horsepower you can out of that engine. This book is a method of training that will turn you into a master mechanic, showing you how to improve the horsepower and performance of any make or model car that walks into your weight room. The tri-phasic undulating block model can be applied to any athlete at any time during his training cycle and achieve the same results—improvements in power, rate of force development, and neuromuscular coordination.

At this point, I would guess that some of you are holding up red flags to question that last statement. “How can one training model be applied to such a wide range of sports with the same results?” That is a fair and legitimate question, a question that I will answer in this book. While on the surface sports like hockey and basketball may seem very different, they are identical at their physiologic core. Bear with me a second—the “ah ha!” moment is only minutes away.

First, let’s agree on a couple things:

- ❖ All athletes use muscles. This is self-explanatory. Moving on...
- ❖ Every sport requires dynamic movement of those muscles. Remember, dynamic muscle action refers to the active movement of a muscle through a partial or complete range of motion (swinging a baseball bat, jumping for a rebound, or sprinting up a sideline).

I know that neither of those points are groundbreaking. Coaches often have a very good understanding of the dynamic movements used most frequently in the sports they train. This is where you can cite the importance of specificity of training until the cows come home. Coaches will often tailor their workouts to try and improve those specific neural pathways and muscle actions in their athletes, with the goal of creating more explosive, powerful, efficient athletes at that movement pattern. The problem doesn’t lie with this approach to training at all. In fact,

taking this approach to training is dead on accurate *one-third* of the time. The problem lies with the other two-thirds.

Remember that “ah ha!” moment I promised you? Well, here it is:

ALL DYNAMIC MUSCLE ACTION IS TRIPHASIC!

That one simple sentence is what ties every sport together and allows all athletes to be trained using the same method, yielding the same results. It is what this entire book is about. Understanding the physiologic nature of muscle action taking place during dynamic movements gives you, the coach, a foundational training method that can be applied to every sport. Couple this method with a periodization schedule that can be altered to fit with any training time frame and you have the tri-phasic undulating block method.

In a very brief and basic explanation that will be expanded upon at length in later chapters, the triphasic nature of all dynamic movement can be broken down into three phases:

- 1) **Eccentric phase:** This is the deceleration or lowering portion of the movement. It is associated with muscle lengthening. During this phase, kinetic energy is absorbed and stored in the tendons of the muscle structure to be used during the stretch reflex.
- 2) **Isometric phase:** This is where the mass, or athlete, comes to a complete stop before being reaccelerated in a new direction. (This is actually governed by Sir Isaac Newton’s Laws of Motion. More on that and physics later.)
- 3) **Concentric phase:** This is the acceleration of an athlete or mass. It is associated with muscle shortening.

As the adage goes, a chain is only as strong as its weakest link. If your training program consists solely of methods that train the concentric portion of dynamic muscle action, your athletes are heading into the season with a chain consisting of one strong link and two weak links. This book is designed to show you how to develop the other two phases of dynamic human movement

within a periodization model that will make all three links strong and optimize the performance of your athletes. Remember that:

ATHLETIC MOVEMENT = DYNAMIC MOVEMENT = TRI-PHASIC MOVEMENT

WRAP UP

I'm sure by now I have peaked your interest and forced you to rethink, in part, the training model you currently use with your athletes. When you are done reading this book, you'll not only be able to write programs that produce explosive, powerful athletes, but you'll also be able to spot flaws in the various movement patterns pertinent to their sport. These flaws tend to develop over time, especially during yearly training phases or macro-cycles. Keep in mind, these issues can develop even with the use of the best training methods. Any time an athlete develops a specific aspect of his performance (strength, speed, or power), it likely causes a deficit in a separate but related performance quality. For example, let's say you make an athlete faster with concentric only focused training. Great! The problem, however, is that you neglected to train the athlete's eccentric decelerator in tangent to be able to absorb the higher levels of force now placed on him by the athlete's improved speed. When the athlete decelerates to make a cut or jump on the field/court, he can't change direction as quickly due to a undertrained eccentric phase—the inability to absorb the increased force. This book will give coaches and/or trainers an understanding of how to address those qualities and fix and spot these issues to help your athletes reach a new level.

Now that you have a better idea of what this book *is* and *is not*, it is time to get to work. At this point, you've read the course outline. Now, it's time to get into the nitty gritty details and learn the tools that you, the master mechanic, will take back to your garage, the weight room, to start tuning up your athletes.

SECTION 3

THE TRIPHASIC NATURE OF
ATHLETIC MOVEMENT

3.1: THE IMPORTANCE OF TRIPHASIC TRAINING

The revelation that led to the creation of the triphasic undulating block system and ultimately this book occurred in the fall of 2003. I'm very fortunate to work at a university with an engineering department willing to loan out its \$20,000 force plate to a bunch of meatheads over in the athletic building. A huge thanks must go out to that entire department as well as the wealthy guy who donated the money for it. Now, I'm not any smarter than the next guy. I don't claim to be a genius, but I've been blessed with two gifts—logical reasoning and critical thinking. These gifts have allowed me to make certain connections and realizations with training that have enabled me to come up with a training model that generates incredible results for athletes of all sports.

At the time, I had two track and field athletes—throwers—who had me perplexed. One of these athletes (let's call him Ben) was a potential world-class thrower. He could throw the shot over 65 feet. The other athlete, Tommy, was an average D-1 thrower. He had trouble breaking 55 feet. Aside from the large throwing discrepancy, the loads they used in the weight room were basically the same. Nothing jumped out that you could point a finger at and say, "Ah ha, that's why Ben is so good!" or "That must be why Tommy is struggling." I couldn't figure out what the limiting factor was that caused a difference of over ten feet between their top throws. I knew it had to have something to do with their rate of force development (RFD), but I wanted to understand specifically how it applied to their throws. More importantly, I wanted to understand, physiologically, what made the difference between world class and average.

To find some answers, I decided to test their bench press using the force plate. I chose this exercise for two reasons.

- 1) Specificity: The bench press has direct carryover and transferability to the throwing motion.

- 2) At the time, both athletes had the same bench press max—415 pounds. Because they both had the same max, it eliminated one of the variables that contributes to RFD—max strength. The other variable is time (which we will talk about in short order).

Wanting to see how Ben and Tommy produced force explosively, I used the band method on the bench press so that I could see acceleration throughout the entire range of motion on the lifts. Without the extra band tension at the top of the movement, both athletes would have had to decelerate the bar halfway through the concentric phase or the bar would fly out of their hands. This early deceleration would skew the results. The band tension ensured that both of them, Ben and Tommy, would drive the bar as hard as they could, generating a high rate of force through the entire range of motion. For those of you not familiar with the banded bench method, the hyperlink gives you a visual of the exercise — [Bench press band method](#)

The bar was loaded with 205 pounds (50 percent of their 1RM) and 90 pounds of band tension (20 percent of their 1RM). At the top of the press, each athlete would be moving 70 percent of their 1RM. Both athletes were instructed to bring the bar down hard and fast, stopping it at their chest, and reaccelerating the bar upward as fast as they could. It should be noted that neither athlete bounced the bar off his chest. (I will talk about the importance of this detail in a moment.)

The graph below shows the results recorded by the force plate. The x-axis (horizontal axis) depicts time in hundredths of a second. The y-axis (vertical axis) represents power in watts. In essence, the graph is showing how much force each athlete absorbed and displaced in a given amount of time. Ben's repetition is shown by the dark blue line while Tommy's is shown by the red line. The actual repetitions are taking place during the "V" shaped segment of the lines in the middle of the graph. The descending line of the "V" is the eccentric or yielding phase of the bench press. The bottom, or point, of the "V" is the isometric or static phase, and the line ascending from the bottom of the "V" is the concentric or overcoming phase.

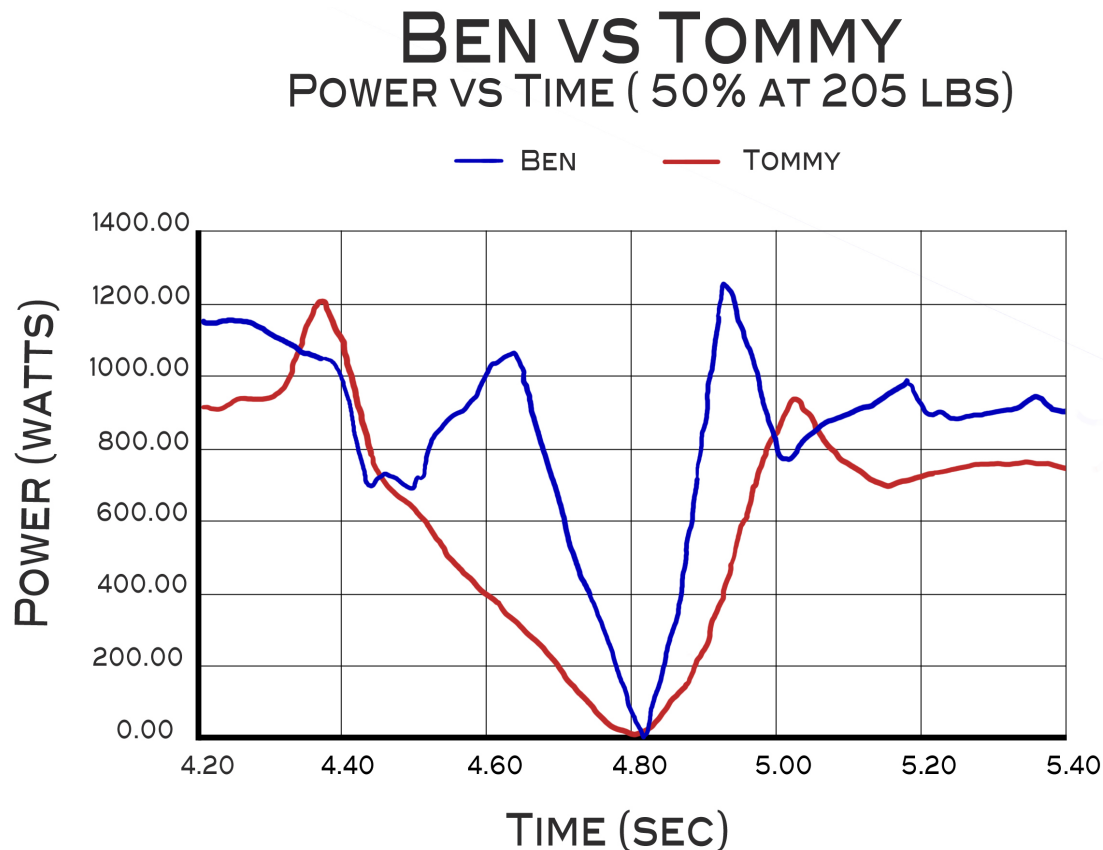


Figure 3.1: Graph comparing the ability of Ben and Tommy to absorb and displace force during a maximal dynamic contraction. Notice the athlete that can absorb eccentric force more quickly has a higher power output in the resulting concentric phase.

As soon as I saw the graphical printout for the first time, I realized what separated Ben and Tommy. While both athletes could produce the same amount of maximal force in the bench press (each with a 415-pounds 1RM), Ben could absorb more force eccentrically at a higher velocity. This is where it was essential to make sure that neither athlete bounced the bar off his chest. If they had, they would have eliminated their stretch reflex and lost power in reaccelerating the bar. Instead, the absorbed energy went directly from the bar into their arms, shoulders, and chest, maximizing both the stretch reflex and the stretch shortening cycle (SSC) before being recoiled back into the bar and reaccelerated upward (I'll speak more about the stretch reflex and SSC later.) The graph (figure 1) shows that Ben was able to load up his muscles with more energy to use concentrically, enabling him to accelerate the bar faster than Tommy did, producing more power. Applying this same idea to throwing, Ben could store more energy in his muscles during the stretch of his windup, thus applying more force to the shot before it left his hand than Tommy

could. When Ben's shot left his hand, it was powered by a jet engine. When Tommy's shot left his hand, it was powered by a propeller.

You have just learned the key to improving sport performance in every athlete. It isn't about who is the strongest, although many coaches incorrectly believe this to be the case. The key to improved sport performance is

producing more force in less time. This results when an athlete can absorb more force eccentrically, allowing him, in turn, to apply higher levels of force concentrically in less time. In other words, the athlete who has the

narrowest "V" wins every time. Looking back

ELITE ATHLETE VS ADVANCED ATHLETE

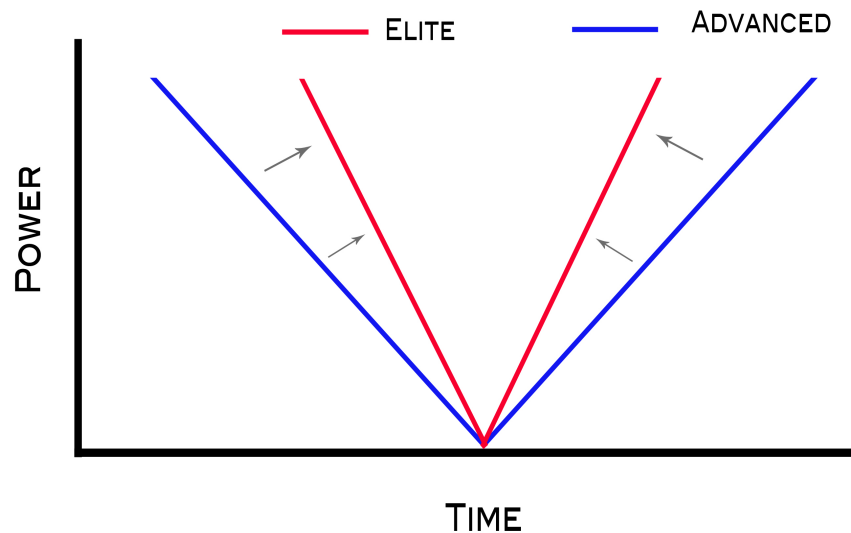


Figure 3.2: Graph showing the tri-phasic "V" of an elite athlete (red) versus an advanced athlete (blue). This holds true for any maximal effort, dynamic contraction.

at Ben and Tommy's graph, it becomes very clear—sport performance is about which athlete can absorb more force, enabling the athlete to produce more power. It's all about the "V" baby!!

Have you ever noticed that Adrian Peterson breaks a lot of arm tackles? The reason isn't because his legs are huge or because he keeps pumping his knees. Granted, those are contributing factors, but there are many average runners whose legs are just as huge and who pump just as hard. The reason Peterson is able to break so many tackles is because he gets defenders out of position to make a solid tackle in the first place. How does he do that? He has superior triphasic muscle action. When Adrian Peterson goes to make a cut, so does the defender. However, Peterson can decelerate his body more quickly by absorbing more kinetic energy eccentrically in a shorter

amount of time, come to an isometric stop, and then explode concentrically in a new direction. The defender meanwhile takes a few hundredths of a second longer to completely decelerate his body. He can't absorb eccentric force at the same rate as Peterson, so he takes longer to decelerate. He has to spread the force out over a longer period of time to reduce the net effect on this muscles. This results in a longer deceleration period as well as less force absorbed into the stretch shortening cycle to be used during the concentric contraction. When the defender does finally make his cut and tries to make the tackle, Peterson is already out of his break and reaccelerating. It's too late. The extra couple hundredths of a second it takes the defender to decelerate has cost him. His only option is to dive at Peterson's legs and try to make an arm tackle.

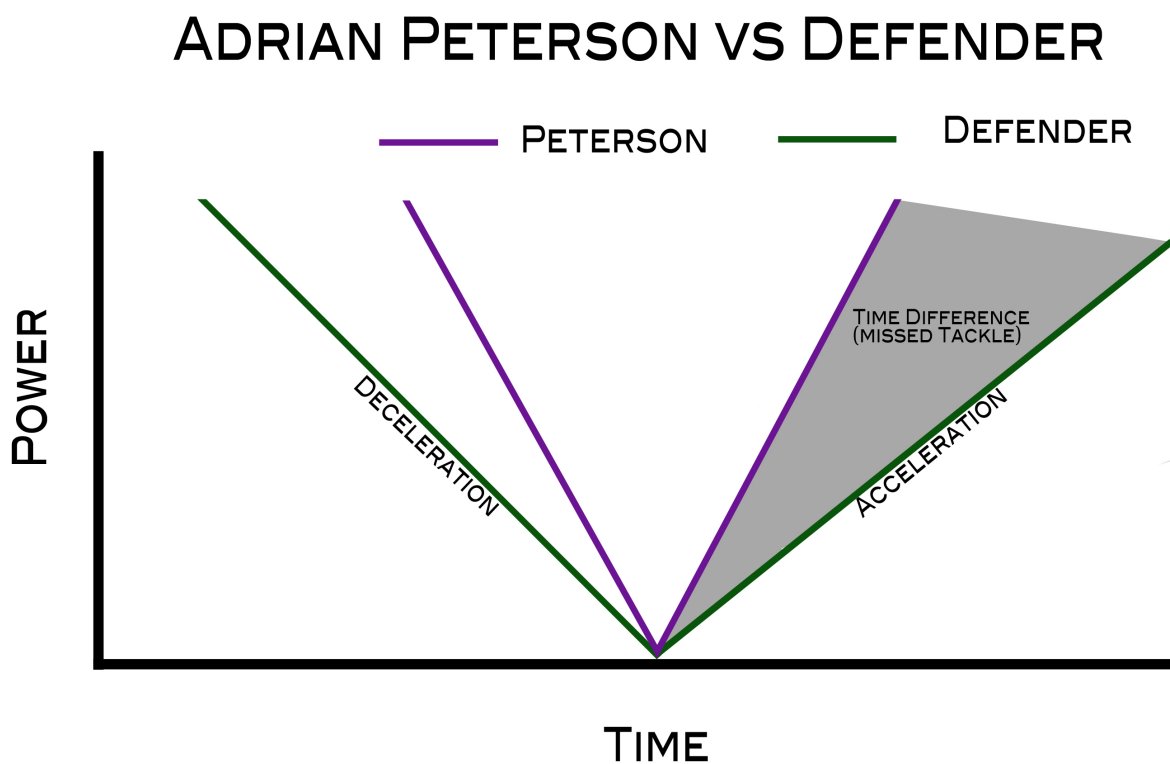


Figure 3.3: Graph depicting the difference in rate of force production and power output of Adrian Peterson and a defender. The shaded area shows the increased time it takes the defender to accelerate compared to Peterson.

Many traditional training methods teach athletes how to expel energy; little time and effort is spent teaching them to absorb it. That is the entire point of the triphasic method—learning how to eccentrically and isometrically absorb energy before applying it in explosive dynamic

movements. It is important to note that triphasic training and the “V” are improving and referring to maximal dynamic movements only. During a maximal effort dynamic contraction, you will never see the eccentric portion of the “V” at a shallower angle than the concentric portion. The body can't generate more force than it can absorb maximally. If an athlete deliberately slows the rate of the eccentric contraction such as during a slow tempo squat, it's possible for the eccentric rate of force absorption to be less than the resulting force output. However, in anaerobic sports, an athlete never deliberately gives less than 100 percent effort in competitive movements.

As a strength and conditioning coach, you must remember that athletes aren't powerlifters. They must be strong but only to the extent that can benefit them in their sport. Every dynamic human movement has a time frame, a limited amount of time in which an athlete has to produce as much force as possible. Ben was a world class thrower because he could generate more explosive strength (defined as maximal force in minimal time) in the time frame it took to throw a shot. Here are some examples of dynamic movements and their allotted time for force development:

TABLE 3.1: TIME TO MAXIMAL FORCE DEVELOPMENT	
DYNAMIC ACTIONS	TIME (SECONDS)
SPRINTING	0.08–0.12
JUMPING	0.17–0.18
SHOT PUT	0.15–0.18
POWERLIFTING	0.8–4.0

Looking at table 3.1, it's clear that an athlete doesn't have much time to produce force. Numerous studies have been done showing that the average person takes 0.3 to 0.4 seconds to generate maximal muscular force and sometimes longer—up to 0.7 seconds.¹ Usually these studies are performed by hooking subjects up to an electrocardiogram (EKG) and having them perform a

¹ Khamoui A, Brown L, Nguyen D, Uribe B (2011) Relationship between force-time and velocity-time characteristics of dynamic and isometric muscle actions. *Journal of Strength & Conditioning Research* 25(1):198–204.

maximal isometric contraction. Then researchers look to see how long it takes the muscle to reach its peak force level. With almost all athletic, dynamic movements taking less than 0.2 seconds to complete, athletes will never develop their full force potential during competition. The only sport that does this is powerlifting, where athletes have upwards of three or four seconds to develop all the power they can muster. As a result, it is imperative that you train your athletes for force development, not just maximal strength!

Figure 3.4 shows how large the gap actually is between maximal strength and dynamic strength.² The line represents the force development curve of an athlete with the actual rate of development represented by the slope of the line. The dashed line to the right depicts the time it takes the athlete to develop 100 percent of his maximal muscular force (F_m). The dashed line to the left shows how much force the athlete could produce given a time constraint. In this case, the athlete produced 50 percent of his F_m in 0.14 seconds.

FORCE PRODUCTION CURVE

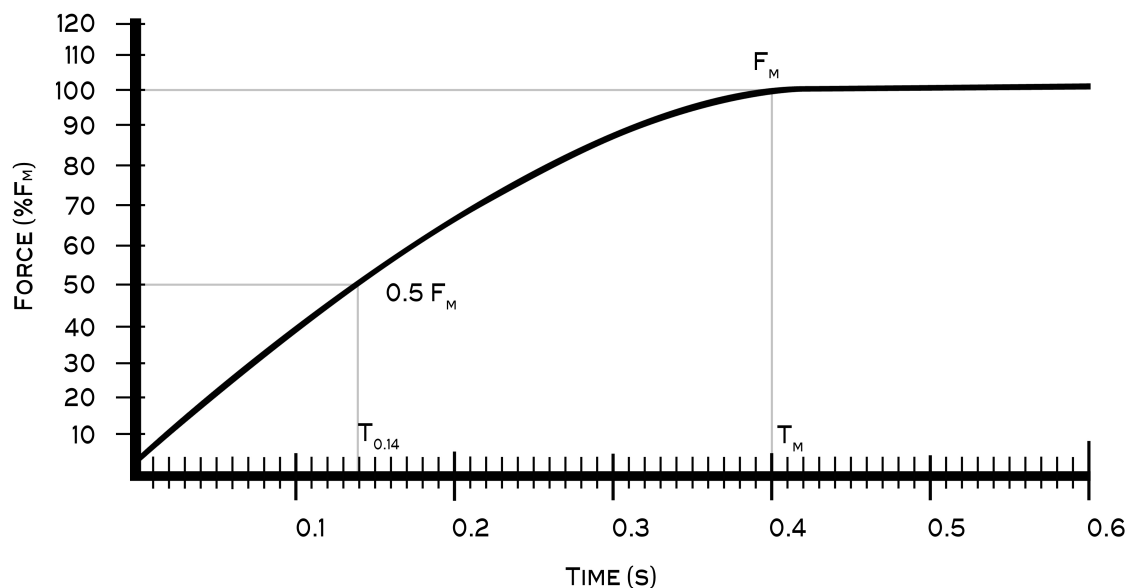


Figure 3.4: Graph depicting the difference between maximal muscular force (F_m) and dynamic force production. It takes roughly 0.4 seconds to develop F_m , yet most sports only allow 0.14 seconds or less to develop dynamic force.

² Zatsiorsky VM, Kraemer WJ (2006) *Science and Practice of Strength Training*. Champaign, IL: Human Kinetics.

The goal of all athletes should be to increase the slope of the line, in essence shifting the force line to the left and enabling them to produce a higher percentage of their maximal muscular force (F_m) in the period of time allotted for their sport. In other words, the goal is to shrink the time difference between their maximal strength and dynamic strength. For further reading on the subject, I highly recommend the book *Science and Practice of Strength Training* by Vladimir Zatsiorsky and his explanation of the explosive strength deficit.

Let's go back and look at what Ben and Tommy's graphs would look like. First, let's look at Tommy's. Looking back at our "time to maximal force development table" we see that a thrower has about 0.15 to 0.18 seconds to develop force before the shot leaves his hand. We'll give Tommy the benefit of the doubt and give him the full 0.18 seconds. In the graph below, you will see the red line extending upward from the x-axis at 0.18 and running into the force development curve at a point that correlates on the y-axis to 61 percent. This means that within the time constraint of throwing a shot, 0.18 seconds, Tommy only has enough time to develop 61 percent of his maximal force behind the shot to propel it.

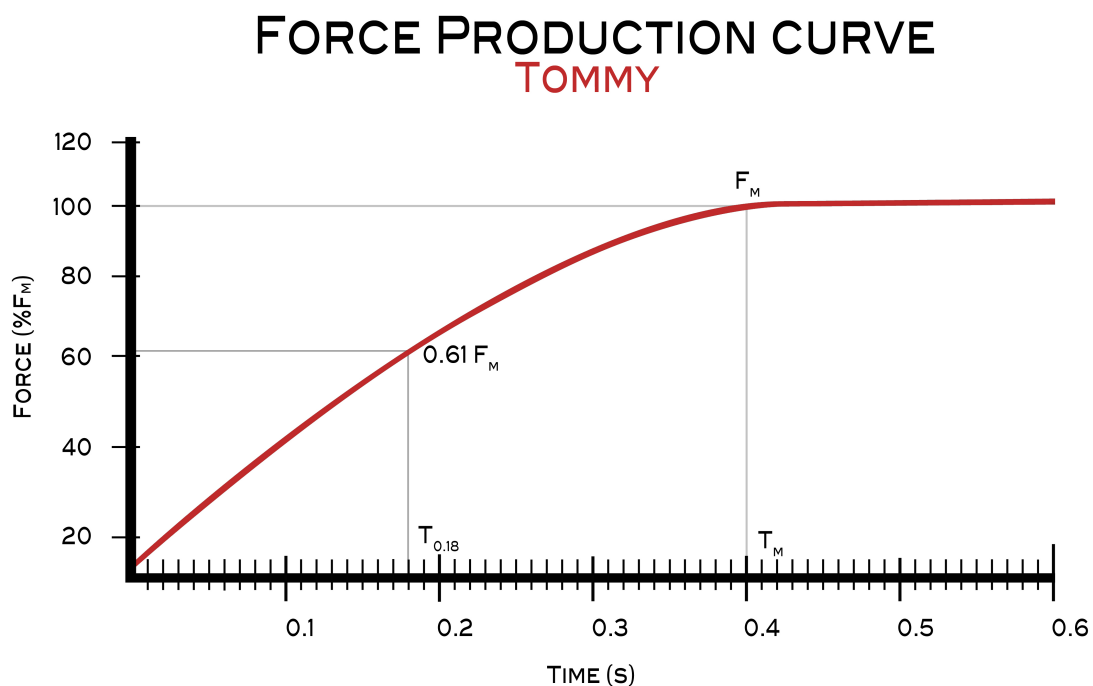


Figure 3.5: Graph depicting the theoretical force production curve for Tommy. Notice that in 0.18 seconds, Tommy only produces 61 percent of his F_m .

Now let's take a look at what Ben's graph would look like. Below you see the same basic graph but now with a blue line extending up from 0.18 seconds on the x-axis. However, the difference is that Ben's force production line is shifted to the left; its slope has increased. The blue line intersects the force development curve at a point associated on the y-axis with 78 percent. This means that Ben, again with the same time constraints as Tommy, could develop 78 percent of his total force behind the shot before it left his hand—a difference of nearly 20 percent!

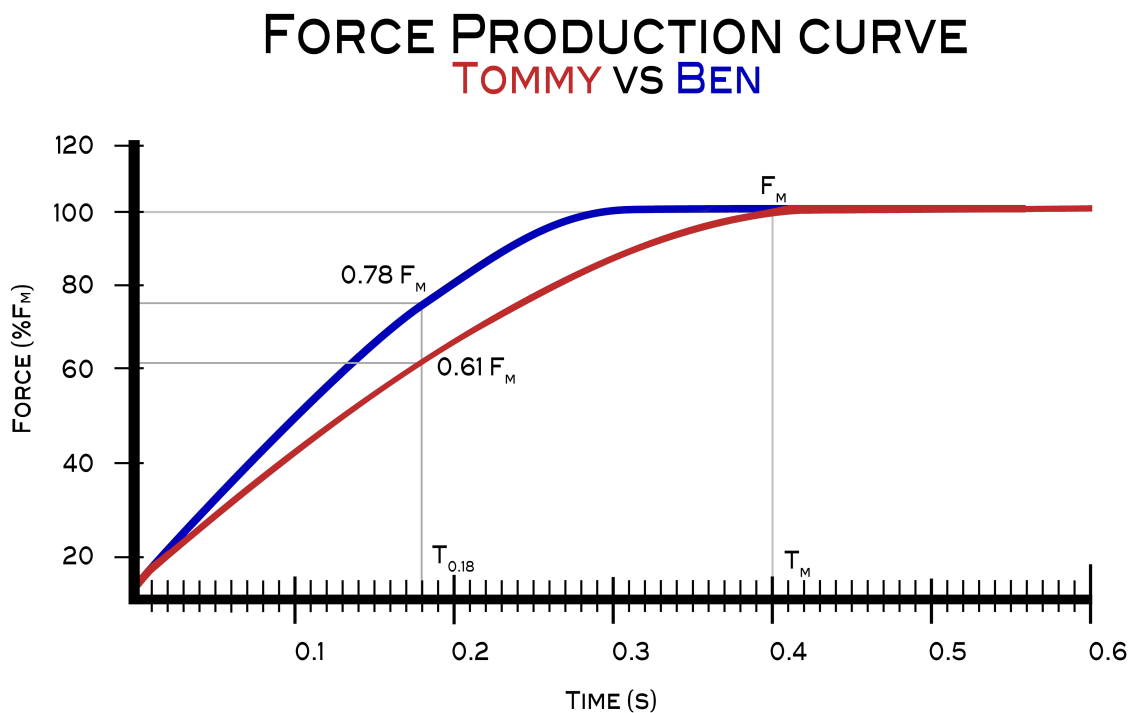


Figure 3.6: Graph comparing the force production curves of Ben and Tommy. Ben's curve (blue line) is shifted up and to the left of Tommy's (red line). This shift shows that in the same amount of time (0.18 seconds), Ben can produce 17 percent more of his F_M than Tommy.

The concept of needing to increase an athlete's RFD is nothing new. I wish I could take credit for it, believe me. But the concept is one that the Russians have known about for decades, researching RFD and training methods since the early 1960s. They came up with a great training method to try and enhance it. *Accommodated resistance*, which is the use of chains, bands, or weight releasers to modify a load to match an athlete's RFD curve, was created to try to maximize an athlete's explosive contraction. The use of these implements allowed the athlete to push all the way through his entire range of motion without having to decelerate the bar at the

end, allowing for pure explosive concentric contractions. This concept was identified by Fred Hatfield and termed compensatory acceleration.

The shortcoming of these methods is that they focused solely on the development of explosive strength by emphasizing the concentric phase of dynamic movement. My epiphany—my 'light bulb going off' moment in 2003—was when I first looked at that printout and realized that we (and by “we” I mean strength and conditioning coaches) were approaching the development of force from the wrong angle. The key to improved force production, and thus sport performance, doesn't lie in the concentric phase. In order to develop explosive strength and do so in a manner that is transferable to sport, you must train the eccentric and isometric phases of dynamic movements at a level equal to that of the concentric phase.

I have used the force plate with hundreds of athletes and on dozens of different dynamic movements—everything from plyometric jumps to squats to presses. In every instance, the results come back the same. The better athletes, defined as being those with higher rates of force production, are the ones who can absorb more kinetic energy eccentrically. The steeper the left side of the “V” going in, the steeper the right side of the “V” going out (assuming a maximal dynamic movement).

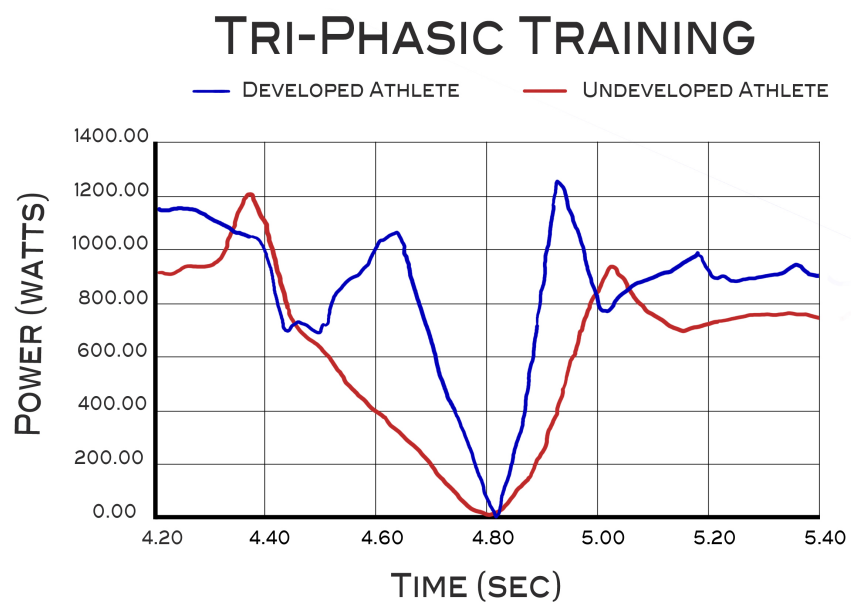


Figure 3.7: Tri-phasic “V” depicting elite (blue) and advanced (red) athlete.

Look at the original printout again in Figure 3.7 (and get used to it because you're going to see it about a dozen more times in this book). This is the key, folks. It's the Holy Grail of improved sport performance. Don't think of this graph as depicting two separate athletes anymore. Imagine

the graph as depicting the same athlete at different times during his development. The red line is the athlete when he first walks through your doors. The blue line is where the athlete will be by the time he walks out two, three, or four years later. The lines are the same athlete, but one shows the results of an athlete developed using the triphasic undulating system of training while the other is in the early stages of development. Your new goal as a strength and conditioning coach is to narrow that “V” as much as possible.

4.7: WEDNESDAY, HIGH INTENSITY (MAXIMAL EFFORT)

LOADING

Wednesday is every strength coach's favorite day or at least my favorite day—the “go big or go home,” let's get after it, slap the weight on the bar, high intensity day! Below, again, is a section of the loading table pertaining specifically to the high intensity day within the above 80 percent mesocycle. Just as before, sections that are shaded mean that these are loads that wouldn't be used at this point of the training week.

TABLE 4.11: WEDNESDAY LOADING (HIGH INTENSITY)				
7 1RM	MAXIMUM REPS POSSIBLE	HIGH QUALITY REPS (STRENGTH)	SETS (OFF-SEASON)	SETS (IN-SEASON)
97.5%	1-2	1	1-2	1-2
95 %	2	1	2-3	1-2
92.5%	2-3	1	3-4	1-2
90%	3-4	1	3-4	2-3
87.5%	4			
85%	4-5			
82.5%	5			
80%	5-6			
77.5%	6-7			
75%	7-8			

For the high intensity day, there aren't any triphasic means applied. Every high intensity day is simply that—high loads of 90–97 percent of the athlete's 1RM lifted with a reactive tempo to stimulate neuromuscular recruitment and neural rate coding and improve the organizational sequencing of the athlete. To ensure that the quality of work remains high, efficiently stimulating the nervous system and promoting positive adaptation through explosive force development,

only one rep is performed per work set. As we discussed earlier in this section, it is much more advantageous to the athlete to perform seven sets of single repetitions than to perform three sets of three repetitions. In higher reps sets with such high loads, the neuromuscular system will fatigue after the first set to such a degree that the ability to perform high quality work thereafter is impossible.

TABLE 4.12: WEDNESDAY TRIPHASIC LOADING PARAMETERS					
BLOCK	INTENSITY	LOAD	TEMPO	REPS	SETS
BLOCK 1 (ECCENTRIC)	HIGH INTENSITY	90-97%	REACTIVE 0:0:0:0	1	1-4
BLOCK 2 (ISOMETRIC)		90-97%	REACTIVE 0:0:0:0	1	1-4
BLOCK 3 (CONCENTRIC)		90-97%	REACTIVE 0:0:0:0	1	1-4

The tempos and rep ranges outlined in table 4.12 are to be used primarily with the specialized method of applying training means discussed earlier in this section. All assistance work should be performed within the loading parameters for that day within the undulated block, in this case 90–97 percent. An exception to this rule on this (the high intensity day of the week) is to add assistance work in the form of plyometrics. Although they aren't high load means, they exert an enormous amount of force and stress on the athlete. For examples of assistance work that should be used to optimize performance gains and for suggested rep ranges of these exercises within each block, refer to the programs throughout this section.

SEQUENCING

There isn't any sequencing required for the high intensity day of the mesocycle. Walking into the weight room on this day, the goal is simple—move a heavy load as fast as possible. The athlete must be reactive. Remember, the heavy loads alone provide sufficient stimulus to the athlete to promote positive adaptation without the addition of other methods or means.

WORKOUT

Below, you will find Wednesday's workout for each block of the three-day above 80 percent model—the eccentric block, isometric block, and concentric block. Just as before, the column on the left is the actual workout using our “imaginary” athlete to calculate the loads used on each exercise. The column on the right, labeled “Coaching Points,” gives further explanation about exercise sequencing and important coaching queues to use with your athletes. At the end of this section, you will find workouts for each block of a four-day, five-day, six-day, and two-day in-season model.

BLOCK ONE, WEDNESDAY

100%	Wednesday	4-Nov-10			
		REPS	LOAD	SETS	NOTES
500	Back Squat	5,3	250 - 335	1,1	
	2-Min Rest/B-Breath				
500	Back Squat	3	400	1	
	2-Min Rest/B-Breath				
500	Back Squat	3	440 - 465	4	
	Stndng SQ Drop Jump	4		3	
	25 rest- BB				
	Delt BO Lat Reb Drop	4		3	
	25 rest- BB				
	Thors Hammer	12		3	
300	BENCH PRESS	5,3	150 - 200	1,1	
	2-Min Rest/B-Breath				
300	Bench Press	3	235 - 240	1	
	2-Min Rest/B-Breath				
300	BENCH PRESS	3	270 - 280	3	miss 2 board
	Med Ball Chest Pass	5		3	
	25 rest- BB				
	1 Arm DB Row	6		3	
	25 rest- BB				
	Pike SWB Abs	5		3	
200	DB Walking Lunge	4		3	Band
	Pair w/				Squeeze
	Laying External Rot	6		3	
	Pair w/				
	1 S.A.S. R.G Lat P	10		3	
	GH HYPR	8		3	
	Pair w/				
	Iso Ball Groin Squeeze	10S		3	
	Pair w/				
	Bam Bam	8		3	
	Inc Delt Lat Reb Drop	6		2	
	25 rest- BB				
	Hip FLXor ISO Pull	6		2	
	25 rest- BB				
75	DB Shoulder Press	10	50 - 55	2	oc-D+1
150	Rev Grip Tri Push	8	115 - 120	2	
	25 rest- BB				
	Bicep shock curls	6		2	
	25 rest- BB				
	Blackburn	6		2	

COACHING POINTS AND EXERCISE TUTORIAL

Box 1-2

-Notice that the back squat is a wider stance back squat used to involve the posterior chain during a max effort squat.

-As in the sports back squat, the key coaching point for this movement is press your feet through the ground.

-Even though we have a wider stance, I don't direct the athletes to drive through the hips.

-These work sets are paired with the three exercises below it. This allows for the athlete to rest and recover between high intensity work sets so that the athlete doesn't stand around for four or five minutes.

[Back Squat](#); [Squat Drop Jump](#); [Delt Bent Over Lateral Reactive Drop](#); [Thors Hammer](#)

Box 3-4

-The work sets in the bench press in this particular day are heavy (90-92 percent%).

-If the athlete misses or it is believed that he will miss the next rep of a set, we slide a two-board on to his chest, limiting his range of motion so he can get the rep and finish the set on his own.

-The medicine ball chest pass is always done with one arm. I've found little value in the chest pass because of the lack of stretch reflex and the amount of force generated.

[Bench Press](#); [Med Ball Pass](#); [One Arm Dumbbell Row](#); [Pike Swiss Ball Abs](#)

Box 5

-The dumbbell walking lunge is done with a band tied to the athlete's back. The band is pulling backward while the athlete is walking forward to apply force in the same direction as he does when he runs.

-In this particular phase, the athletes are pausing their lunge at the bottom for a couple seconds and trying to squeeze their legs together as like in the running action.

[Dumbbell Walking Lunge](#); [External Rotation Prone](#); [Single Arm Supine Rev Grip Lat Pull](#)

Box 6

[Glute Ham Hyper](#); [Isometric Ball Groin Squeeze](#); [Bam Bams](#)

Box 7

[Incline Delt Drop](#); [Hip Flexor Isometric Pull](#); [DB Shoulder Press](#)

Box 8

[Reverse Grip Tricep Push Down Adaptability](#); [Bicep Curl Shock](#); [Blackburn](#)

BLOCK TWO, WEDNESDAY

100%	Wednesday	18-Nov-10			
		REPS	LOAD	SETS	NOTES
500	Back Squat	5,3	250 - 335	1,1	
	2-Min Rest/B-Breath				
500	Back Squat	3	400	1	
	2-Min Rest/B-Breath				
500	Back Squat	3	440 - 465	4	
	Stndng SQ Drop Jump	4	BNVA - BNVA	3	
	25 rest- BB		BNVA - BNVA		
	Delt BO Lat Reb Drop	4	BNVA - BNVA	3	
	25 rest- BB		BNVA - BNVA		
	Thors Hammer	12		3	
300	BENCH PRESS	5,3	150 - 200	1,1	
	2-Min Rest/B-Breath				
300	Bench Press	3	235 - 240	1	
	2-Min Rest/B-Breath				
300	BENCH PRESS	3	270 - 280	3	miss 2 board
	Med Ball Chest Pass	5		3	
	25 rest- BB				
	1 Arm DB Row	6		3	
	25 rest- BB				
	Pike SWB Abs	5		3	
	Walking Band Lunge Jump	6	BNVA - BNVA	3	Drop
	Pair w/		BNVA - BNVA		
	Laying External Rot	6	BNVA - BNVA	3	
	Pair w/		BNVA - BNVA		
	1 S.A.S. R.G Lat P	10		3	
	GH HYPR	8		3	
	Pair w/				
	Iso Ball Grion Squeeze	10S		3	
	Pair w/				
	Bam Bam	8		3	
	Inc Delt Lat Reb Drop	6	BNVA - BNVA	2	
	25 rest- BB		BNVA - BNVA		
	Hip FLXor ISO Pull	6	BNVA - BNVA	2	
	25 rest- BB		BNVA - BNVA		
75	DB Shoulder Press	10	50 - 55	2	oc-D+1
150	Rev Grip Tri Push	8	115 - 120	2	
	25 rest- BB				
	Bicep shock curls	6		2	
	25 rest- BB				
	Blackburn	6		2	

COACHING POINTS AND EXERCISE TUTORIAL

Box 1-2

-Some key points to remember and remind the athletes when performing the back squat: be sure to keep the back flat, chest up, and torso tight. The loads used on this day are heavier so be sure to be aware of technical breakdowns

-For the standing squat drop jump, pull the body into position using the anterior hip musculature; immediately upon impact with the ground, jump as high as possible

-For the Thors hammer, keep the elbow tucked into the side

[Back Squat](#); [Squat Drop Jump](#); [Delt Bent Over Lateral Reactive Drop](#); [Thors Hammer](#)

Box 3-4

-Some key points to remember and remind the athletes when performing the bench press: set up as tight as possible on the bench, with an arched back and retracted scapula. The loads used here are heavier so be aware of technical breakdown

[Bench Press](#) ; [Med Ball Pass](#); [One Arm Dumbell Row](#); [Pike Swiss Ball Abs](#)

Box 5

-The biggest change is in the walking band lunge jump. The athlete will actually jump into the lunge drop and then explode forward with the band still attached to him.

--The walking drop lunge jump with a band is a highly reactive exercise; be sure not to put too much tension on the band as it will decrease the athlete's ability to generate force rapidly.

[Walking Drop Lunge Jump](#); [External Rotation Prone](#); [Single Arm Supine Rev Grip Lat Pull](#)

Box 6

-The iso ball groin squeeze is performed with a Swiss ball between the knees in an athletic stance; squeeze the knees together as hard as possible into the ball

[Glute Ham Hyper](#); [Isometric Ball Groin Squeeze](#); [Bam Bams](#)

Box 7

[Incline Delt Drop](#); [Hip Flexor Isometric Pull](#); [DB Shoulder Press](#)

Box 8

-During the bicep shock curl, the athlete must be sure to turn the palms down and away from the bar after they release; when bringing the hands back up, supinate(palm up) the hands and catch the bar rapidly

-The bicep shock curls develop explosiveness of the arms
[Reverse Grip Tricep Push Down Adaptability](#) ; [Bicep Curl Shock](#); [Blackburn](#)

BLOCK THREE, WEDNESDAY

100%	Wednesday	2-Dec-10			
		REPS	LOAD	SETS	NOTES
500	Back Squat	5, 3	250 - 335	1, 1	
	2-Min Rest/B-Breath				
500	Back Squat	3	400	1	
	2-Min Rest/B-Breath				
500	Back Squat	3	440 - 465	4	
	Standing SQ Drop Jump	4		3	
	25 rest- BB				
	Delt BO Lat Reb Drop	4		3	
	25 rest- BB				
	Thors Hammer	12		3	
300	BENCH PRESS	5, 3	150 - 200	1, 1	
	2-Min Rest/B-Breath				
300	Bench Press	3	235 - 240	1	
	2-Min Rest/B-Breath				
300	BENCH PRESS	3	270 - 280	3	miss 2 board
	Med Ball Chest Pass	5		3	
	25 rest- BB				
	1 Arm DB Row	6		3	
	25 rest- BB				
	Pike SWB Abs	5		3	
	Walking Band Lunge Jump	6		3	Drop
	Pair w/				
	Laying External Rot	6		3	
	Pair w/				
	1 S.A.S. R.G Lat P	10		3	
	GH HYPR	8		3	
	Pair w/				
	Iso Ball Groin Squeeze	10S		3	
	Pair w/				
	Bam Bam	8		3	
	Inc Delt Lat Reb Drop	6		2	
	25 rest- BB				
	Hip FLXor ISO Pull	6		2	
	25 rest- BB				
75	DB Shoulder Press	10	50 - 55	2	oc-D+1
150	Rev Grip Tri Push	8	115 - 120	2	
	25 rest- BB				
	Bicep shock curls	6		2	
	25 rest- BB				
	Blackburn	6		2	

COACHING POINTS AND EXERCISE TUTORIAL

*The same methods are used in coaching this maximal effort day.

Box 1-2

-Some key points to remember and remind the athletes when performing the back squat: be sure to keep the back flat, chest up, and torso tight. The loads used on this day are heavier so be sure to be aware of technical breakdowns
 -For the standing squat drop jump, pull the body into position using the anterior hip musculature; immediately upon impact with the ground, jump as high as possible
 -For the Thors hammer, keep the elbow tucked into the side.

[Back Squat](#); [Squat Drop Jump](#); [Delt Bent Over Lateral Reactive Drop](#); [Thors Hammer](#)

Box 3-4

-Some key points to remember and remind the athletes when performing the bench press: set up as tight as possible on the bench, with an arched back and retracted scapula. The loads used here are heavier so be aware of technical breakdown.

[Bench Press](#) ; [Med Ball Pass](#); [One Arm Dumbell Row](#); [Pike Swiss Ball Abs](#)

Box 5

-The biggest change is in the walking band lunge jump. The athlete will actually jump into the lunge drop and then explode forward with the band still attached to him.

-The walking drop lunge jump with a band is a highly reactive exercise; be sure not to put too much tension on the band as it will decrease the athlete's ability to generate force rapidly.

[Walking Drop Lunge Jump](#); [External Rotation Prone](#); [Single Arm Supine Rev Grip Lat Pull](#)

Box 6

-In the glute ham hyper, more advanced athletes can focus on dropping as fast as they can to full extension and then rip themselves up. For less advanced athletes, continue to perform the standard glute ham method.

[Glute Ham Hyper](#); [Isometric Ball Groin Squeeze](#); [Bam Bams](#)

Box 7

[Incline Delt Drop](#); [Hip Flexor Isometric Pull](#); [DB Shoulder Press](#)

Box 8

[Reverse Grip Tricep Push Down Adaptability](#) ; [Bicep Curl Shock](#); [Blackburn](#)

SECTION 6

HIGH VELOCITY PEAKING
(BELOW 55 PERCENT)

6.1: TRANSFER OF TRAINING AND DYNAMIC CORRESPONDENCE

The previous blocks are devised to give an athlete a solid foundation of potential athletic ability, strengthening their muscles and tendons to absorb large amounts of force and teaching their nervous system to fire efficiently, violently, to ensure that the energy is unleashed in a controlled, advantageous manner. But understand that I said it only gives an athlete *potential* ability, not direct athletic ability. For athletic potential to transfer to the field, an athlete must learn to harness his new found power and learn to use it quickly, explosively, with a high rate of acceleration and velocity.

Forces that athletes encounter on the field are ten times what they normally experience in the weight room. This isn't due to excessive loads but rather the high accelerations and decelerations that take place to jump, sprint, cut, and throw. This last block—below 55 percent or high velocity peaking—is designed to maximize the transferability of the athletic abilities (speed, strength, and power) that the athlete has gained through his hard work over the past two mesocycles.

The transfer to training gains isn't by any means an easy thing. It has been the quest of many coaches, athletes, and scientists alike to try and find methods that allow the acquisition of a skill in one exercise to transfer positively to another. For example, performing exercise A results in improvements in exercise B. Furthermore, this isn't a situation where you can just throw a lot of stuff at a wall and see what sticks, trying dozens of exercises and variations to improve performance. The transfer can just as likely be negative as it can be positive. In this instance, performing exercise A would result in decreased performance in exercise B.

According to Dr. Anatoly Bondarchuk, there are actually three types of training transfer—positive, negative, and neutral.³ In his extensive writings on the subject, which you can read in

³ Bondarchuk A (2007) *Transfer of Training in Sports*. Ultimate Athlete Concepts.

his book *Transfer of Training in Sports*, Dr. Bondarchuk concludes that to maximize the transfer of training gains to performance enhancement, the athlete must do two things:

- 1) Choose specialized developmental exercises that are closely related to the movement patterns and neural firing rates the athlete will find in competition.
- 2) Perform these exercises at velocities that are slightly slower (light loads) or slightly faster (assisted loads) than those found in competition.⁴

If a progression of these types of exercises isn't used leading up to competition, Dr. Bondarchuk noted that there was little to no transfer observed.⁵ It was also noted that excluding specialized developmental exercises during the last mesocycle block led to a loss in the previously achieved physical abilities of the athletes during competition. Not only is it essential to properly peak your athletes to maximize performance, but if the wrong methods are used (or worse, nothing is used at all), their performance will decrease.

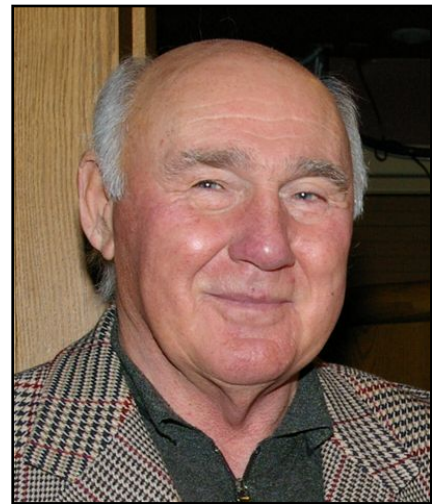


Image 6.1 - Dr. Bondarchuk

Below is a table from Dr. Bondarchuk's book that helps explain his findings. Figure 6.1 displays the transferability of multiple exercises to throwing the shot. He performed extensive statistical analysis, calculating the correlation coefficients of dozens of exercises from hundreds of elite Russian national team athletes to their respective sports. Very simply, he tried to figure out what exercises made his athletes better and which exercises transferred the best from weight room to field. The column on the far left lists the exercises performed by the athletes. The top row is an athlete classification system. Instead of classifying them by group (world class, elite, or amateur), the athletes were grouped by their performance level, taking their best throw or time to put them in a group. For example, a lower end thrower who had a personal record (PR) throw of 14.25 meters would be placed in the first column to the right of the exercise column. A world

⁴ Bondarchuk A (2007) *Transfer of Training in Sports*. Ultimate Athlete Concepts.

⁵ Image 6.1: Used with permission from Dr. Anatoly Bondarchuk.

class thrower with a PR throw of 20.1 meters would be placed in the far right column. The other numbers in the table are a statistic known as the correlation coefficient (r). In statistics, r is a measure of the relationship between two variables, X and Y. In this case, it is the relationship between a given parameter (exercise) and the resulting performance measure (throwing distance). All values for r are always between -1.0 and +1.0. Numbers closer to +1.0 have a high correlation and thus high transferability to performance. Numbers close to zero don't have any correlation and would be considered to have no transfer; they are neutral. Negative numbers have a negative correlation and a detrimental (decrease) effect on performance.

Exercise	Sports Result, Coefficient of Correlation						
	14-15m	15-16m	16-17m	17-18m	18-19m	19-20m	20-21m
Throwing a 5kg shot	0.768	0.702	0.724	0.564	0.512	0.456	0.365
Throwing a 6kg shot	0.872	0.765	0.689	0.654	0.607	0.582	0.498
Throwing a 8kg shot	0.654	0.669	0.754	0.788	0.845	0.824	0.754
Throwing a 9kg shot	---	---	0.706	0.806	0.765	0.824	0.724
Throwing a 10kg shot	---	---	0.552	0.605	0.786	0.765	0.714
Throwing a 6kg shot from place	0.882	0.786	0.765	0.806	0.776	0.721	0.687
Throwing a 8kg shot from place	0.712	0.687	0.722	0.742	0.825	0.786	0.670
Barbell snatch	0.410	-0.387	0.406	-0.354	0.276	0.211	0.197
Power clean	-0.366	0.324	-0.287	-0.212	0.226	0.268	0.107
Squat with a barbell	0.521	0.605	0.724	0.807	0.657	0.398	0.165
Bench Press	0.574	0.665	0.642	0.786	0.602	0.605	0.126
Standing long jump	0.398	0.344	-0.324	0.245	0.221	0.156	0.127
Triple jump from place	0.345	0.367	0.325	0.214	0.242	-0.198	0.222
Vertical jump	0.566	0.488	0.376	0.324	0.256	0.224	0.178
Throwing a shot forward	-0.367	0.321	0.298	0.246	-0.200	0.242	0.192
Throwing a shot backward	-0.387	0.345	-0.309	0.288	0.244	-0.187	0.156
Running 30m from blocks	0.426	0.367	0.312	0.242	0.212	-0.178	0.198

Figure 6.1: Table showing the results of Dr. Bondarchuk's experiments on the transferability of exercise parameters and performance, looking specifically at throwing distance in shot putters. Relationships shown by statistical analysis of correlation coefficients (r). Table reproduced from *Transfer of Training* with permission from *Ultimate Athlete Concepts*.

When examining figure 6.1, two things pop out. First, as the exercise becomes more similar (specialized) to the competitive movement, the transferability of that exercise increases. In

looking at figure 6.1, you see that the highest transferability (correlation) was seen with athletes throwing different weighted shots, both heavier and lighter than competition weight. The next highest transfer exercise is the bench press, which again is a similar motor and neural firing pattern to throwing a shot.

The second thing to note is the change of transferability from left to right seen in the table. Notice that the correlation coefficient (transfer) for a given exercise isn't the same for every level of athlete. In almost every instance, as the level of athlete improves, the transferability of an exercise decreases. Let's look again at the bench press in figure 6.1. The first four athlete classifications, up to 17–18 meters, see large improvements (transfer) in their throws as a result of increasing their bench press (r increasing from 0.57 to 0.78). However, as you continue to move across the line, getting to the 20–21 meter group, their transfer plummets to only 0.126. Why?

There comes a point when the level of athlete quite literally out grows the transferability of an exercise. There is a tipping point where being stronger will no longer help an athlete perform at a higher level. This is due to the time constraints imposed on the athlete by his event or sport. To be able to lift a heavier weight doesn't do him any good because he doesn't have time to transfer that strength into the implement (shot, field).

Let's look at another example. Figure 6.2 outlines the PR loads and distances of 1984 Olympic hammer throw champion, U. Sedykh (yes, he's Russian). Looking at his power clean, squat, and snatch numbers from 1980 to 1984, you should notice something you might think odd. They never increased! Alright, so his snatch went up five kilograms in four years, but other than that, his strength numbers remained exactly the same. Now look at the distances of his 7.296-kg hammer throw during the same time. They increased from 81.8 meters to 86.34 meters! For Sedykh, increasing his strength wouldn't have been advantageous. There came a point when to continue to improve he had to focus on more specialized developmental exercises that more closely resembled the parameters of his sport.

Exercise	Years						
	1980	1981	1982	1983	1984	1985	1986
Throwing the 7.260kg hammer, m	81.80	80.14	81.66	80.94	86.34	80.50	86.74
Throwing the 5kg hammer, m	97.00	95.00	96.00	95.00	99.00	96.00	100
Throwing the 6kg hammer, m	96.00	90.00	93.00	91.00	95.00	90.00	96.00
Throwing the 8kg hammer, m	77.50	74.00	76.00	75.00	80.00	75.50	80.46
Throwing the 9kg hammer, m	72.00	70.00	72.00	71.50	75.00	71.00	75.50
Throwing the 10kg hammer, m	67.00	64.00	67.50	66.50	69.50	65.50	70.2
Throwing the 16kg weight, m	23.70	---	---	---	23.40	---	23.85
Barbell snatch, kg	115	115	110	115	120	120	120
Power clean, kg	155	155	155	155	155	155	155
Squat with a barbell, kg	230	230	230	230	230	230	230
Throwing the shot forward, m	16.00	15.50	16.00	---	---	---	16.00
Throwing the shot backward, m	18.00	18.00	17.50	18.00	---	---	18.00
Long jump from place, m	3.10	3.10	3.10	3.10	3.10	3.15	3.15
Triple jump from place, m	9.00	9.00	9.00	9.00	---	---	---
Vertical Jump, cm	85	85	80	80	80	85	---

Figure 6.2: Table showing the personal records of Olympic champion U. Sedykh in both throwing implement and major assistance lifts by training year from 1980 until 1986. Table reproduced from *Transfer of Training* with permission from *Ultimate Athlete Concepts*.

Now, I'm not saying that you abandon heavy lifting with your athletes and constantly perform specialized developmental exercises. That won't work. An athlete must be at the highest levels physically and mentally before these methods will produce optimal gains. By 1980, Sedykh had already built an impressive strength base, squatting 230 kg. That's a 506-lb squat. The impressive performance gains made by Sedykh and other elite athletes using high velocity peaking methods were obtained after years of proper periodized training building strength and power. If an athlete isn't already strong and powerful, there isn't anything to transfer to competition. Also, keep in mind that Sedykh and other athletes like him don't stop lifting heavy during this time. They continue to lift loads above 80 percent during their yearly macrocycle. However, when lifting during a strength focused mesocycle (such as the high force at low velocity phase), their focus is simply to maintain the parameter rather than increase it. When only looking to maintain a parameter, less time needs to be allocated in training for its maintenance. Instead of spending six to nine weeks training with loads above 80 percent, these athletes only need to spend three to four weeks to maintain their strength levels. As a result, more training time could be allocated for

lightened load, high velocity training. This means there's more time training with the methods and parameters that we know improve sport performance!

What you need to take away from these examples is the importance of peaking your athletes with a method that allows for a high level of transferability, preparing them and their bodies for the rigors specific to their sport. In most instances, training occurs at velocities that are considerably lower than the actual competition. For example, a college level thrower releases the shot put with a velocity around 14 meters per second. Conversely, most dynamic effort bench speeds (assuming 50 percent of a 1RM on the bar) only reach 0.9–1.1 meters per second.

To determine the validity of the transferability of an exercise, researchers have developed a set of criteria. These have come to be known as the *criteria of dynamic correspondence*.⁶ Determining the transferability of an exercise isn't by any means a science. However, a good coach will always analyze and evaluate the merits of a peaking program based on this criteria.

CRITERIA FOR DYNAMIC CORRESPONDENCE:

- THE AMPLITUDE AND DIRECTION OF MOVEMENT
- THE ACCENTUATED REGION OF FORCE PRODUCTION
- THE DYNAMICS OF THE EFFORT
- THE RATE AND TIME OF MAXIMUM FORCE PRODUCTION
- THE REGIME OF MUSCULAR WORK

The amplitude and direction of movement is a fancy way to saying range of motion (ROM). To meet this criterion, the exercise must exhibit the same general movement pattern and range of motion that an athlete will perform during competition. When selecting or modifying exercises to be performed, it is important to know the starting position, finishing position, and posture of the athlete as well as understand the direction of application with which force is applied during the movement. For example, the degree of knee flexion for a linebacker is different than an offensive lineman at the snap of the ball. A good strength coach who has programmed a back squat into the

⁶ Verkhoshansky Y, Siff M (2009) *Supertraining*. Sixth edition. Ultimate Athlete Concepts.

high velocity peaking program before camp will take note of this difference and adjust the ROM with which each player performs the back squat to increase transferability to the field.

The accentuated region of force production looks at the importance of building joint angle specific strength for the athlete. Similar to amplitude and direction, this criterion looks at the specific point within the range of motion where the athlete must generate the most force. This point is generally within ten degrees of the athlete's starting position or the lower end of his ROM.

The dynamics of the effort simply means that the effort exerted and the speed produced by the athlete during training must be at a level equal to or greater than those seen in competition. A high velocity of movement is essential. Every repetition of the exercise must be performed with 100 percent effort with the athlete pushing or pulling through the entire ROM.

The rate and time of maximum force production is another way of terming a concept that you're familiar with from earlier sections of this book—the rate of force development (RFD). The focus on every exercise must always be a high RFD to improve the neuromuscular system, enabling maximal force to be produced in a minimal amount of time.

The *regime of muscular work* is stating that the type of “work” performed by the athlete's physiologic structures in competition should be simulated in training. For example, boxers and shot putters can perform the same exercises in training because the amplitude and direction of the movement and the dynamics of effort are very similar.⁷ However, because boxing requires quick, unresisted contractions performed in a repetitive manner with the ability to repeat it many times without a significant decrease in force, its regime of muscular work is unique. It must be different than that of a shot putter, who's sport involves single, explosive muscular contractions against a specific resistance with long durations of rest. To accommodate for these differences, the use of time as a parameter for training has proved to be optimal for peaking an athlete.

⁷ Verkhoshansky Y, Siff M (2009) *Supertraining*. Ultimate Athlete Concepts.

Transferability and the criteria of dynamic correspondence dictate that as the competitive season nears, velocity of training must increase within a specific ROM to make the nervous system more sport-specific and allow transfer of the previously attained physical adaptations. This mesocycle is designed to do just that. Some of the criteria are very similar and overlap. If an exercise meets one criteria from the list, it likely meets one or two more. I have never found an exercise that perfectly meets all five, so I keep a rule of three. If an exercise doesn't meet at least three of the criteria for dynamic correspondence, I won't program it in my peaking phase. To accomplish the high levels of transferability required for sport performance improvement, a coach must take advantage of an antagonistically facilitated specialized method of training (AFSM).

ABOUT THE AUTHORS

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Cal Dietz has been the Head Olympic Strength and Conditioning coach at the University of Minnesota since 2000. He has developed the Strength and Conditioning Programs and overseen the daily progress in Men's Hockey, Men's Basketball, Women's Hockey, Men's and Women's Golf, Men's Swimming, Track and Field, Baseball, and Wrestling.

During his tenure, Dietz has trained a Hobey Baker Award winner, two Big Ten Athletes of the Year, over 400 All-Americans, 28 Big Ten/WCHA championships teams and 7 NCAA National Team Champions, and 13 teams finish in the top four in the nation. He has consulted with Olympic and World Champions in various sports and professional athletes in the NHL, NFL, NBA, MLB, and Professional Boxing. Also, during his time at the university help founded and chairs the Sport Biomechanics Interest Group with its purpose to explore the physiological and biomechanical aspects of advanced human performance encompassing the various aspects of kinesiology, biomechanics, neuro-mechanics and physics.

The Shelby, Ohio, native earned his bachelor's degree in physical education from the University of Findlay in 1996 and his master's degree from Minnesota in kinesiology in May, 2000. During his athletic career at the University of Findlay Dietz won three National team championships, two in football and one in wrestling. Highlights of his career was earning 2 All-American honors in Football and winning the NAIA National Duals MVP in wrestling. In 1995 he received the NAIA College Sports Magazine Athlete of the year and was inducted into the University's of Findlay's Hall of Fame in 2005.

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Ben is a graduate of Northwestern University where he played football for the Wildcats. During his tenure he developed a passion for discovering what makes the human body tick -- creating and implementing new methods to train, develop and improve sport performance. Ben started his

career working for the Minnesota Twins as an assistant strength and conditioning coach in 2008. Over the past four years, Ben's passion and creativity have allowed him to work with hundreds of professional athletes in the NFL, NHL, and MLB; helping them maximize the limits of their athletic potential. Most recently, Ben has been a consultant for Octagon Hockey, spending the NHL off-season working with their athletes in the Minneapolis area.

Ben is currently pursuing his Doctorate in Kinesiology and Exercise Physiology at the University of Minnesota. At the university he helps run the Sport Performance Lab while assisting to teach two courses within the kinesiology department; *Strength/Power Development* and *Health and Wellness*. His research looks at repeated sprint ability in anaerobic athletes, specifically as it pertains to energy system efficiency and fatigue. His research also looks heavily at power and rate of force development in athletes and its dynamic correspondence and transferability to sport.

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