The Vertical Jump Development Bible

By: Kelly Baggett
Higher-Faster-Sports.com

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Published By: Higher-Faster-Sports.com
22 Mimosa Drive
Harrison, AR
72601
phone: 870-365-8484
email: services@higher-faster-sports.com

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Introduction

"I increased my vertical jump by 19+ inches- I'm gonna show you how to increase yours too!"

If you want to fly, you've got 3 options:

1. Buy a plane ticket
2. Sprout feathers and wings
3. Improve your vertical jump

While flying in a plane is nice and all, it's a bit expensive and way too temporary. Sprouting feathers and wings ain't gonna happen! So, unless you've got money to burn or you really believe in evolution, you're stuck with improving your vertical jump.

A strong vertical jump is at the core of some of the most beautiful and graceful movements known to man – Kobe Bryant dunking on the fast break, Michelle Kwan hitting a triple axle, and Barishnikov seemingly floating in air during the ballet. But don't get me wrong, the vertical jump is also a measure of pure raw power that is used

widely throughout professional and college athletics as a performance test. An athlete's vertical jump can effectively determine how explosive they are and how efficiently they utilize their strength in athletic movements. In fact, in the NFL, the single biggest predictor of success isn't one's size, speed, or strength, but rather their vertical jump!

Vertical Jump I Know – So Tell Me How I Can Improve It!

Of course the reason you bought this manual was because just like everybody else you're wondering, "What is the best routine to give me the hops?" People pursuing the answer to that question are responsible for millions of dollars of revenue per year for the athletic performance industry. Unfortunately, a lot of those dollars are wasted. If you're like most athletes you're probably confused as to what exactly you should do. What program works best? What's the "magic bullet"? Should I be doing plyometrics, isometrics, jump rope, sprints, calf raises, 1 million jumps per day, wearing special shoes, weight training, weighted-vests, stretching, taking special pills, doing special exercises to increase my height, wearing ankle weights, or meditation? The list goes on and on and on. I've been part of the athletic performance industry for a very long time now and I've seen it all. With so many programs, products, modes, systems, gimmicks, and so much information (mostly mis-information) floating around out there its no wonder the average athlete is so confused.

What's even worse is every program promises the moon but usually does nothing more then empty your wallet. You may be one of these guys who has a long list of programs, gadgets, and systems that you either have tried or are going to try. You probably know plenty of people who've had success using one or more of the many programs out there. You may have had success at some of them yourself. Or maybe you haven't? You may have tried other programs without getting anywhere or maybe you've just stalled out and want more. You may have asked the question, "well how come xxxx programs worked for him but not for me?" Why did xxxxx program put 10 inches on so and so's vertical but made me lose 3? Why can so and so jump but I can't? The truth is, I can't tell you what the best program is out there because every program or gadget I've seen neglects solid training principles.

You might wonder what motivated me to write this manual. Well, truthfully, I was originally motivated because I was angry. I get questions everyday from people who have been burned by fast-buck artists selling hype without results. I've seen a lot of programs that seem to do no more then extract dollars from unknowing athletes. These programs are put together without much understanding of how the body works, the science or reasoning behind how the training methods work, and the reasons why a system brings gains if in fact it does. So, I decided to do something about this and help do what I can to spread the knowledge.

Vertical Jump Secrets?

So what exactly is the secret to a great vertical jump? The truth is, there are no secrets or magical systems. There are, however, solid principles that have been around for ages. The magic lies in the application of established principles. The information you'll find here comes from a variety of resources compiled over the better part of the last century.

The approach I talk about is the same approach used by the best athletes and the best leapers in the world. This includes track and field athletes, jumpers, throwers, olympic weightlifters, football players, volleyball players, as well as a few basketball players. You see, olympic or professional athletes achieve their spectacular leaping ability as a "side effect" of effective training principles and practices. Their approach is multifaceted and their vertical jump improves because of effective training designed to improve various other qualities like strength, speed, and overall explosivness. When these qualities improve the vertical jump just comes along for the ride.

Rest assured you won't find any professional or olympic athletes out there searching for the magic jumping cure because there is none. The vertical jump itself is a feat that coaches from government sponsored programs all over the world have spent over 50 years investigating. The number of readily accessible scientific studies on the VJ is astounding. In other words, if there was a magic bullet that was really going to put 20 inches on anyone's vertical in 6 weeks then you can be sure that a sport scientist would've known about it long ago. Fortunately, these same scientists have produced principles that take the guesswork out of everything. What I've done is taken all the information, tested it, and compiled it into a format that "zeroes in" on the vertical jump.

It's taken me many years to compile, test, and implement all this information. The information was out there all along but sorting through it all it has been much like searching for needles in haystacks! This meant spending endless hours, days, and nights not only training athletes but also perusing through countless scientific studies and huge complicated texts in an effort to pull out miscellaneous tidbits of effective information. It also meant listening to feedback and advice from other coaches and observing thousands of athletes over the years. I have spent the better part of 10 years researching and practicing the methods outlined in this book. This has meant using myself, and others, as a virtual guinea pig for the last 10 years. I have to admit I've loved doing it all! Experimenting, observing, and putting it all into action is the fun part. My only hope is that this manual will make a substantial difference for you.

When I write, it is in a no-nonsense, straightforward manner. I prefer to talk about "principles" rather then "secrets". What I will do is explain the science involved in the vertical jump and do so in a simplistic manner complete with real-life everyday examples. My goal is not only to tell you what to do but also to help you understand why you're doing it. There's a saying that goes, "Feed a man a fish, and feed him for a day." "Teach him how to fish and feed him for a lifetime." What I'd like to do is

give you both. I promise when I'm done you'll have a newfound understanding of this athletic display and how to improve it. I will explain the various training methods you might be familiar with and show you how you can easily determine which method of training or combination of training will work best for you or anyone else at any given time. Then I'll give you several complete programs. Along the way, I'll also answer practically every question you've ever heard on vertical jump development including gadgets, programs, and just about anything else you can think of.

SHOW ME THE MONEY

Years ago it was thought there wasn't a whole lot if anything we could do to improve jumping ability because it relied solely on genetics. More and more we now know this is utter nonsense. The reason why athletes of years past didn't improve is because they:

1. Didn't train at all

or

2.Didn't know how to train correctly.

Fortunately, those days are coming to a close. I will admit the large majority of athletes and even a lot of coaches still fit into group #2 - They don't know how to train correctly and a lot of the training they do actually detracts from the qualities necessary to jump high. Yet, in the coming years this will completely change and you can count on it. Once a person understands what is needed for spectacular jumping ability as well as understands the correct training methods and their application - improvement is relatively easy. In fact, near never ending improvement is possible. Let me tell you right now, barring injury and old age, permanent plateaus should never occur providing you know how to correctly train. Regardless of how advanced a person is they can always improve.

Now you're probably saying, "That all sounds well and good but how about specific improvements - What exactly can you give me that I want and what makes you an authority?!" For one thing, since everybody is an individual and responds differently, I won't promise specific results. I can, however, show you how to progress from wherever your starting point might be.

I also don't necessarily believe that in order to be a great coach that you have to be a great athlete. However, I recently heard a top strongman say "If you're gonna coach someone to an 800 lb. squat than you gotta know what it feels like to bust your butt for years and work up to an 800 lb. squat yourself"- and I do believe in large part that is true. Science and theory is great but unless you have experience implementing that information there remain many lessons to be learned. There are plenty of people who really seem to know their stuff yet have never practiced what they preach. However,

there are also plenty of naturally gifted athletes who can “walk the walk” yet would have a difficult time coaching because they don't know what its like to be average and have to struggle for everything.

In between those 2 extremes there is an optimal balance between knowledge and personal experience. I don't want to toot my own horn but just so you realize you don't have to be born with spectacular ability I can tell you that for me personally, over several years and using a similar but less refined approach than what I'll show you here, my vertical jump improved from 23 to 42 inches and my forty-yard dash times improved from 5.0 to 4.27 seconds. If you would like to read about my personal story you can read about it later on in the miscellaneous questions section. However, let me say that I don’t consider what “I” did all that important. What is important is how much of that experience and accumulated knowledge I can pass along to develop others like you.

Performance coaches are usually limited in the time they have to work with a specific athlete because of all the obligations that athletes have to deal with. Therefore, it’s rare that a performance coach gets to work one on one with an athlete for an extended period of time without outside interference. Even then you can't control what someone does out of the gym. Yet even with that I expect most people that I work with to surpass their previous 2 years performance improvements within 3 months - and that is usually not too difficult.

If you’ve already decided that you’d like to skip the science and background portion and would rather get started right away then you can just skip ahead to the INDIVIDUAL TESTING section and you’re only 5 minutes away!

With that said, let’s get to it! Welcome to Vertical Jump 101!

Vertical Jump 101

To begin, understand that the vertical jump is basically just a measurement of power.

WHAT IS POWER?

Power is a side effect of explosive strength and is determined by a simple equation:

Power = Force x Velocity

To break it down just realize that power and explosive strength simply mean the ability to apply a lot of force in minimal time. The more force you can put out and the faster you can apply that force, the higher your power output will be.

In order to understand how to improve power, it helps if we to know how to manipulate each component of the equation, force and velocity.

When we most often think of force, the word strength comes to mind. In mathematical terms **Force = Mass x Acceleration**.

Simply put, if you move a larger or heavier mass or accelerate it more rapidly from point A to point B, you will increase force and subsequently, power output. For our purposes however, no need to get overly technical! It's easier to think of the force part of the equation as your maximal level of strength.

Velocity- is the speed of movement.

Simply put, the greater the force or velocity, the higher the power output.

It's really not much more complicated then that. However, before we move on, I'd like to define some key terms that are all interconnected in the quest to improve power and jumping ability. You'll see some of these terms periodically throughout this book.

Limit Strength- is simply the maximum force you can voluntarily apply. Maximum force is typically measured in the weight room with powerlifting being a classic example of a sport that measures maximum force. Actually a better name for that sport would be force-lifting or strength lifting. Because of the slower velocities inherent when lifting a maximal load, powerlifters actually generate less power then athletes in many other sports. Other then arm wrestling and maybe tug of war, powerlifting is also about the only sport where maximum force is measured.

Absolute strength- is the maximum force one is potentially capable of applying. As you will learn later it is rare to see our strength potentials fully realized.

Relative strength- is the strength per pound of bodyweight

Rate of force development- Is the speed at which you can develop force.

Starting strength- influences rate of force development and is the ability to instantaneously turn on as many muscle fibers as possible when movement begins to take place.

Reactive strength- is also known as elastic strength, reversal strength or plyometric strength. This is the ability to gather and utilize reflexive force during a movement when switching from an eccentric (negative) contraction to a concentric (positive) contraction.

Now let's use a real life example to see what the above complicated terms look like in real life.

WHAT STRENGTH AND SPEED REALLY LOOK LIKE

	Bodyweight	**Maximum force or strength without time constraint (squat)**	**Max force put out in the vertical jump (.2 seconds)**
Athlete A	175 lbs	400 lbs.	200 lbs.
Athlete B	175 lbs	300 lbs.	225 lbs.

Look at the chart for a moment and try to decide which athlete would have an advantage in the vertical jump. Assuming both athlete A and B are the same size, you can see how they have very different strength patterns. Both of them weigh 175 lbs. Now look at the next row that says "maximum force or strength without time constraint". In this example we're using a maximum squat since it is a slow movement and during a squat we have ample time to apply max force. What we're describing here is how much force these athletes can put out regardless of how long it takes them to apply that force. A squat is a good example of that.

As stated, power-lifting, arm wrestling, and tug-of-war are some sports that measure this. In practically every other athletic event, there isn't enough time to allow true maximum force to be developed. So in this case you see that athlete "A" reaches a higher peak force and he squats more weight, 400 lbs vs 300 lbs, yet if you look at the 3rd row, the amount of force he can put out in .2 seconds, which is the same amount of time it takes to complete a vertical jump, - Athlete A's force output is lower then that of athlete B, so he develops force slower. Therefore, athlete A is going to be able to squat more than athlete B, but athlete B is going to smoke athlete A in a vertical jump test. Here's why:

In the maximum squat or maximum force test, the athlete has plenty of time to generate peak force. It takes roughly .4-.7 seconds to develop peak force. On the other hand, movements like the vertical jump inherently occur very quickly, around .2 seconds. So, <u>how much force you can put out in a short period of time is going to determine performance.</u>

Don't get too carried away with this just yet though. Although being able to apply force rapidly is a very useful characteristic, you still need to have enough potential force to tap into for anything to happen. The 6'3", 200 lb guy with a max squat of 100 lbs is not going to be dunking any time soon, even if he can apply all that force very rapidly.

Here is an example of what that athlete might look like on paper when we break his strength qualities down like we did above:

	Bodyweight	Max force (strength) in the Squat	Max force in vertical jump
Weak Athlete	200 lbs	100 lbs	95 lbs

You should be able to see that even though this athlete utilizes 95% of his potential force (95 lbs) within those .2 seconds, and has good rate of force development, he still doesn't have enough potential force to tap into for that awesome rate of force development to do much good. He's only capable of squatting 100 lbs and even though he's able to use 95% of that in the vertical jump he's still only putting out 95 lbs of force, which isn't going to do a whole lot to get him off the ground!

Now here is an example of what an ideal athlete's maximal force and rate of force development profile might look like:

	Bodyweight	Max force (strength) in the squat	Max force in the vertical jump
Ideal Athlete	175 lbs	400 lbs	325 lbs

Even though this athlete is very strong he is also capable of utilizing a large % of that force in a very short time-span, which is ideal. His max squat is 400 lbs. and he's able to utilize over 75% of his potential force, or 325 lbs., at toe off.

10 Key Performance Qualities

With that out of the way let's now quickly go over 10 key qualities that you'll be using and focusing on in the programs. Keep in mind that none of these qualities or training methods exist completely in isolation yet they are all important..

1. **Control and stability**- Obviously before you can develop maximum power, strength, speed, or anything else, - you need to be able to stabilize and control your own bodyweight and control minimal loads. Control and stability is related to coordination and learning. When it comes to learning a new skill or movement, this should be the initial focus. If you've never done a particular movement before it's best to start off light and slow so that you can learn the correct performance. Once you've learned incorrect movement patterns those bad habits can be hard to break so it's essential you learn how to do each movement correctly. After you have enough experience you can then move on.

2. **General Strength**- The goal here is to strengthen the muscles involved by adding additional loading. An emphasis should be placed on correct technique with less emphasis on the load.

3. **Range of Motion**- Range of motion is also known as flexibility. You need to have a certain degree of flexibility in order to prevent injury and optimally carry out the movements in your sport. In the vertical jump, if your ankles and calves are so tight that you can't achieve the desired range of motion then you risk serious injury. On the other hand, it's not necessary and could in fact be detrimental to have the flexibility of a contortionist. It is essential that a minimal amount of flexibility be maintained yet flexibility training won't do miracles.

4. **Maximum Strength**- Here the focus is on strengthening the musculature by lifting maximum loads. This greatly enhances a muscle's maximum force output. If you were to attempt a maximum strength phase without first developing basic conditioning there would be a high risk of injury. To illustrate this, consider an exercise such as the squat. If you've never executed a squat before and you immediately go in the gym and try to establish a 1-rep maximum (max out), there's a chance you'll injure yourself. A better way is to learn the correct movement performance using low loads and more repetitions (general strength and stability). Pay attention to form and work the correct muscle groups. After you've done this, you can gradually begin to add additional loading and advance towards maximal strength training.

5. **Maximum Power**- Power (force x velocity) is a combination of strength and speed. Virtually any type of training can qualify as power training as long as there is some load that must be moved and you "focus" on moving fast. You can train for power using your bodyweight, your bodyweight with an additional load, lifting light loads, or attempting to move a heavy load quickly. Most of the training methods utilized in this manual will either directly or indirectly impact power. Maximum strength training, due to it's inherent slower movement speeds, may not produce a lot of power during it's execution, yet it will boost your strength levels and that will enable you to put out more force which translates into more power.

6. **Starting Strength**- Starting strength is the ability to instantly apply lots of force at the very beginning of a movement. Try this. Sit back in a chair in a "ready to jump" position. Make sure your butt is touching the chair. Now without rocking backward simply jump up from this dead stop position. This is an example of starting strength and also involves rate of force development. Just like any other strength quality, it can be trained and improved. Your muscles can be trained to fire quicker.

7. **Force Absorption Training**- This is the ability to absorb and stabilize high eccentric or negative forces and is the first step in developing great plyometric power. In the vertical jump, the eccentric forces are the forces that are created as you execute a quick countermovement or bend down before you jump. You can also see this when you run-up into a jump stop and have to stop or reverse

direction in order to transform your horizontal mass into a vertical movement. These movements create a lot of force as the negative movement (or eccentric) causes your muscles and tendons to stretch, which creates a gathering of energy. The forces you gather are then stored in the tendons and muscles, causing your tendons to act like a stretched rubber band. In order to excel at this you first need good levels of basic strength along with muscular control. Being able to absorb energy is a pre-requisite to the next step, which is reactive training.

8. **Reactive training**- This is the result of being able to "release" lots of stored energy after you absorb it. Reactive training is also known as plyometric training, reversal strength, elastic strength, and static-spring proficiency. They all essentially mean the same thing. Reactive training can account for a significant part of performance in any athletic endeavor. In the earlier example when you sat down and paused on the chair before jumping, were you able to jump as high as you normally do? Probably not. That is because you would naturally reflexively execute a quick ¼ squat, or countermovement, just prior to your jump. The difference between your vertical jump with and without a countermovement is how much additional force you're getting from reactive contributions. This strength quality is also highly trainable. Certain drills allow you to increase both energy absorption ability and reactive ability. Together they make up plyometric training. This topic will be explained in more detail later.

9. **Short response reactive training**- This type of training differs from regular reactive training in that the switch from "down" to "up" happens a lot quicker and is nearly completely reflexive with little voluntary input. For example, look at the difference in the time you spend changing direction from down to up in a vertical jump done with a running start vs the time your foot spends on the ground during a max speed sprint. Which one occurs quicker? The quicker the movement, the shorter the response time, and the greater the reflexive force contributions tend to be. Sprinting is the ultimate display of reactive or plyometric training. The movements occur too quick for much voluntary force output or "strain". In much the same way, executing a uni-lateral one legged jump after a run-up also qualifies as a short response reactive activity because the movement occurs much faster then a regular vertical jump. Certain drills are better for this type of training.

10. **Speed of movement/Quickness/Velocity**- When you increase the force and power behind your movements and then increase the absolute speed at which you move, you get the best of both worlds. The qualities above will mainly increase the "horsepower" behind your movements. When you combine that with an increase in absolute speed your results will be far superior. How fast can you turn your system off and on? How fast can you move your limbs without regard to force? Can you catch flies with your bare hands? How many times can you tap your feet in place in 5 seconds? Fortunately, you really

don't have to be all that "fast" to improve your vertical jump or even your running speed. There is a blend of physical qualities needed for optimal performance and typically strength and power output per pound of bodyweight are more important then the ability to actually move your limbs fast. However, improving speed of movement never hurts. It can be done by lots of practice being fast and developing an optimal mind to muscle link, better learning to control your muscles.

Strength as the Backbone

Let's go back to the importance of power production and our power equation

(Power = Force x Velocity)

You should be able to see that you can increase power either through an increase in force or an increase in velocity. However, it is generally accepted that the maximum force you put out is going to be the main determining factor for an increase in power. This is due to many reasons, one being that maximum strength is the foundation for all the other strength qualities such as speed, power etc. Think of this. If you weigh 150 lbs and your goal is to move your bodyweight off the ground as fast and as far as you can - and you are only capable of putting out 200 lbs of force, what is going to happen? If you can only squat 200 lbs then trying to move your 150 lb. bodyweight requires a significant portion of your maximum strength. You'd have to use 75% of your maximum strength just to move your own body. In this situation you're probably not going to be moving very fast or jumping very high! Another example that may hit home – A space shuttle with a 4 horsepower motor surely won't make it out of the earth's atmosphere in a hurry!

Being strong just makes things easier. In the above example if you were able to put 350 lbs of force into the ground then moving your bodyweight (150 lbs) requires a lot less of your maximum strength so you have a larger strength reserve to work from. In this case you would only have to use 30% of your max strength to move your body and 30% of your maximum can be moved with greater speed and power then 75%. Make sense?

Another major consideration is that it is easier to increase force then it is to increase velocity. That is, the ceiling on maximal force or strength improvement is much lower then the ceiling on pure levels of speed. Speed has much more genetic limitation than strength does. It's not that pure velocity or speed of movement can't be increased, but due to genetic factors, such as body structure, neural factors, or the number of fast twitch fibers one has, speed improvement is much more limited.

To illustrate this, many people who lift weights over a period of several years can easily double their strength in exercises such as the bench press and squat and thus double their levels of force. Yet in tests of pure speed of movement, such as the

ability to tap the feet in place as many times as possible in 5 seconds, or to tap your finger as quickly as possible, improvement is much more limited.

The good thing is that in most athletic events, speed of movement does not exist in isolation, but rather is strongly related to force. Even in what would be considered a pure test of speed, the 100-meter dash, it might come as a surprise that elite level sprinters don't move their limbs much if any faster then regular folks do! Anybody can get on their back and cycle their legs 5 times per second. Rather, it's the amount of force a sprinter puts into the ground with each foot strike that propels them down the track at lightning speed. Each footstrike does occur quickly, yet the amount of force per footstrike is key.

When executing a vertical jump, people do change direction during their countermovements (transition from down to up) at different speeds, but in much the same way, everyone pretty much straightens their legs at the same rate of speed. The main determining outcome in the vertical jump isn't how fast your legs move, it's the amount of force relative to your bodyweight that you are able to put into the ground. With that said I can now give the basic vertical jump equation:

Spectacular vertical jump = High levels of force + High speed of force application

That is all there is to it! Any improvement in the vertical jump comes about through increasing one or both of those factors.

The goal of this entire program is to increase your vertical jump by increasing both of those factors.

If velocity and rate of force development stay constant, yet force levels, or strength levels, go up, you can also expect your power, and thus leaping ability, to improve as well. So how do you increase levels of force without negatively impacting the speed at which you apply that force?

Can weight training make you slow?

As mentioned before, the application of force in a movement like the vertical jump occurs very quickly, somewhere around 200 milliseconds (2 tenths of a seconds). It generally takes around 400-700 milliseconds (4 to7 tenths of a second) to apply max force. Therefore the body must not only be able to apply a lot of force, but also be able to apply it quickly.

One problem with weight training is that bodybuilding programs have dominated the programs of athletes everywhere and many athletes are trying to make "athletic" gains by following weight-training methods designed for bodybuilders. Not that I have a single thing against bodybuilding but bodybuilders should train for bodybuilding and athletes should train for athletic performance. Training programs based upon bodybuilding methods often include a high number of repetitions performed to

exhaustion with a focus on keeping the muscle under tension for prolonged periods of time. Such programs mainly develop muscle size rather than improved force or rate of force development. Over time such programs can indeed make you slower by negatively impacting your ability to apply force at high speeds. Our goal is to become stronger while directly increasing transferable strength into power and increasing the speed at which we utilize our strength. In fact, we actually want to become stronger and faster at the same time! To do this requires strength training designed for athletic performance.

When you lift weights, you must use fairly heavy loads and apply force against the resistance quickly so that your body learns to generate maximum force quickly. This recruits more fast twitch muscle fibers and trains the nervous system to engage more muscle fibers. This makes the strength derived from the program directly transferable to our goal, which is to get you up in the air!

Do I have to strength train?

For those of you out there who are not keen on lifting weights and wonder if you have to strength train to improve your vertical jump the answer is, "no of course not". I've included several very effective jumping programs that can be performed without weights just for these people and I know these programs are very effective on their own.

It's been said that the main reason many trainees avoid leg training is because it hurts too much. Maybe they're right. After all, leg training in the gym with heavy iron can be painful. I'm not going to try and sugar coat anything. But I'll also tell you that most of you out there are not going to come close to reaching your potential unless you do some strength training somewhere along the way. Now, some of you, especially those who are naturally strong, will be able to gain a significant amount on your vertical jump without ever even lifting weights. Sometimes even a **VERY** significant amount. However, eventually there will come a time when your gains will stop and the only way to further your improvement will be to increase your base of strength. I want everyone to benefit here. If you have only a very limited amount of time and don't have access to a weight room I'd encourage you to give it your all on one of the non-resistance training programs. For those of you who still want to strength train but don't have access to a weight-room I've also included a routine that will increase your strength using a variety of unique bodyweight exercises which you'll find challenging. For everyone else, virtually all you'll need is a weight room with a squat rack and a barbell!

Training Loads

Before discussing the exercises I'd like to address the loads used for strength training exercises. Load can be defined as the % of your 1-repetition maximum that you use in a movement. So, if you're training with a 50% load and your max 1 repetition squat is 200 lbs, you would be using 100 lbs (50% of 200=100).

Many people are confused as to how heavy the load should be for optimal power development. Some people say, "Use light weights with more speed." Others say "Train with heavy weights or go home." Still others say, "Use Olympic lifts." It can get very confusing with all the varying opinions out there. The truth is, there is a time and place for **ALL** types of loading. However, different loading percentages have varying effects on the body. Following is a list of the different training loads and what they're best utilized for:

Speed training (0-25% of maximum): Here speed is maximized while power output and force are low. This training zone can be used to train speed of movement and rate of force development but has little benefit for improving maximal force production. Training in this zone could be considered similar to the effects of performing plyometric type training. With resistance exercises this training is more effective when you can project either the load or your body in the air. Exercises such as jump squats and medicine ball throws are best suited for this training load.

Speed-strength (25-50% of maximum): Here you'll find a compromise between speed and strength with speed and rate of force development being the dominant qualities affected. If you train in this zone you will get gains in force development and speed, however the gains in maximal force production will be marginal.

Strength-speed (55-80% of maximum): Here you'll find the best compromise between speed and strength with strength (maximal force) being the dominant quality affected. Training in this zone will give you gains in both rate of force development and strength with a marginal gain in speed.

Maximum strength (80-100% of maximum): Here strength and force are maximized.

Now, which loading zone should you spend most of your time in? The answer to this is fairly complicated. First, remember the power equation. If your goal is to improve the "Force" part of the equation as quickly as possible then there is no question about it, using a heavy load (80-100%) will strengthen your muscles much quicker and will allow you to get more out of the time that you spend training. The problem with this approach is that if you were to only lift heavy loads 100% of the time while doing no other types of training or sports specific activity, you obviously wouldn't be doing a whole lot to improve rate of force development and speed. Thus, over time those qualities would suffer. You would undoubtedly become very strong, but you'd eventually sacrifice some speed as well.

However, you also have to consider the <u>training effect</u> that comes from other activities that you do outside the weight-room. If you're also playing a sport requiring speed (basketball), or doing any running or plyometric work, you'll be getting plenty of stimulation in the speed aspects as well. This occurs just from participating in and practicing your sport. So, for the majority of people who engage in sports training as

infrequently as 2 times per week, there isn't a whole lot of need to try to duplicate this work (speed and rate of force development) in the weight room.

We also have to ask ourselves if training for speed in the weight room is as effective as other methods of speed training such as sprinting, plyometrics, or even playing a sport. Consider the effects of performing a 60-meter sprint vs using light weight training for speed. The movement speeds of a sprint are far faster then anything that can occur in the weight room. Lifting weights should improve your ability to apply more force, which you can then take advantage of and use in the sprint, yet trying to duplicate the speed of the sprint with a weight room activity is impossible.

Since you can develop the velocity and rate of force development components through jump training itself, your priority in the weight room should generally be to develop your strength qualities. This is best achieved through the use of 'limit' strength exercises such as squats. This is also the same reason most top sprinters, jumpers, and other track athletes spend the majority of their weight room time training to improve maximal force production by lifting weights in the 80-100% bracket, with a smaller percentage of the total volume dedicated to performing exercises in the 55-80% bracket for power and rate of force development (force + speed together). Most of you should spend the majority of your weight room time training in these 2 zones as well. Doing so will lead to quicker increases in maximal force and strength, and better economize your training time.

However, you will also see the programs I've designed are customized to the individual and sometimes do lend a portion of weight-room time using lighter loads with quicker speed of execution. Yet, for the most part, those qualities are addressed using other training methods such as plyometrics.

Specific vs General Strength

Now another question that is often asked is, "Do specific weighted activities in the weight room that mimic the sporting activity carry over into increased performance better then general strengthening movements?" In other words, if our goal is to run faster, would it be better to perform a sprint running with a heavy loaded sled rather then increase leg strength through squatting? Or, if our goal is to hit a baseball harder why not just train with very heavy bats all the time instead of increasing general upper body strength? Well the answer to this question is fairly complicated. There is a place for general loaded movements, such as weighted jump squats. However, one needs to be careful about trying to get too specific and use too much loading in technical movements because when we add additional loading to a sports movement we can negatively affect the movement pattern.

Load a movement too close to a technique-crucial sports movement pattern and you risk changing the technique of the athlete. You do not want to do this, as usually the loaded technique is significantly different than that of the unloaded technique.

For example, say you try to train for increased sprinting speed by running with a heavy weighted sled all the time. If the weight is too heavy it will cause negative changes in your sprinting technique. Not a good thing. Since you obviously don't sprint in competition with a weight attached to your body then the technique required for doing so wouldn't do you much good if you're a sprinter! The same thing occurs when baseball players use high volumes of very heavy bats in their training. The technical differences can throw off technique once the player returns to a regular bat. When used short term the heavier bat can enhance batting proficiency by creating a contrast effect. Yet use it all the time and it will detract from technique. Not to mention, swinging a heavy bat, running with heavy weights, throwing a weighted punch, or other specific loaded activity won't have near the effect of increasing the maximal strength of your muscles like basic barbell exercises will.

The goal in general strengthening movements is to increase the strength of the muscles involved in the movement and their order of muscular recruitment, not necessarily duplicate the exact task. In other words, when you squat to develop maximum strength there is no need to perform it in the exact same manner and stance that you perform a vertical jump. To increase general strength, basic movement patterns should be chosen that stimulate the same muscles as the desired sporting activity. These exercises do not have to mimic the movement. This ensures there is no risk of ruining technique through heavy loading, yet you still get the adaptive stress. The squat is a perfect example of this.

An example of a good exercise that can be loaded is a jump squat. When performing general strengthening exercises such as the squat, the technique is not so much like the vertical jump that the body compromises technical abilities. However, these also need to be utilized along with un-weighted jumps, which you'll definitely be doing plenty of.

When looking at jump squats vs squats, if the athlete could improve faster by increasing his general muscular strength, there is no contest, - regular squats and other strength development methods will offer substantial advantages. If the athlete already has plenty of general muscular strength then jump squats would be useful, but they aren't as effective as a complete program that addresses development through multiple angles.

WHY THE NEED FOR FULL RANGE MOVEMENTS??

Along these same lines many people will ask, "Since during a vertical jump one only descends into a ¼ squat position, then why should they do loaded squats with a full range of motion going past parallel?" Again, realize the purpose of strength training is to improve the general strength of the muscles involved. The fact is that a full deep squat is better at strengthening **all** the muscles involved in the vertical jump, despite the fact that one is capable of using much more weight in a ¼ squat. A full squat fully activates the muscles of the quadriceps and also strongly engages the hamstrings,

glutes, and even calves. Not only does this build strength, but it also keeps the lower body in developmental balance and helps prevent knee injuries and muscle strains. A ¼ squat doesn't strengthen the muscles of the posterior chain nearly as well and also puts a lot of stress on the tendons of the knee. However, there is a time when the ¼ squat can be effective. That is after a base of strength has been developed. The ¼ squat can then be used for short periods for further enhance strength development. If I could throw out one piece of advice to every young athlete in the world it would be, "Do squats and do them full and deep!"

IMPROVING FORCE AND INCREASING STRENGH – EXERCISES OF CHOICE

For our purposes, the basic barbell squat, the "king of all exercises", is the exercise of choice. The barbell squat trains nearly all the muscles involved in the vertical jump and strength derived from the squat translates very well into increasing the Force part of the power equation. In fact, some studies have demonstrated one's relative strength in the squat, or strength per pound of bodyweight, is the single biggest determinant in the vertical jump! (Chu)

Another exercise we'll use heavily in one form or another is the deadlift. The deadlift works the muscles of the posterior chain (hips, hamstrings, and lower back) like no other. These muscles are not only very important for power production but also tend to be the weak link in the chain for many athletes. You've probably heard that a chain is only as strong as it's weakest link. The prime muscle contributors to the vertical jump are the quadriceps, glutes, hamstrings, calves, and lower back. Even if your quadriceps are very strong if your posterior chain, or to put it more eloquently, your backside, is weak; - your performance will be severely limited. By strengthening both the squat and the deadlift we can ensure that **ALL** the muscles involved in getting you off the ground are strengthened optimally.

HOW TO TRAIN

Your strength will improve as a result of creating high-tension levels in the muscle, which is directly related to the training method employed. Your ability to generate maximum strength depends on the size of the muscle involved, the capacity to recruit or use your fast twitch muscle fibers, and the ability to coordinate all of your muscles involved into action. The ability to recruit your fast twitch fibers depends on training content, in which heavy loads and explosive power training should dominate. Improving your muscle coordination and synchronization depends on learning, which means performing many reps of the same exercise.

High-tension levels in the muscle are necessary to create increased levels of force and strength. So how does one go about creating a lot of tension in the muscles and thus improve force output? The answer is simple. Lift a moderately heavy to heavy load in good form with as much force as you can muster! When lifting a heavy load, even

though you might be pushing as hard and as fast as you can, the weight probably won't move all that fast. Each muscle cell has to contract forcefully for fairly long periods of time, therefore your muscle cells are subject to greater amounts of tension which is necessary to create strength. Lifting a lighter load with more speed doesn't subject the muscle cells to the prolonged levels of high tension, so, although useful for increasing other aspects of performance like increased rate of force development, won't have near the effect of heavy weights at creating maximum levels of useable strength and force.

Won't Getting Bigger Muscles Slow Me Down?

If any of you out there are worried about becoming overly "muscular" or getting too big from weight training, first I might ask what are you worried about? Don't you know the opposite sex loves hard bodies?! All kidding aside you definitely don't have to develop huge bodies and large muscles to become significantly stronger. Research shows that strength training methods typically bring a 3:1 ratio of strength vs. muscle mass increase. This means if your body mass increases 10%, your strength should increase 30%, which makes your gains purely functional.

Say you weigh 150 lbs right now and can squat 200 lbs. Your bodyweight is 75% of your squat. Let's say you gain 15 lbs of bodyweight bringing you to 165 lbs while at the same time your squat increases to 260 lbs. Now your bodyweight is only 63% of your squat! This means your relative strength, or strength per pound of bodyweight, has improved substantially and your performance will also improve dramatically. The take home point is to not be afraid of gaining muscular bodyweight.

Can't I get Too Strong?

Remember that the vertical jump occurs in about .2 seconds and it takes at least .4 seconds to develop maximal force. Up to a certain point strength is beneficial for power development. However, if you were to do nothing but train for maximum strength for months or years on end there will come a time when your bodyweight and strength increases above and beyond the speed at which you can apply useable force.

This is why it's important to pay attention to your strength per pound of bodyweight or <u>relative strength</u>. So you may ask, "What is the point that additional strength per pound of bodyweight is of no use for vertical jump improvement?" This will vary from person to person and depends on many factors, the biggest probably being your plyometric capacity in comparison to your maximal strength. Fortunately, there are tests to determine this, which I'll go into detail on later.

<u>One simple thing you can do is pay attention to how quickly you can move heavy loads</u>. You want to be able to lift relatively fast and explosively with a relatively high % of your maximum strength. To give you an idea, Fred Hatfield set a world record squat of over 1000 lbs. What's really amazing is his squat attempt took him less than 3 seconds to complete from start to finish. With that kind of explosiveness it's no

wonder he at one time had a vertical jump around 40 inches even without any specific training for it! You should be able to complete your maximum lifts in 4 seconds or less from start to finish. If it takes you longer then that any extra strength you gain won't be very useful when performing a high-speed maneuver like a jump.

To make it easier we can say that strength training can be detrimental to your performance when:

1. Increases in strength fail to yield improvements in leaping performance
2. When strength increases are only achieved through a large increase in body weight and hence do not increase the power to bodyweight ratio.
3. When the training frequency required for an increase in strength compromises the time needed for sport specific activity.
4. When extra strength can only be gained by increasing the duration of a max lift above ~4 seconds.

We can also do a strength analysis of some of the most powerful and explosive athletes around, sprinters. Upper level sprinters are universally very strong for their bodyweight. In fact, at bodyweights anywhere from 160 to 200 lbs they will routinely squat a minimum of 400 lbs on up to 600 lbs! With this knowledge it's probably safe to say that unless you're squatting 2.5 to 3 times or more your bodyweight you could still benefit from increased strength!

THE CNS – YOUR MUSCULAR COMPUTER

The next step towards maximum strength and force involves manipulating the central nervous system (CNS). You might know that the central nervous system basically connects your brain through a neurological network to all of your muscles. Your central nervous system is like the computer that controls all of your muscles. Your mind is like a central computer and your CNS carries out what you tell it to do. When you decide to move in any fashion your brain sends a message telling your muscles to contract. The more efficient your CNS operates, the more muscle cells you can use, the better you can control your muscles, and the greater your potential levels of strength and force development. Imagine if you could supercharge your CNS so that the signals you send your muscles are sent faster and with more precision? Fortunately you can impact this through correct training.

Step one is optimizing the mind/muscle connection and learning how to activate a large number of fast twitch muscle fibers. Through correct training methods - using the correct loads, speed of force application, and rest intervals between sets; you will be able to supercharge your central nervous system and be able to call upon and use muscles you've never used before. You'll also increase your muscular control and coordination and move not only in a powerful manner but also an effortless manner. Before talking about what to do to improve this aspect of your performance let's talk about what not to do!

A Word On Fatigue

This training program does not call for repetitions of weight training, drills, or plyometrics to be performed under conditions of muscular exhaustion or extreme fatigue as in bodybuilding or endurance training. Doing so would inhibit the central nervous system and dampen FT fiber recruitment and basically amount to a waste your time. Imagine trying to run as fast as you can for 30 seconds and then having to perform a maximal vertical jump. Try it sometime if you haven't! You'll probably find you don't get very high. The reason for this is that optimal speed and power can only be maintained for about 6 seconds. After this, lactic acid begins to accumulate in the muscles and this is what gives the "burn" feeling after a long set. This lactic acid interferes with the contraction of the fast twitch muscle fibers. If you train with elevated lactate frequently enough you will interfere with power production as your muscles adapt to endurance.

If you're training with higher repetitions and getting a humongous "burn" from your training, then you're probably not able to use enough weight or put enough intensity into the exercises you're doing to create the adaptations or affect the muscle fibers that you want. Likewise, when performing plyometric drills, some of the goals are to increase the efficiency of the nervous system, improve rate of force development, and increase muscular recruitment. To accomplish this, the rep range needs to be fairly low so that each repetition can be performed with nearly 100% intensity and power.

Some programs out there use repetitions of 100-500 per exercise! This is training muscular endurance, not muscular strength or power! Any gains made on these programs are made in novice athletes mainly because technical abilities were lacking. If you think training for endurance is all well and dandy realize the average marathon runner has a vertical leap of about 12 inches!! Any high volume endurance training you do will tend to interfere with power development. The body can be trained to be fast, quick, strong, and powerful at the same time, or it can also be trained to have a lot of endurance. It does not do both (gain power and endurance) at the same time very effectively. I realize that athletes do need to maintain a level of conditioning but it needs to be the right kind of conditioning that develops the endurance specific to the sport.

There definitely is a time and place for the right type of conditioning and endurance training but unless you're very out of shape ideally you should not try to train for vertical jump improvements along with endurance at the same time. If you want to train for strength and power in a workout then focus on that. If you want to train for conditioning and endurance don't try to do it with your strength and power program by doing high reps of exercises designed to increase your power. Ideally you should focus on boosting your power and jumping capacities while maintaining general fitness. Once you have your power capacity in place you can then focus more on endurance and conditioning.

More On Specific Endurance

Another reason you don't want to train for endurance in power related events until you first have developed the power you want is because training endurance won't transfer into increased maximal performance, it will only increase the length of time you can maintain a sub-maximal effort. One of the best ways to improve your power endurance is to simply increase your maximum because when your maximum goes up any given percentage of that maximum becomes easier as well. I know that was a mouthful but let me give you an example. If you have a 30-inch vertical jump and you increase that to 40 inches, you will then be able to perform more consecutive jumps at 24 inches then you could before because 24 inches goes from being 80% of your max to 60% of your max. A 60% effort can be maintained with less effort than an 80% effort.

However, performing 100 consecutive 24-inch vertical jumps won't take your vertical jump from 30 inches up to 40 inches, it will only improve the number of lower intensity jumps you can do before fatigue. Would you rather be able to vertical jump 24 inches 100 times in a row or would you rather be able to vertical jump 40 inches one time? I would assume you want the latter so I suggest you train for that while maintaining a minimal level of conditioning.

In much the same way, performing a drill of jumping as high as you can in place 50 times might improve your jumping endurance, but unless you're de-conditioned it won't do much to improve the height you can jump one time. Elite level 100-meter sprinters don't actually develop their speed training over 100 meters. They develop speed training at 10, 30, and 60 meters. After they have built up the necessary speed in these shorter distances they then train to extend that speed out to 100 meters. The point to take home is that you should develop your vertical jump to the max and pay some attention to conditioning but don't do a high volume of endurance training until your power is where you want it to be or until you must prepare yourself for your sporting season.

Now back to how this relates to the topic at hand, the central nervous system. You can get maximum activation of your central nervous system through factors such as concentration, motivation, taking enough rest between sets, and training in the correct repetition and loading bracket without creating the wrong kind of muscular fatigue. With each and every repetition you will also improve muscle coordination and synchronization. This translates into an overall more efficient movement.

Jumping With a Weighted Sled

The next step to manipulating the CNS (central nervous system) is to prevent it from antagonistic muscle contraction and muscle recruitment inhibition. I know that probably sounds complicated but it's really easy to comprehend. An antagonistic muscle is the muscle opposite the one contracting. For example, if you're doing a pulling movement the antagonistic muscles would be the pushing muscles on the

opposite side and vice versa. If you were doing a bicep curl, the antagonistic muscle would be the triceps, which is the muscle on the back of your arm. Normally, when contracting a muscle, some tension is maintained in the antagonist muscle and this decreases the force application of the working muscle. Try this out for yourself. Try to do an arm curl while also contracting your tricep muscle as hard as you can. When you perform a high-speed movement with a lot of force and power your body will exactly that to a certain extent.

What happens in this situation is your master controller (CNS) tries to work against you by "pushing" while you "pull". It's largely a protective mechanism to prevent you from injuring yourself and also occurs because you haven't trained your CNS to relax completely when moving at high speeds. This is like running with a weighted sled attached to you. Any weight you can remove from that sled will instantly make it easier to go the same speed or in the case of the vertical jump, make it easier to go higher. For another simple example of this, tap your hand on a desk as fast as you can for 10 seconds straight. Did you find it difficult to avoid tensing up? If so, that's because you were unable to completely relax in between taps.

Being able to put out a lot of force is very useful but being able to relax completely is just as important for any high- speed movement and the vertical jump certainly qualifies here. In fact, the key characteristic of world-class sprinters is their ability to completely relax between strides. Lower class sprinters will maintain lots of tension in the antagonists yet top sprinters relax completely which enables them to go faster. Training methods such as energy absorption training and reactive methods done at high speed with an emphasis on relaxation can teach your system to eliminate antagonist contraction.

The end result after implementation of these training methods is a very smooth and powerful contraction of the muscles involved and a relaxed flow to the movement. Eventually, when you apply maximum force at high speed the antagonist muscles are coordinated in such a way that they don't contract to oppose the movement, which automatically means increased performance. Have you ever noticed how most of the best jumpers, or athletes in any field, appear to be so relaxed and perform with such ease and grace that they make what they're doing look easy? They leave the ground smooth and relaxed without any unnecessary muscle involvement. This is just one of the effects of an efficient nervous system. Contrast this to the guy with a 15-inch vertical jump who looks like he's about to have a conniption when he jumps!.

Programming Your Master Computer

Now the most important part of CNS manipulation. The nervous system normally prevents you from fully activating all of your muscle motor units in a particular task. Yep, not only can it make things difficult when you want to move effortlessly, it also prevents you from exerting all of your potential force in a given movement!

If you were to take a muscle and hook it up in the laboratory to a special measuring

device you can accurately determine how much force that muscle is potentially capable of exerting. This figure is the definition of absolute strength and is the maximum amount of force you could apply if you were able to voluntarily contract all motor units in a muscle. Potential is big here because it turns out most folks aren't able to use anywhere near the potential force their muscles are capable of exerting. In fact, untrained folks might only be able to voluntarily put out around 50% of their potential absolute force in a given task. Trained athletes with years of experience can approach 85-90%.

The nervous system inhibits you from using all your potential strength in 2 ways. First, exerting all your voluntary force and getting all your muscle motor units turned on requires strong and efficient neural (electrical) signals emanating from the brain and spinal cord. These signal your muscles to turn on and exert force. The more efficiently this process works the more muscle fibers you can fire and the quicker you can turn your muscles off and on. However, the reason your body makes this difficult is because if you were able to voluntarily turn on all your muscle motor units you'd stand a good chance of ripping your muscles right off the tendon! Therefore, the body naturally "protects" or inhibits you from doing this. However, it is possible to condition your body to push this natural inhibition back with proper training and this is why trained athletes are able to use more of their potential ability than sedentary folks. This also partly explains why some small guys are exceptionally strong and powerful, while some large guys are weak.

Second, and this example will be more specific to jumping, eccentric stretching brought on by plyometric activity (which leaping inherently relies on) causes the muscles and tendons throughout your lower body to stretch and quickly store energy in the tendons like a spring. When this energy is released it causes a reflexive, or involuntary contraction that can increase force output more than double what you'd get through voluntary force output. The faster the speed and more forceful the stretch in reactive/plyometric activity the greater the level of force in the subsequent contraction which is why we instinctively use plyometric contractions in just about everything we do (rearing the arm back to throw, dipping down prior to a jump etc).

However, most are not able to fully take advantage of this because the muscle/tendon complex has proprioceptors. The job of a proprioceptor is to monitor the degree of the eccentric stretch and prevent overstretching and injury by basically shutting the muscle down when the stress or stretch is too great. The problem is, sometimes these proprioceptors kick in sooner than you would like and they inhibit you from taking full advantage of your reactive, or plyometric capacity. So, they prevent you from injuring yourself but also prevent you from fully utilizing all of your potential power output.

To illustrate this for yourself perform a simple vertical jump from the floor (down and up) and measure the height you jump. Next, find some aerobics step boxes about 6-8 inches high and stand on one, step off, and as soon as you hit the ground immediately jump as high as you can and again measure the height you jump. The large majority of

you will notice you can jump higher when stepping off the box then you can from the floor. This is because when you step off the box you increase the rate and the force of the eccentric stretch in your lower body muscles and tendons at ground contact - so your muscles responded with a stronger reflexive/reactive contraction, which caused you to jump higher. Notice you didn't have to really try any harder, the added force just kind of came reflexively, which is what plyometric strength is all about.

Next, keep increasing the height of the boxes until you find the point where your jump after ground contact begins to decline. For some this might be 8 inches, for others 15, for others 25 inches or more. Wherever that point may be it signifies the point where the force of the eccentric stretch begins to cause your proprioceptors to kick in and cause muscular inhibition. Fortunately, this can be trained and improved - an increase will translate into increased jumping prowess.

Examples of Superhuman abilities

Under extreme circumstances, such as life and death situations, adrenaline causes the nervous system to send stronger then normal electrical signals to the muscles and proprioceptor inhibition is largely removed. This allows nearly all the muscle motor units to turn on and nearly 100% of one's strength and force potential can be utilized. Have you ever heard stories of 110 lb women lifting cars off of children? Have you ever been chased by the cops, an attack dog, or anything else that scared the living daylights out of you and noticed how much faster you ran!? Have you heard stories of people on PCP or other drugs being able to bust out of straight jackets and handcuffs? These are all good examples of manipulation of the nervous system. Because of the apparent life or death situation, inhibition is removed and all the muscle fibers are able to fire with the outcome being apparent superhuman strength, force, and power. Unfortunately, the people who accomplish these tasks often end up hurting themselves because of what I described above. The muscles are potentially strong enough to rip the tendons right off the bone!

Here's another less dramatic example of this. Have you ever noticed how you can jump quite a bit higher and run faster whenever you're feeling really energetic, fired up, or maybe even anxious? Most players notice they can "get up" better or move faster in a game or even prior to a game when their adrenaline is pumping. This is because the increased adrenaline allows you to fire more muscle then normal and thus produce more force and power. One of the main objectives of this program is to learn to eliminate CNS inhibition without needing an adrenaline surge or life or death situation to do it! Imagine what would happen if you went from using 50% of your force capacity and you suddenly increased that to 100%? The results would be very, very impressive to say the least!

Improving Strength – What will that give you?

The raw force and strength gains you make through a solid strength program can greatly enhance power development alone. Remember again Power=Force x Velocity. After an effective phase of properly designed strength training, even in the absence of additional sports specific activities, your Force part of the equation should go up substantially, and your Velocity should stay the same or possibly even increase. However, your power will increase substantially more if you also focus on methods designed to increase the rate of force development and reactive strength, which allow you to apply your force in a shorter time span and also increase the velocity side of the power equation.

IMPROVING RATE OF FORCE DEVELOPMENT AND VELOCITY

Before I get into describing specific means of improving the rate of force development I'd like to mention again that even when you perform strength training with heavy loads you can also significantly impact your rate of force development as well. A high speed of contraction against a heavy load will not only help accomplish all the processes regarding the nervous system I described above but it will also train your CNS to quickly recruit FT fibers resulting in the best of both worlds - more force and improved rate of force development.

Can I really get both stronger and faster in the weight room?

Again, because of the stereotype that weight training builds muscle bound athletes who can't move, and perhaps because many athletes are still under the influence of old-time coaches who think weight training automatically makes people slow; many people are under the misguided assumption that one can't become both stronger and faster at the same time through weight training. The fact is there are correct and incorrect methods of training. Bodybuilding won't do much for your speed and power but plenty of athletes have been using weights to not only get extremely large and strong but extremely quick and powerful as well. Consider Olympic lifters. Chances are you probably don't know a whole lot about Olympic lifting other then what you see during the Olympic games on television, and even then the networks typically only show the heavier weight classes.

Olympic Lifters and Explosiveness

The Olympic lifts consist of the clean + jerk, and the snatch. In the clean and jerk, the weight is lifted from the ground, to the shoulders (called a clean), and then overhead (the jerk). In the snatch the weight is lifted from the ground all the way overhead in one motion. The Olympic lifts inherently have to be executed quickly and require a good blend of force, speed, and thus power in order to be performed correctly. Because of this, performance in the Olympic lifts correlates quite strongly with other tests of power. In fact, due to the nature of their training, Olympic lifters are some of the most powerful athletes in the world! In a test conducted at the 1968 olympic games the lifters were actually faster then sprinters in a 25 meter dash! Well how about their vertical jumps you might ask? It is well known in the strength and

conditioning community that Olympic lifters consistently have very high vertical jumps relative to their size. It's not uncommon to see lifters weighing nearly 300 lbs. with verticals of 35 +! The same thing can be said for high level shot-putters and throwers. In fact, if you take a true vertical jump from a standstill without any run-up, these folks tend to vertical jump as well or better then any group of athletes. The world record standing broad jump is actually held by a thrower weighing close to 300 lbs! Unfortunately, basketball players aren't anywhere close to this level of explosiveness. The average NBA 1st round draft pick has a standing vertical of something like 28 inches.

Now I'm not going to try and turn anyone into an Olympic lifter and I'm not saying their training is perfect for what you want, but this is just an example to illustrate a point! The point is that if you train properly in the weight room with a program designed to increase your power production you definitely can become both very strong and very explosive at the same time, even without much jump training. When jump training is added to a properly designed resistance program the results are magnified even more.

When you're lifting weights, all you have to do is pay attention to how fast you attempt to lift the weight. There are some movements that can be dangerous if you try to do this, but whenever possible try to control the load during the negative portion and execute the positive portion with as much speed as possible. Doing so will allow your muscular system to adapt to quickly recruiting the fast twitch muscle fibers. If you're lifting a heavy enough load the weight probably won't actually move all that fast but your force application against the resistance should still be as quick as possible. One thing you can do to help achieve this explosive attitude is to maximize your concentration and motivation prior to each set. You don't have to go into a manic rage in the gym or anything but try to get focused up prior to each set of every exercise you do!

Rate of Force Development

So how does rate of force development fit into the picture and why is it so important? You've probably seen the following scenario many times. There are some athletes who are very strong under the iron, with a very large muscle mass, yet be unable to effectively display their "potential" power due to an inability to contract their strong muscles in a very short time. The typical muscle bound athlete comes to mind. Usually when you see someone like this they train for maximal size or maximal strength like a bodybuilder or powerlifter, rather then maximal power like a thrower, Olympic lifter, or jumper.

How Do We Increase Rate of Force Development?

The methods used to increase the rate of force development are numerous. In the weight room there exists a wide variety of lifts designed for this task. Exercises such as weighted jump squats and other explosive lifts that are done with an emphasis on

speed really hone in on the "force development" aspect. As mentioned above, many exercises done in the weight room can increase both maximum levels of strength and rate of force development at the same time, as long as you emphasize speed of contraction.

Outside the weight room certain plyometric type drills and other bodyweight exercises are inherently good at improving your rate of force development. All of these methods have a few things in common. They are inherently explosive and performed with high velocity or speed. The advantage of explosive, high velocity power training is that it trains your nervous system to fire quicker by shortening the time it takes your muscles to contract, especially the fast twitch muscle fibers. Training in this fashion also improves your mind to muscle link giving you better muscular recruitment ability. Strength training by itself stimulates a high recruitment of fast twitch muscle fibers leading to increased levels of force. Explosive and high velocity movements increase the speed at which your muscle fibers can contract. Combine them together in some fashion and you get power improvements across the board.

Plyometrics

No discussion on vertical jump training would be complete without a section on plyometrics. Before we get into discussing various plyometric drills and how they work I'd like to first address their history. Plyometrics is the term now applied to exercises that have their roots in Soviet training methods. This method was originally known as "shock" training and was invented by Yuri Verkhoshansky in the Soviet Union. Interest in this jump training increased during the early 1970s as East European athletes emerged as powers on the world sport scene. As the Eastern bloc countries began to produce superior athletes in such sports as track and field, gymnastics, and weight lifting, the mystique of their success began to center on their training methods, which consisted of plyometric training.

The actual term "Plyometrics" was first coined in 1975 by Fred Wilt, an American track and field coach. Based on Latin origins, plyo + metrics are interpreted to mean "measurable increases". These seemingly exotic exercises were thought to be responsible for the rapid competitiveness and growing superiority of Eastern Europeans in track and field events. Although thought to be secretive and exotic, originally plyometrics consisted of only 2 rather simple exercises, - "depth" jumps and "shock" jumps. A depth jump entails jumping or stepping off of a bench or object and immediately jumping up as high as possible at ground contact. A shock jump is pure energy absorption training and consists of jumping off of a very high object and simply landing and absorbing the impact. After plyometrics were given their now common name, coaches began to lump all types of hopping, jumping, skipping, and bounding drills in with the original plyometrics.

Plyometrics rapidly became known to coaches and athletes as exercises or drills aimed at linking strength with speed of movement to produce power. They became essential to athletes who jumped, lifted, or threw. During the late 1970s and into the '80s, those in other sports also began to see the applicability of these concepts to their own movement activities. Throughout the 1980s, coaches in sports such as volleyball, football, and weight lifting began to use plyometric exercises and drills to enhance their training programs.

So How Do They Work?

Plyometric drills are utilized to bridge the gap between force and explosive power and increase reactive strength. Reactive strength fits in nicely with power development. It is also known as plyometric strength, reversal strength, and elastic strength.

You can think of a reactive movement as a "spring-like" movementt. The drills are performed to develop force by a quick loaded eccentric, or negative contraction. This contraction causes a stretching of the tendons and also increases muscle recruitment. Basically the muscle cells lock up as the tendons stretch. The body stabilizes this negative force, stores this force, and then "releases" this force. The reflex action brought on by the quick stretch allows you to put out a stronger than normal muscular contraction in the opposing direction. Pick up a ball, any ball, and throw it. Now pay attention to what you naturally did without thinking about it. Did you bring your arm back behind your head and pause and then throw it? I would hope not! Chances are you quickly drew your arm back and let it fly. That is a plyometric movement! The quick rearing back of your arm quickly stretched the tendons in your shoulders and built up energy, which allowed you throw harder. Would you have thrown as hard if you brought your arm all the way back, paused for 3-seconds and then released the ball? Definitely Not!

By definition, almost all activities (and certainly all sports) rely to some degree or another on this stretch-shortening cycle, plyometric strength, elastic strength, reactive strength, or reversal strength. Don't let the terminology confuse you, they all mean the same thing! Examples of plyometric activities are walking, running, rope skipping, jumping, and just about any dynamic activity that you can think of (i.e. all of them).

However, I want to differentiate between a plyometric activity (such as walking) and plyometric training. Generally speaking, true plyometric training is very high intensity work like depth jumps (stepping from a box, hitting the ground and exploding) and bounding type exercises that require a strong loading and stretching of the muscle/tendon complex. Even many of the introductory plyometric exercises are not technically plyometric training. They are intended to condition the body for the more intense work to come. True plyometric training involves high intensity activity.

Plyometric action is much like a rubber band in that, if you stretch a rubber band quickly, it will spring back faster due to storing potential energy. Stretching the elastic muscle and tendon components produces elastic potential energy similar to that of a

loaded spring. When the muscle is stretched rapidly the muscle-tendon complex stores a portion of the load force in the form of potential energy. The recovery of that stored energy occurs during the concentric or upward phase. To take advantage of the SSC reflex, the concentric (positive) muscle action must immediately follow the stretching. When you jump, a great amount of force is gathered as you absorb the negative (downward) forces and gather this energy to propel your body upward. The body must be able to quickly stabilize and store the negative (downward) forces and then flex and extend to leave the ground.

A muscle that is rapidly stretched before a contraction will also contract faster and more forcefully. This is why the best leapers tend to move "down" into their countermovement the fastest and poor leapers move down slower.

AMORTIZATION PHASE

Plyometric training also works by decreasing your ground contact times when you run or jump. The ground contact time is also known as the amortization phase. The amortization phase refers to the time between your foot contacting the ground and being able to leave again (i.e. the time in between the muscle stretching and being able to contract again). The amortization phase is in essence the time spent paying off the time spent on the ground. Analysis of great jumpers and sprinters shows that they spend very little time on the ground during their activities. Thus, by decreasing this time by specific training you should be able to improve jumping and sprinting skills.

Plyometrics can be broken down into several categories. All the various categories are important and have their place in a program. These categories include:

1. **Light reactive exercises**- such as jump rope, toe and ankle bounces, side- to-side line jumps, and low stair jumps. These exercises are characterized by relaxation and lack of "strain".

2. **Moderate standing "power" or "up" variety exercises**- these exercises are characterized by less reactivity or stretch and rather a focus on applying max force from more of a standstill either vertically or horizontally. These, along with lighter load/high speed weight training are great for improving the rate of force development. They include for example: on-box jumps (jumping on a box from the ground), standing broad jumps, 1-leg step-up jumps and un-weighted squat jumps. They develop the ability to apply max force instantaneously without a large involvement of the reflexive stretch shortening cycle.

3. **Moderate reactive exercises**- these are true plyometric exercises, but of the less intense variety. They include low-box depth jumps (jumping off a box impacting the ground, absorbing the energy, and immediately transferring that energy into an explosive jump, lateral cone jumps, jumps over hurdles and a variety of other exercises.

4. **High intensity reactive exercises**- generally these are the original plyometric exercises depth jumps and drop jumps. They can also include other intense methods such as high barrier jumps and other various hybrids.

5. **Short response reactive exercises**- these exercises are characterized by a very short amortization (ground contact) phase. Most of them tend to be 1-legged variety jumps. Examples include: power skipping, one-leg bounding, single leg speed hops, 1-legged speed box jump, and 1-legged jumps for height or distance.

Furthermore, plyometric exercises can be broken down into 3 simple methods of performance. These include:

1. **Jumps**- land with both feet
2. **Hops**- done with single leg
3. **Bounds**- take off on one foot land on the other

The good thing about plyometric training is that all the individual components of the reactive stretch-shortening cycle are trainable and respond to training.

Over time, plyometric training results in the following:

1. Recruitment of most motor units and their corresponding muscle fibers.
2. Development of explosive power.
3. Development of the nervous system so it will react with maximum speed to the stretching of the muscle developing the ability to contract rapidly with maximum force, thus leading to better plyometric strength.

4. An increase in rate of force development
5. A shift in muscular fiber type from type I (slow contracting), into type IIA (fast contracting), and type IIA into type IIB (fastest contracting).(Paddon-Jones 2001)
6. Increase in plyometric or reactive strength.
7. An increase in the proficiency of the central nervous system (CNS)
8. An increase in the ability to transform eccentric force absorption into concentric force output.

It is important to note that plyometrics, especially more intense methods such as depth jumps and shock jumps, can fatigue the nervous system to a large degree and are best used within an intelligent plan. The nervous system actually takes about 5 times longer to recover then the muscular system. Plyometrics increase muscle recruitment but the nervous system still has to fire to recruit those muscles and it is like a battery that needs recharging.

The fatigue of the nervous system can be illustrated like this. Imagine going for 3 whole days without any sleep. Even if you were completely inactive during those 3 days and hadn't used your muscles at all, you'd still likely be very weak and tired. Remember that your CNS is like your computer or central controller and needs recharging once it's worn down. Plyometrics may not create much muscle burn or soreness, but because of the way they involve the nervous system, intense plyometric drills can actually take as long or longer to recover from then any other training method.

The problem with many athletes and coaches is that they don't feel that intense plyometric drills are all that difficult. After all, getting up on a box and jumping down 20 times may not be considered as difficult to some people as going out and running a mile! Because of this, many people prescribe and/or do way too much volume in depth and/or shock jumps and young athletes without much of a training base to begin with do way too much volume of them and wonder why they don't see much improvement. So make sure you pay attention to the total amount of intense plyometric training you do. The programs are designed to give you enough plyometric volume without leading to overtraining, but if in doubt do less plyometric training and never more.

Next, let's take a look at the guidelines for the prescription of high intensity plyometric drills.

Guidelines when performing depth jumps:

1.The ground contact (amortization) phase should be short enough to avoid losing the elastic energy produced but long enough to allow for the shock stretching to occur. To maximize the training effect, you should not spend more than .5 seconds on the floor and less than .2 seconds is much better. It's best when doing plyometrics to think of the ground as a hot skillet. If you stay down too long your feet will get burned.

Plyometrics are very effective, but when increasing maximum power is your goal, they should be done with concentration and intensity on every repetition and not in a fatigued state or in a high volume per set fashion. When performance begins to decrease during a set it is time to stop. Much like strength training involving higher repetition sets, doing depth jumps in a high volume fashion dampens recruitment of the FT fibers which is essentially just wasted time unless you are training for endurance.

2. The height of the drop should be regulated so that the heels don't touch the ground during the landing phase. If they do the height of the drop is too high. A height varying between 18-28 inches appears to be ideal for most strength and power athletes with up to 45-50 inches for advanced athletes. The distance that you jump away from the box should be approximately the same distance as the height of the box. So if you're jumping off a 36-inch box you should land approximately 36 inches out. (Zatsiorsky)

3. Depth jumps have a very powerful training effect so the volume of work should be low: no more than 4 sets of 10 repetitions (or 40 total jumps spread over more sets), 2-3 times per week for advanced athletes and 3 sets of 5-8 repetitions (or 15-24 total jumps spread over more sets), 1-2 times per week for lower classes of athletes

4. Because of the very powerful training effect of depth jumping, it is best to avoid performing this type of training constantly throughout the year. For consistent gains these blocks should only be used when a rapid rise in power and reactive strength is needed. Every training method, regardless of how effective it is, will lose its effectiveness over time. Plyometric training is no different. If you use it year-round there comes a point where you will get no added benefits from it. However by using shorter blocks of training of no more then a few weeks, you can give a quick boost to your performance and everytime that you use them you will get a substantial boost.

Guidelines for "shock" or depth drops or jumps:

Remember a shock jump is also called a depth drop and is done when you step off a box and just try to "stick" the landing without jumping back up. The landing portion of a depth jump has a very high training effect when it comes to improving explosive force output and even strength. During the landing portion the stress is at its highest as all the energy accumulated during the fall is transformed into muscle loading (energy absorption training). With each foot contact in a sprint the legs have to absorb forces equivalent to around 5-6 times bodyweight. With a shock jump the force upon impact can exceed 10 times bodyweight. Specific training in this fashion can greatly increase your capacity to absorb energy. If you are weak in the eccentric (landing) portion of the depth jump what will happen? The amortization phase or coupling time (time it takes you to switch from landing to jumping) will be very long and the resulting jumping capacity will be low.

Before you can put force out in a plyometric movement you have to be able to take force in and gather it. The more force you're able to efficiently take in and store, the shorter your amortization phase will tend to be and the more force you'll put out, thus the higher your subsequent jump.

Depth jumps do increase absorption strength but shock drops really allow you to zero in on this portion of a plyometric movement. So, when utilizing shock jumps you will just execute the "landing" portion of a depth jump and practice sticking the landing without allowing your heels to hit the ground. You can vary the position as well to zero in on different muscle groups. Sometimes you may land with straight legs, sometimes you will land in a squat, and sometimes you will land in a lunge. Regardless of the performance, you will immediately break the downward movement as soon as you hit the ground. You can also use higher drop heights (up to 30-50 inches). Just make sure you always pay attention to the point at which force created starts to overcome force absorbed. When you land with a loud "thud", you're no longer absorbing the energy efficiently. Like depth jumps, when executing a drop jump you should land "away" from the box about the same distance as the height of the box.

Guidelines for "other" plyometric drills:

Other plyometric drills include various hops, bounds, and jumps that don't have the same extreme landing forces of depth jumps or shock jumps. Athletes of all ages and classifications can do some form of these drills and they are very effective to use to build an athlete up to being able to tolerate a cycle of more advanced plyometric depth jump or shock jump training. The intensity and volume can be gradually built up, but just like the more intense versions of plyometrics, one must pay attention to recovery and volume. I like to do a higher volume of these drills in between cycles of more intense depth jumps and plyometrics and a lower volume during the cycles of depth jumps and shock jumps. A sample 12-week cycle might look something like this:

Week 1-3: Higher volume lower and moderate intensity jump training (i.e. single and double leg jumps, hops, skips – depth jumps up to 18 inches)

Week 4-6: High volume weights + low volume low intensity jump training

Week 7-9: Moderate volume accelerated weight training (jump squats, speed pulls) + low volume shock jumps (depth drops)

Week 10-12: Low volume general weights + high volume depth jumps

In this way one can progress consistently and get the most from their training without burning out on any particular training method. The workouts I've designed provide plenty of variety so that people never have to worry about performing the same exercise over and over again!

Is a certain level of strength necessary before engaging in plyometrics?

A certain level of strength is necessary for optimal performance in plyometric movements and added strength can also bring enhanced reactive strength. To explain this, let's use the example of performing a depth jump. During a depth jump you stand on a box or bench, drop off, and at ground contact you absorb the impact, your muscle lock up, your tendons stretch and gather energy, then you reverse direction and jump up. Now, whenever you step off the box gravity is quickly bringing you down to the ground. Upon immediate impact your muscles are trying to lock up and stabilize. At that point they are subjected to tension and forces up to 9 times or more your bodyweight. If you do not have enough strength to absorb these forces your body will do one of 2 things:

1. It will shut down the stretch reflex to avoid injury
2. You will take too long absorbing the forces to utilize the stretch shortening response.

The greater your strength the more force you'll be able to gather and put out and the quicker you'll be able to do it. A minimal level of muscular strength is necessary to absorb the high forces.

So what is the minimal amount of strength I need?

Many people ask this question and the entire topic has really created a lot of confusion in strength and conditioning community. Many coaches say that athletes should be able to squat at least 1.5 times their bodyweight before performing any plyometric training. This is both true and false. Remember that from their eastern roots originally plyometrics consisted of only 2 exercises, depth jumps and "shock" jumps. Remember that a depth jump consists of stepping off of a bench or object and upon hitting the ground immediately jumping back up. A shock jump consists of stepping off of a very high object and simply landing and absorbing the impact. Both of these exercises were also used for heights of around 3 feet or more. It is true that for intense exercises like these an athlete needs to have strength levels sufficient to absorb the high forces without injury. Squatting 1.5 bodyweight would be a minimal number for these types of high intensity exercises.

The problem is, after plyometrics were brought to the USA and given their now common name, coaches began to lump all types of hopping, jumping, skipping, and bounding drills in with them. In the process, many of the general strength recommendations such as being able to squat 1.5 x bodyweight given for "real" plyometrics ie.- depth jumps and shock drops, were also carried over to include all plyometric drills. Although having good strength levels is definitely a positive thing it is not necessary to squat 1.5 x your bodyweight to partake in light to moderate plyometric drills. These include just about all kinds of jumps, hops and bounds. In fact, pretty much everything except for high depth jumps and shock jumps. If you think about it, life and play are plyometric activities! Next time you go by a

playground have a look at the kids jumping around off and on playground equipment and such. They are putting a lot of stress on their bodies and surely not able to squat 1.5 x bodyweight yet how often do they get injured? Not very often!

The bottom line is that improving your strength will allow you to get more out of the plyometric activities that you do and will also allow you to do more intense variations of them. So, when it comes to plyometric activity, strength is definitely necessary and gives you an advantage.

Now you probably know more than 99% of all people when it comes to the science of the vertical jump. Comprehending power, force, and velocity is quite simple but let's do a quick review!

The vertical jump is a measure of power.

Power= Force x Velocity

Force- is increased by high-tension movements such as moderately heavy and heavy weight training

Velocity- is increased by lighter and faster weight training movements to improve the rate of force development, and by plyometric type movements to improve both rate of force development, and reactive strength.

To keep it simple all you need to know for a spectacular vertical jump is that you need:

1. Force or Strength
2. Rate of Force Development
3. Plyometric or Reactive Strength

High Tension vs High speed movements

To better understand the reasoning for the various training methods and their focus think of it this way. Methods that improve maximal force tend to be high tension/long duration movements. That is, the weights are generally heavy, our force output is high and the muscle fibers are subjected to a fairly long duration of tension due to the load. When you execute a maximal squat it is impossible to move the weight at a lightning rate of speed no matter how hard and how fast you push. The muscle cells are under tension for a longer period of time, which improves their maximal force capacities.

In contrast, an exercise such as a jump squat is a high tension/low duration movement. The force output is high, but because of the reduced loading and the speed at which the exercise occurs, the duration of this tension is much shorter. This doesn't do a whole lot to improve maximal force output yet it does do a great job at improving

maximal rate of force development or the speed at which you can build up to maximum force!

Now consider a depth jump. When stepping off a high box and impacting the ground at the moment of impact the force output is very, very high. In fact, the amount of force is up to 9 times your bodyweight or more! At first glance you might think this may be good for increasing maximal force production and it does provide value in this regard, yet the duration is also very, very short. The depth jump, due to the quick stretching of the muscles and tendons and subsequent powerful contraction, trains the stretch-shortening cycle. This is something that heavy load weight training and even lighter load/high speed power training do not do quite as well. Likewise, the depth-jump, although great for training the stretch shortening cycle and reactive strength, is not as good as weight training at boosting maximal force capacity. Also, due to its reliance on the quick stretch-shortening cycle, which is largely an involuntary reaction, this training method is not as good as some others at improving the rate of force development. Pure rate of force development training is purely voluntary and "cheating" bouncing or trying to get a reflexive reaction actually takes away from its training effect.

Now, to see how these training methods all fit together if you were to take out a sheet of paper and to the far left hand side write "Squat", and to the far right hand side write "Depth-Jump", those exercises are at the 2 extremes for power training. The squat for pure voluntary force and the depth jump for involuntary force. They are both necessary but do not train the same qualities. One is high tension/long duration and one is high tension/short duration. One is dependent on muscular strength and one is more dependent on tendon strength.

Next, if we were to progress from left to right from high tension/long duration to high tension/short duration there are a lot of middle ground training techniques to fill in the big gap between squats and depth jumps. These would include for example: squats progressing to lighter weight explosive squats, weighted jump squats, 1 and 2-legged skips, hops, and jumps, jumping on or over objects, bounding activities, and finally, drop jumps and depth jumps.

The following table categorizes the different training methods as either targeting maximum force, rate of force development, or stretch-shortening cycle/reactive strength.

Maximum Force and Strength (high tension-long duration)	**Rate of Force Development (high tension-short duration)**	**Reactive Strength (very high tension-very short duration)**
Any strength training movement using 75% or more max weight in that particular movement	Any strength training movement using less than 60% maximum weight done with maximum speed and force along with little if any prior countermovement.	Any rhythmic exercise heavily involving the stretch-shortening cycle
Squats	Weighted jump Squats and speed Squats – especially those done with a pause before the contraction	Jumps back and forth over obstacle
Deadlifts	Stationary "up" and "out" variety plyometrics	Hurdle jumps
Lunges	On-box jumps	Depth jumps
Romanian Deadlifts	Standing broad jumps	Shock jumps (depth drops)
Glute-Ham raise	1-leg step up jumps	One leg speed hops
Leg-curl	Un-weighted jump squats	Jumping off of 1 leg for height
Calf raise	Vertical jump from dead stop crouched position	Rhythmic rim jumps

Of course, no single exercise is usually going to be purely a maximum strength, rate of force development, or reactive strength exercise. With most exercise variations there is generally going to be some overlap between the different qualities. However, I wanted to make the point that certain exercises do a better job at targeting different qualities.

The following table summarizes the effects different types of training have on different strength qualities.

Strength Quality	**Heavy Weight Training**	**Lighter load explosive weight training (jump squats) and other explosive bodyweight exercises**	**Plyometric drills like shock jumps and depth jumps**
Maximum Strength	Excellent	Fair	Fair to Good
Maximum Rate of Force	Good	Excellent	Fair

Development			
Stretch-shortening cycle/Reactive strength	Poor	Good	Excellent
Jumping skill and muscle coordination	Poor	Good	Excellent

You know you need optimal levels of all the 3 qualities (maximum strength, rate of force development, and plyometric strength) to really improve your vertical. This is also verified by scientific studies that show a combination of the above training methods to provide much better results then either method alone. Check out the results from a 6-week study:

Effect of Squats and Plyometrics on Vertical Jump

EXERCISE TYPE	**VERTICAL JUMP INCREASE**
Squats	3.30 cm
Plyometrics	3.81 cm
Squats + Plyometrics	10.67 cm

Those results show those who performed both strength training (squats) and reactive training (plyometrics) gained more then 3 times the amount on their vertical jump training then either method alone!

Simple enough!

Identifying Individual Strengths and Weaknesses

Obviously, the most effective type of training for a given athlete may depend on which component of strength is most deficient for that person. One might be deficient in strength yet have very well developed rate of force development. Another might be deficient in reactive ability yet have very well developed strength. Testing of these components can help define individual needs. Targeting your weakness will produce the greatest overall gains.

One question you might be asking by now, especially if you're quite intelligent and dedicated as many readers who purchase this program tend to be, (Hey dummies don't normally invest in improving themselves!) is, "well how do I know if I should train more for increasing my max strength or for increasing my rate of force development and reactive strength? Do I need to lift weights for more force? Do plyometrics? Improve rate of force development? Never Fear!! By the time we're done you will know <u>exactly</u> what type of training will be most effective for <u>you</u> so all the guesswork

will be eliminated. If you're one of those guys who's always dreamed of flying above the rim throwing down on Shaquille O'Neal, or even just getting above the rim for the first time, you probably can't wait to see the training prescription just for you. But before we get you hopping off boxes, throwing a ton of iron around, and bounding across the gym, there are just a few more considerations that need to be addressed.

1. **Body composition** – You probably already know this, but if you want to fly, you need to keep your body-fat levels in check. Excess body-fat is going to do nothing but glue you to the ground. Don't try to get too lean, as doing so will probably leave you too weak to perform optimally, but do pay attention to your body composition. If you're above 10% body-fat you're going to also need to pay attention to diet and possibly do some general fitness work as well throughout the program. Here's a way to determine your body-fat percentage.

    A. First determine your waist measurement. The best time to do this is first thing in the morning. Get a cloth measuring tape and measure your waist just around your bellybutton. Don't suck in or push your stomach out, just relax it.
    B. Find your height in the left-hand column of the table below and find your weight at the top of the chart.
    C. Locate where your height and weight measures intersect. This location on the table indicates the average waist measurement of someone who is 10 percent body-fat.
    D. If the waist measurement of where your height and weight intersect equals the same that is seen on the table you are approximately 10 percent body-fat. Therefore, a player who is six feet tall and weight 190 pounds with a 34-inch waist is approximately 10 percent body-fat (19 pounds of fat and 171 pounds of lean muscle mass). If your waist measurement is lower, then you are below 10 percent body-fat. A higher waist measurement means you are above 10 percent body-fat. If you are above 10 percent follow sound nutritional practices until you get down to 10-percent or less.

WEIGHT

Height	110	120	130	140	150	160	170	180	190	200	210	220	230	240
5'2-5'4	29.5	30	30.5	31	32	32.5	33.5	34	34.5	35	36	36.5	37	37.5
5'5-5'7		30	30.5	31.5	32	32.5	33	34	34.5	35	36	36.5	37	37.5
5'8-5'9			30.5	31	32	32.5	33	34	34.5	35	35.5	36	37	37.5
5'10-5'11				31	31.5	32	33	33.5	34	34.5	35.5	36	36.5	37.5
6'0-6'1					31.5	32	32.5	33	34	34.5	35	36	36.5	37
6'2-6'3						32	32.5	33	33.5	34.5	35	35.5	36	37
6'4-6'6							32.5	33	33.5	34	34.5	35.5	36	36.5
6'7-6'9								33	33.5	34	34.5	35.5	36	36.5

2. **Training experience –** The less advanced you are the more basic your program should be. Don't make the mistake of starting out with an advanced program if you haven't built your training foundation. Doing so will likely cause you to overtrain and leave you weaker and less explosive. If you are relatively new to strength training or plyometrics, you'll want to first complete the more basic programs, regardless of your current level of explosiveness. You'll make superior progress on the basic programs and, by developing your foundation you'll be able to get more out of the advanced programs when you finally do use them.

3. **Initial strength levels –** Regardless of what some of the following tests may indicate, if you haven't built up a necessary strength base then it will be pointless to dive into intermediate and advanced plyometric drills. For this reason, one of the basic programs provides an initial phase with the focus on general strength and muscular development. One of the ultimate goals is to get your back squat and deadlift up to 1.5-2 times your body weight. If you don't like or want to lift weights or don't have access to weights I've also included a program using bodyweight exercises that will also allow you to boost your strength. If you've read this far and are **STILL** not convinced of the value of strength training I've also included programs utilizing only plyometric and other bodyweight drills. Now you **COULD** go ahead and jump in and do a more advanced plyometrics program, but you probably won't get the full benefit or could possibly injure yourself. If you choose to do so anyway I'll go ahead and admit that you'll probably get superior results anyway, but you have been warned in advance!!

If you dedicate yourself to the program and follow all the tips that I offer by the end of this program, you will be stronger, bigger, faster and throwing down over Shaquille O'Neal. Ok, not the Shaq part, but maybe Shawn Bradley! Before you can throw down a dunk, you need to understand how to Jump! Ok, that was a joke! Everyone knows how to jump right? Of course they do, but have you ever wondered why people not only have different heights of their jump but also different styles of jumping? I've always found the topic of individual response and variety to training a very fascinating topic and this is what I've found.

Individual Differences

If there's one thing I learned over the years working with many individuals in athletic programs and observing thousands more it's that people have individual differences that determine what type of training routine will work best for them.

These differences range from size, strength, body structure, limb lengths, fast twitch fiber ratio, mind to muscle connections, and variable performance in tasks like lifting vs jumping. Factors such as these will predictably determine what type of program an individual does or doesn't respond to.

All these individual differences go into consideration when determining what type of methods are going to work best for you. Unfortunately, not all athletes will respond alike to a particular training routine. A specific exercise or type of exercise that may produce superior results for one individual may only produce marginal results or inferior results for another individual.

One example is an athlete with insufficient strength might experience great results from high-tension/high load exercises like the squat, while another athlete who already has sufficient strength but lacks rate of force development and reactive strength will likely find plyometrics and loaded acceleration methods work better for him. So there's really no magic bullet for everyone and anyone.

Furthermore, an athlete may find that a training method that doesn't produce good results initially may produce excellent results at a future time as he gains strength, skill, coordination, or speed. Some training methods are good for a quick burst of improvement but over-relying on them will actually cause regression. Some exercises will plateau in their effectiveness very quickly while others should be consistent staples in the training of anyone desiring consistent progress - Other popular training methods or gimmicks should be chunked out the window.

Taking a Look At The 2 Different Types of Leapers

There are 2 dominant types of leapers with most people possessing a tendency towards one or the other. The first type I'll cover is the strength jumper.

The strength jumper tends to rely more pure strength and explosive ability to get up in the air. He tends to look a little less "springy" and a lot more "powerful" when he jumps. He may even appear and sound like he's tearing holes through the floor when he takes off! When choosing his jumping style, he'll definitely tend to do best jumping off 2 feet and likely feel quite horrid jumping off of 1. He'll also tend to use a deeper knee bend and may also have physical characteristics like thicker muscles and joints. He will tend to have natural levels of "strength" that are greater then his natural levels of "bounce", or reactive ability.

At the extreme end of this group are athletes like olympic lifters and throwers. Many of these guys have spectacular vertical jumps along with spectacular rate of force development. They can exhibit their impressive power from a virtual standstill, but you won't see them dunking from the free throw line or winning any high jump medals.

Now realize that not all strength jumpers are strong or can jump, it's just that their body structure, muscle-tendon lengths etc. will naturally tend to make this their dominant style when they do begin working specifically for vertical jump improvement. Some people are "strength" jumpers but don't know it yet because they may not yet have any strength. Having said that, as long as this style of jumper has his strength levels up to par, he'll make further gains using plyometric and accelerative

methods which, when coupled with his strength, will make him even more explosive and smoothen out his rough style. At the upper levels of sports, natural "strength" jumpers also learn to become smooth and graceful as well. Think for a minute about some of your favorite dunkers and I'm sure you can identify a few that fall into this group.

The 2nd type of leaper is the elastic jumper.

The elastic jumper, also known as the reactive, elastic, or plyometric jumper, tends to naturally be more fluid and often appears to take off effortlessly into the air when he jumps. He just looks bouncy. Most of the time, he will be gifted in the structural department with long legs, long achilles tendons, and small joints. He also tends to naturally be able to get up higher jumping off of one leg with a running start then he will be with a short 2-legged take-off or from a standstill. His levels of strength may often seem inconsistent with his performance and he probably won't be turning many heads in the weight room. The elite level high-jumper or long jumper are both excellent illustrations of extreme elastic jumpers.

The reasons the elastic jumpers tend to excel at this style of jump are due mainly to structure (length of the bones, muscles, tendons etc.), but also muscle fiber considerations. They naturally tend to rely more on the action of the stretch-reflex and involuntary plyometric ability. In contrast to the strength jumpers, over time at the upper levels, elastic jumpers learn and train to become more like strength jumpers. They do this by increasing their pure strength and voluntary rate of force development. Since the elastic jumper is naturally bouncy and gifted in the plyometric department, it usually doesn't require as much focus in his training. Michael Jordan is a good example of an athlete who was naturally an elastic jumper but who also learned to become an excellent "strength" jumper.

In addition, most will favor a bilateral 2-legged takeoff if they rely more on their strength because one can obviously apply more muscular force with 2 legs than with one.

Those who favor a 1-legged take-off do so either because their natural structure and build favors the quick reflexive rubber band type action in the tendons rather then pure voluntary explosive strength,- or because they don't have enough strength or aren't yet able to apply their strength quickly enough (rate of force development) to execute a powerful 2-legged take-off. This is why some people with sub-par jumping ability will gravitate towards this style.

Different Means - Same Result

To explore this a little deeper, jumping is inherently plyometric and regardless of your style of jump (1-leg or 2), there is still a process of stretching, stabilization, and reaction in the tendons and musculature of the lower body as you plant to take off. No matter what your dominant qualities are, you can both improve and learn to use your

plyometric ability optimally, but there are differences in how you might go about doing it and the qualities required.

The plyometric/reflexive/reactive/ or elastic contribution to jumping can be divided into two categories, long and short response reactivity. Recall from the plyometrics chapter, as you plant to jump, the brief time you spend changing direction as you're on the ground just before the take-off is called the amortization phase.

When executing a jump with a 2-legged takeoff the amortization phase is around .250 seconds or greater which, when it comes to plyometrics, can be considered long. We can call this longer response reactive ability because the ground contact times are fairly long.

When leaping off of one foot the amortization phase is shorter than .250 seconds and generally closer to .100 seconds. We can call this short response reactive ability because the ground contact times are shorter.

Some people, especially strength jumpers, tend to excel more at the 1st, longer ground contact type of jump; whereas elastic jumpers tend to naturally excel at the 2nd type. This is due to the fact that the longer the ground contact times are, the more voluntary strength tends to be involved - A jump off of 2 feet with a longer amortization phase allows one more time to voluntarily apply force. The shorter the amortization phase and ground contact times are, the more that natural structure, muscle tendon lengths, and speed are going to be dominant. These rely more on involuntary rubber band like action rather than strength.

An example of a plyometric exercise that would improve longer response plyometric ability is a simple depth jump.

An example of a plyometric exercise that would improve short response plyometric ability is a running high jump or full speed sprint.

Both long and short response reactive ability rely on a base of strength in order to add stability, absorb the eccentric forces created when planting, and give an athlete a bigger base of potential force ability to take advantage of.

Muscular Contributions To Each Style

It's also worth mentioning that the muscular contributions to a uni-lateral (single leg) takeoff vs a bi-lateral (2 legged) take off are different. Both of them rely on the muscles of the glutes, hamstrings, quadriceps, and calves, yet the contribution that each muscle group provides changes depending on the style of jump. The unilateral jump relies much more on the glutes, hamstrings, and calves with the quadriceps providing a lesser role. The bilateral jump relies on the quadriceps musculature for up to 50% or more of the power output. The glutes and hamstrings are inherently fast twitch muscles and tend to be more efficient then the quadriceps when contracting at

very high speeds such as those that occur in a unilateral take off. The quadriceps tend to be more efficient when contracting a little slower.

To illustrate how 2 people can accomplish the same task via different strength qualities an athlete who is at an elite level utilizing the short amortization phase stretch shortening cycle (1-foot jump) like a higher jumper, long jumper or someone like Brent Barry, will not necessarily be proficient in performance of the other type of jump (2-foot jump) and vice-versa.

It used to be in the NBA most all of the good dunkers were unilateral 1-foot dominant jumpers. If you ever check out some of the older NBA slam-dunk contests that run at 3:00 a.m. on ESPN classic you'll see this! Back then, because of the lack of effective training, the thought was that there wasn't much you could do about increasing the vertical jump and the guys who were good at it were naturally good at it. Nowadays, however, take a look at the best dunkers and you'll notice the 2-foot jumpers dominate. This is in large part directly due to the influence of strength training, which really has a large impact on the 2-foot jump and allows one to take advantage of their voluntary explosive strength, which is much easier developed and under less genetic influence than speed and short response reactive ability (amortization phase of around ~.100 seconds) So just because you may naturally be slow, weak, and not blessed with a great jumping structure doesn't mean you have to stay ground bound because the *sky is the limit!*

Although raw speed of muscular contraction and short response reactive ability is under quite a bit of genetic control and in large part determines performance in movements like the high jump and long jump; Anyone and everyone can dramatically improve their explosive strength and longer response reactive ability, which can dramatically impact the vertical jump.

Can You Switch Styles?

So what if you're a 2-legged jumper or a 1-legged jumper and decide you want to switch styles, is this possible? Yeah, sure you can switch from being a 1-foot jumper to being a 2-legged jumper but it may take a lot of practice at the particular style you're less gifted in. The 2 types don't always share a direct correlation. That is, you could for example really increase your overall 2 legged jumping abilities while at the same time not see your 1-legged jump increase much and vice versa. This is in large part due to the muscular considerations I mentioned above.

To switch from being a good 1-legged jumper to 2 legged jumper you'll have to work on strength and explosiveness, particularly in squatting type movements, along with lots of practice with the 2-legged jump.

To switch from being a good 2-legged jumper to a 1-legged jumper you will really have to bring up the ability of your glutes, hamstrings, and calves to absorb and put out energy at high speeds.

One-legged jumpers who are really good at it (high jumpers, long jumpers and some ball players) probably do have a genetic advantage in body structure and speed of contraction in the tendons, connective tissue of the lower body that allows them to be good at it naturally. A few are good at both.

Obviously, all leaping action is a combination of both general strength which is enhanced by movements like the squat, and reactive strength which is enhanced by various plyometric type exercises. The best leapers tend to have both but to varying degrees. Most of the time, regardless of structure or dominant jumping style, an individual will be more gifted towards one side or the other; ie either strength or reactivity, so his optimal training program should have him focusing on his weak points while maintaining his strengths. Barring injury, with this approach it's about impossible for improvement to ever plateau.

MORE INDIVIDUALITY

Now imagine if we were to take someone who is naturally as strong as an ox and an excellent strength jumper and we put him on a program consisting of mainly weight-room work with little plyometric training. Chances are, his plyometric ability is his limiting factor in furthering his leaping ability. Because he already has well-developed strength, explosive, strength and rate of force development, a training program focused on those methods probably isn't going to bring about much improvement for him.

Now, say on the other hand, we have someone with good natural reactive ability and poor strength levels and we put him on a high volume of plyometrics with little strength and weight-room work. Chances are he won't improve much either due to the fact that his progress is being limited by his strength.

How Body Structure Influences Expression of Strength

Your performance in the vertical jump and the type of training you respond to will also be influenced quite significantly by the way you are built. We can classify people as either long limbed, termed brachiomorphs, or short limbed, termed dolicomorphs. In weight-lifting, long-limbed individuals are prone to thinking that they're genetically disadvantaged. But are they really? Depends on the sport or movement. Long-levered athletes can express their strength much more successfully on the playing field than in the weight room. For example, Michael Jordan at one time had a startling vertical jump and was very strong, yet when compared to a person his same weight and a foot shorter he has a large disadvantage in a parallel squat and I doubt if you would ever see him setting any lifting records. When you're 6'6", bending the legs to parallel is a *long* way down!

At the same time, those in sport often say that those with short limbs are cursed on the field and, while their long limbed counterparts would appear to have an advantage, the short limbs curse is definitely not a rule. If anything, those with short limbs tend have an advantage during the beginning phase of a movement. Nobody ever accused former

world record sprinters Maurice Greene or Kelli White of being long limbed, yet it didn't seem to hold them back any. It also didn't hold back guys like Dante Hall, Barry Sanders, Mugsy Bogues, Spud Webb, as well as any and every Olympic gymnast.

In some sports, such as weightlifting, athletes with short limbs will have an advantage over those who possess long limbs, because the weight is moved through a shorter distance. On the other hand, if an athlete requires a long powerful stroke, such as in swimming, canoeing, sprinting, jumping, or rowing, - then a longer lever, provided it is accompanied by the muscular power to propel it, has an advantage in these types of sports because of the speed those longer limbs can generate at the end of their range of motion. The same point can be made in other sports where hitting or throwing are important. For example, speed in a tennis serve, volleyball spike, or a baseball pitch will all be higher for long-levered athletes as long as they have enough muscle power to rotate the longer limbs.

TENDONS LIKE A KANGAROO

By the same token, many athletes who can jump high and/or run fast have physical characteristics such as long lower legs, high calves and long Achilles tendons. The length of the achilles tendon gives them a leverage advantage and enhances plyometric ability because it acts like a long rubber band. If you take 2 rubber bands of equal strength the longer one will fly further. Recall that in a plyometric movement the muscles and tendons are stretched and energy is stored and released in greater quantities. Having long tendons in the lower leg can enhance this entire process. The achilles tendon is amazing at storing elastic energy and giving it back to you; it's an adaptation to make activities like walking and running more efficient. In the animal kingdom kangaroos have the longest achilles tendons and are also the best leapers. They can literally bounce around all day over 10 foot fences with hardly any effort. This doesn't at all mean that if you don't have long legs and tendons that you won't be able to jump. It just means that your leaping ability will likely be naturally more dependent on pure strength and your reactive strength will come less easy. You'll probably be excellent at demonstrating your explosive power from a virtual standstill as well. Likewise, if you have long legs and tendons, - strength and the ability to demonstrate that strength in the weight room or jump from a pure standstill probably won't come as easy for you, yet being able to bounce around like a kangaroo, running at top speed, high jumping, long jumping and overall just demonstrating good reactive ability will.

Since there is obviously nothing you can do to change your body structure once you're done growing besides adding muscle (despite what some people may want to sell you), the only thing you can do is work with what you have and train to maximize your natural attributes so that you can perform to the best of YOUR ability!

Testing and Program Design

Obviously you now know the importance of having good levels of strength, rate of force development, and well-developed reactive ability. If we separate the 3 strength categories and look at them independently most everyone will have one category that needs a bit more work then the other. For the tough guy who is already squatting 3 times his bodyweight it's obvious he's already strong enough, so he will immediately move to a program focused more on rate of force development and reactive strength training. For the rail thin guy that crumbles when he looks at ½ his body weight on the squat rack, it's definitely time for strength training 101 with limited plyometric training. But for the rest of us that are somewhere in the middle, the answer may not be so clear.

Finding Your Ideal Training Focus

Is there anything we can do to determine this for you? Well, good thing for you there is but first you're going to have to do a little test! An old mechanic once told me that vehicles will talk to you and tell you what's wrong with them but the key is to know how to listen to them. I believe our bodies are much the same way. If we know how to read into them and listen to them, they'll tell us how to train them for optimal results. Figuring all this out can take years however! Luckily for you, when determining where to focus your training and how to structure it, a highly effective diagnostic method has been around for ages

Voluntary explosive strength and plyometric strength are independent components of motor function. That is, you can be really good at one and not the other but both are trainable.

When analyzing the vertical jump, have you ever noticed how regardless of their style of jump, some guys can jump nearly as high from a standstill as they can with a long run-up, - while some guys can fly through the air with a long run-up but can't get a foot off the ground when jumping from a standstill? In a sprint, some guys can accelerate to their top speed very quickly while others take forever to reach top speed but once they get there they're very fast.

As noted above, the ability to jump from a standstill position or start and accelerate in a sprint is more dependent on pure voluntary explosive strength and rate of force development while jumping after a run-up or sprinting at top speed are both more dependent on involuntary plyometric efficiency. The greater speeds of movement both allow and rely more on reactive ability.

Yet another example of this would be to compare the standing broad jump to a high jump, long jump, and sprinting at top speed. Even though one can initiate a bit of a bounce when performing the broad jump, it is still mostly dependent on pure strength and rate of force development. The long jump, high jump, and full speed sprint are much more plyometric in nature. Athletes who are really good at broad jumping are usually extremely strong (throwers and Olympic lifters) and tend not to be the best at high jumping or long jumping and vice versa.

When your reactive ability is good the amount of energy that you put out in a movement will be directly proportional to the energy you take in. So if you absorb more force you develop more force. There is a test that will measure the amount of force you can take in and put out. It will show you the difference between your plyometric strength and your explosive strength. The test is called the Reactive Resources jump test. With the results of this test we can determine where to focus your efforts for quick improvement.

SO HOW DO I TEST MYSELF?

Simply follow these steps!!

1. Test your vertical jump using a regular "down and up" vertical jump descending down with your feet flat on the floor. Jump how you normally would. Descend naturally into a ¼ squat position and jump as high as possible and make a mark against a wall or use a piece of tape so you can measure your jump. This jump is heavily dependent on pure explosive strength without much of a plyometric response in the contributing musculature.

2. Next, find some benches or boxes that you can increase in 6-inch increments. Start off with a low 12 inch box and, standing on it next to a wall, step off with both feet, hit the ground, and immediately execute a depth jump and try to jump as high as high as possible and again measure the height you jump by making a mark on a wall. We will call this your reactive jump. Wait for the reflexive gathering of force that occurs at ground contact and explode out of it as high as possible. Don't try to come off the ground too fast but don't wait too long either. If you have to reset and gather yourself you've wasted too much time.

Next, note the difference between the height of your down and up vertical jump and your reactive jump. If your reactive jump is less than your vertical jump than you can stop now, but if not continue on to step # 3.

3. Repeat the process but increase the height of the box in 6-inch progressions until you find the point where your reactive jump is less than your vertical jump. The depth jumps (reactive jumps) done off boxes heavily involve plyometric action and the plyometric contribution will increase the higher the box is raised. The greater the height of the box the more force you're taking in at impact and as long as your reactive jumps increase the greater the force you're putting out and thus the better your reactive ability.

By comparing your performance in the jumps you can determine where you are weak, or where to direct your efforts for further improvement. Some athletes best drop jump score off the lowest box may be below their normal squat jump, indicating large untapped reactive resources. This indicates a deficit in reactive strength with a need to emphasize reactive or plyometric training.

If your vertical jump is about the same or less than your reactive jump your ability to absorb negative force and transfer it into positive energy is lacking. You'll want to start using explosive and reactive training immediately along with depth drop landings to train your system to better absorb force. Once you become proficient at absorbing force you can then use regular depth jumps.

For others there will be a gradual increase in jumping height with each increase in box height. They may find their best jump comes off a 30-inch box or better. The higher your reactive jumps are from increased box heights in comparison to your squat jump, the better your reactive ability is and the more you'll benefit from increased muscle size and strength. If you fit into this group you are very plyometrically efficient so you'll want to emphasize muscular strength and even hypertrophy so that you can create more basic resources you can utilize in plyometric movements.

Here are a few examples of what different people might experience with this test:

Athlete A:

Vertical Jump: 24 inches

Reactive Jump from 12-inch box: 22 inches

Needs: Reactive strength and speed work

Athlete B:

Vertical Jump: 32 inches

Reactive Jump from 12-inch box: 33 inches

Reactive Jump for 18-inch box: 35 inches

Reactive Jump from 24-inch box: 36 inches

Reactive Jump from 30-inch box: 38 inches

Reactive Jump from 36-inch box: 34 inches

Needs: Strength

Athlete C:

Vertical Jump: 28 inches

Reactive Jump from 12-inch box: 29 inches

Reactive Jump from 18-inch box: 30 inches

Reactive Jump from 24-inch box: 27 inches

Needs: An overall mix of Reactive strength, explosive strength, and Limit Strength work

With the above tests we're able to accurately determine where to best direct your efforts for further improvement. Performance in a movement involving lots of reactive (involuntary) strength always has much more potential then pure voluntary activities due to the additional reflexive force that occurs with the quick stretching, gathering, and releasing of energy through the tendons. When this action is eliminated, the result is determined by voluntary force.

Quite often, however, we need to "tap into" this potential (plyometric) strength and teach our bodies how to utilize it. If someone has a regular "down and up" standstill jump that is better then their jump when using the boxes, this can be interpreted as a lack of development in the stretch-shortening cycle/plyometric abilities, with the subsequent need to emphasize reactive movements such as plyometrics in training.

In contrast, another athlete's best drop jump off the boxes may be 20-25% greater than his/her squat jump and their best jump will tend to be off a higher box. This indicates well-developed reactive (plyometric/reactive) strength. In this case, one should emphasize basic strength and muscle growth followed by methods designed to improve the rate of force development. This will create new potential, or raw muscle and strength, from which to draw from.

To quickly recap, if your vertical jump off the boxes is 20% or more greater than the squat jump, you are very efficient plyometrically and will probably make further improvements by focusing on building up your strength through heavy weight training. If your regular down and up jump is fairly even with your drop jumps, your reactive strength is lacking so you should focus on plyometrics in training. Those who have very well developed reactive ability will find their best jump is off a higher box (>18 inches), and they are probably fairly strong as well as plyometrically efficient.

Making It Easy!

If that's too confusing for you here's another way to look at it. If you're one of these guys who can really get up but you need to take a running start of 20 feet in order to do so, then you likely need to work more on your strength. However, if you're the guy who can stand flatfooted and jump nearly as high as you can with a long run-up then you will definitely see the best results using plyometrics and other dynamic methods.

If you're somewhere in the middle with no clear-cut weakness then you'll do well on a well rounded overall program consisting of both strength training and plyometric drills.

While we're on the subject of testing for the vertical jump, make sure you don't cheat during your test. There are several ways of cheating to make your vertical appear higher then it actually is. The easiest way is to simply not reach all the way up whenever you determine your reach. The 2nd way is to pinch your shoulder blades together when you reach up. If you pinch your shoulder blades together you won't be able to reach as high even if your arms are fully extended. This will make your reach lower and thus make your vertical appear higher then it really is. Save these tricky little maneuvers until you want to impress someone besides yourself!

Testing Part II – Testing General Leg Strength

The next thing we need to do is determine your general leg strength. The best way to do this is to test your maximum squat in the gym. If you know how to squat, then get in the gym, perform a good warm-up, and build up to your 1 repetition maximum. If you already know what your 1-rep max is or can get an accurate estimate, all you need to know is how heavy it is in relationship to your bodyweight. Let me go ahead and mention that the results of this test over-ride the results of the first test. In other words, no matter what the reactive jump test tells you, - if your squat is less than 1.5 times your bodyweight you will need to work on building your basic strength! If your maximal squat is 1.5 x your bodyweight or more, your options become larger. So, for example, if you weigh 140 lbs. you will need to be able to squat 210 lbs with good form (140 x 1.5) before you start getting more specific analyzing other things. If you've never done a squat before then just assume it's less than 1.5 x your bodyweight and start off doing one of the general strength programs using either bodyweight exercises or weights. If you currently train with weights it shouldn't be too hard to test your squat.

So what parameters do I use to test my squat?

Most squats I've seen in the gym wouldn't pass for what I consider a legitimate squat. To be considered legitimate, as you reach the bottom of the squat your hip joint should break parallel. To illustrate, put one hand on your knee and the other hand on the area where the upper thigh ties into the hip (the hip joint). When you descend into your squat, have someone monitor your form and pay attention to both the hip joint and the knee joint. In order to be considered a good squat your hip joint must temporarily go below the knee joint. This occurs roughly when the middle part of the thigh is parallel or a little beyond parallel. If you're not used to squatting like this then don't be averse to start off light until you get the feel of the movement. It can also help if you put a box behind you that you can use as a gauge to determine depth.

Are full squats dangerous?

Many people ask if it is dangerous to squat full and deep like this and the answer is a resounding NO! There is actually more stress on the knee joint during a ¼ or ½ squat! When you squat deeper, the hip joint absorbs the majority of the load and takes stress off the knee. In contrast, when you squat above parallel the knees tend to absorb more of the force. Also, when you squat correctly the muscles of the vastus medialis, glutes, and the hamstrings are involved to a much greater extent. These muscles tend to be weak and underdeveloped in the majority of athletes. The vastus medialis (VMO) muscle of the quadriceps, also known as the "teardrop" muscle, is responsible for giving the knee stability. Full squats can effectively strengthen the VMO, which actually makes it a good exercise for knee stability.

I don't know how to squat, can I do leg presses instead of squats?

First, I suggest you either get someone to show you how to squat or teach yourself. Squatting is a natural movement and is rather easy to learn. Simply start off with your bodyweight and squat down on a box to get the feel of it. Practically any good trainer, coach, or even experienced lifters, should be able to teach you how to do a squat within 10 minutes. Now to answer the question, yes, for the purposes of this test, if you don't know how to squat, the leg press can be used as a substitute but you will need to do a leg press with 3 times your bodyweight to be considered equivalent to a squat done with 1.5 times your bodyweight. If you choose to do this, I still encourage you to learn to squat and drop the leg press in favor of the squat because the leg press really doesn't have any carryover to athletic activities.

PROGRAM COMPONENTS

Now, lets quickly go over the intricacies of the program(s) structure so that you fully understand how the programs are structured to get you flying.

1. **General Strength training** – Remembering that P=FV, the goal here is to improve force and thus power. We will consider your limit strength equivalent to the maximal amount of weight you can lift for one repetition. For our purposes, the lift to focus in on will be the medium stance back squat. Unless otherwise noted, you should

terminate each set as soon as form begins to breakdown, which will generally be a couple of reps shy of failure.

For almost all but the heavy-duty lifting crowd, general limit strength is an area that will likely need some improvement. It also is an area that can be improved quite quickly as the legs contain our largest muscle groups and respond very quickly to strength training.

2. **Rate of Force Development training** – While there are certain types of lifts that focus on acceleration, such as lighter load movements performed with great speed and acceleration, any lift or exercise can bring about improvements in rate of force development. The key to bringing about this improvement is to lift the load as fast as possible no matter how fast the load is actually moving. Whether the load is moving fast or slow does is really inconsequential. The act of trying to accelerate the load as fast as possible will lead towards the proper adaptations in the nervous and muscular system responsible for increased rate of force development.

When you improve the ability to turn on as many muscle motor units as possible instantaneously you increase starting strength, which will enable you to begin a movement with greater proficiency. Certain types of lifts and bodyweight exercises that emphasize a start from a near dead stop are great for this. Starting strength is the ability to instantly develop force whereas rate of force development is the ability to build up to maximal force in the shortest time possible. A good example of a strength training movement that is good at developing both is a jump squat performed with a pause at the bottom. We will also use plyometric type drills of the "power" or "up" variety such as one-legged (uni-lateral) step up jumps.

Because rate of force development is so important to increasing the vertical jump, it will be included throughout all programs and phases.

3. **Reactive Strength Training** – Again to confuse you, known as plyometric strength, reversal strength, or elastic strength! Being able to shift a load (especially your own bodyweight) quickly from the eccentric (down) phase to the concentric (up) phase is one of the key components of developing explosive power and jumping through the roof. Exercises include various jumping, hopping and skipping exercises along with the "big-daddy" original plyometric movements depth jumps and drop (shock) jumps. Plyometrics maximize the stretch reflex, improve muscle recruitment and override CNS inhibition. Loaded full range jump squats are another exercise that will be used to developing a quick eccentric to concentric contraction, as are any other lifts and exercises that use a quick drop and explosion. This component of training will also be included in all programs, but to varying degrees, depending on your strengths and weaknesses.

PROGRAM FLOW

Ok, now you've measured your vertical jump, your explosive to reactive jump deficit, you've tested your general leg strength, now it's about time to get in the gym. So lets figure out how to decide what program you need.

Raw Beginner-

1. Jumping efficiency and muscle coordination
2. General strength
3. Rate of force development
4. Reactive strength

Novice-

1. General strength
2. Rate of force development
3. Reactive strength
4. Muscle growth

Intermediate–:

1. Rate of Force Development
2. Reactive strength
3. General strength

or

1. General Strength
2. Rate of force development
3. Reactive strength.

Advanced – Everything

Lets take a look at the various profiles you may fall under so you will know where to start

Beginner Profile:

1. You've spent little time in the past lifting weights, doing plyometric drills, or any other jump programs.
2. Your strength and reactivity are both undeveloped.
3. Your vertical jump is poor to average (24 inches or less)
4. Your vertical jump from the ground is better or approximately equal to those done off boxes.

Recommendations:

If you're a beginner you'll need to develop a base of strength and begin conditioning your body by utilizing basic jump training. You should follow the raw beginner jump/plyometric routine and either the beginner weights or bodyweight strength training routine. This is the one situation where doing a fairly high volume of low intensity jump training can work fairly well for. The jump training increases general physical preparation and teaches the body how to work and move economically. After about 6 weeks of this type of training, you can then move on into another program that

incorporates more advanced strength training and more intense plyometric training. See the beginner strength programs.

Novice Profile

1. You've spent little or no time lifting weights and thus squat less then 1.5 x bodyweight or leg press < 3x bodyweight
2. Your reactivity is naturally better developed. Your reactive jump off the boxes or with a running start will be somewhere around 20% or greater then from the stationary jump on the ground.
3. Your vertical jump is fair to good (up to 28 inches)
4. Lots of strength needed!

Recommendations: If you're this type of novice you have naturally better reactive strength. Whether this comes from structure, training, or practice, your strength needs to catch up to your reactivity. This means you need to focus on strength training. The beginners strength- training program is tailor made for you. When you have built up your strength strength, you can then move on to the intermediate programs and mix both plyometrics and strength training. See Novice Strength Training program

Intermediate I profile

1. You've either lifted weights in the past or you're naturally strong. You squat 1.5 x bodyweight or more or leg press 3x bodyweight or more.
2. Your reactive strength is under-developed. When doing the reactive jump test your jump off the ground will tend to be fairly even with your best box jump. Your jump with a 3-step run-up will be less than 20% better then your jump from a stand-still.
3. Your vertical jump is typically poor to good (< 28 inches)

Recommendations: If you're this type of athlete you need to emphasize plyometric and rate of force development training to better utilize your natural strength. If you're this guy, a program consisting of Intermediate plyometrics with once per week strength maintenance will work extremely well. See "plyometric focused intermediate" routine.

Intermediate II profile

1. You squat 1.5 x bodyweight or leg presses 3x bodyweight or more.
2. Your reactive strength is well-developed. Your best jump off the box or with a run-up will be somewhere around 20% or more better then your squat jump.
3. Your vertical jump could be good to very good (24-32 inches).

Recommendations: If you're this guy you have decent levels of strength along with excellent reactive strength. You'll make your best gains with a program heavily focused on strength to balance out your well-developed reactive strength. A program

focusing on strength with a moderate volume of plyometrics will be just the ticket. See "strength focused intermediate" routine.

Regular Intermediate Profile

1. You squat 1.5 x bodyweight or leg presses 3x bodyweight or more.
2. Your general strength and reactive strength are both good but neither one outweighs the other. Your best box jump will be somewhere between 5-20% greater than your ground jump but not more.
3. Your vertical jump could be anywhere from average to very good (20-32 inches).

Recommendations: If you're this guy you probably have a difficult time figuring out whether you need more general strength or more reactive strength. You really have no clear-cut strengths or weaknesses. You'll benefit from a well-rounded combination program incorporating good amounts of both. See "general intermediate" routine.

Advanced Profile

1. You squat 1.5 x bodyweight or leg presses 3x bodyweight or more.
2. You have experience both lifting weights and doing plyometric programs.
3. You have an excellent vertical jump (32 inches or more)
4. You generally, but not always, have excellent reactive strength with best box jump being 20% or more greater then his ground jump.

Recommendations: If you're this guy you have an excellent vertical jump and have experience with all facets of training. If you do match the profile of the advanced athlete, yet don't have the training experience, you should go back and do the intermediate programs first before doing the advanced program, regardless if you have a high vertical jump already. The advanced program utilizes very intensive weight training and plyometric drills. The one pre-requisite to the advanced program is you must have a high enough work capacity to recover from the high volume of lifting and jump training. If not then you probably won't get much out of this program. See "advanced" program.

What if I'm still not sure which profile I fit under?

If you're still not sure which profile best describes you I suggest you either consider yourself a novice and do the novice workouts or do the general intermediate workout. These workouts provide a nice blend of strength and plyometric work and will provide you a good balance. If you know that your strength or leaping ability is not yet up to the "Intermediate" level, these series of workouts will work like a charm for you. In fact, the novice workouts will work for just about anyone, regardless of whether they're novice, intermediate, or advanced. The purpose of the more advanced programs is to provide a bit more specialization, focus, and variety for those who have a strong base of previous training experience.

EXERCISE DESCRIPTIONS

Low Intensity Plyometric Exercises exercises

Ankle bounces- also referred to in some other programs as "thrusters". To perform these you just jump as high as you can while using the force of your ankles and calves and without much knee bend. Perform the movement rhythmically without any pause between repetitions. Can be done using 2 or 1 legs.

Jump rope- self-explanatory. If you don't have a jump rope you can mimick the motion by pretending to be jumping rope but this is not as effective.

4-star drill- imagine 4 numbers or stars about 18-24 inches apart. It may look something like this: 1 2

4 3

Start off at 1, jump to 2 then to 3 then to 4 then to 1 then back to 4 to 3 to 2 to 1. Hop all the way around and back. That equals 1 repetition. Can be done with 2 legs or 1 leg.

Slalom jumps- also called line jumps or slalom jumps. Simply imagine a line or low object directly on the ground under you and hop lightly back and forth across the line. Can be done with either both or 1 leg. Each ground contact equals 1 repetition. Pace will be about the same as you would use if you were jumping rope.

Ricochet jumps- also known as low stair jumps. Find a low object, box, or stairs about 6-12 inches high and using the strength of your calves only simply jump up and down in quick fashion.

Rhythmic jump squat- This exercise is known as "leap-ups" in some other programs. In a rhythmic fashion squat down and jump back up as high as possible. Can be done

using either a ¼ squat motion or a deeper squat. Can be done with the hands either behind the head or with the hands reaching up with each jump.

Low squat ankle jump- Get in a low squat position while you rise up on your toes. From this position you should bounce up and down forcefully on the balls of your feet while you stay down in a squat position. Try to use the power of your hips and calves but without straightening your legs – With each mini-jump attempt to bring your feet up towards your chest

Bent over donkey ankle bounces- Find an object about waist high you can lean against for support. To perform the movement you bend over until your upper body is parallel to the ground and resting the majority of your upper body weight on the object. Your legs will be back behind you and straight. The exercise gets its name from an old bodybuilding calf exercise called Donkey Calf raises. The idea was to have someone sit on your back as you perform straight legged calf raises. You will be doing the same thing, only you won't have anyone sitting on your back and you will be leaping up using the power of your calves and ankle extensors. Can be done with 1 or 2 legs and also jumping with 2 and landing on 1.

Moderate plyometric exercises (up variety)

The following exercises place an emphasis on starting and explosive strength without such an emphasis on reactive strength. Most of these exercises have you starting off from the ground and jumping on, over, or above something without a chance to get much bounce into the action.

On-box jump- From the ground simply jump onto a box or bench and then step-off - Can also be done unilaterally.

Standing broad jump- Stand in a stationary position and jump up and forward as far as you can. Pause and re-set yourself and perform the required number of repetitions.

Double leg bounding- also known as leapfrogs – This exercise is performed much like a standing broad jump but is more rhythmic in nature and the squatting phase is not as deep. Jump up and out as far as you can and immediately execute another jump at ground contact.

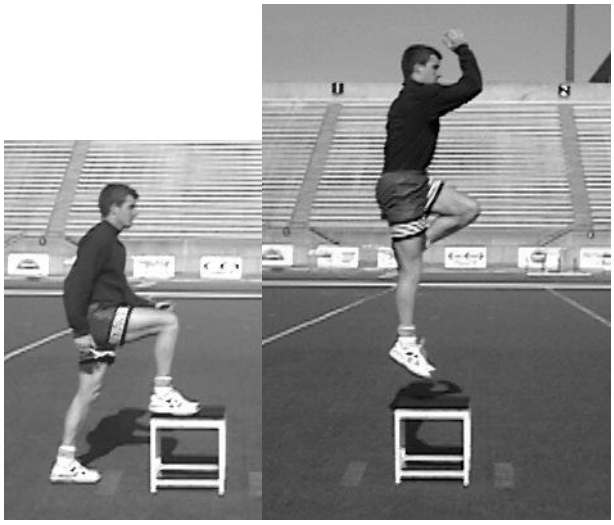
Hurdle barrier jump- Set up objects in front of you that are approximately as high as your best vertical jump. Now simply jump over them one at a time. Try to perform the entire set smooth and with little effort. This exercise can be done unilaterally as well. If you don't have objects or hurdles you can also use imaginary objects.

Knees to chest tuck jump- From a stationary position jump as high as possible while bringing your knees up into your chest. At ground contact immediately straighten your legs and execute another jump.

Star Jump- Bend down and grab your ankles and then jump up while you spread your arms and your legs so that you look sort've like a star. Hit the ground, reset for a second and repeat for the desired # or repetitions.

Burpee- Also known as a "squat-thrust"- Start with your feet shoulder width apart and standing erect. Squat all the way down until your hands touch the ground on either side of your legs. From this position kick your legs all the way back so that you're now at the start of the push-up position. From this position bring your legs back even with your hands so that you're now in sort've a deep squat position. From here jump up as high as possible. At ground contact repeat the entire series.

One-legged step up jump- Also known as 1-legged bench jumps or split squat jumps – Find a bench about 18-24 inches high and place one leg on the bench with one leg on the ground. Now, from a dead stop and without bending down at all, jump as high as possible and land in the exact same position with the same leg on the bench and the same leg on the ground. Pause for a second and repeat. Perform all the reps for one leg before moving on to the other leg.



Box squat jumps- also known as sit jumps**-** Sit back on boxes or a chair in a ¼ or 1/2 squat position. From this position jump up as high as possible or out as far as possible. You can also have another box you can attempt to jump on or over. By varying the height of the box you're sitting down on you can vary the intensity of the exercise.

Paused Squat Jump- Done like a rhythmic squat jump only this time you pause for 3 seconds at the bottom of each repetition.

Leap Frog Jump- Squat down with your hands on the ground. Next, jump up and out as far as possible, land, squat down once again, touch the ground and repeat.

Moderate Reactive Exercises

These include all types of commonly known medium intensity reactive plyometric movements**.**

Rim jumps- Using a basketball goal or other high object as a target jump up and down without any pause between repetitions attempting to touch the object.

3 steps + jump for height (double legged variety)- Take 3 steps and using a quick jump stop jump for maximal height.

Lateral cone or obstacle jumps- Using cones or low obstacles (12-18 inches) jump back and forth over the object. Performed just like line/slalom jumps except you should be using an actual object to jump over and the jumps will be higher and more intense. Each ground contact equals one repetition.

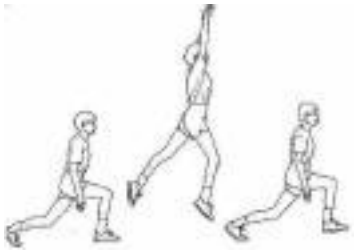
←----------→

Low box depth jumps- Using a low box (<18 inches) stand on the box and step off. At ground contact either immediately jump up as high as possible or jump up onto another box if you have one available. If you don't have another box turn around and step back up on the box and repeat or if using another box simply turn around on that box and repeat. Each ground contact equals one repetition.

Low box depth jumps for height- Using a very low box (6-12 inches) stand on the box next to a wall, goal, or something that you can reach up and try to touch or grab. Step/bounce off the box and at ground contact immediately jump up and reach for your target - This is the same type of box jump used in the testing portion.

Low side to side box jump- Using a box lower then 18 inches start off on the box and jump off to one side – At ground contact immediately bounce back up on the box, then step off to the other side, hit the ground, and rebound back up on the box. Repeat to the other side continuing to go back and forth. Each ground contact equals one repetition.

Rhythmic alternating lunge jumps- From a lunge position push off of both legs simultaneously and jump up as high as possible. When you're in midair switch legs and land in the same position you started but with the opposite leg forward. Perform this exercise smooth and with rhythm. As soon as you land immediately execute another jump. Complete for the desired number of repetitions.



High-Intensity Reactive Plyometrics

"Shock" or Altitude lunges- From the standing position simply jump up as high as possible and land in a lunge position with the front leg at around a 90 degree angle or parallel. Try not to move as you absorb the impact. Re-set and repeat for the desired number of repetitions. The main emphasis here is on the landing not the pushoff. When you land in the lunge position, try to absorb the force of the impact with both legs so that your lead knee doesn't absorb all the stress. This places the majority of the stress on the hamstrings and glutes.

Deep lunge jumps- From the deep lunge position push off of both legs simultaneously and jump as high as possible. The emphasis here is on the pushoff. Land in a deep lunge position with the same leg forward. Absorb the impact, pause briefly, then immediately execute another jump and continue completing all the repetitions for that leg before advancing on to the other leg. When you land in the lunge position, try to absorb the force of the impact with both legs so that your lead knee doesn't absorb all the stress. This places the majority of the stress on the hamstrings and glutes.

Low squat ankle jump into lunge jump- This is an advanced level exercise - standing erect with feet shoulder width apart squat down into the low squat position and bounce once then jump up as high as possible. In mid-air assume a straddle position so that you land in a lunge position with the lead leg roughly parallel to the ground. At ground contact immediately jump back up out of the lunge position as

high as possible and land back in the low squat position. Repeat all the reps for the desired leg prior to advancing on to the other leg.

Low squat ankle jump into paused or "shock" lunge- From the low squat position bounce once then jump up high and land in a deep lunge position. Absorb the impact, try not to move, and after pausing for 2 seconds once again reset into the deep squat position and repeat for the desired number of repetitions. The emphasis of this exercise is on the landing. When you land, try to absorb the impact with both legs so that your lead knee doesn't absorb all the stress. This places the majority of the stress on the hamstrings and glutes.

High box depth jumps- Using a high box (>18 inches) but up to over 36 inches, stand on the box and step off, upon hitting the ground either immediately jump up as high as possible or jump up onto another box if you have one available. The distance that you jump away from the box should be approximately the same distance as the height of the box. So if you're jumping off a 36-inch box you should jump approximately 36 inches out. If you don't have another box turn around and step back up on the box and repeat. If you are using 2 boxes simply turn around on that box and repeat. Each ground contact equals one repetition.

Drop Jumps- Also known as "shock" and "altitude" depth drops. Using a high box (>24 inches) stand on the box, step off, and bending the knees as little as possible and staying on your toes simply attempt to absorb the impact. Hold the landing for a few seconds and get up on the box and repeat for the desired # or repetitions per set. Like depth jumps, the distance that you jump away from the box should be approximately the same distance as the height of the box.

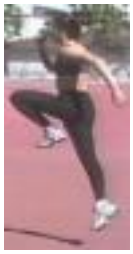
Short response plyometric exercises and unilateral varieties

Most of these exercises are executed unilaterally (single leg) and generally require a shorter ground contact time. For this reason they tend to be more effective at increasing 1-leg jumping performance.

3-step + jump for height- Take 3 steps and jump as high as you can. In between repetitions walk back to your starting point and repeat. You can either repeat all the repetitions for 1 leg before moving onto the other or alternate jumps with each rep, one rep take off of the left leg, the next rep take off with the right leg and go back and forth.

1-2-3 Jump- This is a drill that is performed in rhythmic alternating fashion. Take 2 short steps and jump as high as possible. As soon as you hit the ground take 2 more steps and jump with the opposite leg this time. Continue to do that alternating push off legs back and forth without stopping until the desired # of repetitions are complete.

Power Skipping- Using an exaggerated powerful skipping motion attempt to jump as high and far as possible with each skip alternating legs with each skip - Usually done for a pre-determined distance such as 25 yards or 40 yards.



Standing triple jump- Standing in the erect position with feet shoulder width apart squat down and jump up of both legs as far and high as possible. Land on either the left or right leg and immediately upon landing again jump up as high and far as possible this time pushing off with the same leg you landed with. Land with the other leg and once more push off with that leg and jump as far as possible. It's basically a 2-legged jump, immediately followed by a 1-legged jump, immediately followed by another 1-legged jump off the other leg. Walk back to the start and repeat for the desired # of repetitions.

1-leg speed hop- also known as 1-legged bounding - Usually done for a pre-determined distance such as 10 yards or 20 yards. Simply hop on one leg as fast as you can for the desired distance trying to maintain a straight plant leg. This exercise can also be done with a sprint into a 1-leg speed hop. In this version you start off with a moderate sprint and without slowing down begin bounding forward on one leg.

Sprinting- The act of sprinting is self-explanatory but what many do not realize is that sprinting is very effective at training short response reactivity. In the programs sprints are done from a standstill and also done with a version called **acceleration sprints**. In

this version you start off striding forward for 10-20 yards at a slower pace and then suddenly accelerate for the required distance.

1-leg box jump- This is an on/off box jump done with one leg. Set a box in front of you at a level somewhere between your ankles and your knees. You will stand on the ground on one leg. Next, hop up and tap the box with the same leg you jumped with and then quickly come back down, touch the ground and instantaneously spring back up on the box. The important thing to focus on is full extension of your leg at ground contact so that you recruit the glutes and hamstrings. If you do it correctly there should be little voluntary effort instead you should reflexively bounce on and off the box.

STRENGTH TRAINING EXERCISES USING WEIGHTS-

Barbell Back Squat- Position the bar on the squat racks at a height of approximately 3 to 5 inches lower than your shoulders. Preferably using spotters, position your hands evenly on the bar and, with your feet squarely under the bar lift the bar from the rack with the legs. Step back just enough to avoid bumping the rack during the exercise, and position your feet at a comfortable width – this is called the "athletic stance," where your force output capability is at its maximum – usually a bit more than shoulder width. Your weight should remain centered over the back half of your feet throughout the descent and ascent not on your toes. Descend by first pushing your hips back and then following through by bending your knees. Descend with control into a position where the tops of your thighs are at parallel or a bit below, keeping your torso and back erect so that your hips remain under the bar at all times. Do not allow your knees to drift inward or your torso to incline forward. Vigorously rise out of the squat position following the same path that you descended – the torso and back remain erect and the hips remain under the bar throughout the exercise.

Jump Squat- Assuming the squat stance and position using a weight from 10-30% of your maximum squat descend down into a ¼ squat position and jump up as high as possible. When landing immediately bend the knees and jump again- Repeat for the desired # of repetitions. The exercise should be executed smoothly and in a rhythmic fashion.

Iso-ballistic jump squat- This is another version of the jump squat – the only difference is rather then being executed rhythmically in non-stop fashion the iso-ballistic squat is executed with a pause (from 3-10 seconds) just above the parallel position before each jump.

Reactive Squat- Using 20-50% of your max squat and starting from an athletic "jumping" stance with your hands pulling the bar tightly across your shoulders, from a standing position drop quickly down into a deep squat position and quickly reverse direction, reverse the downward momentum and explosively drive the weight back up. The emphasis here is on rebounding out of the bottom of the hole, not necessarily jumping up.

Deadlift- Maintain a flat back, bend your knees and grip the bar at shoulder width, one hand is palm-forward and the other hand is palm-facing back (so the bar won't roll from your grip – called a mixed grip) Push directly into the ground with your leg muscles while stabilizing with your back muscles – do not pull with your back initially use the power of your legs and butt to drive the bar off the ground. When the bar is just about knee height, begin pulling with your back to finish the movement, stand erect – do not lean backward at the finish of the movement. To lower the bar look up while pushing your hips back and let the bar to the ground at a fairly quick pace.

Leg curls- Lying face down on a leg curl machine, curl the padded lever upward using your hamstrings. Make an effort to point dorsi-flex your ankles while doing the curl by pointing your toes up towards your knee. This movement can and should be substituted with a glute-ham raise if you have access to one.

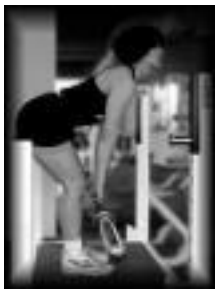
Glute Ham raise

Barbell or Dumbell Lunge- Begin with your feet hip-width apart, torso erect -take a slow controlled step either forward (dynamic) or backward. From this position, lower your hips so that your forward thigh drops below parallel with the floor. At the fullest stretch, your forward knee will be positioned slightly ahead of your ankle, with your foot pointing straight ahead or slightly in. Allow your trailing knee to drop to a point just before it touches the floor. Continue the exercise by pushing off your front foot until your knee is straight, then step back to the start. Execute all the repetitions for one leg before performing the reps for the other leg.

Barbell or dumbell split squat- Also known as the Bulgarian squat. Performed exactly like the lunge described above, but this time you elevate your back leg on a

block or bench anywhere from 6-18 inches high. This allows for greater range of motion and thus greater activation of all muscle groups.

Romanian Deadlift- also known as semi-stiff legged deadlift – this exercise stresses the hamstrings and gluteals and sues the lower back in a supporting role. With bar in hands and keeping the back tight and arched bend the knees slightly and maintain this bend the entire movement. Bend forward and attempt to push your hips back behind you while slowly lower the bar to just below your knees. You should feel a slight stretch in the hamstrings and glutes as you descend. Make sure to keep the back arched the entire time. When rising concentrate on pushing your feet down and back, like a bull pawing at the ground. Your feet won't actually move but if you concentrate on that it makes the exercise much more effective.



Calf raise- Using a special calf machine stand on block with the balls of your feet and keep your knees locked. Raise up on your toes as high as possible, hold position momentarily, then return to starting positing letting the heels descend down until you feel a good stretch in the calf.

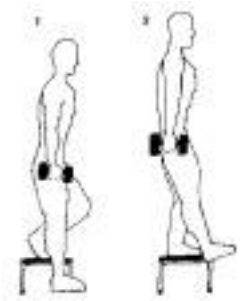
One-legged weighted calf raises- Standing on a block and holding a dumbell in one hand and holding onto something else with the other hand for support keep the knee locked and descend down until you feel a good stretch. Rise up on your toes as high as possible, hold position momentarily, then return to starting position. Repeat with other leg.

One-legged squat- Although the one-legged squat is usually not done with weights I decided to put it here as it is included in many of the programs including weights. To perform it you start by placing your non-working hand on an object for balance. Extend your non-working leg in front of you and VERY slowly bend your working leg as far as comfortable into a full squat and then return to the start. I've found it helpful to start using something to sit back on like a low chair or steps. As this become easier, you can make the exercise more challenging by not holding onto an object for balance, and by using dumbbells.

BODYWEIGHT STRENGTH TRAINING EXERCISES

Ski-Squat- This exercise gets its name because it's a favorite of competitive skiers who use it to develop awesome quadriceps strength and endurance. Place your feet shoulder-width apart, about two feet out from the wall, and lean your back against the wall. Bend your knees to a half-squat position. This is position one. After a specified time of 10-20 seconds lower down to position two, about two inches lower. After the specified time, lower another two inches down to position three. You should be about thigh parallel by now. Use another two lower positions, with position five being about as far as you can bend at the knees. The five positions should be done with no rest between them. That's one set. It can also be done with one leg at a time.

Peterson step-up- Stand on the edge of a low block or bench (1/3 to 1/2 the height of normal bench height). Have the weak leg on the box and the strong leg off the edge of the box. With your hands on your hips, bend at the knee of the weak side, lowering down (two to three seconds) until the sole of your feet almost brushes the floor. Keep the foot parallel to the ground. Pause for one second and return to full extension in about one to two seconds. If possible, don't hold onto anything during the set—the challenge of having to balance yourself will add to the fatigue. However, you may wish to do this near a wall or squat stand, just in case. Repeat with the other leg.



Split squat- also known as the "bulgarian squat" Face away from a normal height bench and place your rear leg up on the bench. You can check your distance by ensuring that you keep a relatively vertical shin throughout the movement. Keep your chest and trunk vertical throughout. Lower the body down by bending the knee of the lead leg until the knee of the back leg is almost on the ground. Use a slow speed of execution – something like 5 seconds down, pause for 2 seconds, and 3 seconds up. Keep the knee aligned over the foot during the entire movement. After you've exhausted the weak leg, repeat with the other leg.

One legged-deadlift- Stand on one leg. Keep the other foot off the ground but roughly parallel with the leg doing the supporting. Bend the knee of the leg supporting your weight slightly, but remember not to change that knee angle during the exercise (get a partner to watch for this, as it will be tempting!). Now, bend at the waist while allowing the back to round and reach slowly toward the floor. If your range allows, touch the floor with the fingertips and return to the starting position. Use a speed of three seconds down, pause for one second at the top and bottom, and three seconds up. You may struggle with balance, but persist—you'll also be developing the muscles in the foot! The first time you do this, you may find that you're touching down with the non-supporting foot regularly to avoid falling over. That's okay, but try to minimize this in later workouts.

One-legged good morning- This is exactly the same as the one-legged deadlift, except you start with a broomstick or other object on your shoulders as you would while doing a conventional good morning exercise. Hold onto the broomstick/bar with your hands in the normal fashion standing on one leg. Now bend forward and down as if you were going to touch your toes only you won't be touching your toes because your hands will be holding onto the broomstick. Don't panic if five reps is your starting situation, and do the weak-side first.

King Deadlift- This exercise gets its name from its inventor – Australian strength coach Ian King. Stand on one leg (starting with the weak side) and bend the other leg up until the lower leg is parallel to the ground. Place your hands on the hips or by your side. The aim is to bend the knee of the supporting leg until the knee of the non-supporting leg is brushing the ground. In reality, you may have to settle for a shorter range (you'll understand why as soon as you do this workout). If the aforementioned is the case—and I expect that it will be—look to increase the range from workout to workout. You're allowed to flex (bend) forward at the waist as much as you want, and doing so will increase the gluteal involvement. Keep the working knee aligned neutrally throughout the movement. Take three seconds to lower, a one-second pause at each end, and two seconds to lift.

Cross Body off box lunge- With a slightly narrower than shoulder-width stance, stand on top of a 12 to 18 inch step or block. Make sure there's extra floor space on the sides. With one leg, step down and behind you and across the body to the floor. Next, push with the elevated foot so that the "crossed-under" foot can return to shoulder-width position on the step.

Scissor hip extension- Lie on your back with your feet elevated on either a high bench or pressed firmly against a wall. The legs should be slightly bent. Perform two movements at the same time. First, bring the non-working leg towards your chest (hip flexion and knee flexion). Second, lift your hips off the ground by concentrating on driving the working leg down. Both movements must be executed as fast as possible.

Natural glute-ham raise- Kneel down and lock your feet under something solid and heavy (a partner can do just fine, but he must be able to hold you down). The trunk is upright and the arms are alongside the body. Find a pad or something to rest your knees on. A towel will work just fine for most. Without rounding your back Lower yourself towards the ground as slowly as possible. To do so you must produce a powerful hamstring contraction or else you'll find yourself embedded in the floor! If you're able to bring yourself back up on your own, do so, but most guys will need a little push-off with the arms to get moving.

Slow tempo lunge- Standing with your feet hip width apart take a large step forward with one leg and descend down very slowly until your front knee is well over your

toes and the back knee is just shy of the ground. Pause for 2-3 seconds and slowly rise back up but don't move your feet. Stay in that position and complete all the reps for that leg before moving onto the other leg.

Standing hip abduction- This exercises strengthens the outer hips and glutes. Find something to lean against and take the opposite leg and slowly raise it as high as possible and try to hold that position for 3-5 seconds. The finished position would appear as if you're kicking something. Bring the leg back down slowly and repeat.

Jump in place + land in deep lunge- With your feet shoulder width apart and standing erect take a moderate jump in the air and land in a deep lunge position. Attempt to "stick" the landing without any bouncing or unnecessary movement. Try to absorb the impact with both legs so that your lead knee doesn't absorb all the stress. This places the majority of the stress on the hamstrings and glutes. From the landing position stand up and repeat.

THE ROUTINES

Plyometric routines-

The plyometric programs are designed for those who wish to perform a program without any concurrent weight training or for those who want to supplement their weight training. These programs, unlike most plyometric programs, address multiple aspects of explosiveness. Not only do they increase your traditional plyometric ability, but they also consist of exercises to improve your rate of force development, short response reactivity, full rom strength, full rom reactivity, and starting strength. The combination of exercises and training means in these programs has proven very effective.

For those who wish to perform their own weight training programs along with the plyometric programs this can be done very successfully but I recommend the volume of plyometrics be reduced to no more then 2 days per week. The flow of the plyometric routines will carry you from one level to the next and from less advanced exercises into more advanced exercises.

Upon first glance it may appear that there are just a bunch of exercises lumped together into each routine without a specific purpose, but what you should understand is that each exercise is done for a specific purpose to address a certain function. Each exercise, each workout, each week, and each phase of every program is designed to carry you forward into the next workout, week, exercise, phase, or program. It helps to understand the natural progression of exercises and different types of exercises. Here is a general overview of each category of exercise along with some exercises in each category. Keep in mind, however, that there is always going to be considerable overlap in between exercises and/or types of exercises but we can make a general divide and outline the progression for each type. The types of exercises and their focus can be divided up into 6 different categories. These areas are:

1. Lower intensity plyometric drills
2. General mixed jump exercises
3. Exercises specifically for rate of force development and power
4. Medium to high intensity reactive methods
5. Exercises to enhance full range plyometric strength and power
6. Short response reactive methods

Low intensity drills

These drills are lower in intensity and generally done earlier in the training session to progress from the warm-up into the more intense exercises. They tend to be fairly low intensity in nature and address movement efficiency. The general flow of exercises in this category is:

1. Ankle bounce
2. Slalom jumps
3. Ricochet jumps
4. 4-star drill
5. Bent over donkey ankle bounces
6. Unilateral (1-legged) varieties of the previous

General Jump Exercises

These exercises are fairly general in nature and can train a good mix of different strength qualities, depending on how they are performed. In the routines listed you will often seen these exercises prescribed with varying recommendations to work on different aspects of power. They are also frequently prescribed in higher volume fashion to contribute towards muscular growth and some power endurance. The general flow of exercises in this category goes:

1. Squat Jumps (from either ¼, ½, or full squat)
2. Paused Squat jumps

3. Consecutive broad jumps
4. Leapfrog jumps
5. Double leg bounding

Power and Rate of Force Development

These exercises are characterized by a very large focus on moving your body at high force from nearly a dead stop or a paused position. Fundamentally these drills aren't really "plyometric" drills, because of the lack of movement preceded by accelerated muscular stretching, but they are still often lumped into this category. For most of these movements, the focus is on generating as much voluntary force as possible as quickly as possible without much bouncing or cheating. Exercises in this category are very effective at enabling you to develop peak power from a near standstill. The general flow of exercises in this category goes:

1. Star jump
2. Standing broad jump
3. 1-leg step-up jump
4. On-box jump
5. Box squat jump
6. 3 step lead into on-box jump

General Plyometric Exercises

These are typically the types of exercises people think of when they hear "plyometrics". I won't bore you to death explaining plyometric training methods again! The general flow of exercises in this category goes:

1. Rim jumps
2. Low side to side box jumps
3. Lateral cone jumps
4. Low box depth jumps for height
5. Low box depth jump (<18 inches)
6. Knees to chest tuck jump
7. Barrier jumps
8. 3 steps + jump for height off 2 legs
9. High drop jumps
10. High depth jumps

Full Range Reactive Exercises

Exercises in this category tend to be performed through a full range of motion, with the muscle in extension. When you squat down your muscles actually extend and when you stand up they shorten. Thus, exercises that train the muscle during extensions tend to be exercises that involve a deeper knee bend. Developing awesome strength and explosiveness over a full range of motion is very important for an athlete. The natural tendency is for one to be weaker in these positions, but when you are strong through a full ROM you will automatically tend to strengthen your already stronger positions. This will also help prevent injuries. Exercises in this category also tend to involve the muscles of the hips, hamstrings, and vastus medialis to a very large extent - something that is neglected with most plyometric programs. The result is these exercises won't just make you more powerful in the vertical jump but will also give you awesome acceleration and agility from all angles; making you a better athlete. The general flow of exercises in this category goes:

1. Low squat ankle jump
2. Rhythmic jump squat
3. Paused full squat jump (1/2 or full position)
4. Rhythmic lunge jump
5. Deep lunge jump
6. Low squat jump into "shock" lunge
7. Shock lunge
8. Low squat jump into jump lunge
9. High drop jump into ½ squat
10. Drop jump into lunge

Short Response Reactive Exercises

As noted before, exercises in this category tend to be characterized by shorter ground contact times when compared to regular plyometric exercises. This means speed and reflexive contractions are a much greater focus. Most of these exercises tend to be uni-lateral (one-legged) The most common short response reactive exercise is sprinting. The general flow of exercises in this category goes:

1. Power Skipping
2. 1-2-3 jump
3. 3 steps + jump for height
4. 1-leg speed hop (1-leg bound)
5. Standing triple jump
6. Sprinting
7. Sprint into 1-leg speed hop

Now lets get to the programs!

Beginner Plyometrics Routine

This routine is for the beginner who doesn't have any type of prior organized jump training experience. Although it is classified as a beginner routine it is still quite demanding and very highly effective. The program flow progresses from higher volume/low intensity workouts to lower volume/higher intensity workouts. For many, the workouts will actually seem tougher physically during the initial phases. This serves to condition the tendons, and ligaments as well as prepare the system for the more demanding phases to follow. You may also notice a change in volume from week to week. This is to take advantage of the body's supercompensation or recovery abilities and will lead to superior improvements. During the final phases, you may notice a sharp decline in the number of repetitions per set. This is to allow you to focus completely on each repetition and maximize your concentration and power output, something that can't be done doing higher repetitions. For this purpose it's better to do 1 or 2 repetitions per set with maximum power and concentration then it is to do 20 repetitions with half-hearted effort.

Program Overview:

Goals: Improve general fitness capacities and gradually condition the body and improve general coordination, speed, and jumping technique.

Intensity: moderate to moderately high intensity

Length- Divided up into 4 phases with each phase 3 weeks in duration

Frequency- If used on it's own then the frequency should be 3 times per week on non-consecutive days (Mon, Wed, Fri. or Tues. Thurs. Sat) for the 1st two weeks of each phase – during the 3rd week skip the 3rd workout and test on that day. Phase IV should be performed 2 times weekly for the duration of the phase with at least 3 days between workouts.

If used in conjunction with any other strength-training program the frequency should be reduced to 2 times per week throughout the entire program.

Rest Intervals- 1 minute between sets during the 1st two phases - 2 minutes during the last 2.

Phase I

EXERCISES	WEEK#1	WEEK#2	WEEK#3
Ankle jump	2x50	3x50	3x75

4-star drill	2x5 (all the way around and back = 1 rep)	2x10	3x10
Alternating lunges	2x20 (per leg)	3x20	3x20
Jump squat (hands behind head)	1x20	2x20	2x20
Slalom jumps	2x50	3x50	3x50
Lunge jumps	2x10 (each leg)	3x10	3x15
Low squat ankle jump	2x30	3x30	3x30

Phase II

Exercise	**Week#1**	**Week#2**	**Week#3**
1-legged 4-star drill	2x10	3x10	3x10
1-leg ankle bounce	2x75	3x75	3x75
Knees to chest tuck jump	2x15	3x10	3x15
Low side to side box jump	2x10	3x10	3x8
Standing broad jump	2x5	3x5	3x5
Stationary squat jump	2x15	3x15	3x15
1-2-3 jump	2x 5/leg	3x5/leg	3x5/leg

Phase III

Exercise	**Week#1**	**Week#2**	**Week#3**
1-leg slalom jump	3x75 (leg)	4x50	3x50
Low squat foot jump into paused lunge	2x8 (per leg)	3x8	2x8
Box Squat jumps	4x6 (2 sets jumping up – 2 sets jumping out)	4x6	4x6
Barrier jumps (hurdle jumps)	2x6	3x6	3x6
Lateral cone jump	3x10	4x10	3x10
3-steps + jump for height	1x5 per leg jumping off of one leg/ 1 x 5 from both legs	1x5 off of one leg/ 1x 5 off of both legs	1x5 per leg jumping off of one leg/1x5 jumping from both legs
1-leg step up jump	2x8 (per leg)	3x8	3x8

PHASE IV

Exercise	**Week#1**	**Week#2**	**Week#3**

Ricochet jumps off low box or stairs	2x20	3x20	3x20
Knees to chest tuck jump	2x10	3x10	3x10
Low depth jump for height (use 6-12 inch box)	3x5	4x5	3x5
Power skipping (straight legs)	2x25 yards	3x25 yards	3x25 yards
Shock drop jumps (altitude landings – use a box 20% higher then best vertical- land up on toes in ¼ squat position)	3x6	4x6	3x6
Squat jump bounding with pause (hands behind head)	1x25 yards	2x25 yards	2x25 yards

NOVICE PLYOMETRICS PROGRAM

This program is for the novice athlete who has done some prior jump training in the past. The program can be used alone or in conjunction with one of the strength training programs. The intensity of the exercises throughout the program is quite a bit higher then the beginners program. For this reason, before embarking on this program one should have a fairly good exercise base prior, as failure to do so could lead to injury and definitely a lack of progress. You will notice the program uses a wide variety of various drills throughout the program. This will allow you to experience a wide variety of different exercises.

Program Overview:

Goals: Introduce a wide variety of movements and exercise techniques. Focus on rate of force development and reactive strength.

Intensity: Moderately high to high

Length: 4 phases with each phase 3 weeks in duration

Frequency:

If used on it's own then follow the guidelines below:

Phase I- 3 times weekly on non-consecutive days (Monday, Wednesday, Friday or Tuesday, Thursday, Saturday) – On the 3rd week skip the 3rd workout and test.

Phase II- Same frequency as Phase I

Phase III- 2 times weekly with at least 2 full days rest between workouts. Skip the 2nd workout on the 3rd week and test.

Phase IV- Same Frequency as Phase III

If you are using this routine conjunction with a strength-training program reduce the frequency to 2 times per week for all phases.

Rest Intervals- Generally about 2 minutes for most exercises (go whenever you're ready). On higher intensity exercises like high depth jumps and shock jumps take at least 3 minutes rest between sets. Focus 100% on executing each repetition of every exercise with full power, focus, and speed

PHASE I

Exercise	Week#1	Week#2	Week#3
Slalom jump	2x50 (per leg)	3x50	3x50
Star jump (pause before each jump)	3x10	4x8	4x8
Power skipping	2x 30 yards	2x30 yards	2x30 yards
Side to side box jump (box around 12-18 inches)	2x8	3x8	3x6
1-leg step-up jump	2x8 (per leg)	3x8 (per leg)	3x8 (per leg)
Low squat ankle jump	3x30	4x30	3x30

PHASE II

Exercise	Week#1	Week#2	Week#3
1-legged ricochet jump (on stairs or low box)	3x15	4x15	3x15
Standing broad jump	3x6	4x6	3x5
1,2,3 jump	3 sets (4 jumps per leg each set)	4 sets	3 sets
Rim Jumps	2x8	2x6	2x6
High drop jump (altitude drop)(use box approximately 20% higher then best vertical)	2x5	2x5	2x5
Jump squats with pause (pause in ½ squat position prior to each jump)	1x12	2x10	2x10

PHASE III

Exercise	Week#1	Week#2	Week#3
4 star drill	2x10	3x10	3x10
Knees to chest tuck jump	3x8	4x8	3x8
3 steps + jump for height off one leg	3 sets (4 jumps per leg per set)	4 sets	4 sets
Lateral cone jump	2x10	3x10	3x10
Rhythmic lunge jump	3x10 (5 jumps per leg)	4x10	3x10

Double leg bounding (Hold hands behind head and descend into squat position prior to each jump)	2x25 yards	2x25 yards	2x25 yards

PHASE IV

Exercise	**Week#1**	**Week#2**	**Week#3**
1-leg slalom jump	2x30 (per leg)	3x30	3x30
1-leg speed hop	2x20 yards	3x20 yards	3x20 yards
On-box jump	3x6	4x5	3x5
Low squat ankle jump into shock lunge	1x5(per leg)	2x5	3x5
High depth jump (box >18 inches)	3x6	4x5	3x5
Leap frog jumps	1x25 yards	1x25 yards	1x25 yards

INTERMEDIATE PLYOMETRIC PROGRAM

This program is for the intermediate trainee who chooses to embark on a program of plyometric training without following one of the strength training routines. This program should not be done at the same time as the other intermediate routines because those routines already incorporate both strength-training and plyometrics. Following one of those programs while also attempting to perform this program could possibly lead to over-training.

If someone wanted to follow this program in conjunction with a strength training program it can be coupled with the Novice strength training program with fantastic results! If you take a look at the program you might notice the frequency is 2 times per week for the entire duration of the phase. If you're like many you may be asking the question, "well if it's an intermediate program then why is the frequency less than the beginners program?" This is a good question. The reason is mainly because the drills used throughout the program are of the more intense varieties with more depth jumps and other highly stressful/reactive exercises. These exercises take longer to recover from. Another reason for this is because intermediate athletes, due to their enhanced athletic capabilities, are capable of applying more intensity into their exercises and often take longer to recover from that intensity.

The more advanced one becomes the better their muscular recruitment capabilities, the more damage they can inflict on their body. Any individual can rapidly improve their performance, but their capacity to recover from that activity doesn't advance so rapidly. To get a better grasp on this concept think of this. Which athlete puts more stress on their body, the athlete who performs a 40-inch vertical leap or the athlete who performs a 20-inch vertical leap? For this reason novice athletes can not only get away with, but also respond to more volume in their training because they are not creating as deep of an inroad into their system. The more advanced you become, at

least initially, the longer you need to recover from highly intense training and thus a frequency of 2 times per week is optimal on this program. As you become more advanced your system will gradually adapt to more volume.

Intermediate Plyometrics program guidelines:

Goals: A large focus on improving reactive strength

Intensity: Moderately High to High

Length: 4 phases with each phase 3 weeks in duration

Frequency: 2 times per week with at least 2 full days between workouts. On the final week of each phase test first and then perform the workout. At the conclusion of the entire program take an entire week off then re-test.

Rest Intervals: 2 minutes for most exercises. At least 3 minutes between sets on depth jumps and sprints.

Phase I

Exercise	Week#1	Week#2	Week#3
Bent over straight legged donkey ankle bounce	2x30	3x30	3x30
1-2-3 jump	2 sets – 4 jumps per leg per set	3 sets	3 sets
Rhythmic ¼ jump squat	2x8	3x8	3x6
Broad Jump	3x6	4x5	3x5
Low box depth jumps	4x5	4x5	3x5
20 yard sprints (rest 5 minutes after depth jumps before performing)	4	5	4
Low squat ankle jumps	2x40	3x40	3x40

Phase II

Exercise	Week#1	Week#2	Week#3
4-star drill (try to keep legs straight and emphasize speed)	3x10	3x10	3x10
Lateral cone jump (use cone or object high enough to be challenging)	3x10	3x8	3x8
1-leg step-up jump (use high box on 1st 2 sets – lower box on last 2)	2x8 (per leg)	3x8	3x8
Power Skipping	2x40 yards	2x40 yards	2x40 yards
Medium box depth jump (box around 18 inches)	2x5	3x4	4x4

30 yard sprints (rest 5 minutes after depth jumps before performing)	4	5	4
Double Leg Bounding (hold hands behind head and descend into ½ squat position prior to each jump)	1x25 yards	1x25 yards	1x25 yards

Phase III

Exercise	**Week#1**	**Week#2**	**Week#3**
1-leg slalom jump	2x30 (per leg)	2x30	2x30
Barrier jump	2x8	3x8	3x8
On-box jump	3x5	4x5	3x5
Low side to side box jump	4x8	3x8	3x8
Rhythmic lunge jump	2x10 (5 per leg)	2x10	2x10
1-leg speed hop	4x25 yards	4x25 yards	3x25 yards
40 yard sprints (rest 5 minutes after 1 leg hops before sprinting)	5	5	4

Phase IV

Exercise	**Week#1**	**Week#2**	**Week#3**
One legged bent over donkey ankle bounce	2x30 (per leg)	2x 30	2x 30
Low box jumps for height	5 x 1	5 x 1	5 x 1
Box squat jump (2 sets jumping up followed by 2 sets jumping out – preferably jump up or over boxes)	4x6	4x6	4x6
3 steps + jump off 1 leg for height	3x4 jumps per leg	3x4 jumps per leg	3x4 jumps per leg
High drop jump followed by 5 knees to chest tuck jumps (absorb the shock and hold the landing for 3 seconds and then execute the tuck jumps)	3 sets	3 sets	3 sets
40 yard acceleration runs (stride 15 yards into a max 40 yard sprint – rest 5 minutes after the previous exercise before sprinting)	4	4	4
Rhythmic full squat jumps	1x15	1x15	1x15

Advanced Plyometrics Program

This program is for the advanced athlete who wants to do a plyometrics routine in the absence of any additional strength training. It is designed for someone who is already

at the advanced level or for someone who has worked his way up through the previous workouts.

Goals: Improve Reactive ability

Intensity: High

Length- 4 Phases with each phase 3 weeks in duration

Frequency- Two times per week with at least 2 days between workouts

Rest- 1-3 minutes between exercises

Phase I

Exercise	Week#1	Week#2	Week#3
Bent over donkey ankle bounce	2 x 50	2 x 50	2 x 50
Hurdle barrier jumps	3 x 6	4 x 6	2 x 6
1-leg step up jump	4 x 6	4 x 6	2 x 6
1-leg speed hop	3 x 25 yards	3 x 25 yards	3 x 25 yards
Shock lunges	4 x 5/leg	4 x 5/leg	2 x 5/leg
30-yd acceleration runs	3	3	3
Paused Squat jump	2 x 10	2 x 10	2 x 10

Phase II

Exercise	Week#1	Week#2	Week#3
Ricochet jump	3 x 50	3 x 50	3 x 50
Side to side box jump	2 x 10	2 x 10	2 x 10
On-box jump	4 x 4	4 x 4	2 x 4
Low squat jump into jump lunge	2 x 5/leg	3 x 5/leg	2 x 5/leg
1-2-3 jump	3 x 5 jumps/leg	3 x 5 jumps/leg	3 x 5 jumps/leg
30 yd acceleration runs	4	4	4
Consecutive broad jumps	3 x 8	3 x 8	3 x 8

Phase III

Exercise	Week #1	Week#2	Week#3
1-leg 4 star drill	2 x 10 (around and back equals 1 rep)	2 x 10	2 x 5
Barrier jumps	2 x 8	2 x 8	2 x 6
Box squat jump (2 sets up – 2 sets out)	4 x 6	4 x 6	4 x 6
Drop jump into ½ squat	3 x 5	3 x 5	3 x 5
Straight leg bounding (power skipping	3x50 yards	3 x 50	3 x 50

with an emphasis on straighter legs)		yards	yards
40 yd accelerations	3	3	3
Double leg bounding	1 x 25 yards	1 x 25 yards	1 x 25 yards

Phase IV

Exercise	**Week #1**	**Week #2**	**Week#3**
Bent over donkey ankle bounce 2/1 (Jump off 2 legs land with one and alternate)	2 x 10/leg	3 x 10	3 x 10
Medium height depth jumps (box about 18 inches)	4 x 1	4 x 1	4 x 1
On box jump with 3 step lead in	4 x 3	4 x 3	4 x 3
Drop jump into lunge position	4 x 3/leg	4 x 3/leg	4 x 3/leg
Sprint into 1-leg speed hop	3 x 20 yards	3 x 20 yards	3 x 20 yards
40 yard accelerations	4	4	4
Leap frog jumps	3 x 25 yards	3 x 25 yards	eliminate

BODYWEIGHT STRENGTH TRAINING PROGRAM

This is a 12-week strength-training program that utilizes bodyweight exercises. It is an excellent means of increasing general leg strength for those who don't have easy access to a weight-room. Although the program utilizes bodyweight exercises, it is still not only very effective, but you will be amazed how stressful working with your own bodyweight can be as anyone who's ever used it or does use it will attest to! This program can be used along with any of the other plyometric programs or even by itself. If done in conjunction with one of the plyometric programs it will be most effective if done on the same day but can also be done on the plyometrics off-days if time constraints are an issue.

Bodyweight strength training program guidelines:

Goals: Improve general leg strength, balance, and coordination

Intensity: Low to moderate

Length: 4 phases with each phase 3 weeks in duration

Frequency: 2 times per week

Rest Intervals: generally about 1-minute in between sets

Tempo: On the workout tables you will see a box marked "tempo" that will have number that look similar to this "3-0-2" This tells you how fast to perform the

movement. The first number is the negative portion, the 2nd number is the pause, and the 3rd number is the positive portion. So, if you were doing a squat and the tempo prescribed was "3-0-2" you would take 3 seconds to lower yourself down, pause for 0 seconds, and take 2 seconds to rise up. Exercises marked with an "x" should be done with an explosive concentric.

PHASE I

Exercise	Tempo	Week#1	Week#2	Week#3
Low Peterson step-up (try to raise box each week)	3-1-2	1x25 (per leg)	2x25	2x25
2-leg ski squat	10 second pause at each position with 5 positions	1 set	2 sets	2 sets
Split squat	5-2-2	2x15(per leg)	3x15	3x20
Cross body off-box lunge	3-2-2	2x20 (per leg)	3x20	3x20
Standing hip abduction	3-2-2	2x25 (per leg)	3x25	3x25
Scissor hip extension	3-0-x	2x20(per leg)	3x20	3x20
Bodyweight squats (go all the way down)	1-0-x	2x100	3x100	3x100

Phase II

Exercise	Tempo	Week#1	Week#2	Week#3
High Peterson step-up	3-0-2	1x20	2x20	3x20
2-leg ski squat	5 positions – hold each position 15 seconds	2 sets	3 sets	3 sets
One-leg squat (hold onto something for balance)	3-0-2	2x6-8	3x8	3x8
Scissor hip extension	3-3-x (pause 3 seconds at the top)	2x20 per leg	4x20	3x20
Side to side twisting lunge	3-0-2	2x25	3x25	3x25
1-leg straight leg deadlift	3-0-2	2x10 per leg	4x10	3x10
Burnout complex: squat, alternating lunge (per leg), alternating step-up jumps, jump squats	Perform 20 reps of each in succession	2 sets	2 sets	2 sets

Phase III

Exercise	Tempo	Week#1	Week#2	Week#3
1-leg ski squat	5 positions with 5 second pause at each position	2 sets	3 sets	3 sets
King deadlift	3-0-2	2 sets of as many reps as possible	3 sets of A.M.R.A.P.	3 sets of A.M.R.A.P
Low squat ankle jump into paused lunge	Explosive- hold the landing for 3 seconds	2 x 6 per leg	3 x 6 per leg	3x6 per leg
1-leg good morning	3-0-2	2x max reps	3x max reps	3x max reps
1-leg squat on box	3-0-x (place low box behind you and sit down and back on it)	2x10	3x10	3x10
Burnout complex: perform 20 reps of each in non-stop fashion 1 leg at a time: split squat, step-up jump, one legged hop in place	3-0-2 on split squats, explosive on step-up jumps and one legged hops	2 sets per leg	2 sets per leg	2 sets per leg

Phase IV

Exercise	Tempo	Week#1	Week#2	Week#3
Split squat (pause at the bottom and explode up)	5-3-x	3x8	3x8	3x8
Jumping King deadlift	1-0-x	2x max reps	3x max reps	3x max reps
1-legged ski-squat	5 positions- 10 second pause at each position	2 sets (per leg)	3 sets	3 sets
Natural glute-ham raise	Lower slowly and push yourself back up	2x15	3x15	3x15
Free standing 1-legged squat	3-0-2	2x10	3x10	3x10
Scissor hip extension	2-0-x	2x20	3x20	3x20
Burnout complex: perform 20 reps each non-stop of squat, alternating lunge, alternating step-up jump, jump squat	Explosive	2 sets	2 sets	3 sets

NOVICE WEIGHTS PROGRAM

This is a strength-training program designed for someone who is either a beginner or has less than 1 year of consistent weight training experience. The routine is designed to not only prepare and condition your body but also dramatically increase your strength in the lower body. It does this by focusing on the largest "bang for the buck" exercises, those being the barbell squat and deadlift. The routine is not overly fancy or dramatic as most effective strength training programs tend to share one thing in common and that is lots of basic hard, heavy exercises. The program calls for 2 training days per week with at least 2 days rest between workouts. The program works really nice when the novice plyometrics program is added in during the last 2 phases, which would call for 2 plyometric workouts per week and 2 strength training workouts per week. Ideally you would perform the plyometrics program on the same days that you weight train but this is not absolutely necessary. You could set it up any number of ways as long as you have 2 whole days rest in between weight training workout. For example you might set it up like this:

Option #1

Monday- Lower body workout #1 + plyometrics

Tuesday- Off

Wednesday- Plyometrics

Thursday- Off

Friday- Lower body workout #2

Saturday and Sunday- Off

Option #2 (this would be ideal but not absolutely necessary)

Monday-Off

Tuesday-Lower Body workout #1 + plyometrics

Wednesday Off

Thursday- Off

Friday Lower Body workout #2 + plyometrics

Saturday and Sunday- Off

Option #3

Monday- Lower body workout #1

Tuesday- plyometrics

Wednesday-off

Thursday- Lower body workout #2

Friday-off

Saturday- plyometrics

Sunday- Off

Option #4 (this option calls for only 1 plyometrics training day per week – this will still allow you to benefit and I actually suggest this option if you really need to work on your strength because you will be a lot fresher throughout the week)

Monday- Lower body workout #1

Tuesday- off

Wednesday- Plyometrics

Thursday- off

Friday- Lower body workout #2

Just make sure you only add the plyos in on the last 2 phases.

Program guidelines:

Goals: Dramatically increase lower body strength

Intensity: moderately heavy loading

Length: 4 phases with each phase 3 weeks in duration

Frequency: 2 times per week

Rest Intervals: 3 minutes between sets of most exercises – no specific need to monitor rest intervals – simply go whenever you're ready and make sure you are fresh so that you can hoist the heavy iron!

PHASE I (Week 1-3)

Exercise	Sets/reps	Remarks
Workout A:		
Squat	3x8-10	Do 2-3 prior warm-up sets of 8-10 reps adding weight to the bar with each set. Once you build up to your working weight try to stay with the same weight for all 3 sets
Leg curl or glute ham raise	4x8	
Calf raise	3x20	
Workout B:		
Deadlift	3x8	Do 2-3 prior warm-up sets of 6-8 reps adding weight to the bar with each set. Once you build up to your working weight try to stay with the same weight for all sets
Barbell lunge	3x8 (per leg)	Perform all the reps with 1 leg before advancing to the other leg. Follow the weak-side rule and work the weaker leg first
Single leg calf raise	3x20	Hold dumbell

Phase II (Week 4-6)

Exercise	Sets/Reps	Remarks
Workout A:		
Squat	4x8	
Explosive squat	2x5	Using 50% of the weight you used in your heaviest squat attempt perform 2 sets of 5 reps trying to explode up as fast as possible
Leg curl	4x8	Use a glute-ham instead if you have access to one.
Calf raise	4x20	
Workout B:		
Barbell Split Squat	3x8	Elevate back leg on a bench approximately 12-18 inches high
Romanian Deadlift	4x8	Focus on keeping back arched and pushing hips back
Glute-Ham raise/ leg curl	3x15	Lower yourself slowly and use your arms to push yourself back up
1-legged calf raise	3x20/leg	

Phase III (Week 7-9)

Exercise	Sets/reps	Remarks

Workout A		
Squat	4x5	The 4 sets do not include warm-ups.
1 and 1/3 squat	2x8	Squat all the way down come up 1/3 of the way then go back down and then come all the way up = 1 rep
Leg curl	4x6	
Calf raise	3x20	
Workout B:		
Platform Deadlift	4x5	Stand on a very low box or plate for a greater range of motion.
Barbell lunge	2x8/leg	
1-leg calf raise	3x20/leg	

Phase IV (Week 10-12)

Exercise	**Sets/reps**	**Remarks**
Workout A:		
Squat	4x4	Not including warm-ups
¼ squat	2x4	After your regular squats add additional weight to the bar and do 2 sets of 4 reps using a much shorter range of motion
Leg curl	4x5	
Calf raise	4x15	
Workout B:		
Deadlift from blocks	4x4	Put blocks, boxes, or plates under the plates to elevate the bar about 8 inches higher than normal. After elevation the bar should be just below your knees.
Regular Deadlift	2x4	Strip some weight off the bar and perform 2 sets of regular deadlifts
Dumbell lunge	2x8	
1-leg calf raise	3x20/leg	

INTERMEDIATE FULL WEIGHTS + PLYOMETRICS PROGRAM (FOCUS ON STRENGTH)

This program is for the intermediate athlete who needs more focus on strength. It is a complete program utilizing both weights and plyometrics, however more emphasis is placed on developing strength. For this reason this program should not be used in

conjunction with any other plyometrics or strength training programs. When you look over the program the first thing you might notice is the volume of weight-room work is a bit higher than the volume of plyometric work. The reason for this is due to the fact that the tests will indicate this trainee already has reactive (plyometric) capabilities that are ahead of his basic strength. I have included enough plyometric work to allow one to at least maintain, and possibly improve, plyometric ability without interfering with increases in strength.

The program calls for 2 weight room sessions per week and included in these sessions is a low volume of plyometric work as well. On a separate day each week there is a program consisting of plyometrics exercises. So, basically, on this program you will train with high volume weights/low volume plyometrics 2 days per week and on a separate day perform a higher volume plyometrics session. It is important to note that during the 4th week of each phase the plyometrics session is dropped. This is perfectly fine and will actually enhance your explosiveness as the lower volume will allow you to fully recover and you will actually find yourself feeling most explosive heading into the 1st week of each phase. Some individuals will need to drop the once/weekly plyometrics session throughout the duration of the entire program if this extra workout is being detrimental to their strength gains. This is quite easy to determine. If you are not gaining strength and able to add weight to the bar each week in the weight room then there's a good chance you're overtraining so in order to promote better recovery cut out the plyometrics session.

Intermediate strength focused program guidelines:

Goals: The number 1 goal is to dramatically increase basic strength by focusing on compound movements such as squats and deadlifts. The #2 goal is to increase reactive (plyometric) strength and efficiency.

Intensity: Moderately High to High

Length: 4 phases with each phase 4 weeks in length for a total of 16 weeks

Frequency: 2 weight training sessions per week with 1 plyometrics session. The plyometrics session is termed the "B" workout and should ideally fall in between the "A" and "C" workouts during the week. So you might do Workout A on Monday, Workout B on Wednesday, and Workout C on Friday or Workout A on Tuesday, Workout B on Thursday and Workout C on Saturday.

Rest Intervals: Generally 2-3 minutes between sets

Testing: Retest prior to the 2nd workout every 4th week.

Phase I (weeks 1-4)

Exercise	Week#1	Week#2	Week#3	Week#4	Remarks

Workout A:					
Single leg on-off box jumps	2x10	2x10	2x10	2x10	Per leg – start off with low box and try to slightly increase the height each week
Lateral cone jump	2x10	2x10	2x10	2x10	Use fairly low cone or other obstacle – Do not try to go 100%
Single leg squat	2x8-10	3x8-10	3x8-10	2x8-10	Start off holding onto an object for balance – try to progress into performing the movement unassisted
Dumbell Split Squat	2x10	2x8	3x6	2x6	Attempt to go heavy on these.
Barbell Squat	2x8	3x6	4x4	3x3	Perform 2 lighter warm-up sets before counting the working sets. Try to stick with the working weight for all sets.
Leg Curl	2x6	4x6	4x6	3x6	
Calf raise	3x20	4x15	4x15	3x20	
Workout B: Plyometrics					
1-leg slalom jump	2x15	2x15	2x15	N/a	Eliminate this session during week #4
Standing broad jump	2x8	2x8	2x8	N/a	
1-leg step-up jump	2x8	2x8	2x8	N/a	Per leg
Low box depth jump	2x6	2x6	2x6	N/a	Box less than 18 inches
1-leg speed hop (1-legged bounds)	2x20 yards	2x20 yards	2x20 yards	N/a	
Workout C:					
Leg curl	2x5	3x5	4x5	2x5	
Dumbell lunge	2x10	2x8	3x6	2x6	
Deadlift	3x6	3x6	4x5	3x5	
Leg extension	2x12-15	2x12-15	2x12-1	2x12-15	
1-leg calf raise	3x20	4x15	4x20	3x20	Rest 5-10 minutes
Single leg on-off box jumps	2x10	2x10	2x10	2x10	Per leg – start off with low box and try to slightly increase the height each week
Lateral cone	2x10	2x10	2x10	2x10	

jumps					

Phase II (weeks 5-8)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
Jump rope	3x1 minute	3x2 minutes	3x3 minutes	3x3 minutes	Start off doing 3 sets of 1 minute increase the duration 1 minute each week until you get to 3 minutes
Squat	3x8	4x6	6x4	3x5	
Dynamic Lunge (barbell or dumbbell)	2x10	2x8	2x6	2x6	Step forward and push forcefully back to starting position. Alternate legs
Leg curl	3x10	4x8	4x6	3x6	
Calf raise	2x15	2x12	2x10	2x8	Add weight each week
Drop jumps (shock jumps or altitude landings)	N/a	N/a	2x5	3x5	Use a high box at least 20% higher than your best vertical. Attempt to "stick" the landing landing in ¼ squat position.
Workout B: (Plyometrics)					**Eliminate this workout during the 4th week**
Single leg box jumps	2x15	2x15	2 x15	N/a	Per leg – use low box or stairs 6-8 inches. Be fast and move reflexively - fully extend the plant leg at ground contact
Box squat jumps	4x6	4x6	4x6	N/a	Use a box placing you in ¼ to ½ squat position when sitting back. Jump up as high as possible for 2 sets and out as far as possible for 2 sets.
3 steps + jump for height from one leg	4 x 1	4 x 1	4 x 1	N/a	Alternate legs. Jumps are per leg
Take about a 5 minute break and					

move to the 40's.					
40 yard sprints	4	4	4	N/a	
Workout C:					
Jump rope	3x1 minute	3x2 minutes	3x3 minutes	3x3 minutes	
Drop Jumps (shock jumps or altitude landings)	N/a	N/a	2x5	3x5	Land in ¼ squat position attempting to "stick" the landing
Platform Deadlift	3x5	4x5	6x4	3x5	Stand on a very low box or plates about 6 inches high to increase the range of motion
Barbell split squat	2x8	2x8	2x6	2x6	
Leg curl	2x6-8	3x6	4x6	3x6	
1-legged calf raise	3x15	3x12	4x10	4x8	Per leg – try to add weight each week

Phase III (weeks 9-12)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
Ankle Jumps	2x15	2x15	2x15	2x15	
Knees to chest tuck jumps	2x8	2x8	2x8	2x8	
Squat	2x8	3x6	4x4	2x5	Sets do not include warm-ups
¼ squat	2x5	3x5	3x4	2x5	Add weight to the bar after doing the regular squats and proceed to do supramaximal ¼ rep squats
Jump squat (rhythmic)	3x10	4x8	4x8	3x8	Use 30% of your max squat and perform ¼ jump squats in rhythmic fashion
Leg curl	3x8	3x6	3x6	3x6	
Workout B: (Plyometrics)					
1-leg 4 star drill	2x10	2x10	2x10	N/a	Per leg
Double leg bounding	3x25 yards	3x25 yards	3x25 yards	N/a	Hands behind head- Drop into full squat position before each jump.

Lateral cone jump	3x10	3x10	3x10	N/a	Use fairly high cone or obstacle – make it very challenging
Standing triple jump	4 sets	4 sets	4 sets	N/a	Alternate the lead leg with each set
40 yard dash	4 sets	4 sets	4 sets	N/a	
Workout C:					
Deadlift	2x5	3x5	4x3	2x5	
Deadlift from blocks	2x5	3x5	2x3	2x5	Use boxes to elevate the plates 6-8 inches higher than normal – Add additional load to the bar after the regular deadlifts
Paused Jump Squat	2x8	2x8	2x8	2x8	Use 30% of max squat
Glute-ham raise	3x15	3x15	3x15	3x15	Lower yourself under control and use your arms to assist yourself back up
Ankle jump	1x15	1x15	1x15	1x15	
Knees to chest tuck jump	1x8	1x8	1x8	1x8	
Low squat ankle jump into paused lunge	1x8/leg	1x8	1x8	1x8	Hold the lunge position for 3 seconds

Phase IV (weeks 13-16)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A					
Jump rope	3x2 minutes	3x3 minutes	3x3 minutes	3x3 minutes	
½ Squat	3x5	4x5	4 x 5	2 x 5	Stop 1-2 inches above parallel rather then going all the way down.
Jump Squat with pause (iso-ballistic jump squat)	2x8	3x6	3x6	2x6	Use 35% of max squat – descend down and pause 3 seconds 2 inches above parallel with each rep and explode

					up trying to leave the ground.
Dumbell stiff legged deadlift off box	3x8	3x8	2 x 8	2 x 8	Use fairly light weight – slightly unlock knees – and bend down all the way for a good stretch
3 steps + jump for height	2x1 with 1 leg/ 4x1 with both legs	2x1 with 1 leg/4x1 with both legs	2x1 with 1 leg/4x1 with both legs	2x1 with one leg/4x1 with both legs	Take a break first. Perform 2 sets each per leg executing a one legged takeoff and then 4 sets of 1 rep jumping off of both legs
Workout B: (Plyometrics)	**Week #1**	**Week #2**	**Week #3**	Eliminate this workout during week 4	
Power skipping	3x40 yards	3x40 yards	3x40 yards	N/a	
Low box jump for height	4x1	5x1	5x1	N/a	
Hurdle barrier jumps	3x6	3x6	3x6	N/a	
Low squat foot jump into lunge jump.	2x5	2x5	2x5	N/a	Per leg
40 yard sprints	4	4	5	N/a	
Workout C:					
Jump rope	3x2 minutes	3x3 minutes	3x3 minutes	3x3 minutes	
depth jumps	2x6	2x6	2x6	2x6	Use box about 18 inches high
3-steps + jump for height	2x1 with 1 leg/4x1 with both legs	2x1 with 1 leg/4x1 with both legs	2x1 with 1 leg/4x1 with both legs	2x1 with one leg/4x1 with both legs	Perform 2 sets each per leg executing a one legged takeoff and then 4 sets of 1 rep jumping off of both legs
Romanian Deadlift	3x8	4x6	2x5	2x5	

Jump Squat with pause (iso-ballistic jump squat)	3x8	3x8	4x6	3x6	On each rep pause 3 seconds 2 inches above parallel and explode up. Use 25% of maximum squat
Barbell lunge (step-back)	2x8/leg	2x8	2x8	2x8	Instead of stepping forward step back with each rep. Complete all the reps for one leg before moving on to the other

Intermediate Full "Balanced" Strength training + plyometric workout

This workout is for the intermediate trainee who is fairly well balanced between strength and reactivity. The routine provides a good blend of both strength training and plyometric work and incorporates it all into the same workout for convenience. The routine calls for 2 workouts per week, "A" and "B". It is divided up into 2 phases each 4 weeks long for a total of 8 weeks. At the conclusion of the 8-week series I would suggest one retest to determine which aspect of their power development needs more work or has responded more to the training. Most trainees make fantastic progress on this program due to the excellent combination of strength and power production it focuses on but at the conclusion you may find which side (strength or plyometric power production) responds better for you. If at the conclusion of the 8 weeks, it is determined that strength needs more work, then one could follow one of the strength- based programs. If plyometric efficiency and speed needs more work, then one of the plyometric workouts can be followed.

Intermediate Strength Training + plyometrics routine guidelines:

Goals: Provide a good blend of training to both increase general strength and reactive strength and rate of force development.

Intensity: Progressing from moderate to high throughout each phase

Length: 8 weeks total divided up into 2 separate 4-week phases

Frequency: 2 days per week with at least 2 whole days between workouts.

Phase I (Weeks 1-4)

Exercise	Week#1	Week#2	Week#3	Week#4	Comments
Workout A:					
Rim or high object jumps	2x10	3x10	4x10	2x10	Perform continuously – 2 minutes rest between sets
Rhythmic lunge jumps	1x10 (per leg)	2x10	3x10	1x10	1 minute rest
Depth jump	3x5	4x4	5x4	2x4	Use moderate box around 18 inches – 2 minutes rest
Jump squat with barbell	3x12 (10% of max squat)	4x10 (15%)	4x8 (20%)	2x6 (25%)	Perform rhythmically and continuously – The percentage given is the % of max squat – 2 minutes rest
Romanian Deadlift	2x6 (70%)	3x5 (75%)	4x4 (80%)	3x3 (85%)	The percentages listed are guidelines – The important thing is to add weight to the bar each week – 3 minutes rest
Full Squat	2x6 (70%)	3x5 (75%)	4x4 (80%)	3x3 (85%)	3 minutes rest
Workout B:					
Full Squat	3x6 (75%)	4x5 (80%)	4x4 (85%)	3x3 (90%)	3 minutes rest
Romanian Deadlift	3x6 (75%)	4x5 (80%)	4x4 (85%)	3x3 (90%)	3 minutes rest
Jump Squat with barbell	2x12 (10%)	3x10 (15%)	2x8 (20%)	2x6 (25%)	2 minutes rest
Depth Jumps	2x5	3x5	3x5	2x5	2 minutes rest – moderately high box
Rhythmic Lunge jumps	2x10	2x10	2x10	2x10	1 minute rest
					Rest intervals are just guidelines.

Phase II (weeks 5-8)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
One leg	2x12	3x12	4x12	2x12	Perform rhythmically and

box Jumps					try to keep ground contact time as short as possible with full extension of the plant leg at ground contact – use a box just below knee level in height – 1 minutes rest
Box squat jumps	3x6	4x6	4x6	2x6	2 minutes rest – from ¼ position sitting on box jump up as high as possible, preferably onto another box.
Depth jumps	2x5	3x5	3x5	2x5	Use moderately high box around 18 inches – 2 minutes rest
Jump squat with barbell	2x12 (15%)	3x10 (20%)	4x8 (25%)	2x5 (30%)	2 minutes rest
Romanian Deadlift	2x6 (75%)	3x5 (80%)	3x4 (85%)	2x3 (90%)	3 minutes rest
Full squat	3x6 (75%)	4x5 (80%)	2x4 (85%)	2x3 (90%)	3 minutes rest
Workout B:					
Full Squat	3x6 (75%)	4x5 (80%)	2x4 (85%)	2x3 (90%)	3 minutes rest
Regular Deadlift	2x6 (80%)	3x5 (85%)	2x4 (90%)	2x3 (95%)	3 minutes rest
Jump squat with barbell	2x12 (15%)	3x10 (20%)	4x8 (25%)	2x5 (30%)	2 minutes rest
Depth jumps	2x5	2x5	2x5	2x5	2 minutes rest
Box squat jumps	4x4	4x4	4x4	4x4	2 minutes rest – 2 sets jumping up/2 out
One leg box jumps	2x12	2x12	2x12	2x12	1 minutes rest

Intermediate full "Reactive" focused Workout

This workout is for the intermediate athlete who needs more focus on reactive strength, speed, and rate of force development. It also includes a good amount of regular pure strength work to continue to increase muscular strength throughout the program while prioritizing speed and plyometrics. The program calls for 2 workouts per week termed "A" and "B". They should be performed with at least 2 entire days

between workouts for example, Workout A on Monday, Workout B on Friday. The exact days really aren't important just make sure you have at least 2 days rest between workouts. Testing should occur prior to the 2nd workout during the 4th week in each phase. So you will test every 4 weeks prior to the 2nd workout. At the conclusion of this workout you may want to move into more of a strength based phase to continue to push your levels of strength upwards.

Intermediate reactive workout guidelines:

Goals: Dramatically prioritize and increasing reactive strength, speed, and rate of force development while further increasing basic strength.

Intensity: moderately high to high

Length: 16 weeks total consisting of 4 phases – each phase 4 weeks in duration

Frequency: 2 times per week

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
4-star drill	2x10	3x10	3x10	2x10	1 minute rest
Low squat ankle jump	2x30	3x30	3x30	N/a	1 minute rest
Rhythmic lunge jumps	1x8 (per leg)	2x8	2x6 (weighted)	2x6 (weighted)	Add weight in the form of light dumbbells – 2 minutes rest
1,2,3 jump	1x5/leg	1x5/leg	1x5/leg	N/a	2 minutes rest
20 yard sprints	3	4	5	N/a	2 minutes rest
Squat	3x5	4x5	3x5	3x3	Rest 5 minutes after the sprints before performing squats - 3 minutes rest in between sets of squats
Leg curl	2x5	4x5	4x5	2x5	2 minutes rest
Low depth jump	N/a	N/a	4 x 1	4x1	2 minutes rest – low box <18 inches
Workout B:					
4-star drill	2x10	2x10	2x10	2x10	1 minute rest

Ankle jumps	1x15	2x15	2x15	2x15	1 minute rest – aim for maximum height and power with each repetition
Rhythmic lunge jumps	1x10	1x8	2x6 (weighted)	2x6 (weighted)	Add weight in the form of light dumbbells – 2 minutes rest
					Take a brief break before the sprints
20 yard sprints	3	4	4	3	2 minutes rest
Jump squat with loaded barbell	3x10 (35%)	3x10 (30%)	4x8 (25%)	3x8(25%)	Rest 5 minutes after the sprints before performing jump squats – rest 2 minutes in between sets of jump squats
Barbell Lunge	2x8 per leg	2x8	2 x 6	2 x 6	2 minutes rest
Leg curl	2x8	2x8	2x6	2x6	2 minutes rest
Low box depth jump	N/a	N/a	4x5	3x5	2 minutes rest (use box <18 inches)

Phase II (weeks 5-8)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
1-leg speed hops	2x20 yards	2x20 yards	2x20 yards	2x20 yards	2 minutes rest
Knees to chest tuck jumps	2x15	2x12	2x10	2x8	2 minutes rest
Power skipping	2x40 yards	2x40 yards	N/a	N/a	2 minutes rest
30 yard sprints	2	2	N/a	N/a	3 minutes rest
Deadlift	3x5	4x4	5x3	3x3	3 minutes rest
Iso-miometric squat	3x5 (use 55% of maximum squat)	4x5 (60%)	5x5 (65%)	3x5 (65%)	Descend to parallel and pause 5 seconds – explode up – rest 2 minutes between sets
Rest 5-10 minutes then perform					
High box drop jumps (shock	N/a	N/a	2 x 5	2 x 5	Use high box about 20% higher than

or altitude landings)					best vertical jump – land in ¼ squat position and "stick" the landing.
Workout B:					
1-leg speed hops	2x20 yards	2x20 yards	2x20 yards	2x20 yards	2 minutes rest
Box Squat jumps	2x6	2x6	N/a	N/a	2 minutes rest
Power skipping	2x40 yards	2x40 yards	N/a	N/a	2 minutes rest
30 yard sprints	2	2	2	2	3 minutes rest
Barbell split squat	2x8	2x8	3x6	2x6	2 minutes rest
Dumbell straight leg deadlift	3x8	4x8	4x8	3x8	2 minutes rest
Rest 5-10 minutes then perform					
High box drop jumps (shock jumps or altitude landings)	N/a	N/a	2x5	3x5	Use high box about 20% higher than best vertical jump

Phase III (weeks 9-12)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
Power skipping	2x40 yards	3x40 yards	3x40 yards	3x40 yards	2 minutes rest
Standing triple jump	2 sets	3 sets	3 sets	3 sets	Alternate lead leg with each set – 1.5 minutes rest
Double leg bounding	2 x 25 yards	3 x 25 yards	N/a	N/a	Hands behind head – descend down into half squat position prior to each jump – 2 minutes rest
Low box jump for height	3x5	3x5	4x4	3x5	2 minutes rest
40 yard sprints	3	4	4	3	3 minutes rest
Rest 5-30 minutes then					

perform					
Speed Squat	6x3 (60%)	8x3 (55%)	8x3 (50%)	6x3 (50%)	Find a low box just below parallel to sit back on as you squat – sit back slightly on the box, pause for 1 second and explode up – 1 minute rest intervals
Barbell lunge	2x8	2x8	2x8	2x8	2 minutes rest
Leg curl	3x5	4x5	4x5	3x5	2 minutes rest
Workout B:					
Power skipping	2x40 yards	2x40 yards	2x40 yards	2x40 yards	2 minutes rest
Standing triple jump	4 sets	4 sets	4 sets	N/a	Alternate lead leg with each set – 1.5 minutes rest
Double leg bounding	3 x 25 yards	4 x 25 yards	N/a	N/a	Hands behind head – descend down into half squat position prior to each jump – 2 minutes rest
Low box jump for height	2x5	3x5	3x5	3x5	2 minutes rest
40 yard sprints	3	4	5	4	3 minutes rest
Rest 5 minutes then perform					
Iso-ballistic jump squat	3x5 (40%)	4x5 (35%)	4 x 5 (30%)	4x4 (30%)	Pause for 3 seconds at the bottom of each rep – rest 2 minutes
Romanian Deadlift	2x8	3x8	3x8	3x8	Rest 3 minutes

Phase IV (Weeks 13-16)

Exercise	**Week#1**	**Week#2**	**Week#3**	**Week#4**	**Remarks**
Workout A:					
1-leg speed hop (1-leg bounds)	4x20 yards	4x20 yards	4x20 yards	3x20 yards	Per leg – rest 2 minutes
Rim or high object jump	3x6	4x6	N/a	N/a	Perform rhythmically and continuously – 2

touches					minutes rest
Low squat ankle jump into paused lunge	2x6 (per leg)	2x6	N/a	N/a	2 minutes rest- jump as high as possible out of the squat position – land in deep lunge position attempting to stop your downward momentum and hold the landing
40 yard dash	4 sets	5 sets	5 sets	4 sets	3 minutes rest
Rest 5 minutes then perform					
Full Squat	3x5	4x5	N/a	N/a	3 minutes rest
Glute-ham raise or leg curl	2x15	2x15	N/a	N/a	Lower yourself under control and assist yourself up with your arms – 2 minutes rest
Rest 5-10 minutes then perform					
High depth drops	3x5	4x5	5x5	3x5	Use high box up to 20% higher then best vertical – rest 3 minutes
Workout B:					
1-leg speed hop (1-leg bounds)	4x20 yards	4x20 yards	4x20 yards	3x20 yards	Per leg – rest 2 minutes
Rim or high object jump touches	3x6	4x6	N/a	N/a	Perform rhythmically and continuously – 2 minutes rest
Low squat ankle jump into paused lunge	2x6 (per leg)	2x6	2x6	N/a	2 minutes rest - jump as high as possible out of the squat position – land in deep lunge position attempting to stop the downward momentum and hold the landing
40 yard dash	4 reps	5	5	4	3 minutes rest
Rest 5 minutes then perform					
Deadlift	4x4	4x4	N/a	N/a	3 minutes rest
One-leg squat (unweighted)	2x15	2x15	N/a	N/a	Grab onto an object to assist yourself up– 2 minutes rest
Rest 5-10 minutes then perform					

High depth jumps	3x5	4x5	5x5	3x5	Use high box up to 20% higher then best vertical – rest 3 minutes

Complete Advanced Workout

The advanced workout is a 9-week workout that utilizes concentrated strength loading to build up the various qualities. Most advanced athletes will already have fairly well developed strength, explosive strength, and reactive ability, so they require more volume in order to disrupt homeostasis enough to stimulate an adaptation. The problem is, this volume becomes excessive if everything is focused on at once. With concentrated loading, we use a high volume of strength loading to "disrupt" the system and stimulate a long term delayed training effect. The high volume phase stimulates incomplete recovery, therefore you will probably not make great gains during the first 2 phases. In fact, you may even notice a decrease in your abilities. No need to worry though. You're simply laying the groundwork for future gains. Once volume is tapered down all the functional indicators (strength, speed strength, reactive ability) will rise up and above baseline.

The workouts are higher frequency than the others with work being performed 3 times weekly. Although you address each individual strength quality throughout the week, the first 2 phases will "focus" on strength. The advanced workouts also utilize a new type of volume regulation format called "auto-regulatory" loading. Auto-regulatory loading means you let your performance on any given day tell you how much volume to do of a given exercise. As one becomes more advanced, the ability to perform on a daily basis tends to fluctuate. Because of this, telling someone to perform X number of sets and reps on a given exercise is not the best method of programming. Instead of using this method, auto-regulatory loading calls for you to find your best effort for a given exercise on a given day and simply perform the exercise until your performance begins to drop off by a predetermined percentage. For example, say a program calls for you to run 40 yard sprints (or any other exercise) twice per week. If you were to time yourself on these sprints, chances are your performance would not be the same for both training days. You'd likely be able to run faster on one day then on the next. Due to the fluctuations in recovery ability and trainability, that type of thing is to be expected. Along the same lines, if you were performing heavy bench presses, squats, or any other weight-room movement, you'd likely find the same type of thing in that your strength fluctuates on a daily basis from workout to workout. What auto-regulatory loading does is let this work for you. You simply find what you are capable of for a given movement on a given day and perform repetitions and sets until you drop below your best mark for the day. In these workouts usually you will work until your performance drops off up to 3%.

Say your program calls for you to perform 40 yard sprints and you warm-up and find that you are running a 5.0 second 40 yard dash that day and the program calls for you to train to a 3% drop-off. In this case you would continue sprinting until you drop off by 3%, or until you can no longer run the 40-yard sprint in less than 5.15 seconds (5.0

x .35=.15). On this workout you'll find your performance may fluctuate on a daily basis, but over weeks it will increase dramatically. Movements that call for auto-regulatory volume management will be identified in the "sets and reps" column. When establishing your daily max on these movements, keep in mind these are "training" maxes and not competitive maxes. Go for a true hard effort but don't get overly psyched up and aroused, otherwise it'll take you to long to recovery.

The workout is divided up into 4 phases. The first 2 phases are 4 weeks long and the last 2 are 3 weeks long. On the 4th week of phase 1 and 2 you will see the guidelines are different. Volume is lowered and you test during the 3rd workout of that particular week. Obviously, you will want to test yourself in the vertical jump but I also recommend you test your 40-yard dash, standing broad jump, and squat. For the vertical jump you should test yourself from a static start, from a running start, and from a 1-legged takeoff. If you keep careful tabs on these markers as well as the other tests, you can get an idea of which component of your program needs more work. The workout is designed for performance 3 times weekly on non-consecutive days. A good way to structure the workouts would be to do them on Monday, Wednesday, and Friday, or Tuesday, Thursday, and Saturday. Ideally take 2 full rest days at the conclusion of the training week (Saturday and Sunday, or Sunday and Monday) before starting the next week's workout. Lets get to it!

Phase I – Weeks 1-4

Workout #1

Exercise	**Sets and Reps**	**Load**	**Rest Intervals**	**Comments**	**Week #4**
Warm-up routine				As outlined	same
Slalom jumps	3 x 25		1 minute	Low intensity	Replace with vertical jumps from a running start. 4 sets of 3 repetitions – measure each attempt
60 yard strides	4 sets		Walk back to start	Accelerate smoothly over 60 yards	Replace with 40 yard dash and perform 4 maximum 40 yard sprints
10-20 minute					

break					
Squat	Auto-regulatory loading – sets of 3	80-85%	3 minutes between sets	Do sets of 3 with 80-85% of your maximum. Keep going until bar speed slows down. Perform no more than 8 sets and ideally between 5 and 8. If you can perform 8 or more increase the weight next time. If you can perform less than 5 decrease the weight next time.	Execute 3 sets of 3 reps at 80-85% of max
Romanian Deadlift	2 x 5	70% of max	2-3 minutes	Pause for 3 seconds at mid-shin level and explode up	Execute 2 sets of 5 reps
Standing calf raise	4x5	80-90%	2 minutes	Pause for 3 seconds at the bottom and 3 seconds at the top.	2 sets of 5

Phase I Workout #2

Focus

Exercise	**Sets and Reps**	**Load**	**Rest intervals**	**Comments**	**Week #4**
Warm-up routine				As written	Same
4 star drill	2x10		1 minute	Low intensity	Same
50 yard build-ups	4 sets		Walk back to start	Run and accelerate smoothly to 90% of top speed over 50 yards	3 sets
Side to side box jump	4 x 6		2 minutes	Use about an 18-inch box	2 x 6
Jump Shrug/Snatch	4 x 3	40-50% of max deadlift	2-3 minutes	Start from the floor grasping the barbell in a deadlift position. Drive it up explosively and jump at the top, while you shrug your shoulders to your ears.	2 x 3
Box Squat	3-4 sets of 2	60% of max squat	1 minute between sets	Use a wide stance and sit back on a slightly below parallel box. Relax the hips	4 sets of 2 reps

	reps			and then explode up. Really focus on bar speed. Stop performing sets when the bar speed slows and you are unable to complete a rep without hitting a sticking point. If you can complete all 8 sets add weight the next workout.	
Glute ham raise or leg curl	3 x 5	80%	2 minutes	Explode on the way up, lower down slowly on a 5 count.	2 sets of 5 reps

Phase I Workout #3

Focus

Plyometrics: Short response reactive strength

Weight room: Maximum and reactive strength

Exercise	Sets and reps	Load	Rest intervals	Comments	Week #4
Warm-up routine				As written	Warm-up normally then test vertical jump, 40 yard dash, standing broad jump, and squat. Take the rest of the workout off. Commence phase 2 the following Monday
Donkey ankle bounce	3 x 25		1 minute	Low intensity	
Power skipping	2 x 40 yards		Walk back to start	Moderate intensity	
30 yard dash	Auto-regulatory (but no more than 6 total		1-2 minutes between reps – 5 minutes	Time yourself in the sprints and once you've established your daily max keep performing	

	sprints)		between sets	repetitions until you begin to drop below your best effort. Perform reps in groups of 3 with 1-2 minutes between reps and 5 minutes between set groupings.	
Snatch Grip Deadlift	5 x 3	80-85%	3 minutes	Focus on keeping the lower back tight and straight and lifting with controlled bar speed.	
Barbell Split Squat	2 x 5/leg	75-80%	1-2 minutes		
Calf raise	3 x 15	70%	1-2 minutes		

Phase II Weeks 5-8

Focus: A general focus of all strength qualities throughout each workout

Workout #1

Exercise	Sets and Reps	Load	Rest Interval	Comments	Week #8
Warm-up routine				As written	Same
Ricochet jump	3 x 20		1 minute	Low intensity	Same
On-box jump using 3 step lead in	4 x 4		2 minutes	Use a box that is very challenging in height	Same
50 yard acceleration run	4 sprints	Accelerate smoothly up to 90% top speed	2 minutes		same
Squat	cluster – on each set perform 4 consecutive singles with 30 seconds rest in	85-87.5% - Aim for good bar speed	30 seconds rest between reps and 3		Perform 3 sets of 3 reps with 80-85% of

	between each. After 4 reps rest 3 minutes and repeat the cluster a total of 3 times or 12 total reps.		minutes between clusters		max
Romanian Deadlift	2 sets of 5	80-85%	2 minutes		Perform 2 sets of 5
Calf raise	2 x 10	75-80%	1 minute		Perform 2 sets of 10

Phase II - Workout #2

Exercise	**Sets and reps**	**Load**	**Rest interval**	**Comments**	**Week #8**
Warm-up routine				Perform as written	Same
1-leg slalom jump	3 x 30 (per leg)		1 minute		Same
30 yard acceleration runs	Auto-regulatory loading – Train to the first signs of drop-off		3 minutes	Jog forward for 20 yards accelerating gradually. At this point accelerate maximally for 30 yards.	Same
Explosive snatch grip deadlift	4 x 4	80%	2 minutes	Use a load that would enable you about 8 reps. Perform each rep with good form and bar speed.	eliminate
Barbell lunge	2 x 5 (per leg)	80%	2 minutes	Slow down – Explode up – Lower slowly for 5 seconds all the way down and explode up	eliminate

Phase 2 – Workout #3

Exercise	**Sets and reps**	**Load**	**Rest Intervals**	**Comments**	**Week #8**
Donkey ankle bounce	3 x 25		1 minute		Warm-up and then test in the vertical jump,

					40 yard dash, broad jump, and squat
Box squat jump	4 x 6		1 minute	2 sets jumping up as high as possible – 2 sets jumping out as far as possible	eliminate
¼ Squat	4 x 4	Load should be about 100% of your best full back squat for the ¼ squat and 50-60% of your best squat for the reactive squat	3 minutes		eliminate
Leg curl	3 x 5	80-85%	2 minutes	Lower with one leg for a 5 count and raise explosively with 2. Alternate the leg you use for lowering	eliminate
Calf raise	5 x 5	Heavy	1 minute	Pause for 3 seconds at the bottom of each rep and 3 seconds at the top	eliminate

Phase III

Weeks 9-11

Workout #1

Exercise	**Sets and Reps**	**Load**	**Rest Intervals**	**Comments**	
3 steps + jump for height off 1-leg	Auto-regulatory loading		1-2 minutes	Perform in sets of 3 reps. Perform an equal # of repetitions per leg. Establish daily best	

				jump and terminate when your performance drops off at all	
Reactive Squat	5 x 3	40%	2-3 minutes	Drop down into the hole, absorb the force, and explode out. Focus more on the "absorbing" rather than the "exploding"	
Explosive Leg curl or glute ham	4 x 5	60-70%	2-3 minutes	Emphasize speed on both the lowering and the raising phase	

Workout #2

Exercise	Sets and Reps	Load	Rest Intervals	Comments
Warm-up				
40 yard dash	4-6		3-5 minutes	
Power Skipping	4 x 40 yards		1-2 minutes	

Workout #3

Exercise	Sets and Reps	Load	Rest Intervals	Comments
High Drop Jump into ½ Squat	Sets of 3 – Auto-regulatory loading	Use a box up to 20% higher then best vertical jump	3 minutes	Alternate back and forth with the depth jumps
Low box depth jump for maximum height	Sets of 3- Auto-regulatory loading	Use a 12-18 inch box	3 minutes	Alternate back and forth with the drop jumps- work up to your best jump of the day.

				Terminate both the depth jumps and drop jumps when your performance drops off noticeably
Squat	3 x 3	80-85%	2-3 minutes	Low volume and moderate intensity – Focus on good depth on the eccentric and good bar speed on the concentric
Romanian Deadlift	3 x 3	80-85%	2-3 minutes	Lower slowly and explode up.

Phase IV – Weeks 12-14 (note: this phase only contains 2 workouts per week. You should rest 3-4 days in between workouts. A Monday and Thursday setup works well.)

Exercise	Sets and Reps	Load	Rest Intervals	Comments
Depth Jumps	6-8 x 3	Use a box equivalent to the height of your best vertical jump	2-3 minutes	Make sure you land as far away from the box as the box is high. (e.g. If your vertical jump is 30 inches you should land 30 inches away from the box)
40 yard dash	Auto-regulatory loading		3-5 minutes	Work up to daily best effort and stop when you drop below that

Workout #2

Exercise	Sets and Reps	Loading	Rest Intervals	Comments

High Drop Jump into ½ Squat	Sets of 3 – Autoregulatory loading	Use a box up to 20% higher then your best VJ	2-3 minutes	Alternate with Vertical Jumps for height
Vertical Jump for maximum height	Sets of 3		2-3 minutes	Use any style that you wish – The goal is simply maximum height

The Time Efficiency Workout

This workout is for the person short on time who wants to commit to a full program but doesn't have a lot of time to train. It requires a little more than an hour of total training time per week and is broken down into 2 sessions per week. The first session is dedicated to plyometric drills and the 2nd session is dedicated to weights along with a couple of plyometric drills. This is an ideal training split for those who have busy schedules or those who are in the middle of a sporting season and also have to contend with practices, games, etc. The workouts can be performed on any day, just as long as there are at least 2 complete rest days in between each workout.

Session #1

Exercise	Sets/Reps	Comments
Donkey ankle bounce	3 x 20	1 minute rest between sets
Knees to chest tuck jump	4 x 8	2 minutes rest between sets – aim for maximum effort and explosion
Rhythmic Lunge Jumps	3 x 5/leg	Alternate legs back and forth making sure to descend into a deep lunge position prior to each jump – 2 minutes rest between sets
3 steps + jump for height	5 x1	Pick a high object and take 3 steps and try to touch it. Jump off of both legs. Rest 15-20 seconds between each jump and 2 minutes between sets
40 yard sprints	4 sets	3 minutes rest between sets – ideally time each sprint

Session #2

Exercise	Sets/Reps	Comments
Squat	4 x 6-8	Perform at least 2 lighter warm-up sets prior to counting the work sets. Start off with a weight you can lift for a maximum of 7 reps and try to complete all 4 sets with the same weight for at least 6 reps – At first you shouldn't be able to do this but increase the weight whenever you can. Rest 3 minutes between sets
Leg curl or glute	4 x 6-8	Perform in the same fashion as the squats – Rest 2 minutes between sets

ham		
Box Squat Jump	2 x 5	Perform 2 sets jumping up and 2 sets jumping out – Use a light load by holding light dumbbells (10-20 lbs) in each hand – rest 2 minutes between each set
Depth Jump	4 x 4	Use a moderately high box (18-30 inches) Aim for maximum concentration and motivation prior to each jump – rest 2-3 minutes between each set and 15-20 seconds between jumps

WARM-UPS AND STRETCHING

When the time comes to prepare the body for a workout, most trainees fall into one of two groups.

1. People who know they should warm-up and stretch but don't do it.

2. People who do warm-up and stretch but instead of doing so in a manner that enhances the workout, they work against the body and end up hindering the workout.

A proper warm-up and stretching routine can undoubtedly be advantageous if done properly. In fact, I believe the proper warm-up coupled with the correct stretching program can enhance your results substantially. We all know you can't make progress when you're injured.

Warming Up For Athletic Performance

When people warm-up and stretch they usually start off by doing 5-10 minutes of low intensity cardiovascular activity like jogging or cycling followed by a few stretches to prevent injury. Actually there isn't any solid research to support this approach. When you warm-up for a strength or power session by performing several minutes of light cardio you activate and fatigue the lower threshold type I muscle fibers. This approach actually can wear you out before you ever start your workout. A better approach is to warm your body up using movements similar to those movements you'll use in your training session, while at the same time stressing range of motion and dynamic flexibility.

To enhance range of motion and develop the required flexibility you'll need to focus on dynamic flexibility rather than static Dynamic flexibility is the ability to move a joint through a full range of motion using muscular assistance or with movement. Throwing a kick above your head is an example of this. You can also call this type of flexibility "active flexibility." Static flexibility is the ability to stretch without any momentum or muscular assistance. Sitting in place and doing the splits is an example

of this. It turns out there isn't always a good correlation between static flexibility and dynamic flexibility. That is, you might not be very flexible when doing the splits (static flexibility), yet still might be able to kick well above your head (dynamic flexibility). The reverse can also be true. You might see someone with very good static flexibility, yet not very good dynamic flexibility.

What's more, performing static flexibility prior to a workout has been shown to lead to a decrease in strength and power in that workout. Healthy muscles remain at optimum contraction length in a resting position. When you stretch them, you cause them to go into a sub-optimal contraction length, hence weakening the fibers (temporarily). Don't get me wrong, static stretching has benefits, just not when done before you are going to call upon a muscle to perform at peak output levels. So save your static stretching for after your workout. Too much static flexibility work can also have a negative influence on reactive strength. An overly flexible muscle-tendon complex can dampen the reactive reflex.

Since the type of flexibility you need whenever you jump and run is dynamic, I recommend you focus the majority of your time in achieving optimal dynamic flexibility. Some static flexibility work can be beneficial, but it should only be done after your workout and never before. The following dynamic flexibility workout will greatly assist you in achieving and increasing the range of motion necessary to have awesome jumping ability speed. This warm-up and dynamic stretching routine takes less than 10 minutes and not only will it serve to get you good and warmed up, but it will also allow you to improve your dynamic flexibility. Perform it prior to plyometric or speed workouts.

Over-speed good mornings- With your hands crossed behind your head move like you would if you were bending down to touch your toes. Push your hips quickly back behind you as your upper body descends down. Execute the movement in a quick manner performing 15-20 repetitions per set.

Dynamic Lunges forward- Step into a deep lunge position then back and repeat with the other leg. Perform 10 reps with each leg.

Dynamic lunges side to side- Instead of lunging forward lunge to the side while keeping your upper body facing forward. Perform 10 reps each direction.

Wide stance speed squat- Take a very wide stance and sit back into a deep squat position. Perform the movement quickly and with an emphasis on stretching the hips. Perform 15-20 repetitions.

Walk forward heel to toe and touch ground- Walk forward in a straight line with one foot directly in front of the other touching heel to toe. With each step squat down and tough the ground. Perform 15-20 repetitions.

Crescent kicks outside to inside- Keeping your leg straight and knees completely locked kick using a high swinging motion from outside to inside. Perform 5 repetitions with each leg.

Crescent kicks inside to outside- Like the above but instead of swinging your leg outside to inside swing it inside to outside.

Duck under hurdle- Use a real hurdle or imagine a low hurdle and slide under it popping your head up on both sides. Either go back and forth under it or in a straight line ducking under it for 10 repetitions each direction.

Duck under hurdles with twist- Like the above but imagine a row of hurdles lined up. Duck under one and pop up and face the opposite direction and duck under the next one. Continue in this manner for 10 repetitions.

Butt kicks- run forward 25 yards while swinging your foot up to contact your buttocks.

High knees- run forward 25 yards with an exaggerated high knee motion.

Arm circles- swing your arms in exaggerated circles for 20 reps.

Chest flyes- use an exaggerated tree hugging posture swinging your arms forward and backward for 20 repetitions.

Trunk twists- With your arms extended all the way out to your sides simply twist back and forth for 20 repetitions.

Side bends- Using an exaggerated motion bend side to side for 20 repetitions.

Warming Up For a Strength Training Work-Out

A good option when warming up for a strength routine is to simply warm-up with your first exercise. For example, if it's squat day, I have people immediately go to the squat rack and start squatting. This is specific preparation for the task at hand. The proper muscles are activated (i.e. warmed) and the proper motor units are fired. Maximal strength is a product of number of Type II muscle fibers and the capacity of your nervous system to activate them. These are the most sensitive of all of your fibers and as you know they are referred to as "high threshold". Treat these fibers wrong and they'll definitely cause you to lose strength. The following is a list of mistakes you want to avoid and tips for warming up for strength training.

Mistake #1: High Rep Warm Ups- High reps (10 and above) will cause your body to release lactic acid into the blood stream which significantly impairs the nervous system's ability to activate high threshold (think strength) motor units. Keep the reps in your warm up sets at six or below (see examples below).

Mistake #2: Low Set Warm Ups- Knock out 10 reps with the bar, 10 reps with plates on each side, and hit it…right? Wrong! Let your nervous system know what's coming slowly and gradually. Don't make your body hear the alarm clock and immediately jump out of bed and start lifting! The closer you are working to your one rep max during your working sets, the more warm-up sets you need. I recommend between 2-4 warm up sets on your first exercise of each session. Each one of these sets should be performed with progressively heavier weight, but never excessively fatiguing yourself for your main sets. After the initial exercise you may need at most 1 warm-up set just to orchestrate the movement.

Mistake #3: Stretching- Although static stretching of the muscle you're going to be training during a strength-training session can hinder strength, there is a certain way of static stretching prior to a workout that can actually increase your strength. All you have to do is stretch the antagonist (opposite) to the muscle you are going to use. For example, if you're doing a heavy bench press go ahead and stretch the antagonistic muscle, the lats, by hanging in a chin-up position! Squatting heavy? Stretch the hip flexors by getting into a deep lunge position and holding it. You will find that this can temporarily make you stronger by relaxing the hip flexors, which act as antagonists when you jump.

Another thing you can do is, during your specific warm-up, perform reps where you hold the bottom position of a movement. This will help improve active flexibility. "Sink down" and hold the bottom position up to 10 seconds per rep. If you have trouble squatting properly due to flexibility issues you might do 2-3 sets of 5-8 reps with a 5 second hold at the bottom of a squat. Go down a little bit further on each repetition. Do the same thing on lunges or any other movements that don't feel quite right. This really helps improve specific flexibility and is in fact the only flexibility training that Olympic lifters do and they're as flexible as gymnasts!

Mistake #4: General Warm Ups- The nervous system picks up patterns, and running on the treadmill, or pedal pushing for 5-10min to "get the blood flowing" or whatever rationale you use does nothing to prepare the C.N.S. for a highly specific task like benching, squatting, rows or any other exercise for that matter (other than running or biking). So do your body a favor and don't waste your energy on something that isn't going to help your body complete the task at hand. If you're going to squat, warm up by squatting, stay away from the treadmill.

Example Warm Up Routines:

- Keep a constant moderate tempo on all reps, about 3 seconds down, 3 seconds up.
- Only perform warm up sets for the 1st exercise per cold muscle group

Rest only as long as it takes to change the weights between warm up sets

Planned Work Sets- 4 sets of 6 reps @ 225lbs

Warm up set 1: 50% 6RM =110lbs x 6 reps
Warm up set 2: 70% 6RM =160lbs x 4 reps
Warm up set 3: 90% 6RM =205lbs x 2 reps

Planned Work Sets- 3 sets of 8-10 reps @ 185lbs

Warm up set 1: 50% 10RM =95lbs x 6 reps
Warm up set 2: 80% 10RM =150lbs x 4 reps

Post Activation Potentiation Trick: Ever wonder why in the on-deck circle at a baseball game the batter has weighted donuts on his bat during his warm-up swings? When he steps into the box his bat feels light, therefore increasing swing speed and power output. This little trick can also be applied to your weight training routine for immediate gains in strength. What you do is add more weight to the bar during your warm-ups then what you will be working out with. Go up and above your working weight for 1 rep before dropping back down to your working rep range. You'll be stronger then you would otherwise.

Example Post Activation Potentiation Warm Up:

Planned Work Sets- 3 sets of 8-10 reps @ 185lbs
Warm up set 1: 60% 10RM =110lbs x 6 reps
Warm up set 2: 90% 10RM =165lbs x 3 reps
Warm up set 3: 130% 10RM =240lbs x 1 rep

Working Set 1: 185 x 8-10 reps

The heavier set of 240 lbs will increase the working effect of the 185 lbs set.

Applying these techniques to your workouts will offer the benefits of better workouts, faster progress, and fewer injuries.

Special Addition: Mental Imagery

Chances are you've heard of mental imagery or "visualization" yet never gave it a whole lot of though. Mental imagery can be thought of as a "secret weapon" in your quest for more explosive power. One of the key components of many mass marketed vertical jump programs is a very high volume of sub-maximal jumps. By having you practice over and over and over again, you'll eventually jump higher and hopefully find the technique that allows you to do this.

This volume of repetitive jumping not only borders on overtraining, but as you know by now, it obviously neglects other aspects of improving power such as limit strength, rate of force development training, and true reactive strength training.

So what does this have to do with mental imagery? Well, instead of repeating endless jump after jump on the basketball court 7 days a week for hours a time, you're going to practice the technical aspects of your jump in your mind 3-5 times a week. Now don't worry, it's not going to take much if any time to do this and is really not part of the "program" so to speak just a bonus addition that will really help you out.

To understand how mental imagery works, realize that EMG studies show that the muscle activity when you think about something is exactly the same as when you actually do it. The main difference is that the amplitude of the EMG signals are lower with imagery then they are with the actual tasks. For our purpose, this means that with imagery your muscles are learning the same recruitment and firing patterns that you'll need without the endless stress of jump after jump after jump like other programs. Specifically, you are going to break down and repeat all of the different components of the movements it takes to dunk a basketball or to jump out of the gym. Don't worry, you'll still be practicing this on the court as well because research and experience tell us that the combination of mental imagery and actual practice has the best cost/benefit ratio. Performing endless jumps leads to overtraining but without practice you never get a chance to perform what you visualize. By combining the two, real life and imagery, you save wear and tear on the joints and muscles and actually teach your mind and muscles to optimally work together.

Want evidence that this works? Consider a study done on basketball players shooting foul shots. The study took one group of players and for 2 weeks had them practice shooting foul shots every single day. The 2nd group was not allowed to touch a basketball but instead, they were required to get together for 30 minutes everyday and practice shooting foul shots in their mind. At the conclusion of the study both groups had their free throw percentage evaluated. The 2nd group, the group who hadn't even touched a basketball but who had just gone through the shooting motions in their mind, actually did better then the first group at the end of the study!

Another experiment consisted of 2 groups, a control group and an imagery group. Both groups were told to complete specific golf skills like making putts, drives, etc. At the end of the study it was concluded that the imagery group performed better because they had higher goals and expectations of themselves.

It is well-known amongst top amateur and professional athletes that the best of the best are usually avid imagery practitioners, even if they don't realize it. I'm sure you've all heard stories of how the top athletes like to get alone by themselves prior to a big game. Whether someone is off listening to music, shopping, or taking a scenic drive, they're still practicing imagery and it pays off with spectacular performance. I'm also sure, most of you, whether you realized it or not, have also had success with

imagery. Have you ever had something you were preparing for be it a sport, a test, a project, - or anything where you thought and visualized the moment ahead of time for days on end? In your mind you visualized all the scenarios. You saw it, heard, it felt it, and lived it beforehand. You knew exactly how you would respond, what you would do, say, and how your body would perform. And then, when it actually happened and you responded just how you imagined you would it felt good didn't it? And the best thing is, you just KNEW exactly how it was going to turn out because in your mind you had already achieved it! Now I can promise you doing mental imagery a few times isn't going to put 6 inches on your vertical leap by itself! But I also promise you, that if you try it out and practice it - over time you will be able to harness the power of your mind and put it to work on your body.

I'll now give you a personal experience I've had using mental imagery as it relates to basketball. Several years ago I was learning to dunk and even though I had more then enough physical skills and could jump plenty high to do so, I was still very inconsistent. The main problem I had was my footwork as I approached the basket. I was very short and had small hands so in order to throw down a dunk, my take-off had to be absolutely perfect. I had to approach the basket with great speed and, since I'm a bilateral jumper, I had to do a near perfect mini-jump stop which was a challenge because of the speed I was moving at as I approached the basket. Sometimes I'd get too high on my jump-stop and waste my momentum. Sometimes I wouldn't stop fast enough. Sometimes I'd attempt to stop too quickly and shuffle my feet in the process. Sometimes I'd take off to close to the basket, other times I took off too far. Other times I'd get everything right and then lose the ball. I struggled with this for weeks and months on end. Occasionally I'd get it right and throw down a dunk but I was very inconsistent. Finally, I started to constantly think and evaluate my approach. I would take several minutes per day to visualize the perfect approach in my mind. This can be a lot more difficult then it sounds. Oftentimes, we see ourselves from the outside looking in, like a movie. It's paramount that you visualize as if you're performing the movement in real life, in first person. In addition, if there is a glitch in our physical performance it is hard for the mind to do away with that glitch and visualize the performance the way it should be. Often it can be beneficial to take ourselves away from the main activity for a while in order to eliminate the physical glitch. It often helps if we can view ourselves in another person's body. So, in my case, rather then visualizing my own approach I'd first visualize the approach of someone else, - someone whose approach I wanted mine to look like. I'd then convert this mental picture into my own approach.

During this span of time there were a couple of times where I'd be out playing some ball and I'd be faced with the opportunity to try a dunk. If I couldn't see it right in my mind beforehand I'd pass at the opportunity. It's always better to end on a positive performance then a negative. My goal was throwing down a dunk. To attempt a dunk and fail because of my footwork would have just re-set this glitch in my mind. Finally, when I knew I had it instinctual and perfect in my mind I got out on the court, warmed up, and proceeded to throw down dunk after dunk after dunk without a flaw in my approach or footwork! Now for the imagery work details!

Imagery Details:

Frequency – 3-5 times a week

Duration – generally about 5-10 minutes or 15-30 repetitions of the actual dunking motion

Methods – Optimally, you will find a quiet place where you can completely relax and clear your mind. Take several deep breaths and create the surroundings – the gym, the floor, the basketball, the basket, and yourself. Strive to make the image as vivid as possible. Add sounds and smells along with the basic components of sight and feel.

Initially, you may want to visualize in slow motion to get used to imagery, but you want to work up to real time imagery as fast as possible. As mentioned before, the EMG patterns are the same, so unless you plan to actually dunk a basketball in slow motion, you need to visualize in real time.

Miscellaneous Topics

Q: How do I master the correct jumping technique?

A: Like any other movement pattern the act of jumping does require a certain amount of skill and if you can learn the right technique and practice it your leaping ability can improve dramatically. I am amazed by the sheer number of people I see who simply have no idea how to jump correctly or by those I see who will train hard for hours every day but make no attempt to improve their technique. I most often notice this when an athlete is at the point where he can just about throw down a dunk but can't quite get it yet. I imagine most of you know what I'm talking about. These guys will try to dunk again and again and again using the exact approach, the exact number of steps, the exact little shuffle steps, with the exact same result. When someone reaches this point they're usually better off if they take the time and make some simple adjustments in their technique.

In many circumstances, simply practicing the correct technique will add a nearly immediate 3-6 inches to the vertical jump. I have seen it happen countless times. Keep in mind when it comes to practicing there are many people who go out and practice jumping around for hours on end without much if any improvement. It should be noted that only perfect practice makes perfect!

The first thing you need to do when perfecting your technique is have the mindset that you're gonna muster up all the potential you have in your body. What if you knew that you were only using 90% of your potential? I know that most people are using

less then that because usually I can work with someone for a couple of days, if not hours, and produce at least a 10% improvement. Strength and power aren't built that quickly, so I can only attribute these immediate gains to an improvement in technique, which usually comes from an improvement in the movement pattern – optimizing the technical aspects and contribution by all the correct muscles. There are a few simple things you can begin to do immediately to get the most out of your current potential. First, I will give some tips on how to improve your 2-legged takeoff jump and then I'll address a jump done with a 1-legged takeoff.

Bilateral Jump Technique

The following assumes this is a running takeoff. Basically you want to approach your takeoff point as fast as you can while bending your knees as little as possible while getting off the ground as quickly as possible after your final plant. You want to convert horizontal momentum into vertical force. To do this proficiently requires that you concentrate on and practice 4 phases of your jump.

These 4 phases are:

1. The approach or jump-stop phase

2. The countermovement phase

3. The rising phase

4. The takeoff phase

The first phase is the approach phase. This is the phase where you build up speed and run towards your take off point and involves a jump stop.

If you simply run towards the basket at a high rate of speed and then try to jump off of both legs you'll instinctually perform a jump stop without even thinking about it because you'll have to quickly stop and gather yourself to jump. To do this you'll naturally execute a little "mini-jump" just before you replant to gather energy for your big jump. The problem is, too many people waste all their momentum coming out of their jump stop so they really don't gain much of an advantage from their run-up. If executed properly, a jump-stop should enable you to convert your horizontal momentum into a powerful upward thrust. There are a few mistakes people often make. The first is that their jump stop simply takes too long – they either jump too high during the jump stop and waste their momentum, or they just kind've stumble because they haven't become proficient at executing this movement correctly or with coordination. The 2nd mistake people make is that when they come out of their jump stop they waste too much time and energy resetting themselves prior to their main jump – they spend too much time on the ground and bend their knees too much, thus wasting momentum and potential plyometric contribution. Watch your favorite

dunkers take off out of a jump-stop and I'm sure you'll notice how effortlessly they make the entire process look.

You should concentrate and practice on gathering momentum from your approach instead of being mechanical and having to stop, reset, and then jump. Try to approach your target with as much speed as possible while keeping your jump stop low and short. You don't want to have to stop and reset yourself at all when you come out of your jump stop. Most people approach their target too slowly or too quickly. They either take too high of a jump-stop or take off too close to their target. A properly executed jump stop will add a significant amount to your running 2-legged jump. The solution is nothing more complicated then practice!

The next phase is the countermovement phase. This is the point just prior to take-off where you quickly drop down to pre-stretch the muscles and gather energy. The quicker you drop down and come out of your countermovement or ¼ squat the more force you buildup, the less horizontal momentum you waste, and thus the more potential reflexive force your body will put out during the actual jumping phase. If you pay attention to the best leapers you'll usually notice that they tend to descend very quickly in their countermovements. In fact, the main visual difference that separates those with an elite vertical jump from those with an average vertical jump is the rate of speed at which they descend in their countermovement. The good thing is that you can quickly become better at this with practice. So, attempt to make both the jump stop and countermovement as quick as possible. Many people waste too much horizontal momentum during their countermovement because they take too long to reset prior to their main jump.

The next phase you'll want to address is the rising or ascending phase of your jump. As you begin to rise (ascend) you should straighten your legs in a smooth manner. Don't try too hard. The more you can relax the more reflexive muscle contribution you'll gain. Don't try to be too quick here – doing so will probably just tighten you up and actually cause a loss of power. You can add the intensity at the end, but for now just try to stay smooth and relaxed as you rise.

The final phase I'll discuss is the final takeoff phase. Just prior to leaving the ground you should then concentrate on driving off the balls of your feet and your toes with as much power as you can muster. At this point you should literally try to drive holes in the floor through the balls of your feet. If you can learn to do this correctly you can gain up to 3 inches on your jump within a week. It takes a bit of work and concentration so it's essential you master the first 3 phases before you try to do this otherwise you'll screw everything up. What happens prior to this point should be smooth and relaxed with a gradual buildup of force that culminates with an explosive push-off through the balls of your feet.

If you are able to put all 4 phases together to the best of your abilities it can easily be the difference between coming up 5 inches short on a dunk vs throwing one down.

One-legged takeoff

To execute a proper 1-legged jump you should try to stay as smooth as possible. In most circumstances, the quieter you are and the smoother you take-off, the higher you'll go. In contrast, the louder and rougher your jump sounds the lower you'll go. To stay quiet you'll need to approach your target with a certain amount of speed. Many people also make the mistake of extending their plant leg (jump leg) too far in front of their center of gravity in an effort to apply more force when they jump. This lowers the hips and creates a braking effect that actually slows them down and is responsible for the loud "thud" you hear when some people jump. It also stresses the knee and takes away from the reflexive transformation of horizontal momentum into upward force. Recall that the 1-legged takeoff is inherently more reflexive in nature. This means the majority of force should naturally occur without you having to work for it. Try to make sure your plant leg stays under your center of gravity and don't reach out and "paw" for the ground. Rather, keep your hips high, don't bend your plant leg too much, and don't "try" to push too hard. Just approach and elevate smoothly and let natural instinct take care of the rest. A lot of people tend to do better at this style of jump when they do it without thinking about it. Get them going in for a layup in a crowd of people or have them run downfield and knock a pass out of the air and they'll do fine. Yet tell them to run and jump as high as possible and they'll screw it up.

Once you have the take-off phase down smooth you can add some effect to it by concentrating on a powerful drive up with the opposite knee and lead arm.

Next time you're out "practicing" your jump use some of these technical tips and see how much of a difference they make. Remember only perfect practice makes perfect! I recommend you spend 15-20 minutes 1 day per week just practicing your jump. Ideally, always terminate your jumping or dunking sessions prior to the point that you notice a measurable drop-off in performance. In other words, don't "practice" yourself to the point of extreme fatigue - try to leave each session feeling as fresh as you were at the beginning.

Q: I've heard my calves need to be strong and that they are the most important contributors to a high vertical jump. Should I be doing calf raises, platform shoes or any other exercises that strengthen the calves instead of squats, deadlifts, etc?

A: There is a rather simple method to test this out for your-self. Stand completely flat-footed and without bending your knees jump up as high as possible. How high did you get? Now do the same thing but bounce up and down on your toes without bending your knees and make an attempt to isolate the calves. Again how high did you get? Chances are that relative to your vertical jump with a deeper knee bend, you didn't get very high at all did you? In reality the muscles of the posterior chain

(glutes, hamstrings, and lower back), and the muscles of the quadriceps are responsible for 80% of your leaping power with the quads and posterior chain contributing approximately an equal 40% to vertical jump performance. The small 20% remainder is split up among the calves and muscles of the upper body. So, if you want to jump high your training would be much more economical if you spent it working on developing a nice butt instead of a nice set of calves!!! Don't get me wrong, the calves do contribute to vertical jump performance, but having strong calves alone isn't going to do anything spectacular for you. The calves need to be strong enough to stabilize forces from the ground and transfer forces from your hips, hamstrings, and glutes. This means they mainly act as stabilizers. By themselves they contribute little. If you lack strength and stability in your calves, then yes, you will notice some benefits by training them because they enhance your ability to use the larger hip muscles by increasing your ability to stabilize and transfer force.

You may also notice that many good leapers and sprinters tend to share calf development characterized by long lower legs, long Achilles tendons, and high, short, muscular calves. With this type of build these athletes have an advantage in reactive strength because of their long achilles tendons. Those long tendons transfer energy from the entire body down into the ground. During a high-speed movement they can also store and transfer involuntary force without much involvement of the muscles. In other words, those long achilles tendons lend that particular build an advantage when it comes to being quick and springy off the ground. Unfortunately, there's not a thing in the world you can do about your natural bone, tendon, and muscle structure. All you can do is simply train with what you got. Strengthen the muscles important to the task and increase their power, speed, and firing capacity. The muscle groups that contribute the most to the vertical jump are the posterior chain and quadriceps so spend the majority of your time on those. Your calves tend to get plenty of work with all the hopping around you do during workouts or sport specific work. Sprinters don't train calves at all yet they surely don't struggle when it comes to vertical jump performance or running speed.

What about platform shoes?

But what about strength shoes you might ask?? In reality I'll admit that people DO increase their vertical jumps using platform shoes. However, the improvement is because of the drills and exercises they do not by the magic of the shoes. In scientific studies, folks using the exact same training program without the shoes gain just as well if not better. In fact check out this study. It was a study involving 2 groups, one group did exercises in normal shoes. The other group did exercises in special platform (Strength) shoes. The workout was provided by the manufacturer. It randomized 12 intercollegiate track and field participants to a Strength-Shoe group and a normal-shoe group. After 8 weeks of a training program supplied by the manufacturer, the **normal-shoe group** showed a tendency to **improve more than the Strength-Shoe group on all performance measures!**

The individuals training in regular shoes improved more in the 40-yard dash (8.3% vs 6.9%), vertical jump (9.2% vs 3.3%), strength at slow speed (16% vs 10%), and strength at fast speed (13% vs -5%). Only calf circumference tended to improve slightly more in the Strength-Shoe group (2.3% vs 0.2% in the normal group). Two of the six athletes in the Strength-Shoe group complained of shin splints, and one of them had to drop out of the study because of the pain. None of the normal-shoe group complained of pain or dropped out. The study actually showed people training in normal shoes with the same training program gained more then those training with the special shoes!

In their promotional literature, Strength Footwear Inc. claim that up to 0.2 seconds can be taken off the 40-yard time (about 4%), nine inches can be added to the vertical jump (about 40%), and calf girth can be increased by two inches (about 15%). These claims were clearly not supported in this study. In fact, any slight gain that might be possible with Strength Shoes would appear to be more than offset by the higher risk of injury.

If you're dead set that you want to use platform shoes anyway you can do so. In fact, you can use the shoes for every plyometric exercise and non-weight room drill in this program. For best results you should only wear the shoes on ½ of the sets that you do. For example, lets say a program calls for you to perform 4 sets of a certain exercise. For best results you'd wear the shoes for 2 sets, and then take them off and wear regular shoes for 2 sets. By training like this you'll find you get an enhanced effect on all the exercises.

Q: How important is muscle fiber type? If you are slow-twitch fiber dominant, is it possible to make yourself fast-twitch fiber dominant, or is the type of muscle fiber that you naturally have going to stay with you your whole life?

A: Actually I believe that muscular fiber typing gets more credit then it deserves. Although having a high % of FT fibers may give one an advantage, there is little doubt that the nervous system is actually much more important. Before getting into this, it's important to understand a little about the function of muscles and how they relate to the nervous system.

Individual muscles are made up of individual muscle fibers and these fibers are further organized into motor units grouped within each muscle. A motor unit is simply a bundle, or grouping, of muscle fibers. When you tell your body to move, the brain instantaneously sends a signal through the spinal cord that reaches the motor unit and the signal then tells that particular motor unit to contract it's fibers. When a motor unit fires all the muscle cells in that particular motor unit also fire with 100% intensity. So, a muscle cell either contracts 100% or not at all. A motor unit is either recruited 100% or not at all.

During low intensity activities like lifting a spoon to your mouth, your brain recruits

motor units that have a smaller number of muscle fibers and the fibers that make up these smaller motor units are slow twitch, meaning, they don't contract as fast or contract with the same level of force as type II fast twitch motor units and fibers. If they did you'd be knocking yourself in the head with a spoon everytime you sat down to eat!!

These smaller motor units are termed low threshold motor units. As the intensity needed to apply force increases, so does the number of motor units involved in the task, particularly the number of fast twitch or high threshold motor units. The main difference between a slow twitch motor unit and a fast twitch motor unit is the fast twitch motor unit controls more muscle cells and these cells are bigger. In much the same way, the main difference between a slow twitch muscle fiber and a fast twitch muscle fiber is the fast twitch fiber is larger and can thus produce more force. During an activity such as curling a dumbbell, not only does your body recruit the same motor units as it does when you lift a spoon, but, since curling a dumbbell requires more force, it recruits enough additional fast twitch until enough have been recruited to do the job.

The body recruits the lower threshold motor units first (slow-twitch), followed by the higher threshold motor units (fast-twitch) and continues to recruit and fire motor units until you've applied enough force to do whatever it is you're trying to do regarding movement. When you are lifting something extremely heavy or applying a lot of force your body will contract practically all the available motor units for that particular muscle. During very high intensity or high force activities you get lots of motor unit activation and thus a lot of force.

So how does this relate to the fiber in the available motor units? Well type I muscle motor units contract less forcefully and a little slower then type II fast twitch motor units and they reach peak power in about 1-tenth (100 milliseconds) of a second. They are also highly resistant to fatigue so they have good endurance. This is why you can sit and eat all day or play Playstation all day and never get tired!

The type II motor units are divided into type IIA and type IIB. Both of these sub-groups
are capable of greater levels of absolute force than type I and also fatigue a lot quicker. Type IIA and IIB are capable of roughly the same amount of peak force, but the IIA fibers take a little bit longer to reach their peak power in comparison to type IIB. Type IIA fibers reach peak power in 30-50 milliseconds whereas type IIB reaches peak power in about 25 milliseconds.

Fiber Type	**Contraction Speed**	**Time to Peak Power**	**Fatigue**
I (slow twitch)	slow	100 milliseconds	slowly
IIA (fast twitch)	fast	30-50 milliseconds	fast
IIB (fast twitch)	very fast	25 milliseconds	very fast

Now, when we realize the vertical jump happens in about 200 milliseconds, if you look at the time to peak power of the individual muscle fibers, it should then become

obvious that each type (I,IIA,IIB) has enough time to reach peak power production which they do. So, why the superiority in having more fast twitch fibers? Well, since they contract quicker, if you have an advantage at the very beginning of the movement, it can result in superior performance. They also contract with a bit more force then the type I's.

This can be documented when you analyze a large group of athletes for vertical jump performance and the method of executing a vertical jump. Athletes with more FT fibers change direction a bit quicker during their countermovement (down to up) switch and they tend to use less knee bend. (Bosco) These results can be confirmed by muscle biopsy and even by special force-plate analysis. <u>This doesn't mean that one with a lower FT fiber% can't jump even higher, they just tend to do it a little slower and with a deeper knee bend.</u>

So, aside from muscle fiber involvement why is the nervous system so important? The majority of the time, the real limit to your performance is the number of motor units your nervous system can recruit in the short 200 milliseconds you have to produce max force, not the type of muscle fiber (slow twitch or fast) that comprises those motor units.

Remember the nervous system sends a signal for the muscle motor unit to contract and this determines the degree of motor unit involvement. Now, this next part is important. It normally takes anywhere from .4-.6 seconds for the nervous system to call on all the available muscle motor units to contract. This is the same length of time it takes to apply maximum force. However, it takes only .2 seconds to perform the vertical jump. So, the main determining factor is how many of **ALL** the available muscle motor units one can get turned on in .2 seconds and not how much fast twitch fiber one has.

Recall that most people can only recruit around 50% of their muscle motor units anyway. Therefore, if one lacks fast twitch fiber but also has a very efficient nervous system capable of recruiting nearly all there available motor units in the available .2 seconds - they will tend to have superior performance in comparison to someone with a less efficient nervous system and lots of fast twitch fiber.

Normally the body inhibits the contraction of all available muscle fibers as a protective mechanism. An example of this phenomenon in reverse can be seen when looking at weight-lifters. Often people can considerably increase their strength without any increase in muscle size. Why is this so? It's simply because the body becomes more efficient at the movement and muscle recruitment increases. By engaging in the correct training programs with an emphasis on speed, explosiveness, and power (and a de-emphasis on endurance) you can better teach your body and nervous system to recruit it's FT fibers.

So how can you use this information and apply it in the real world? Well take someone who is say 50/50 fast vs slow-twitch. Over time and with proper training if

he trains his body to utilize 90% of all those available those fibers and also increases the size of the FT fibers he does have, he can outperform someone who has say an 80:20 fast to slow-twitch ratio.

Here's yet another example of how important the nervous system is. In the laboratory you can take a nerve from a motor unit that supplies a slow twitch muscle fiber and replace it with one that supplies a fast twitch fiber and the slow twitch fiber will behave just like a fast twitch fiber! Focus should be placed on manipulating the impulse from the nervous system to create an adaptation favorable to your goals. You can accomplish this by focusing your training on speed, power, explosive dominated activities. By doing this you train your nervous system and all your muscle fibers to behave in a fast twitch manner. The reverse can also occur. For example, if one is blessed with a high % of FT fibers and starts marathon training the FT fibers will begin to behave much more like ST.

Now going back to the original question, can a person actually change their natural muscle fiber type? The answer is a resounding **YES!** Canadian scientists, Drs. J. Simoneau and C. Bouchard, have estimated that 40% of the variance of fiber type is due to environmental influences (i.e. exercise) while 45% is associated with genetic factors. This means you have about 40% control of your muscle fiber type, the other 45% you can do nothing about. The ratio of your fiber type is a result of (1) what you were born with, and (2) transformation of slow to fast or fast to slow through training influence. If you were to look at a muscle biopsy of a muscle fiber you'd see both red and white along with various shades of each. The white being fast twitch and the red being slow twitch. Think of eating chicken, the white meat (breast) is fast twitch. The dark meat (legs and thigh) is slow twitch. It's likely you can't take a completely red (pure endurance fiber) and turn it into a completely white (fast twitch) IIB fiber but the intermediate fibers are plastic to a certain extent and you can change the intermediate fibers into more of a slow twitch version or more of a fast twitch version. However, this may not even be all that important. Here's why.

Guess what group of people has the highest % of the fastest contracting IIB fibers?? **COUCH POTATOES!** This might come as a shock but with just about any type of training, the higher threshold fibers (IIB) change into slower contracting IIA fibers. When training is ceased these fibers once again revert back into faster contracting IIB. The reason why this happens is because the body will deal with stress in the most efficient manner possible. If we go back to our ancestral roots, in humans, fast twitch fibers were used only in times of dire circumstances and stress, such as running away from a predator or fighting. Much like the typical average sedentary person, this didn't happen very often. If you're constantly stressing your fast twitch fibers as an athlete, the body adapts to that stress in the most efficient manner possible and one thing it does with consistency is it makes those IIB fibers a little more endurance oriented, thus converting them into IIA. Fast twitch IIB fibers are fuel hungry and take a lot to maintain. By converting them into IIA this makes those fibers better able to tolerate the constant stress you put them under. This conversion has even been documented in elite level sprinters. During intensive training their IIB % actually decreased even

though their sprint times improved. If fiber dominance is of such paramount importance how is it possible they still improved their sprint times?? Well you knew you'd hear this again didn't you!? The nervous system! They became more efficient in the movements and learned to use ALL their muscle fibers in the task in minimal time.

Now having said all that I do believe that fiber typing, although less important then the nervous system, is still of some significance. What I mean is, with all things being equal it is "usually" advantageous to have a greater preponderance of fast twitch muscle fibers because they do produce more force at high speeds. Yet you can't draw perfect conclusions on this. The research states that the largest, most powerful, and strongest fiber is the fast-twitch fiber. If this were ALL true then an athlete with tremendous muscular size would also be proportionately strong, powerful, and fast. We know this to not be true.

Just compare the physiques of top-level sprinters, powerlifters, etc, and you will quickly find that size is not indicative of anything, and does little to help us project speed or strength levels. And what about guys like pro baseball pitchers? How are they able to throw so fast being that they are far from muscular nor are they known for their strength feats in the weight room, running speed, or jumping ability. Traditionally, defensive backs are faster then linebackers but the LB's are typically stronger. Bodybuilders are bigger then powerlifters yet weaker and slower. The point to take home is be "aware" of muscle fiber type and give it consideration but don't obsess about it. Leave the obsessing to the people like me! Simply train for performance and your body will take care of the rest.

Q: What about black vs white?

I questioned whether to address this topic or not. But, since there has been a movie made about the inability of white men to jump and it is common knowledge that on average there does tend to be differences in the ability of whites vs blacks when it comes to getting off the ground, I thought this information would be too valuable to leave out of this book. Personally, I could care less what color you are. I don't subscribe to either the "white men can't jump" or "black men can jump" philosophies as I believe anyone, regardless of race, can improve more then they ever dreamed possible. This doesn't mean some people don't have either an easier or more difficult time when it comes to getting the hops but with hard and intelligent work anything is possible.

It is obvious in any endeavor that there are significant differences between individuals when it comes to academic, professional, or athletic performance. Not everyone has the same abilities for any given task. Not all of us could make the Harvard dean's list much less play professional basketball or football. Most people just don't have the tools.

Why then do people assume that all groups of people (i.e. races, ethnicities, etc.) have the same talents and capacities in sports? If you're 5'5 and 140 pounds, chances are you're never going to be an offensive lineman in the NFL! If you're 6'6 and 300 lbs., chances are you're not going to be a very good horse jockey. With regard to all men being created equal, certainly in a physical sense, this is not always true.

Anyone who pays attention to or plays basketball is bound to notice a discrepancy between the average leaping ability of blacks in comparison to whites. Note the word "average" there. The most common explanation for this is that blacks are socialized to excel at these events. That is, basketball is held in higher regard by blacks so they tend to excel at it. But in a country like the United States with 260 million people, blacks make up only 12% of the population. In this country there are 5-6 times more whites than blacks, yet look at the ethnic breakdown of professional basketball and football teams and you're bound to notice a discrepancy. When it comes to an activity like sprinting, there is a huge difference between male black and white athletes when it comes to speed, particularly the 100-meter (100m) dash. An examination of the Olympic 100m dash in the past 20-30 years shows a huge dominance by black athletes. Within the US, it is obvious that black Americans dominate the 100m-dash at the high school and college level. The speed positions in professional football are almost exclusively held by blacks. Furthermore, you rarely see an Asian (American or otherwise) competing in the higher echelon of these sports. Nor do you see any Hispanics or Latinos in these events. Granted, socialization may explain, in part, the dominance of blacks in football or basketball, but this explanation is sorely inadequate when it comes to running.

So what's going on here? Are their differences genetically in favor of blacks? Although the performance differences are obvious, I think the question is how can we explain these differences and what can one do with training to either overcome them or take advantage of them.

Let's take a look at what science has to say. There are 4 areas that I'd like to talk about that may have a significant impact on athletic ability. These include:

1. Motor development
2. Body-fat
3. Body structure
4. Muscular characteristics

First lets examine motor development. Motor development basically has to do with coordination and skill in movement as well as muscle recruitment. Being able to move and coordinate your body in a variety of manners while executing complicated physical tasks involve motor development. Remember the talk about the nervous system? Motor skill and motor development are strongly correlated with efficiency of the nervous system. It should make sense that those with superior motor development and skill might also have superior muscle motor unit recruitment abilities. Remember

the more muscles you can recruit and the more muscles you can control, the more power you can develop and the bigger advantage you have in a power or speed dominant movement.

If we analyze what science has to say about this, evidence suggests that blacks are more advanced than white children in motor development during the first two years of life. They have better muscular control and coordination. Several studies that have compared black and white American infants suggest strong racial differences in motor development. Fourth, fifth, and sixth grade black boys and girls run the 35-yard dash faster than their white peers. Also, black adolescents in high school have a higher vertical jump than white adolescents. This should come as no surprise. In a review by Robert Malina in The Canadian Journal of Sport Sciences (1988), the author compiled several studies of motor performance between black and white males between 1938 and 1976. Even over this extended period of time, the results are remarkably consistent. That is, blacks did better in tests of motor ability at all time points. Blacks performed better in the dash (sprint). How much of a difference in motor performance can be attributed to environmental vs. genetic causes? Probably not a whole lot. Just like different races of people have different external physical characteristics, this data seems to indicate they also have different internal physically related performance characteristics. The efficiency of the nervous system is internal and would allow an athlete to have better coordination, skill, and power in athletic movements.

The next factor we'll look at is body-fat. Another fact is that black athletes have, on average, much less body-fat then whites. In one study that examined 74 black and 62 white males an average of 16.5 years old showed that black subjects performed significantly better at the vertical jump and 40-yard dash than the white subjects. (4.8 vs. 5.0 seconds) Interestingly enough, in this study, when you account for body-fat differences between the 2 groups and factor the added fat weight of the anglo group into sprint performance there were no significant differences between the 2 groups in sprint times. It should be obvious that the leaner you are, the less "dead weight" you have to carry around and when you jump or run even a few pounds of fat can make a difference.

Now how about structure? The length of the upper and lower extremities between blacks, whites, and Asians is obviously different to anyone with 20/20 vision. Asians (East Asians: Chinese, Japanese, Vietnamese) tend to be smaller with relatively short legs and arms with long torsos. Blacks tend to have relatively long legs and arms with short torsos and whites are somewhere in between.

As early as 1939, it has been reported that as a group, blacks tend to have longer arms and legs (as a percentage of height), narrower hips, and more slender calves than whites. Having certain structural characteristics, like small hip bones, long Achilles tendons, high muscular attachment points, low body-fat, large muscles, and long legs does give an athlete an advantage when it comes to sports requiring running and/or jumping. These physical characteristics can give one a physical leverage advantage. If you take a look around I'm sure you'll find that many possessing this structure,

regardless of race, tend to do well in activities involving speed or leaping ability. In fact, Olympic coaches from many countries simply go looking for athletes with the right structural characteristics for a particular sport. What looks right flyes right! If you're 6 foot and 400 lbs at 14 years of age you'd probably make a good sumo wrestler or football lineman. In much the same way there is a structure that tends to be ideal for jumping. The color of the skin has little relevance when analyzing one's structure. It just so happens that more blacks tend to have this particular structure than whites. For evidence, look at the sports of volleyball and high-jumping. In these sports there are plenty of white athletes who have have mind-boggling leaping ability and they also tend to share the same ideal structural characteristics.

Next, we'll take a look at muscle fiber type. Do blacks, as a group, tend to be endowed with more fast-twitch muscle fiber? There is one scientific report that measured skeletal muscle characteristics in a black and white population. It examined 23 black male African students. These were untrained sedentary individuals. They were matched for age, body weight, and body mass index. Muscle biopsies from the outer muscle of the thigh revealed that the white subjects had 8% more Type I (slow twitch) muscle fibers and 7% less Type IIA (fast twitch) fibers than black subjects. That is really not a very large difference at all. Blacks also have, on average, a modest but significantly higher level of testosterone (3-19%). Could this affect athletic performance? Possibly. It would make it easier to build muscle mass. Furthermore, it may aid an athlete's training by increasing training intensity, recovery ability, and lend towards a modest reduction in body-fat. This could translate into better performance.

The take-home message from all of this is that yes, blacks may have genetic advantages for speed and jumping activities when compared to whites. But are there more advantages then current training science has an answer for? I believe not. However, our current system as it is here in the United States does not allow one to develop optimally through the public systems, rather, they are forced to do it on their own. If you're reading this manual then congratulations, you're one of the ones with enough dedication, determination, and drive to pursue the achievement of your athletic pursuits on your own!

Out of the 4 variables we looked at: motor skills, structure, muscle fiber type, and body-fat, only one, structure, is entirely out of our control and determined by genetics. You can make a muscle bigger or smaller but you can't change the structure of that muscle, the length of the tendons, or the length of the bone. If you have long tendons you will always have long tendons and vice versa. As far as the other 3 variables, we have quite a bit of control over them.

Motor skills can be improved by partaking in a wide variety of activities throughout childhood and adolescence and by plenty practice and training in our sport of choice as teenagers or adults. Muscle fiber type can be addressed or improved by maximizing the correct methods of training (weights, power, speed) and minimizing the disadvantageous types of training (endurance training). Body-fat can be addressed by paying attention to activity levels and especially diet. In today's society 70% of

Americans are overweight! If a young athlete were to pay more attention to diet and nutrition this one key would go a long way in maximizing their athletic abilities. All these factors that we do have some control over can go a very long way in evening out our genetic advantages or disadvantages. Also, remember that regardless of race, no matter where you're at now or how much you improve in the future, there is always room for further improvement regardless of the individual! Genetic expression is one part genetics and one part environment. Although there isn't a whole lot we can do for our genetic code, we are in total control of our environment so take every advantage of it.

So how much can I expect to gain?

Ahhh! The million dollar question! How much can you expect to gain? Well rather then promise you that you're going to gain 50 gazillion inches in 6 weeks, I'd rather explain all the various things that can affect how much you're going to gain. A lot depends on the person or individual, - their genetics, their work-ethic, their ability to take direction, their ability to listen to their body, their ability to train smart, their ability to train hard, their willingness to eat right, get enough rest, and get enough recovery. So, as you can see, there are really a multitude of factors that can influence how much you'll improve. I can tell you this though. Most people over-expect in the short run and under-expect in the long run. What this means in English is that many folks hope for more improvements then they can realistically make in the short-run (months or weeks), while they underestimate what they can do in the long run.

Many folks enter a program full of motivation and intensity and rapidly apply themselves to it with all that they've got. It's really easy to do this at first when the excitement and enthusiasm is high. But what about those days when the energy or motivation isn't really there? It's not so easy then to maintain that enthusiasm, energy, and excitement. Also, these same folks often apply themselves toward a program and give up when they haven't seen any results within a week or 2. Although I'm all in favor of positive, consistent results on a weekly or bi-weekly basis, there will be times when you won't be motivated to get out there and do what you need to do and times when your gains aren't going to be coming over night. These are the times when motivation is of less importance then simple power of the will. When you feel inspired, confident or motivated it seems easier to take action toward achieving your goals, but you can't depend on those feelings over the long run to take consistent action.

Successful athletes or business people are oftentimes not any more talented or smarter than their less successful counterparts. They are simply more self-disciplined and take more consistent action. Many super talented athletes fall by the wayside even though they have the natural talent. I've seen many athletes with natural ability to die for, who never made it anywhere within their sport simply because they didn't have the consistent work ethic and willpower to take advantage of their talent.

Motivation can drive a person in the moment, but will power drives you even when you feel doubtful, lazy or apathetic. Will power creates persistence, perseverance, and consistent action. Did you know that Thomas Edison failed thousands of times before he invented the light bulb? Rather then looking at each failure as a "failure" he looked at it as a positive. When asked what he thought of each failed experiment he replied that he now simple knew of thousands of ways of creating a light bulb that didn't work, instead of saying "thousands of failures".

You may have heard of Colonel Harlin Sanders, the original founder of Kentucky Fried Chicken. Before there ever was a Kentucky Fried Chicken there was colonel Sanders. He was retired and thought he had a really good recipe for fried chicken. His plan was to find someone who would invest in his recipe for fried chicken and allow him to profit from it and so off he went searching for takers. The first person he asked said "NO!" The 2nd person he asked said "No!" The 3rd person he asked said "NO!" The No's kept coming and coming and coming. In fact, Colonel Sanders was rejected over 900 times before he finally found someone to invest in his fried chicken recipe. When they did, Kentucky Fried Chicken was born, and the rest is history! So what I'm saying is take both a short and a long-term approach to your training goals. Expect to make good short-term progress, but expect to make even greater long-term progress when you stay dedicated to your training. You can expect fantastic results very quickly but the real results and transformations occur over time. Learn all you can about your body and learn to train smart with consistent effort.

RECOVERY

Training hard is only half the battle. You might have the greatest work ethic and willpower imaginable, but if that's all you have you're not going to get very far. You also must be able to train smart and pay attention to your body. One individual might go out every single day and run 15 miles followed by 2 hours of weight training followed by 2 hours of jump training. This would sure require a lot of dedication and it would create a lot of perseverance and the ability to push through fatigue, but what kind've improvements do you think this person would make? I can tell you they'd probably increase their endurance but make no progress whatsoever and their performance in the vertical jump would actually decrease considerably! In contrast, another individual could go and dedicate to training 1 hour total per week on a consistent basis and from experience they could get results that could be earth shattering! It is fairly rare too find a young individual who does just the right amount of training and not too much or too little.

The body only has so much energy available to perform and only so much adaptive energy to recover from the demands you place on it. Progress is basically just adaptive energy being utilized to enhance performance. When you train you're placing a stress on your body. When you rest your body it then adapts to this stress so that it can better handle the stress you're placing on it. Progress doesn't happen when you're training but rather when you're resting! If all you do is train or you train too much then the body doesn't have enough time to adapt to your training. If you don't

eat a good high quality nutritious diet then the body doesn't have enough raw material from which to repair itself.

In contrast, if you don't train enough or at all then your body has no stress, and thus, nothing to adapt to in order to increase performance. This is why the right amount of training and recovery is of utmost importance. The workouts are designed to take care of both. Just realize that it takes time for your body to adapt to the stresses put upon it and you can only make progress so fast. I can say that in about 99% of the cases with athletes, if you're doing the training programs as designed and you're not making progress it is because you're overtraining rather than under-training. This goes for any program not just my programs. This over-training isn't happening from the programs per se, but rather all the other activities that you're doing. If you expect to make progress following a vertical jump specialization program while you're also playing full court basketball for 2 hours per day 7 days per week your progress will likely be either zero or very little. In fact, in this situation, many people actually regress!

Here are some tips or some guidelines you can use to make sure you're getting enough recovery. If you're training consistently simply ask yourself these questions to help assess your state of recovery and thus your state of adaptation:

1) Do I feel stronger and more explosive every week?

2) Do I remain excited about training every week?

3) If my goal is to put on weight, is it happening?

4) Am I sleeping well?

5) Do I wake up feeling refreshed each morning?

6) Am I completing each workout feeling as if I could go back and do more?

If you answer "yes" to all of these questions, then you're on the right track. If you answer "no" to a couple of them, then it's time to take a closer look at your other activities, your rest, and your nutrition. Are you spending too much time playing other sports or spending too many hours on the court? Are you eating plenty of good, clean, nutritious food? Are you getting enough sleep each night? If you answer no to some of these then simply pay more attention to them. If you answer yes to all of these then you may just be burned out and need to take ½ to a full weeks rest. Remember, long-term progress!! There is nothing at all wrong with taking a planned rest period. In fact, one of the greatest performance coaches in the world, Ian King, has all his athletes take a mandatory ½ week of active rest after every 3 weeks of training! The reason he does this is because he has found his athletes actually get much better results following this approach. They come back to train renewed with energy and

excitement and within a week surpass their previous performances. This is also the reason that active rest is already built into the programs I've designed. This can be a few days to a week of "active rest" if you want. You can and should take in some outdoor activities and occasional light exercise. Just stay away from the heavy iron during this time.

The training programs I've put together are designed to be "stimulatory" in nature. That is, they are designed to stimulate your body to increase strength, power, speed, and explosiveness. All these factors combined lead into increased performance. The workouts are not designed to kill you! Stimulate is not the same thing as annihilate! Generating fatigue is not the same thing as generating results. A workout doesn't have to be extremely tough and long in order to be effective. In fact, the reverse is usually true. You could run around with lead boots on holding 50 lbs overhead until you threw up and this would surely wipe you out but what kind've improvements would it stimulate? Probably none. You should finish each workout feeling slightly refreshed, not totally worn out. You should feel as if you could go back and complete 50% of the workout again no problem. If you're feeling totally drained you're probably doing too much and need to cut down on volume.

What's Possible?

So just how much increase is possible in your vertical jump? Well, I can say this. I highly doubt that any one person ever, and I mean EVER, has actually maxed out their vertical jump or hit their absolute peak. It's physiologically and mathematically impossible to do so! Now before you say I'm crazy let me explain. Remember how I broke the vertical jump down into its components force and velocity? Well, regardless of the person, whether they have a 50-inch vertical or a 20-inch vertical there's ALWAYS something they can do to enhance one side of the equation. One person may have a 50-inch vertical jump and spend 2-3 hours per week playing basketball. Do you think maybe if he reduced his on-court time and replaced that with strength training it might allow him to improve a bit? Another person might be in the same situation yet eat an absolutely terrible diet. Do you think if maybe he started eating an optimal diet his performance might increase just a bit? Do you see where I'm going with this?

You can take anyone and regardless of the athlete and no matter how great he or she is, there's almost always something they can do to improve their performance. This could be something as simple as just getting a few more hours rest per week, changing the focus of their training, investing in something like what you're reading here, or paying more attention to nutrition. However, the closer you come to your limits the less room you have for improvement and the less room you have for error.

The fact is that age, injuries, and other things beyond our control will often cause our performance to decrease before the actual maxing out of our abilities ever happens. Another fact is, like it or not, few of you out there are going to be vertical jump specialists. If you play any sports at all, the abilities and energies required in those

sports are going to detract away from any one specific focus. During a game of basketball the average player runs something like between 3-5 miles. No matter how you look at it 3-5 miles takes a lot out of you. So what I'm saying is your vertical jumping ability, regardless of who you are or your situation, - always has room for improvement. Some folks might gain 8 inches in 2 weeks. Others might gain 8 inches in 2 years. Some might gain 20 inches in 6 months. It's very individual. I can say that I am fully confident that if you follow not only the programs I've designed, but more importantly, the science as I've laid it out for you - If you apply yourself to solid scientific training methods I am sure you'll gain more then you ever could following any other cookie cutter program.

When will I see my best gains?

Believe it or not, most people will see their best gains after a few days to an entire weeks rest regardless of what program they're on. Remember when I talked about recovery? After taking a few days rest, our bodies are recovered and ready to perform optimally. This is why each program should be followed with at least a 3-day rest period followed by testing. Athletes across all sports have long practiced "tapering", or the reduction in volume prior to a big event. This allows them to take advantage of the enhanced recovery that comes from the rest. However, it is essential that you have built up enough training volume to have something to have something to taper into! If you're used to resting all the time sitting around watching TV then additional rest isn't going to do you a bit of good! Follow the programs as outlined and the designed rest periods will allow you to take full advantage of this.

I actually remember the very first plyometrics type workout I when I was 16. I busted my butt for 6 weeks on this program and never saw a bit of gains! Knowing what I know now I realize that I was way overtrained at the time. I completed the 6-week workout 3 days before basketball season started. I proceeded to play through the entire season with tired legs. All the playing and running and everything really wore me down. Finally, when basketball season was over in late February I took a full 2 weeks and didn't do anything physical whatsoever. One day I went back in the gym for a pick-up game. I got warmed up and decided to test out my jumping ability and to my amazement I'd actually gained about 5 inches on my jump in the 2 weeks since our last basketball game! I didn't suddenly gain 5 inches overnight. The gains were "stimulated" by my previous 6 months of high activity. When I was finally able to rest my body was finally allowed to adapt to that stimulation Just goes to show you the power of tapering and the power of rest!

What Do I Have To Do To Maintain My Vertical?

So when you develop that big vertical you've always dreamed of what are you going to have to do to maintain it? Actually you can do nothing at all and still maintain everything you have. You can quit playing basketball or any other sport tomorrow

and sit on your butt for the next 5 years without exercising and you will still have the exact same vertical as you did at the completion of your program! Ok, I'm only kidding! The truth is, you're going to have to do some of the same things to maintain your vertical as you do to increase it, only at a lot less frequency and volume. It should make sense that if you improved your vertical by increasing your strength, that you will maintain it by maintaining your strength. If you increase your vertical by performing plyometrics you will maintain it by maintaining that plyometric strength. If you improved it by doing a combination of the 2 you will maintain it doing a combination of the 2. The good thing is that it takes a lot less frequency and volume to maintain a base of strength then it does to increase it. Strength can be maintained by training as infrequently as once every 7 days for a few sets. The same goes for plyometric strength and rate of force development. Plyometric efficiency can be maintained by just playing basketball as infrequently as one time per week. Basketball is a sport that is inherently plyometric, so just playing the sport is a plyometric workout in itself.

Secrets of the Pros

I'll let you in on a little secret in-season training method practiced by virtually all NBA basketball players. Would you like to know what these players do during the season to maintain or increase their leaping ability? Well first thing, most players don't increase anything during the season other then their bank accounts. The season is so long, enduring, and physically demanding that physical capacities tend to dwindle. The players already get more than enough jump training just playing the game and in fact stress their legs so much through practices and games that any additional jump training during the season would be entirely counter-productive and quickly lead to overtraining. Rather, the focus for a professional athlete is maintaining the base of strength that they build in the off-season. They lift weights to maintain strength and let the on-court time take care of everything else. One thing you should get from this is another lesson on the importance of recovery. Unless you play very infrequently your season is not the time to be following a high volume program. Focus on improving your physical capacities in the off-season when you're fresh. Build up your strength and power and try to fit in at least one good strength workout per week during the season to maintain what you have.

What about weighted vests?

Weighted vests are actually one vertical jump and speed improving gimmick or apparatus that science has shown to be quite effective. However, the way a weighted vest should be used may be different then what you've heard. Rather than using a heavy weighted vest and performing all sorts of special exercises with it, the best way to use the vest is to simply wear one for 3 weeks with about 10% of your bodyweight all the time except for when you're sleeping. In fact, one study measured and analyzed the performance of 5 international level athletes during 13 continuous months of training. Drop jumps, average mechanical power output, and vertical jump with and without weight were used to measure their explosive power characteristics.

The athletes did not show improvement in any of the variables studied after 12 months of intensive training. It was assumed that the subjects already had reached their upper limit of performance. However, after that the athletes underwent 3 weeks of training wearing a special vest filled with extra loads (11% of bodyweight). The vest was used from morning to evening. No changes in the ordinary training program were allowed. After they had worn the weighted vest for 3 weeks they all experienced significant improvement in almost all the variables studied. Vertical jump performance was enhanced from 44.3 to 54.9 cm. (or about 3.5 inches).

The bad thing about this study is it also shows that when the vest is no longer used those improvements tend to disappear as well. So, basically, if you're fairly close to your peak, you may gain a few inches in vertical leap by wearing a weighted vest, but if not, it probably won't do much for you. If you choose to purchase one for best results you should dedicate yourself to wearing it all day which can be rather uncomfortable! For that reason it's important to purchase a quality weighted vest such as the x-vest.

What about high volume jump training programs? Don't I need to perform a lot of jumps in order to get good at it?

Upon seeing my programs many people are rather shocked when they see many of the exercises they're familiar with prescribed with many less repetitions then they've seen in some other programs. Why is this? Well the simple answer is that in order for jump training to be effective it has to be performed as a power training method. This type of training needs to be done with high intensity, focus, and concentration on every single repetition. Remember the discussion on endurance training earlier? Maximum power can only be maintained for somewhere around 10 seconds and after about 30 seconds of performing a repetitive movement power output will decline due to fatigue. Repetitions performed in a high state of fatigue are less than optimal for power development.

Having said that, there is a time when it is optimal to perform a large volume of jumps and this is when one has not learned the basic patterns of movement and can benefit from a high volume of repetitions to teach the body how to perform these movements efficiently. Another time when it is ok to use higher repetitions is at the beginning of a workout when the focus is on elevating the muscle and body temperature to prepare for the more demanding exercises to come.

To illustrate this first point, think about it. When a baby first learns to walk he or she doesn't immediately stand up and take off walking. It takes lots of practice and repetitive efforts to develop the muscular control to perform this activity. In much the same way, very young or inexperienced athletes can gain some benefit from doing high volumes of jumps to learn the correct movement patterns. These patterns can be done with a higher number of repetitions but quality repetitions are still key. Once fatigue sets in, the performance quality of these repetitions become low, power output

declines, concentration and focus decline, and thus the learning effect of the movement lessened.

This is why my beginner plyometric workouts start off with larger volumes of jumps but not extraordinary volumes. Most of you out there have already spent more then enough time learning the jumping movements and performing plenty of repetitions just playing basketball and shooting around. I've seen some programs out there that actually call for as many as 500 repetitions per set of an exercise 5 days per week!! This is way too much for any athlete and is training endurance, not power development. In addition, these programs also neglect many of the qualities that go into developing a good vertical jump, these being force, rate of force development, and plyometric strength. Many athletes I've heard from actually report negative results from these programs. The athletes that do gain are doing so most likely because they were either:

A: Unconditioned or untrained – An untrained athlete will respond to just about any program, however, they definitely will get better results by training on an optimum program.

Or

B: They were maturing physically, growing, and naturally getting stronger. This maturation process contributed strongly to their gains. Many teenagers who are growing and maturing physically could actually make significant progress by playing video games!

So the point is, no you do not need to perform programs with a dramatically high volume of jumps and doing so, in fact, would be very detrimental to the performance of most athletes.

Q: **I want to hear your personal story. As a reader I want a few more details…when did you start training? How did your improvement proceed? How many years did it all take to go from 23 to 42 inches?**

I first became interested in vertical jump development when I was 15 years old. I was a 9th grader and was one of the smallest and lightest kids in the entire school. Up until that point I had participated in a wide variety of sports but basketball was not one of them. I'd raced motocross, competed in tae-kwon-do, and played football. My freshman year was the first year that I really didn't have a sport that I could pour my heart into. Motocross had gotten too expensive, martial arts was too far to drive, and since it was February, football and basketball season were already over. This had also been the first year that I had ever really felt athletically inferior to my peers. I went to a very small school and all the guys in my grade (around 50 or so) lifted weights (mainly just bench press) at school as a requirement for athletics. In the 7th grade I

had been pretty strong for my size but by now I was the weakest and also one of the slowest. I had always been a decent athlete for my age up until this point but it seemed like everybody else was growing and maturing and I was still stuck in a little kids body.

I never had the slightest interest in basketball, in fact, I thought it was a stupid sport. Yet around April of my freshman year for no reason in particular I started watching the NBA playoffs and soon became a die-hard Boston Celtics and Utah Jazz fan. My closest neighbor lived about a mile away and had a basketball goal. Every day after school I'd walk over there and I started playing basketball for the very first time. I wasn't very good as I'd never touched a ball before and had no coaching. Yet I would spend at least 3 hours per day practicing and learning the game. I didnt have cable tv so on the weekends I would record basketball games and watch them multiple times during the week to learn moves.

Neither my neighbor friend or me were any sort've impressive leapers but he could jump higher then me. We would have our vertical jumps periodically measured at school. He had a 23-inch vertical and I had a 21-inch. I set a personal goal to beat his vertical by the end of the school my freshman year. I did manage to tie it. At around the end of my freshman year I got my own goal and spent every waking hour outside playing on it.

My sophomore year I played basketball on the team for the first time. It was difficult because the coaches didn't want me in athletics. I persisted though. I was up to 5'5 but still couldn't jump any higher and couldn't run any faster. By now I had determined that I would probably never be an athletic player so I just decided that I would become a shooter so I shot hundreds of shots per day. I was a pretty good shooter too. The summer after my sophomore year I started to see some semblance of athletic ability arise out of my body that was probably due to maturity. At 5'6 I now had a 27-inch VJ and could touch the rim from a run-up. My 40-yard dash had improved to about a 5.0. This really wasn't due to any specific training but just due to me spending a lot of time on the court. About this time I really became interested in physical improvement. I was still extremely skinny and needed to put on some muscle. I got a weight set and a big book by Arnold Schwarzenegger. I read the entire thing and, although he had about 6 different programs in the book from beginner all the way to advanced, I decided to do the advanced bodybuilders workout since I thought it would make me really big really fast!

I only trained upper body since I was afraid to train my legs with weights because I thought it would make me slow. So for exactly 6 days I pounded the weights. I would train an upper body muscle group every day with about 20 sets per bodypart. After a week I was tired, sore, and burned out. The next week I was even weaker so gave up on that idea. I didn't know why I couldn't gain strength but it was irritating because by now most of my classmates were bench pressing up to 200 lbs and I was lucky to get 100. I tried this approach multiple times my sophomore, jr. and sr. years. I would make up my mind that I was gonna start lifting and make out a big royal plan and

follow it to a T. However, nothing would ever happen and I never gained any strength whatsoever. Of course I didn't realize the importance of recovery and nutrition.

My Jr. year I was a pretty good basketball player and my “vertical jump training” consisted of a few plyometric drills and many hours spent dunking on a lowered rim. I still couldn't dunk on a regulation goal though and my vertical was still only 27 inches. By now I had turned into a slasher and a driver and my once pure shooting touch was nowhere to be found. I still don't know what happened to it. It sure didn't disappear due to practice. Yet it was made up by the ability to get to the basket anytime I wanted.

In between my jr. and sr. years I ordered a pair of strength shoes and completed 6 weeks worth of hellacious workouts without a gain of even an inch. This was right before basketball season. After the season I took several weeks off and didn't do anything. One day I went on the court and jumped and found my VJ had improved up to well over 30 inches. About this time I started lifting weights correctly for a couple of months. My first time squatting I was able to squat 180 x 5 reps full and deep, weighing about 130 lbs. By the end of my Sr. year I was able to dunk occassionally. My VJ was 36 inches and I was running a 4.8 forty-yard dash. When I graduated high school I was 5'6 145 lbs.

I went off to college and got out of shape. I never had carried a whole lot of muscle but was always naturally ripped to the bone. In fact the summer after my Sr. year I worked on a very tough concrete construction crew digging up rocks and hauling around wheelbarrows all day. I got up to 155 lbs with a 25-inch waist. I was as ripped and has as much muscle definition as any competitive bodybuilder type but I surely wasn’t dieting or anything like that. So anyway I went to college and started getting out of shape. I lost bodyweight and muscle and this muscle was replaced by fat. So now not only was I skinny but I was also soft. After 8 months of that I decided to get rid of the fat. Even though by average standards it wasn't that much I still didn't like having much of a soft belly. So I started doing a bunch of endurance activity and started strictly watching my diet for the first time ever. I rode a stationary bike for 45 minutes 3 days per week and did a lot of swimming. By the time I was done I was all the way down to 120 lbs and looked like more like a concentration camp victim then an athlete! My vertical jump had gone from a healthy 36 inches all the way down to 15 inches in about a years time. Not only did I lose all my fat but I pissed away most of my muscle too!

So, this was about the time I got serious about training and nutrition. I set a goal to rebuild my muscle and strength. I started devouring everything I could get my hands on regarding bodybuilding and nutrition. I dumped all the cardiovascular activity and started hitting the weights hard for both lower and upper body. Within 6 months I was back up to 160 lbs and was now officially hooked on lifting. I was also back into training in and coaching competitive martial arts at this time as well as delving into gymnastics. Basketball was maybe a weekend thing. My VJ came back up and stabilized at around the 30 inch range and stayed there for several years until I started

to properly utilize "strength and power training". During this time it wasn't really something I cared about.

Finally at about the age of 22 I started taking more of a "powerbuilding" approach to my workouts. The few years prior I was training and eating like a bodybuilder without a whole lot of success. I'd manage to put on 15 or so lbs and then I'd always lose most of it when I tried to shed the fat. This happened on multiple occassions and also occurred because I couldn't make up my mind what to do with regards to my martial arts training. I'd decide to get bigger and put on some muscle then decide I needed to be lighter so I'd go down a weight class. I finally decided just to focus on a gradual approach and focus on strength. By the age of 22 I was squatting 315 x 5 reps at a smallish 155 lbs at 5'8. During this time I started playing basketball again and again became interested in vertical jump development. I had also accumulated a heck of a lot of knowledge that I was anxious to apply. During a winter break from colllege I dedicated myself to a VJ and speed development program that I came up with. By the end of the program I hit a 40-inch vertical and had gone from a 4.8 to a 4.5 forty yard dash. By now I was also constantly training athletes, something that I've continued to do since.

The next year I had problems with my heart due to an arrhythmia. The result was I didn't train for about 8 months. I came back and had to again rebuild all my strength and get back in shape. After 6 months I was all the way back and then some. I was away from the martial arts and thus didn't have to worry about conditioning. I was into powerlifting and training for strength and power. I could raw squat 400 lbs x 2 weighing around 155 and VJ 42 inches for breakfast with no trouble whatsoever. Around the age of 25 I saw an ad for an arena football tryout and decided to train for it. I did and within a couple of months had attained a 4.27 forty from a standing start. Unfortunately, due to my running surface and faulty footwear I developed a nasty knee tendonitis a couple of weeks prior and had to abandon the try out.

By now I was up to a height of 5'9 at 165-170 lbs. (I grew until the age of 23). I could reverse dunk flatfooted from a standstill and take off from the dotted line off both feet and throw down a tomahawk. My running VJ was 45 and my 42 was measured by the height of a tile ceiling that I jumped up and hit my head on. I didn't jump maximally very often because it hurt all over including my ribs, groin, hips, neck, shoulders, and upper back, due to all the force. I can't explain it but if you ever get there you'll know what I mean. A 40-inch VJ was easy and something I could do without trying or even warming up. But the additional stress created by a true max effort at that level could really take its toll.

When I played basketball I would just have fun. On defense I'd intentionally match up with the tallest guy on the court and go after shot blocks. On offense I would mainly just stand around and pass the ball until I saw a good opening and then drive the ball to the basket and try to tear the rim off over someone. My shooting had deteriorated to the point where I couldn't hit the broad side of a barn but I wasn't out there to shoot and didn't. What's funny is that I was a much, much better player as a

Jr. in high school but nobody gave me much attention then. Now that I was nothing but a lazy dunker out there screwing around I actually had coaches trying to recruit me asking me if I had college eligibility left! How ironic is that? I told them, “Hell I’m not a basketball player I’m an athlete and performance coach.” That is a difference that you should be aware of. Most “athletes” are not players.

As you can see my vertical jump arose as a “side effect” of good training practices in which all my other motor qualities rose as well. The one thing that probably separates me from you is that my "internal nervous system" is very gifted. I just needed to build up a whole lot of muscle and strength to apply it. For more on that go to my website higher-faster-sports.com and read my article on quickness vs explosiveness.

FREQUENTLY ASKED PROGRAM QUESTIONS

You talked about the importance of rest. Do I need to cut down on the amount of time I play sports?

Yes you should cut down on the amount of time you’re engaged in high intensity activity or adjust your program accordingly. If you’re very active you might have to cut your vertical jump enhancement program down to only once/week or so. If you have 3 more more days of practices or games you would also be better off eliminating all plyometric work because your sport is plyometric enough. If you play full court basketball, volleyball, football, etc. for 2 hours 5 days per week and you try to add in additional training to this you’re not going to make progress no matter what you do so don’t waste your time. You can probably handle 2 days per week of intense sport before you have to make dramatic adjustments.

This also doesn’t mean that you can’t work on your skills. Anything you do at relatively low intensities isn’t going to kill you so it’s perfectly fine to go out and work on your skills as often as you like. What you want to try to limit is hours upon hours of running up and down a court, field, as well as other high intensity activity.

If I have the option of doing a leg curl or glute ham raise which should I choose?

I recommend you use the glute-ham raise. Keep in mind you can replace a leg curl with a glute ham raise in any of the programs where a leg curl is listed.

If I am very sore and tired before a workout should I push through it anyway?

It really depends. I’d give you the option of either taking the day off and completing the workout the following day or doing the workout and then reassessing how you feel after you’re into the flow of things. Generally speaking the better you feel prior to a workout the better you’ll perform in that workout but that’s no always the case. If you start your owrkout and find your performance isn’t going anywhere I recommend you either:

A: Cut the normal volume by 50% and complete the rest of the workout.

B: Go home and try again the next day.

If I miss a workout should I attempt to make up days?

One thing you should never do is make up for missed days. If you miss a day then don't worry about it just pick up the program on the day of the next scheduled workout.

Why isn't there any ab training in the workouts?

Truthfully it's because direct ab work is over-rated for performance and I don't want to overcomplicate things any further then they are already. You will get plenty of core activation from performing basic compound movements like squats, deadlifts, lunges, etc. Unless you are either older or just a total sedentary slob then your abs aren't going to be a limiting factor for you. In addition, your abs will get plenty of work from the weight training and dynamic movements. If you want to add some in that's fine. You can find some sample exercises on my website higher-faster-sports.com

Can I add in upper body workouts?

Yes you can add in upper body workouts. You can either do the upper body along with the lower body workouts or you can train the upper body on separate days. I recommend you try combining everything together initially. For upper body you might add in a pushing movement like bench press, a pulling movement like a chinup, a shoulder exercise like dumbbell presses, a biceps exercise, and a tricep exercise. That'll be about all you need.

When I complete program can I advance right on to another program or should I take some time off?

I recommend you take at least a week off between programs

I need to lose body-fat. Can you give me an example of activities that will improve my "general fitness" without stimulating unnecessary endurance adaptations?

Yes, you can do low intensity cardiovascular exercise at around 60% of your maximum heart rate for 20-30 minutes 3-4 days per week. To find 60% of your maximum heart rate subtract your age from 220 and multiply that by 60%. If you're 20 years old you'll get 120. That means you can do any cardiovascular exercise as long as your heart rate stays below 120.

You can also do short interval sprints (10-30 seconds per sprint) at 60-70% of your top speed. For example you could do 3 sets of 5 x 100 yard sprints at 60% of your top

speed. Rest 30-45 seconds between sprints and 2-3 minutes between sets. If you really need the extra activity you might do 1-2 days of low intensity cardiovascular exercise and 1-2 days of intervals.

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