

NSCA's

April 2004
Volume 3, Number 2
www.nscs-lift.org/perform

Performance Training

Journal

Plyometric Training

Eating Before Exercise

Maximizing the Effectiveness of Training Logs



Volume 3, Number 2 Contents

Feature: Plyometrics

- 9 | **Plyometric Fundamentals**
By John M. Cissik, MS, CSCS,*D, NSCA-CPT,*D
Plyometrics can be a fun and effective method of training. However, plyometrics can be dangerous and result in injury. To help keep your training safe, this article examines precautions and exercise progressions for lower body plyometrics.
- 14 | **Practical Progressions for Upper Body Plyometric Training**
By Mark Nutting, CSCS, NSCA-CPT
While formally known as “jump training” because of its focus on lower body drills, plyometrics can be very effective in upper body training. This article will explore basic concepts, exercises, and progressions of upper body plyometric training.

Departments

- 4 | **Fitness Frontlines**
By G. Gregory Haff, PhD, CSCS
The latest news from the field.
- 5 | **Mind Games**
Maximizing the Effectiveness of Training Logs
By Suzie Tuffey Riewald, PhD, NSCA-CPT,*D
Training logs have traditionally been used to record intensity, duration, repetitions, etc. Take a closer look at how your training log can be used to motivate, build confidence, and improve your performance.
- 7 | **Training Table**
Eating Before Exercise
By Debra Wein, MS, RD, LDN, NSCA-CPT
The pre-competition meal is an important part of athletic preparation. Examine what you should be eating before exercise or competition, why, and when.

NSCA's Performance Training Journal

NSCA's *Performance Training Journal* is a publication of the National Strength and Conditioning Association (NSCA). Articles can be accessed online at <http://www.nscs-lift.org/perform>.

All material in this publication is copyrighted by NSCA. Permission is granted for free redistribution of each issue or article in its entirety. Reprinted articles or articles redistributed online should be accompanied by the following credit line: "This article originally appeared in NSCA's *Performance Training Journal*, a publication of the National Strength and Conditioning Association. For a free subscription to the journal, browse to www.nscs-lift.org/perform." Permission to reprint or redistribute altered or excerpted material will be granted on a case by case basis; all requests must be made in writing to the editorial office.

Editorial Office

1885 Bob Johnson Drive
Colorado Springs, CO 80906-4000
+1 719-632-6722

Staff

Editor

Keith Cinea, MA, CSCS,*D, NSCA-CPT
kcinea@nscs-lift.org

Editorial Review

Michael Barnes, MEd, CSCS,*D, NSCA-CPT
mbarnes@nscs-lift.org

Graphics/Layout

John Kelton Conner

Typesetting

Suzann K. Henry

Sponsorship Information

Robert Jursnick
rjursnick@nscs-lift.org

NSCA Mission

As the worldwide authority on strength and conditioning, we support and disseminate research-based knowledge and its practical application, to improve athletic performance and fitness.

Future Events

June 11 – 12, 2004

Lifting for Power Symposium

Colorado Springs, Colorado

July 14 – 17, 2004

27th NSCA National Conference and Exhibition

Minneapolis, Minnesota

July 30 – 31, 2004

Plyometrics and Speed Development Symposium

Colorado Springs, Colorado

January 8 – 9, 2005

Sport-Specific Training Conference

Nashville, Tennessee

For more information on these events watch your NSCA publications and www.nscs-lift.org or contact the NSCA Conference Department at 800-815-6826.

TalkToUs

Share your questions and comments. We want to hear from you. Write to *Performance Training* Editor, NSCA, 1885 Bob Johnson Drive, Colorado Springs, CO 80906-4000, or send email to kcinea@nscs-lift.org.

FitnessFrontlines

G. Gregory Haff, PhD, CSCS

Is a low carbohydrate diet ideal for athletes?

Researchers from the University of Connecticut recently examined the effects of a high fat, moderate protein diet (61% fat; 30% protein) and a low fat diet (25% fat; 15% protein). Exercise performance, body mass, and body composition were evaluated before and after six weeks of diet intervention. Overall the researchers determined that a high fat, moderate protein diet resulted in a significantly greater decrease (10%) in anaerobic power when measured with an all out 30-second cycle ergometer test. Additionally, the high fat, moderate protein diet resulted in a significant decrease (18%) in work output during a 45 minute cycling bout. The subjects rating of perceived exertion was increased in response to the high fat, moderate carbohydrate diet. However, the high fat, moderate protein group lost significantly more body mass (2.2 kg) than the control diet group (0.1 kg). Based upon this study, it appears unwarranted for individuals who are attempting to increase their exercise performance to consume a high fat, moderate protein diet, due to the negative performance adaptations that were noted after the 6 week training period. However, if performance is not a consideration, the high fat, moderate protein diet appears to be an effective method for reducing body mass in the short term.

Fleming J, Sharman MJ, Avery NG, Love DM, Gomez A, Scheet TP, Kraemer WJ, Volek JS. (2003). Endurance capacity and high-intensity exercise performance responses to a high-fat diet. *International Journal of Sport Nutrition and Exercise Metabolism*, 13(4):466 – 478.

Buyers beware, anabolic steroids found in some dietary supplements!

Recently researchers from the German Sport University in Cologne, Germany determined that metandienone, a banned anabolic steroid, was found in three nutritional supplements. Researchers purchased supplements from a manufacturer in the United States and a distributor in the United Kingdom in 2002 and then analyzed the supplements for the presence of anabolic steroids and other banned compounds. All the supplements had declared AD-4-Complex Nutrients, MetX Synergistic Blend, 1-T-Matrix, creatine, and ribose on their product labels. Once the researchers acquired the three dietary supplements, they performed biochemical analyses of the compounds to determine the contents of the supplement. Interestingly, all three supplements tested contained metandienone of varying concentrations. It is important to note that metandienone was not declared on any of the product labels, and is a prescription anabolic steroid. Additionally, several of the nutritional supplements had

non-declared concentrations of caffeine, ephedrine, and pseudoephedrine as part of the products. Depending upon the dosage taken of these supplements, athletes may test positive on drug tests for steroids if they use supplements that contain 1-T-Matrix. Therefore, athletes who are taking nutritional supplements must realize that simply reading the product label does not guarantee that a product does not contain banned substances, and that they consume supplements at their own risk.

Geyer H, Bredehoft M, Mareck U, Parr MK, Schanzer W. (2003). High doses of anabolic steroid metandienone found in dietary supplements. *European Journal of Sport Science*, 3(1):1 – 5.

Want to shrink your waistline?

The combination of resistance training and aerobic training appears to result in greater abdominal fat loss than performing just aerobic training. Researchers from the College of Physical Education at Dong A- University of Korea and The Department of Physical Education and Health Education at the University of Tokyo compared the effects of 24 weeks of aerobic training only (60 min a day 6 days per week) to aerobic (60 min a day 3 days per week) and resistance training (60 minutes a day 3 days per week.) After the completion of the 24-week study, it was determined that the combination of aerobic and resistance training resulted in greater cardiorespiratory fitness improvements (32 %) than the aerobic-only training group (26 %). The combined training group had significantly greater reductions in body weight (6.4 kg) and body fat percentage (10.3) than the aerobic-only training group. Additionally, the combination-training group demonstrated significantly greater reductions in abdominal subcutaneous fat volume and abdominal visceral fat volume. Based upon this study it appears that the use of combination training may be extremely beneficial in reducing abdominal fat mass and overall body fat percentage in obese patients.

Park S, Park J, Kwon Y, Kim H, Yoon M, Park H. (2003). The effect of combined aerobic and resistance exercise training on abdominal fat in obese middle-aged women. *Journal of Physiological Anthropology and Applied Human Science*, 22(3):129 – 135.

About the Author

G. Gregory Haff, PhD, CSCS, is an assistant professor and the Human Performance Laboratory Director at Midwestern State University in Wichita Falls, TX. He serves as the program director for the USA Weightlifting Regional Development Center at Midwestern State University and is a member of the National Strength and Conditioning Association's Research Committee and the USA Weightlifting Sports Science and Sports Medicine Committees. Dr. Haff received the National Strength and Conditioning Association's Young Investigator Award in 2001.

MindGames

Suzie Tuffey Riewald, PhD, NSCA-CPT, *D

Maximizing the Effectiveness of Training Logs

Several years ago I had the pleasure of listening to past Olympians talk about their development as athletes. As part of the discussion, the Olympians were asked to give advice to aspiring athletes. The one piece of advice that was endorsed by the majority of the Olympians was to be diligent about keeping a training log.

Is that it? These Olympians have reached the pinnacle in their sport and the advice they offer is to keep a training log? “Most athletes already keep some sort of training log, so let’s move on to advice that will give me an edge,” is what you and most athletes are probably thinking. Rather than wondering about specific training advice or other ideas that could have been offered, maybe it is time to take another look at the concept of training logs and figure out how to make it a more useful tool.

Expanding Your Use of a Training Log

A training log is your own personal training and performance “history book.” It can be used to see what does and does not work for you in trying to meet your performance goals.

A majority of athletes use training logs to record what they do in workout such as the number of repetitions and weight lifted,

miles run, laps swam, balls thrown, or putts made. However, limiting a log to this information is only scratching the surface of the potential of training logs. While each athlete should structure a training log to meet individual needs, a good training log should include:

- The facts of the workout such as the number of reps, weight, miles, laps, weather, time of workout, etc.
- Goal(s) for the workout and the extent to which each goal was achieved.
- How you felt physically.
- How you felt mentally.
- Hours of sleep and important aspects of one’s diet.
- What you need to work on in the future based on today’s training.
- A success from the training session—what you did well or accomplished.
- Lessons learned or reminders that can be applied to competition.



Hidden Benefits of Keeping a Training Log

By keeping a more detailed record of your training, you will be able to reap the following benefits:

Increase motivation: Having daily goals and evaluating your

performance based on attainment of your goals can serve as a source of motivation. A clear purpose to your training today can

enhance your intensity and drive. Additionally, having a written record of things you need to work on based on past training can likewise increase your motivation.

Keep you accountable: Training logs distinguish wishful thinking from reality. That is, it is easy to tell yourself you had a great (or horrible) training session, but writing down what you did, how you felt, goals achieved, etc. will tell the real story. Training logs keep you accountable for what you are doing on a daily basis.

Build confidence: As has been discussed in this Mind Games column, “success breeds confidence.” What better way to build confidence than to purposefully acknowledge daily successes? Athletes often take a critical eye towards themselves, always looking for areas that need improvement. Keeping a log of daily successes forces one to recognize progress and builds confidence in the process.

Allow for self-analysis: Keeping a detailed training log enables you to better identify reasons for good and poor performances. For example, you may find your performance flattens when you get less than 6 hours sleep, or that you tend to train best when you work out with a partner, or that after a stressful day at work you struggle with your motivation. You can scrutinize what you have done to look for trends or patterns so you can make any needed changes.

There is no single training log template that will meet the needs of all athletes. Instead, you need to take the time to develop a training log and a format that will work for you. Experiment with various pieces of information that you may want to include in your training log. Figure out what information is going to be useful to you, then commit to keeping and referring back to the log.

About the Author

*Suzie Tuffey Riewald, PhD, NSCA-CPT,*D, received her degrees in Sport Psychology/Exercise Science from the University of North Carolina – Greensboro. She has worked for USA Swimming as the Sport Psychology and Sport Science Director, and most recently as the Associate Director of Coaching with the USOC where she worked with various sport national governing bodies (NGBs) to develop and enhance coaching education and training. Suzie currently works as a sport psychology consultant to several NGBs.*

Training Table

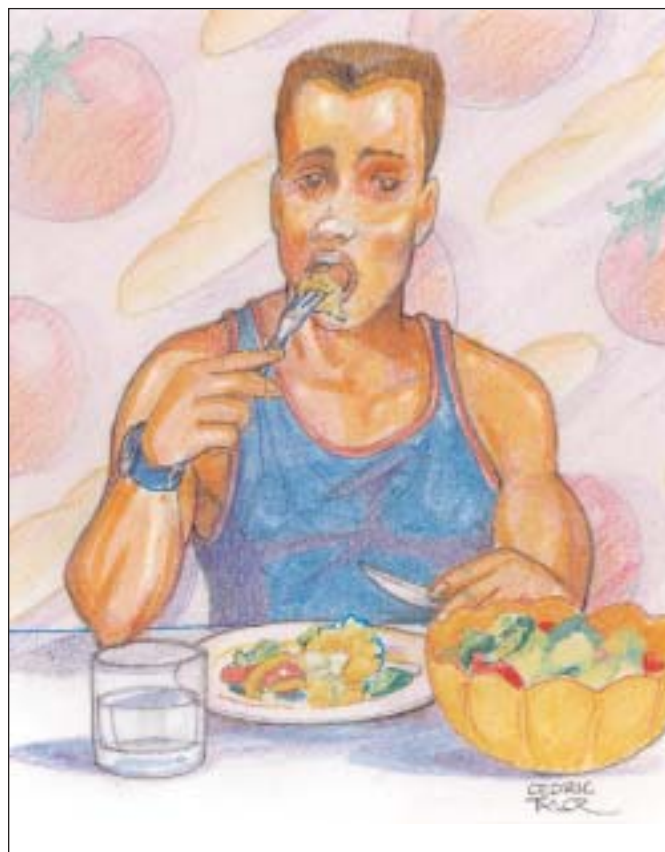
Debra Wein, MS, RD, LDN, NSCA-CPT

Eating Before Exercise

Depending on the duration, intensity, and type of exercise you are performing, there are three stages where nutrition plays a role in performance—before, during, and after activity. The goals of carbohydrate and fluid nutrition strategies are to optimize the availability of muscle glycogen and to keep the body well hydrated, thereby insuring optimal performance.

Properly nourishing yourself before exercise should:

- Prevent low blood sugar during exercise.
- Provide fuel by topping off your muscle glycogen stores.
- Settle your stomach, absorb gastric juices, and prevent hunger.
- Instill confidence in your abilities.
- Remember, fasting is detrimental to performance and is strongly discouraged before exercise or performance.



Why is it important to be adequately fueled before exercise?

Carbohydrates before exercise can help keep glucose levels steady and, if eaten far enough in advance, may increase glycogen stores (the storage form of carbohydrate). Most research points to improvements in performance including the ability to maintain submaximal exercise for longer periods as well as the ability to maintain a higher intensity level when a high carbohydrate diet is consumed.

What should I eat before exercise or a competition?

The pre-exercise meal should consist primarily of high carbohydrate, low fat foods for easy and fast digestion. Since everyone's preferences for, and responses to, different foods are unique, it is recommended that you learn, through trial and error, what works and does not work for your own body. For example, some people respond negatively to sugar intake within an hour before exercise. The temporary "boost" that some people experience after

eating foods with a high sugar (sucrose) concentration such as candy, syrups, or soft drinks actually causes an increase in insulin

production which will be followed by a rapid lowering of blood sugar and can lead to decreased performance. In addition, fructose (the sugar present in fruit juices) ingested before exercise may also lower your blood sugar and cause gastrointestinal distress in many people.

Allow adequate time for digestion and normalization of blood glucose:

- 4 hours for a large meal.
- 2 – 3 hours for a smaller meal.
- 1 hour for a blended meal, a high carbohydrate beverage (10 – 30%), or a small snack.

For an early morning event, plan wisely so that you can consume at least a smaller meal 2 – 3 hours before race time. If you know you get nervous or jittery and lose your appetite before an event, make a special effort to eat well the day before. Always eat familiar foods before a competition, don't try anything new and risk affecting your performance. Experiment only during your training.

What should I eat before exercise?

Choose foods with a low to medium glycemic index. Research shows that these foods are absorbed slowly and have a moderate effect on raising blood sugar levels (which is good.) Foods high in fiber, minimally processed, with a little fat and/or protein tend to have a lower glycemic index. Beans, lentils, citrus fruits, apples, bananas, and pasta are examples. Avoid fatty foods before exercise as they may cause digestive problems during exercise.

And another thing...

Remember to hydrate: Drink before you exercise. Drink 2½ cups (20 oz.) of water 1 – 2 hours before exercise.

Suggested Reading

Achten J, Jeukendrup AE. (2003). The effect of pre-exercise carbohydrate feedings on the intensity that elicits maximal fat oxidation. *Journal of Sports Sciences*, 21(12):1017 – 1024.

Foster-Powell K, Holt SHA, Brand-Miller JC. (2002). International table of glycemic index and glycemic load values. *American Journal of Clinical Nutrition*, 76:5 – 56.

Walberg-Rankin J. (2000). Dietary carbohydrate and performance of brief, intense exercise. *Sports Science Exchange* 79, 13(4).

Walberg-Rankin J. (1995) Dietary carbohydrate as an ergogenic aid for prolonged and brief competitions in sport. *International Journal of Sports Nutrition*, 5 Suppl:S13 – 28.

About the Author

Debra Wein, MS, RD, LDN, NSCA-CPT is on the faculty at The University of Massachusetts Boston and Simmons College. She chairs the Women's Subcommittee of the Massachusetts' Governor's Committee on Physical Fitness and Sports and is the President of The Sensible Nutrition Connection, Inc. (www.sensiblenutrition.com).

Plyometric Fundamentals

John M. Cissik, MS, CSCS,*D, NSCA-CPT,*D

Plyometrics are a type of exercise that crop up in the mainstream media and health clubs fairly often as a means to enhance athletic performance. In general, the term plyometrics refers to types of jumping or throwing drills that are designed to help increase an individual's explosiveness.

While a fun and practical way to increase athletic performance, many individuals do not realize that plyometrics can be dangerous. Injuries may occur if safety precautions are not taken and if proper technique and exercise progression is not observed. Overtraining is also easy to achieve with plyometrics.

With that in mind, the rest of this article will discuss safety and injury prevention, different types of plyometric exercises, and present some sample workout programs.

Safety and Injury Prevention

Plyometrics can be an effective way to improve explosiveness. However, if precautions are not taken they can also cause injury. The following are precautions that should be taken to prevent injuries with plyometrics.

First, learn how to land. Understanding how to land can make the difference between the exercise being effective and causing an injury. It's important to land in such a way that it allows for the muscles of the leg to be loaded as opposed to the ligaments in the knee. When landing, land in a quarter-squat. This is best achieved by pushing the hips back and flexing the knees. The knees should not be allowed to move in towards each other or out away from each other.

Second, observe proper progression. While many of the advanced exercises are fun and challenging, one should master these exercises in the proper sequence. A progression is provided so that you may learn the techniques in a slower, less complicated drill before being expected to apply them in a faster, more stressful

drill. Learning the exercises in the proper sequence ensures that you have the technique and fitness-base necessary for the more advanced exercises.

Third, perform jumps on a non-slip surface. Performing a maximal jump up to a height, down from a height, or over an obstacle and then slipping while landing (or taking off) can result in an injury. Also make sure that if drills are done onto, or off of, boxes that the boxes will not move.

Fourth, make sure the jumping area is free of clutter. This will keep you from tripping on anything and getting hurt.

Finally, realize that more is not better with plyometrics. In general they should only be performed every 48 – 72 hours. This is because they can be very taxing to the central nervous system and a great deal of recovery between workouts is necessary. Also realize that plyometrics lose their effectiveness after too many repetitions. When excessive fatigue sets in, plyometrics tend to be performed slowly and with bad technique. In general, collegiate beginners should only be performing about 100 – 150 foot contacts per workout; younger individuals should adjust that number down. More advanced individuals may perform considerably more per workout, but need to work up to that number over time.

Now that we've covered some of the major safety and injury prevention pointers, the next part of this article will cover several fundamental exercises for a good plyometric workout program.

Types of Exercises

Following are several categories of plyometric exercises. The techniques behind jumps-in-place and standing jumps should be mastered before moving on to multiple hops and jumps.

Jumps-in-Place

Jumps-in-place are single-effort jumps that have individuals landing in the same place they started from. These jumps should be maximum effort and should emphasize correct jumping technique and speed of movement. They are valuable for training

because they teach optimal jumping and landing technique, and they also teach how to move the body explosively. The following are a number of sample jumps-in-place, these are presented in the order in which they should be mastered:

- **Counter-Movement Jump**—Stand tall, feet should be hip-width apart with the hands at the sides (see Figure 1). Keeping the weight on the heels, quickly push the hips back while flexing the knees. As this happens the arms should be swung backwards from the shoulders. Squat down to a quarter-squat. Without pausing at the bottom of the squat, reverse direction explosively and throw the body straight up into the air. When landing, make sure to absorb the impact by pushing the hips back and flexing the knees.



Figure 1: Counter-movement jump, starting position

- **Squat Jump**—Stand tall, feet should be hip-width apart with the hands clasped behind the back or behind the head (see Figure 2). Keeping the weight on the heels, squat down until the thighs are parallel to the floor. Pause in the squat. Without a counter-movement and without use of the arms, jump as high as possible. When landing make sure to absorb the impact by pushing the hips back and flexing the knees.



Figure 2: Squat jump, starting position

- **Split Jump with Cycle**—Begin in a lunge position, with the right leg forward (see Figure 3). The right leg should be flexed at the knee and hip, with the right foot flat. The left leg should have a slight bend in the knee; the ball of the left foot should be on the ground. Using primarily the right leg, jump straight up into the air. While in the air cycle the legs so that upon landing the left leg is in front. Repeat with the left leg.



Figure 3: Split jump, starting position

- **Tuck Jumps**—Stand tall, feet should be hip-width apart with the hands at the sides. Keeping the weight on the heels, quickly push the hips back while flexing the knees. As this happens the arms should be swung backwards at the shoulders. Squat down to a quarter-squat. Without pausing at the bottom of the squat, reverse direction explosively and throw the body straight up into the air. While jumping into the air, try to bring the knees up towards the chest. Clasp the knees if possible.
- **Split Jump without Cycle**—Begin in a lunge position, with the right leg forward. The right leg should be flexed at the knee and hip, with the right foot flat. The left leg should have a slight bend in the knee, with the ball of the left foot on the ground. Using primarily the right leg, jump straight up into the air. Instead of cycling the legs, land with the right leg in front. After the desired number of reps have been performed switch legs.
- **One-Legged Counter-Movement Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides (see Figure 4). Lift the left foot so that it is not in contact with the ground. Keeping the weight on the right heel, quickly push the hips back while flexing the right knee. As this happens, the arms should be swung backwards from the shoulders. Squat down into a quarter-squat. Without pausing at the bottom of the squat, reverse directions explosively and throw the body straight up into the air. Beginners should land on both feet. Advanced individuals can land on the right foot. Switch legs after the desired number of repetitions have been performed.



Figure 4: One-legged counter-movement jump, starting position

- **One-Legged Squat Jumps**—Begin standing tall, with the feet hip-width apart and the hands either behind the back or behind the head. Lift the left foot so that it is not in contact with the ground. Pushing the hips back and flexing the right knee, squat down into a quarter-squat. Pause in that position. Without a counter-movement and without use of the arms jump as high as possible. Beginners should land on both feet, though advanced participants may land on just the right foot. Switch legs after the desired number of repetitions have been performed.
- **Combining jumps with other movement skills**—Jumps-in-place can be combined with other movement skills to add variety, sport-specificity, and increase difficulty. For example, perform a counter-movement jump. Immediately upon landing sprint 10 yards.

Standing Jumps

Standing jumps refer to single-effort jumps that result in moving forwards, backwards, laterally, or diagonally. As with jumps-in-place, they should involve maximum effort and should emphasize correct technique and speed of movement. In addition to teaching how to move explosively, they are also great exercises to help develop and utilize lower body strength. The following are several sample standing jump exercises:

- **Standing Broad Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face the direction of the jump. Begin the exercise by quickly pushing the hips back and flexing the knees. As this occurs swing the arms back from the shoulders. Move into a quarter squat. Without pausing in the squat, jump forward. Remember to swing the arms forward as you jump. A useful cue with this exercise is to “throw yourself forward.”
- **Standing Lateral or Diagonal Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face forward. Perform a maximal effort jump either to the side or (depending upon the exercise) in a diagonal direction.

- **Jump over Cones/Hurdles**—Jumps may be performed forwards, backwards, laterally, or diagonally over cones or hurdles to make the exercises more difficult.
- **Single Leg Jumps**—Advanced individuals may perform any of the standing jumps using only one leg.



Figure 5: Cone hops, starting position

Multiple Hops/Jumps

Multiple hops and jumps are advanced drills and should only be attempted after an individual has mastered the techniques of jumps-in-place and standing jumps. Hops can be defined as submaximal jumps with a directional component. Multiple hops and jumps string together jumps. They are designed to be performed for a specific distance or a specific period of time. When performing these exercises, one should emphasize explosiveness, getting off the ground quickly, and correct technique. The following are examples of multiple hops and jumps:

- **Ankle Hops**—Ankle hops may be done in place, forwards, backwards, laterally, or diagonally. They are hops that are primarily performed by the ankles. These are useful for conditioning the muscles and tissues of the lower leg and good for shin-splint prevention exercises. When performing ankle hops, keep the knees soft but try to avoid using them. Perform the exercises by plantarflexing the ankles and concentrating on getting off the ground quickly. Advanced individuals may perform these drills on one leg.
- **Multiple Hurdle/Cone Hops**—These drills may be performed forwards, backwards, laterally, or diagonally (see Figure 6). String together a number of hurdles or cones and jump over them. Emphasize correct technique and getting off the ground quickly. To increase the difficulty: make the cones/hurdles further apart, make the cones/hurdles higher, etc. Advanced exercisers may perform these drills on one leg, or may combine the hops with other movement skills (for example, perform hops over 10 yards then change directions and sprint to the right for 10 yards).



Figure 6: Diagonal cone hops, starting position

- **Rim Jumps**—As the name implies, rim jumps can be performed under a basketball rim to help with visualization. Stand under the rim, jump as high as possible while reaching for the rim with the right hand. Upon landing immediately reverse directions and reach for the rim with the left hand. Continue alternating until the set is completed. The object is to spend as little time on the ground as possible while touching the rim.
- **Triple Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face the direction of the jump. Begin the exercise by executing a standing broad jump. Land on one foot. Immediately push off that foot and jump forward landing on the other foot. Push off that foot, jumping forward. Extend both legs and land on both feet.

The remainder of this article will present some sample workouts using many of the exercises described above.

Sample programs

I spend much of my time working with younger athletes. Typically they have a shorter attention span and need to work on all of the physical qualities (speed, agility, strength, etc.). As a result, plyometric-only workouts don't work very well. Likewise, having them perform sets of plyometrics (for example, three sets of ten jumps) tends to be ineffective as well. The sample programs that follow are methods I've come up with to introduce plyometrics in a fun, challenging, and effective way. More advanced individuals will probably benefit from a more traditional set and repetitions approach to programming.

Beginner's Drill

This first drill is a way to make plyometrics fun and applicable while developing basic techniques and explosiveness.

Stand behind the start line. Place a tape measure on the ground and set a goal to jump to (for example, pick the six foot mark on the tape). Perform three standing broad jumps, resting in-between attempts.

After performing three standing broad jumps, line up behind the start line again. Perform another standing broad jump. This time, when landing, immediately perform a counter-movement jump. Try to make the second jump as quickly after landing as possible. Perform this combination three times. Rest in-between attempts.

After three standing broad jumps + counter-movement jumps have been performed, it is time for the third part of the drill. Perform a standing broad jump. As you land on the ground, have your partner throw a basketball or medicine ball high into the air, jump up and try to catch the ball. Perform this combination three times. Rest in-between attempts.

The fourth part of this drill is performed exactly like the third (i.e. standing broad jump + counter-movement jump + catch the ball). However, after the ball has been caught, land and immediately perform another counter-movement jump. This time take a jump shot as you are in the air. Perform this combination three times. Rest in-between attempts.

This drill results in 24-foot contacts, makes plyometrics fun, and participants can instantly see how these drills apply to the real world!

Intermediate Drill

The intermediate drill is a circuit with ten stations. Exercise at each station for 30 – 60 seconds (depending upon fitness level). Stress explosiveness and technique. Depending upon fitness level you may rest in-between stations.

- Bodyweight Squats
- Counter-movement Jump, stick landing
- Bodyweight Lunges
- Standing Broad Jump
- Jumping Jacks
- Hurdle/Cone Hops for 5 – 10 yards
- Push-ups
- Medicine Ball Chest Passes
- Crunches
- Medicine Ball Overhead Throws

Advanced Drill

The advanced drill is a circuit with thirteen stations and more advanced exercises. Exercise for 30 – 60 second at each station focusing on explosiveness and technique. Rest may be allowed in-between stations.

- Bodyweight Squats
- Rim Jumps
- Bodyweight Lunges
- Split Jump with Cycle

- Standing Broad Jump
- Jumping Jacks
- Hurdle/Cone Hops for 5 – 10 yards
- Push Ups
- Medicine Ball Chest Pass
- Tuck Jump
- Crunches
- Medicine Ball Overhead Toss
- Squat Jumps

Plyometrics can be a fun, effective way to help increase explosiveness and improve athletic performance. While the advanced drills often look fun and interesting, one should be careful and make sure that they are ready for those drills. Failing to take steps to ensure safety and proper progression could result in injury, or the wasting of valuable time.

About the Author

*John M. Cissik, MS, CSCS,*D, NSCA-CPT,*D is the Director of Wellness Services at Texas Woman's University in Denton, TX. He is the NSCA's Texas State Director, consults with several track and field programs regarding strength training, and runs a business that provides speed and agility instruction to young athletes. He can be reached at john@fitnessconditioning.net.*

Practical Progressions for Upper Body Plyometric Training

Mark Nutting, CSCS, NSCA-CPT

Plyometric training utilizes the reversible muscle action of eccentric deceleration to concentric acceleration. The rapid stretching of the muscle during the eccentric phase sets off the myotatic or stretch reflex, which elicits a contraction from the muscle being stretched. As the eccentric action slows to a stop, connective tissues are stretched and store elastic energy. Now a maximum voluntary concentric contraction is added to the myotatic reflex, which then releases the stored elastic energy producing a more powerful positive action. (See the Push Press as an example of a classical plyometric exercise.)

The start of the eccentric muscle action to the start of the concentric contraction is called the amortization phase. The shorter the amortization phase, the greater the stretching of connective tissue and amount of stored elastic energy. This will give a greater plyometric training effect, but also increases the risk of injury. Because individuals' upper bodies are less accustomed to these kinds of stresses and the increase in eccentric forces increases the chance of muscle soreness, careful progressions are essential.

Considerations

Specificity

Choose exercises that relate most to the activity to be improved upon.

Planes of movement

Try to integrate all three planes of movement (sagittal, frontal, transverse) into the workout. (See Rotational Slams Against a Wall as an example of a multi-planar exercise.)

Proper warm-up and cool-down

As with all training, a proper warm-up prepares the tissues for more intense activity, the cool-down gradually brings the body back down to resting levels.

Progression

All upper body drills can be modified so that almost anyone can do some version of them. Keep in mind that benefits from plyometric training are on a continuum. Maximum results are achieved through maximum effort. But, it is not all or nothing. Significant gains in functional strength, proprioception, and power can be made from less than maximal effort.

The following are generalized progression cues:

1. Strengthen the core to be able to stabilize

Most upper body drills require the ability to stabilize the core. Engaging the core musculature to hold proper form should be stressed from the beginning. It should also be a limiting factor; when the core can no longer stabilize, the drill is over.

2. Simple to complex

Master the simple to coordinate exercises before trying more complex.

3. Lighten the load when starting out

By lightening the load, you lessen the risk of injury. i.e. Use a soccer ball before a medicine ball. Use a lower percentage of your body weight by changing the angle of the body or shortening the lever arm. (See Figures 1 & 2).

4. Eccentric control before eccentric to concentric

Simply put, learn to absorb and control the landing before progressing.

5. Bilateral before unilateral

A bilateral exercise shares the stress between the two limbs, whereas a unilateral exercise puts more stress on that single limb. Generally, it's safer to start with a bilateral exercise. (See the Medicine Ball Slams progression to One Arm Slams as an example of progressing from a bilateral to a unilateral exercise.)

6. Stable before unstable

Individuals should master the exercise on a stable surface before moving onto an unstable surface. Softer, unstable surfaces such as: half dome stability balls, disks, foam pads, etc. elongate the amortization phase and lessen the plyometric training effect, but increase the proprioceptive training effect. The choice to integrate instability depends on the individual's needs. (See the Half Dome Ball Alternating Push Over-the-Top as an example of an exercise that can be performed on a stable surface or an unstable surface.)

7. Low intensity before high intensity

While maximum results may not come from doing an exercise at a lower intensity, it does allow an individual to safely learn the exercise and prepare the musculature to withstand higher intensities in the future.

8. Build from slow speed to fast and longer amortization to shorter

This will also increase the risk of injury. So, when starting out with a new exercise, slow the action down and lengthen the amortization phase until you are ready to progress.

Volume of training

Much discussion arises when talking about the number of contacts/impacts you should have in a workout. Jumping rope is a plyometric exercise and if you jumped for 20 minutes you might have 1200 contacts and that may be fine. Conversely, with depth jumps, 12 may be too many. There is no cut and dried answer. It depends on the individual's goals, training status, and the intensity of the drill. A simple rule is the higher the intensity, the fewer the contacts.

Use an appropriate surface

Too hard a surface can cause impact injuries. A sprung floor, grass, or wrestling mat are all reasonable options.

Creativity: Just understand the principles

Almost any movement can be done in a plyometric fashion. The only limitation is your creativity. See Wall Dribble with Medicine Ball and Forward Hops on a Scooter as examples of less traditional exercises.

Exercises

Push Press

A rapid bending of the hips, knees, and ankles creates a strong eccentric loading of the lower and upper body musculature which elicits the myotatic reflex. The motion is then halted, quickly stretching the connective tissues thus storing elastic energy. Finally, the weight is driven overhead with the aid of these reactions. (See Figures 3 – 5).

Rotational Slams Against a Wall

An example of a multi-planer exercise, rotational slams start with a quick backward rotation of the torso. Then an explosive unwinding hurls the ball forward to the wall. Catch the ball on the fly and repeat. (See Figures 6 – 8).

Medicine Ball Slams

(can progress to One Arm Slams)

The quick raising of the ball overhead and explosive slamming of the ball to the floor can progress from using two hands to using just one. (See Figures 9 – 10).

Half Dome Ball Alternating Push Over-the-Top

With one hand on the floor and one hand on the half dome ball, perform a powerful push-up, skipping over the top to switch hands. (See Figures 12 – 14).

Wall Dribble with Medicine Ball

(shoulder internal rotation)

With the elbow slightly lower than shoulder, cock the arm back then internally rotate the shoulder throwing the ball into the wall. Catch it on the rebound and repeat. (See Figures 15 & 16).

Forward Hops on a Scooter

(can also be done backward or to the side)

In a push-up position with knees (or feet) on a scooter, push up and forward propelling yourself across the floor. (See Figures 17 – 19).

Figures



Figure 1: Push Ups off wall



Figure 2: Push Ups from knees



Figure 4: Push Press, bending of hips, knees, and ankles



Figure 3: Push Press, starting position



Figure 5: Push Press, finishing position



Figure 6: Rotational Slams, backward rotation



Figure 7: Rotational Slams, explosive unwinding



Figure 8: Rotational Slams, finishing position



Figure 9: Medicine Ball Slams, starting position



Figure 10: Medicine Ball Slams, slamming ball to floor



Figure 11: Medicine Ball Slams, finishing position



Figure 14: Half Dome Ball Alternating Push Over-the-Top, finishing position



Figure 12: Half Dome Ball Alternating Push Over-the-Top, starting position



Figure 15: Wall Dribble with Medicine Ball, starting position



Figure 13: Half Dome Ball Alternating Push Over-the-Top, pushing up



Figure 16: Wall Dribble with Medicine Ball, finishing position

About the Author

Mark Nutting, CSCS, NSCA-CPT, is the NSCA Northeast Regional Coordinator and Maine State Director. He is the Co-Owner of Metamorph Fitness, Inc. and is Fitness Director at Saco Sport & Fitness in Saco, ME. He received his BS in Physical Education from University of Maine and has 25 years experience in Personal Training and Health Club Management. Now a Licensed Corporate Wellcoach®, Mark has 10 health/fitness certifications, is a Board of Executives member for the Maine AAHPERD, Liaison to Maine Governor's Council on Physical Fitness, Sport, Health, and Wellness, and Executive Council Member for the NSCA Personal Trainers' Special Interest Group.



Figure 17: Forward Hops on a Scooter, starting position



Figure 18: Forward Hops on a Scooter, pushing up and forward



Figure 19: Forward Hops on a Scooter, finishing position

More Plyometrics Resources

Have we whetted your appetite for Plyometrics? Would you like to learn more about these effective and challenging exercises?



Plyometric Techniques

This video, produced exclusively by the NSCA, includes techniques for lower body, medicine ball training, reactive drills, and upper body plyometrics. The NSCA's position statement is defined in this video, and serves as a reference point for the defined exercises. Contains a total of 47 drills including warm up.

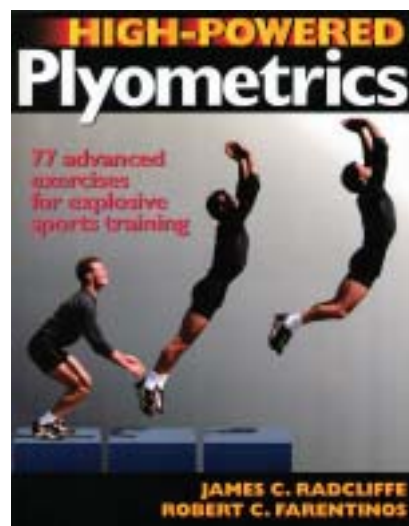
\$40.50 members/\$45 non-members

High-Powered Plyometrics

by James C. Radcliffe and Robert C. Farentinos.

High-Powered Plyometrics gives you the advanced exercises and programs used by top athletes and coaches. This book covers topics from the principles of high-intensity plyometric training to the development of long- and short-term training programs for 21 sports. More than 360 photos illustrate 77 exercises to increase upper-, middle-, and lower-body power. Exercise descriptions and intensity guidelines provide step-by-step instructions to ensure correct technique and proper workload.

\$20 members/\$22 non-members



To order the book or video, contact the NSCA Products Department at 800-815-6826 or +1 719-632-6722 or online at www.nscalift.org.

Plyometrics and Speed Development Symposium

Are you interested in helping your athletes develop speed, power, and agility? Would you like to incorporate plyometric exercises into your programs, but lack the hands-on experience to feel confident introducing these exercises to your athletes? The NSCA's Plyometrics and Speed Development two-day symposium is your chance to learn the theories behind these methods of training and gain practical experience applying those theories. Each day will be broken into two sessions—a classroom session and an applied session at the new state-of-the-art NSCA World Headquarters. The morning classroom sessions will present the theory and scientific basis for plyometric and agility training in the educational classroom. The afternoon applied sessions will give you hands-on experience learning and teaching plyometric, speed, and agility progressions and techniques out on the 70x40 yard speed and agility field.

Learn more about this symposium at www.nscalift.org or by calling the NSCA Conferences Department at 800-815-6826 or +1 719-632-6722.