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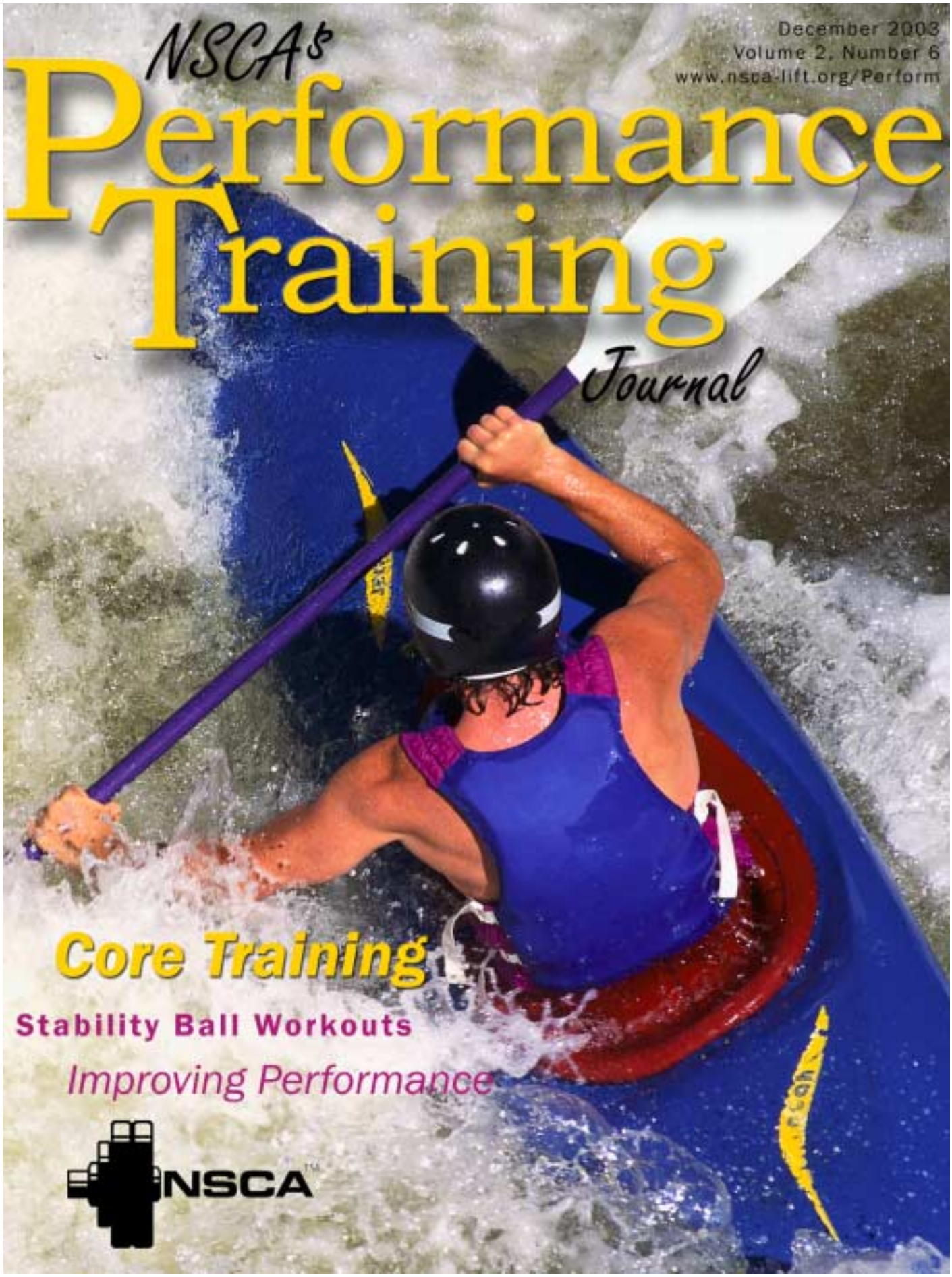
# Performance Training Journal



## Core Training

### Stability Ball Workouts

*Improving Performance*

NSCA™

*NSCA's Performance Training Journal*
www.nsca-lift.org/perform

Volume 2, Number 6

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## Feature: Core Training



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NSCA's Performance Training Journal

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# FitnessFrontlines

G. Gregory Haff, PhD, CSCS

## Preseason Strength Training Can Reduce Injury Rates in Soccer Players

Researchers at the Department of Sport and Health Science at the Karolinska Institutet in Stockholm, Sweden recently examined the effects of a preseason strength training program on the occurrence and severity of hamstring injuries in elite male soccer players. Thirty soccer players from the best premier-league division teams in Sweden were divided into two groups. One group performed eccentric exercises specifically designed for the hamstring 2 times per week for a period of 10 weeks, while the second group performed no special hamstring training. The occurrence of hamstring injuries in the hamstring-training group was 36.7% lower than in the group that performed no hamstring training. The hamstring-training group also experienced significantly greater gains in strength and speed than the non-training groups. The researchers concluded that the inclusion of hamstring exercises that eccentrically load the hamstrings is beneficial from a performance enhancement and injury prevention perspective for soccer player.

Askling C, Karlsson J, Thorstensson A. (2003). Hamstring injury occurrence in elite soccer players after preseason strength training with eccentric overload. *Scandinavian Journal of Medicine & Science in Sports, 13(4)*:244 – 250.

## Training for Muscular Power Increases Functional Test Performance in Older Adults

Recently researchers at Trillium Health Center in Etobicoke, Ontario examined the effects of a 10-week resistance training program consisting of exercises designed to increase muscular power on the functional capabilities of older adults (75 – 94). Eighteen older adults participated in the progressive resistance-training program, which targeted the lower body, while seven older adults served as a control group. Functional performance was measured by examining the subjects' knee extensor strength and power on an isokinetic dynamometer, 6-meter timed walking test, a 30-second chair stand, and an 8-foot up and go test. All functional tests were performed by both groups prior to and after the 10 weeks of training. Average power during the isokinetic leg extension was significantly increased in the resistance-trained group. The resistance-trained group also experienced significant improvements in the 6-meter timed walking test (33%), 8-foot-up-and-go (31%), and chair stand (66%). The researchers concluded that a progressive resistance training program can significantly improve the functional capabilities of older adults.

Hruda KV, Hicks AL, McCartney N. (2003). Training for muscle power in older adults: effects on functional abilities. *Canadian Journal of Applied Physiology, 28(2)*:178 – 189.

## Does Strength Training or Power Training Lead to Greater Improvements in Functionality?

Recently researchers from Veterans Affairs Medical Center in Decatur, Georgia reported that power based training resulted in significantly greater improvements in physical function in community-dwelling older adults. Thirty-nine older adults (72.5 ± 6.3 years) were divided into three groups: 1) control group (n=15), 2) strength-training (n=13), and power training (n=11). Both the power and strength training groups trained three days per week over a 16-week training cycle. The Continuous Scale of Physical Functional Performance test (CSPFP), maximal strength, and anaerobic power were measured. Results indicated that the power-training group experienced significantly greater improvements on the CSPFP test than both the control and strength-training group. There were no differences between the three treatment groups for maximal anaerobic power. The results of the present study seem to indicate that focusing on power development during training is warranted for the older adult who is simply attempting to improve functional abilities.

Miszko TA, Cress ME, Slade JM, Covey CJ, Agrawal SK, Doerr CE. (2003). Effect of strength and power training on physical function in community-dwelling older adults. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 58(2)*:171 – 175, 2003.

## 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.*

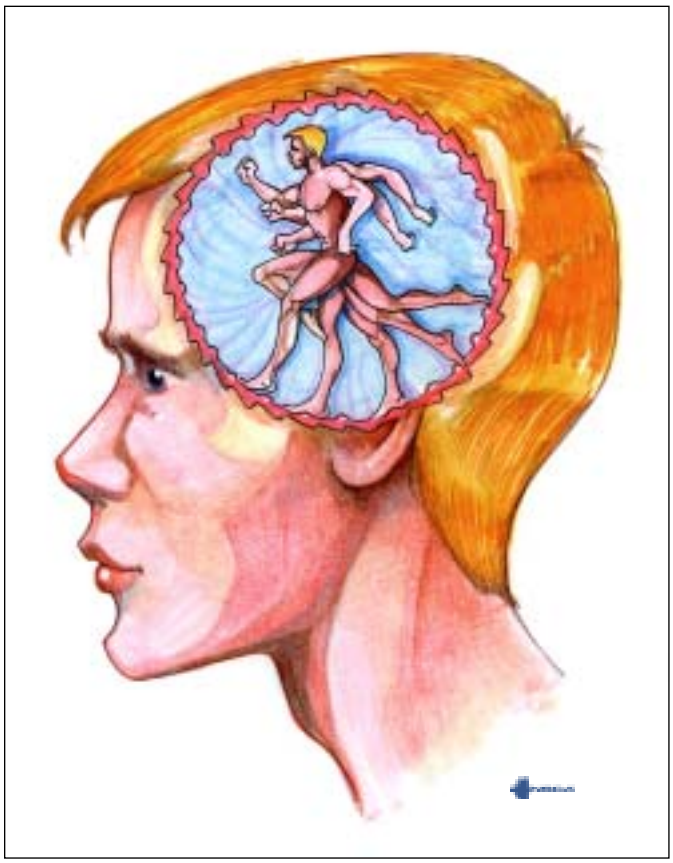
# MindGames

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

# Training the "Other Core"

The theme of this issue of *NSCA's Performance Training Journal* is Core Training. As you know, core training involves training the muscles that surround the body's center of mass—the abdominals, lower back, and hip musculature. A strong core is one of the keys to effective movement, stability, and balance. Activation of the core musculature underlies even the most basic of movements and is certainly paramount to more complex movements. For example, try performing a standing bicep curl without activating your abdominal or lower back muscles. You can't do it, can you?

Core training has received a great deal of attention in recent years and has become a staple in training plans. Recreational and competitive athletes alike appreciate the importance of a strong core for functional and athletic performance.



While developing strength in the core is important, there is another "core" that is also important for athletes to train and develop. So, what is this "other core?" The other core relates to your mind, and can be viewed as analogous to the core of your body. Just as strong core musculature is key to effective movement, stability, and balance, a strong mental core is key to effective movement, mental stability, and mental balance. A strong, well-developed mind or "mental muscle" is critical to effective performance.

The mind is activated during every athletic performance, and how the mind affects performance is intricately tied to how well an athlete has trained and developed her mental muscle. For example, if you doubt your ability to bench press 240 lbs, do you think you will be successful attempting to lift this weight? Or, if prior to a 5k race you tell yourself you are not in good enough shape to run sub-20 minutes, do you think you will be able to run under 20, even if your body is prepared to run that pace? The answer to both these questions is probably "no;" clearly the mental core plays a role in performance.

As you embark on your quest to enhance your athletic performance, address the development of your "physical core" and your "mental core" as they are both at the foundation of performance. A few points to keep in mind as you work on developing your mental core are:

### *The Mental Core Can Be Developed Through Mental Training*

Mental training relates to the development of mental skills and strategies to help athletes manage the mind—to control internal processes to help (as opposed to hinder) performance.

### *Mental Skills Are SKILLS*

Mental skills are analogous to physical skills in that they are both skills that can be learned and ultimately lead to peak performance. Oftentimes, coaches and athletes approach mental skills as something an athlete either has or doesn't have (i.e., she is confident or she is not confident) instead of something the athlete can learn and develop.

### *Mental Training Isn't Easy*

Athletes can learn to manage what goes on internally but it is not easy. Athletes who are unwilling to develop their mental core often demonstrate inconsistent performances due to a weak mental core. Athletes who do make the effort to train the mind discover that it takes time, effort, and persistence, just like physical training. But just as with physical training, the rewards can be great.

### *Seek Resources*

Search for resources that can help you in your quest to develop your mental core. Read books, continue to read this Mind Games column, find a sport psychologist, talk to others.

As you develop your mental core, your performance and mental focus will become more balanced. Use the information and skills outlined in this, and other Mind Games columns from NSCA's Performance Training Journal to strengthen the mental aspect of your game and get the most out of your training and competition. The core of the body and the core of the mind are intricately linked; weakness in either will result in less than optimal performance.

## 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.*

# TrainingTable

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

# Your Mother Was Right… Eat Your Vegetables! Here's Why.

Eating five or more servings of colorful fruits and vegetables a day is an essential part of healthy living. Colorful fruits and vegetables provide the wide range of vitamins, minerals, fiber, and phytonutrients your body uses to maintain good health and energy levels. Phytonutrients are natural plant compounds that give fruits and vegetables their bright colors. The phytonutrients in fruits and vegetables help protect against the effects of aging and reduce the risk of cancer and heart disease.

Fruits and vegetables have been classified into seven color groups. Each color represents a plant chemical with a specific benefit. Try to eat at least one serving from each of the seven groups daily.

## Dining by Color

### Red Group

Fruits and vegetables from the red group contain the phytonutrient lycopene. Eating a variety from the red group may prevent heart and lung disease. This group includes tomatoes, watermelon, and grapefruit.

**Phytonutrient:** Lycopene

**Sources:**

- Tomatoes
- Tomato products
- Pink grapefruit
- Pink grapefruit juice
- Watermelon

### Red/Purple Group

The red/purple group contains anthocyanins, which have been found to protect against heart disease. Anthocyanins are found in red wine, prunes, cranberries, and red apples.

**Phytonutrient:** Anthocyanins

**Sources:**

- Black berries
- Blueberries
- Cherries
- Plums
- Pomegranates
- Prunes
- Red cabbage
- Red grapes

### Orange Group

The orange group, including carrots, mangoes, sweet potatoes, and pumpkin, provides alpha and beta carotene. These substances may protect against cancer and improve vision health.

**Phytonutrient:** Alpha and beta carotene

**Sources:**

- Apricots
- Acorn squash
- Butternut Squash
- Cantaloupe
- Carrots
- Mangoes
- Sweet potatoes
- Yams

### Orange/Yellow Group

The orange/yellow group provides us with beta cryptothanxin, which may prevent heart disease. This group includes oranges, peaches, tangerines, and papayas.

**Phytonutrient:** Beta cryptothanxin

**Sources:**

- Clementines
- Mandarin oranges
- Nectarines
- Oranges
- Peaches
- Pineapple
- Pineapple juice
- Papaya
- Tangerines
- Tangelos

### Yellow/Green Group

The yellow/green group includes spinach, green peas, avocados, and kiwi. These fruits and vegetables contain lutein and zeaxanthin, which concentrate in the eye. These phytonutrients may help prevent cataracts and age-related macular degeneration.

**Phytonutrient:** Lutein and zeaxanthin

**Sources:**

Collard greens
Green & yellow peppers
Green beans
Kale
Kiwi
Spinach
Turnips
Yellow corn

### Green Group

The green group is rich in indoles, sulforaphane, and isothiocyanate, which have been found to speed up the action of enzymes that break down carcinogens. Broccoli, cabbage, and kale are included in this group.

**Phytonutrient:** Indoles, sulforaphane, and isothiocyanate

**Sources:**

Broccoli
Broccoli sprouts
Bok choy
Brussels sprouts
Cabbage
Kale

### White/Green Group

The white/green group includes celery, garlic, onions, pears and chives. Plants in this group contain allicin, which appears to have anti-tumor effects.

**Phytonutrient:** Allicin

**Sources:**

Asparagus
Celery
Chives
Garlic
Leeks
Mushrooms
Pearl onions
Pears
Scallions

## About the Author

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

## Suggested Reading

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Clevidence BA. (2003). Consumption of watermelon juice increases plasma concentrations of lycopene and beta-carotene in humans. *The Journal of Nutrition, 133(4)*:1043 – 1050.

Drewnowski A, Gomez-Carneros C. (2000). Bitter taste, phytonutrients, and the consumer: a review. *American Journal of Clinical Nutrition, 72(6)*:1424 – 1435.

Hu FB. (2003). Plant-based foods and prevention of cardiovascular disease: an overview. *American Journal of Clinical Nutrition, 78(3 Suppl)*:544S – 551S

Lampe JW. (2003). Spicing up a vegetarian diet: chemopreventive effects of phytochemicals. *American Journal of Clinical Nutrition, 78(3 Suppl)*:579S – 583S.

Liu RH. (2003). Health benefits of fruit and vegetables are from additive and synergistic combinations of phytochemicals. *American Journal of Clinical Nutrition, 78(3 Suppl)*:517S – 520S.

Rajaram S. The effect of vegetarian diet, plant foods, and phytochemicals on hemostasis and thrombosis. *American Journal of Clinical Nutrition, 78(3 Suppl)*:552S – 558S.

# The "Core" of the Workout Should Be on the Ball

Paul J. Goodman, MS, CSCS

New technology and high priced machines and equipment that claim to aid in enhancing performance have inundated the market in recent years. However, a simpler approach may be more beneficial for athletes. Stability balls have long been found in clinical and rehabilitative settings, and in recent years they have made their way into strength and conditioning protocols as a fundamental component of core training. This type of training facilitates the athlete's development of core musculature from the inside out.

Training with stability balls has proven to be successful in helping with the following specific areas:

1. Balance
2. Coordination
3. Proprioception
4. Kinesthetic Awareness
5. Strength
6. Power
7. Stability
8. Range of Motion

There are several general considerations in implementing a stability ball program that will be addressed in this article.

## Selecting the Correct Ball

The first consideration when planning to implement stability balls into a core training program is to know what size and kind of ball to purchase. Stability balls come in 10 cm increments ranging from 45 cm to 85 cm. Generally, the following chart can be used to select the correct ball size.

| Ball Diameter | Athlete's Height |
|---|---|
| 45 cm – 17.7″ | < 5′ 0″ |
| 55 cm – 21.6″ | 5′ 1″ to 5′ 7″ |
| 65 cm – 25.5″ | 5′ 8″ to 6′ 1″ |
| 75 cm – 29.5″ | 6′ 2″ to 6′ 7″ |
| 85 cm – 33.5″ | > 6′ 7″ |

If the ball is too large, correct postural development will be compromised in addition to possible hyper-extension of the spine. If the ball is too small, proper elongation of the musculature will not be possible. This will lead to a decrease in range of motion, which will not optimally enhance development. Another rule of thumb for sizing is to sit on the ball and visually determine if the top of the thighs are parallel to the floor (the knees make a 90-degree angle) when the feet are placed flat on the floor directly under the knees. This would be an optimum positioning on a correctly fitted ball.

Most companies that manufacturer the stability ball have similar methods of developing their product. Differences generally range from texture to thickness of the rubber, but this is not an issue when determining which ball to select. All in all, when choosing a ball the most important factor to consider is to make sure the company clearly states their product is "burst-resistant."

## Philosophy Behind Stability Ball Training

Training on a ball elicits greater neuromuscular stimulation than performing similar movements on a stable surface. This increase in stress aids the athlete in improving balance, coordination, and proprioception. A developed core leads to more neuromuscular efficiency, which then lends itself to more fluid and coordinated functional movement. Furthermore, since movements are integrated actions that primarily pass through the core, the transfer of energy and force from lower to upper extremity is higher

when an athlete has enhanced core development. Stability balls enhance performance by forcing the exerciser to use additional muscles in order to maintain balance.

## Program Design Considerations

Drills on the ball should simulate the versatility of athletic movement whenever possible. Many core programs are restrictive, focusing on one component per movement, rather than blending many components into one. Core training involves stabilization, flexion, extension, and rotation of the musculature of the abdominals and back. Multiple movements can also be incorporated (i.e. lateral flexion and opposing side lateral extension or stabilization and lateral rotation). It is necessary to program the training on the stability ball to encompass as many components in a single movement as expertise and performance increases. Beginning with segmentation of the various components is vital in order for beginners to progress and learn how to adapt to the stimulus. This ensures muscular development and coordination, which is a fundamental development to avoid injury.

Progression on the ball can be seen in this schematic:

- Simple to complex
- Uni- to multi- dimensional
- Large to small base of support
- Low-neuromuscular demand to high-proprioceptive drills

In addition to these progression attributes, designing a program on the ball should evolve from low sets and repetitions of an exercise to multiple sets and high repetitions as proficiency increases. If an exercise is time related, increasing the time under the stress should also be systematically designed as well. As ability and neuromuscular coordination are improved, the time performing a specific drill should be increased.

Furthermore, it is imperative to have counterbalancing drills incorporated into the routine. Emphasizing the anterior more than the posterior musculature could lead to imbalance and possible injury. The inverse of this is also true. Incorporating drills that promote a balance between muscle groups will be beneficial in preventing overuse or imbalance injuries both in training and in subsequent competition.

## Periodization

A program for core development on the stability ball will employ the same principles as traditional weight training. The stability ball program should be executed in three phases:

- The Neural-Adaptation and Foundational Phase
- The Accumulation and Developmental Phase
- The Advanced and Specialization Phase

Each phase of the program should be understood and executed thoroughly before progressing onto the successive phase. The *Neural-Adaptation and Foundational Phase* is the most basic of the phases. It involves executing uni-dimensional movements and basic stabilization holds that aid in developing proper motor control. It is imperative to spend quality time perfecting the most basic movements of this phase before progressing. This phase should not be neglected even though it is the most basic. Once the athlete has established proper motor control and adaptation to the unstable surface, then progress can be made more rapidly during the second phase.

The *Accumulation and Developmental Phase* is the longest phase of the program. It involves working on range of motion and more complex movements while stabilizing. This phase is much more intense than the first in terms of difficulty of movements. This phase is where we develop more intricate balance and strength.

The *Advanced and Specialization Phase* is the most specific phase in terms of focusing on combination movements. Because of the need to have a strong foundational base of core development, this phase should not be entered into prematurely.

In terms of daily periodization, the following schematic (table 1) illustrates how one may design a daily regimen with respect to the phase. My recommendation is to begin each training session with stability ball core development after a thorough physiological warm up. Performing a stability ball routine prior to lifting will facilitate an increase in neuromuscular stimulation. This increase may aid in improved coordination and force production of the lifts performed following the core training segment of the program. There is no evidence of decreased athletic performance when executing an intense core training regime directly prior to lifting.

It is not necessary to achieve each of these components every day. However, stabilization should begin every training session, and the following components after stabilization should be addressed, but not necessarily in this particular order.

The following is an example of a 10-week Stability Ball training program that can be incorporated into a traditional non-sports specific regimen. This program should only be implemented after establishing a general yet thorough overall strength base. In addition, it is imperative to understand the concepts of "drawing in" to neutralize the spine and work the transverse abdominus and multifidous. This method is done by visualizing bringing the navel back towards the spine and maintaining that co-contraction while performing all the drills. This method takes time to understand and should be accomplished with simple measures before embarking upon more sophisticated training.

Generally, a thorough stability program should be executed a minimum of two days per week and no more than three times. A typical stability ball program will take approximately twenty

minutes to perform depending upon how adept you are with the drills. If incorporating the stability ball with other core training mediums, then programming should take into consideration what areas are going to be addressed by the ball and which ones will not.

## Conclusion

All in all, stability ball training can be an integral component of an athlete's training program. By performing various movements that focus on all of the aforementioned components an athlete can improve coordination, balance, stabilization, strength, and power simply by using the unstable surface of the ball.

It should be noted that due to the nature of the ball, safety considerations should be strictly followed. Always try to maintain a neutral spine by performing the "drawing in" method to avoid exaggerated lower back arches. The tendency to "let the back relax" is a negative when performing core routines on the ball because of the increase pressure and chance of injury to the spine and musculature of the lower back.

If this is addressed, you can build a strong "core" foundation for training that will always be challenging and consistently improve performance.

## About the Author

*Paul Goodman earned his BA and MS from the University of Wisconsin. He is currently the Head Strength and Conditioning Coach at the University of Vermont. Before taking this position he previously served as an assistant for the University of Wisconsin-Madison.*

Table 1

| Phase | Daily Progression of Exercises |
|---|---|
| Neural-Adaptation and Foundational | Stabilization<br>• Anterior (front)<br>• Lateral (sides)<br>• Posterior (back) |
| | Flexion |
| | Extension |
| | Rotation |
| Accumulation and Developmental | Dynamic Stabilization (stabilization of core while moving extremity)<br>• Anterior (front)<br>• Lateral (sides)<br>• Posterior (back) |
| | Lateral Flexion |
| | Lateral Extension |
| | Rotational Flexion |
| | Rotational Extension |
| Advanced and Specialization | Dynamic Stabilization (stabilization of core while moving extremity)<br>• Anterior (front)<br>• Lateral (sides)<br>• Posterior (back) |
| | Lateral Flexion |
| | Lateral Extension |
| | Rotational Flexion |
| | Rotational Extension (external resistance applied to various drills to increase intensity) |

## Table 2: Sample 10 Week Stability Ball Core Training Program—Phase 1

| Phase 1 | | Week 1 | | | Week 2 | | | Week 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Drill** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** |
| **Stabilization** | Balanced Sitting (Figure 1) | 1 | | :60 | 1 | | :60 | 1 | | :60 |
| | Elbow Bridge (Figure 2) | 2 | | :25 | 2 | | :35 | 2 | | :45 |
| | Side Bridge (Figure 3) | 1 ea. | | :20 ea. | 2 ea. | | :20 ea. | 1 ea. | | :35 ea. |
| | Heels on Ball Elbows Down (Figure 4) | 1 | | :60 | 1 | | :60 | | | |
| | Heels on Ball Arms Across (Figure 5) | | | | 1 | | :40 | 2 | | :50 |
| | Hands on Ball (Figure 6) | 1 | | :30 | 1 | | :40 | 1 | | :45 |
| | Shoulder Bridge—both feet down (Figure 7) | 1 | | :60 | 1 | | :30 | 1 | | :40 |
| | Shoulder Bridge—elbows down/one leg up (Figure 8) | | | | 1 ea. | | :20 ea. | 1 ea. | | :30 ea. |
| **Flexion** | Crunch (Figure 9) | 3 | 20 | | | | | 2 | 25 | |
| | Heel Grab Crunch (Figure 10) | | | | 3 | 25 | | 2 | 20 | |
| **Extension** | Reverse Hyper (Figures 11 & 12) | 3 | 15 | | | | | 2 | 20 | |
| | Superman—hands (Figure 13) | | | | 2 | 20 | | 2 | 12 | |
| **Rotation** | Leg Rotations (Figure 14) | 2 | 8 ea. | | 2 | 10 ea. | | 2 | 12 ea. | |

## Table 3: Sample 10 Week Stability Ball Core Training Program—Phase 2

| Phase 2 | | Week 4 | | | Week 5 | | |
|---|---|---|---|---|---|---|---|
| **Component** | **Drill** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** |
| **Stabilization** | 4 Point Kneeling (Figure 15) | 1 | | :60 | 1 | | :60 |
| | 2 Point Kneeling (Figure 16) | | | | | | |
| | Rollouts—w/hold on last one (Figure 2) | 2 | 10 | :15 | 2 | 12 | :20 |
| | Side Bridge (Figure 3) | 2 ea. | | :30 ea. | 2 ea. | | :35/:30 ea. |
| | Heels on Ball Arms Across (Figure 5) | 1 | | :30 | 1 | | :40 |
| | Heels on Ball—one leg off (Figure 17) | 1 ea. | | :10 ea. | 1 ea. | | :15 ea. |
| | Hip Bridge—Time indicates both feet down; one leg up, keep hips up the entire time (Figure 18) | 1 | | :30/:10 ea. | 1 | | :30/:20 ea. |
| **Flexion** | Pikes (Figure 19) | 2 | 5 | | 2 | 7 | |
| | Diagonal Crunch (Figure 20) | 1 | 10 ea. | | 1 | 15 ea. | |
| | Lateral Crunch (Figure 21) | 1 ea. | 15 ea. | | 1 ea. | 20 ea. | |
| | Crunch With Hip Extension (Figures 22 & 23) | | | | | | |
| **Rotation** | 90 degree Pikes w/Lateral Flex & Rotation (Figure 24) | 1 | 6 ea. | | 1 | 8 ea. | |
| **Extension** | Superman—ankles (Figure 25) | 2 | 15 | | | | |
| | Back Extension | | | | 1 | 15 | |

## Table 4: Sample 10 Week Stability Ball Core Training Program—Phase 2

| Phase 2 (continued) | | Week 6 | | | Week 7 | | |
|---|---|---|---|---|---|---|---|
| **Component** | **Drill** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** |
| **Stabilization** | 4 Point Kneeling (Figure 15) | 1 | | :30 | 1 | | :30 |
| | 2 Point Kneeling (Figure 16) | 1 | | :30 | 1 | | :60 |
| | Rollouts—w/hold on last one (Figure 2) | 3 | 10 | :20 | 3 | 12 | :25 |
| | Side Bridge (Figure 3) | 2 ea. | | :40/30 ea. | 2 ea. | | :40 ea. |
| | Heels on Ball Arms Across (Figure 5) | 1 | | :50 | 1 | | :60 |
| | Heels on Ball—one leg off (Figure 17) | 1 ea. | | :20 ea. | 1 ea. | | :20 ea. |
| | Hip Bridge—Time indicates both feet down; one leg up, keep hips up the entire time (Figure 18) | 1 | | :40/:25 ea. | 1 | | :40/:30 ea. |
| **Flexion** | Pikes (Figure 19) | 1 | 10 | | 2 | 7 | |
| | Diagonal Crunch (Figure 20) | 1 | 15 ea. | | 1 | 20 ea. | |
| | Lateral Crunch (Figure 21) | 1 ea. | 20 ea. | | 1 ea. | 25 ea. | |
| | Crunch With Hip Extension (Figures 22 & 23) | 1 | 20 | | 1 | 25 | |
| **Rotation** | 90 degree Pikes with Lateral Flex & Rotation (Figure 24) | 1 | 10 ea. | | 1 | 12 ea. | |
| **Extension** | Superman—ankles (Figure 25) | 1 | 15 | | 1 | 20 | |
| | Back Extension | 1 | 15 | | 1 | 20 | |

## Table 5: Sample 10 Week Stability Ball Core Training Program—Phase 3

| Phase 3 | | Week 8 | | | Week 9 | | | Week 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Component** | **Drill** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** | **Sets** | **Reps** | **Time** |
| **Stabilization** | 2 Point Kneeling w/Med Ball Pass (Figure 16) | 1 | | :60 | 1 | | :90 | 1 | | :120 |
| | Rollouts Feet Up—w/hold on last one (Figure 26) | 2 | 10 | :10 | 2 | 12 | :20 | 2 | 15 | :30 |
| | Side Bridge (Figure 3) | 2 ea. | | :45/:35 ea. | 2 ea. | | :50/:35 ea. | 2 ea. | | :60/:40 ea. |
| | Heels on Ball Arms Across (Figure 5) | 1 | | :70 | 1 | | :80 | 1 | | :90 |
| | Hamstring Curl (Figures 27 & 28) | 2 | 15 | | 1 | 12 | | | | |
| | Single Leg Hamstring Curl (Figures 29 & 30 ) | | | | 1 ea. | 8 ea. | | 2 ea. | 10 ea. | |
| **Flexion** | Single Leg Pikes (Figure 31) | 1 | 8 ea. | | 3 | 6 ea. | | 3 | 10 ea. | |
| | Diagonal Crunch (Figure 20) | 1 | 20 ea. | | 2 | 15 ea. | | 2 | 20 ea. | |
| | Crunch w/Hip Extension—plate behind head (Figures 22 & 23 ) | 1 | 15 | | 1 | 20 | | 1 | 25 | |
| **Rotation** | Hydrants (Figure 32) | 1 | 6 ea. | | 2 | 8 ea. | | 2 | 10 ea. | |
| **Extension** | Back Extension w/Rotation reps indicated by each direction—front, right side, left side (Figure 33) | 1 | 10 ea. | | 2 | 8 ea. | | 2 | 10 ea. | |

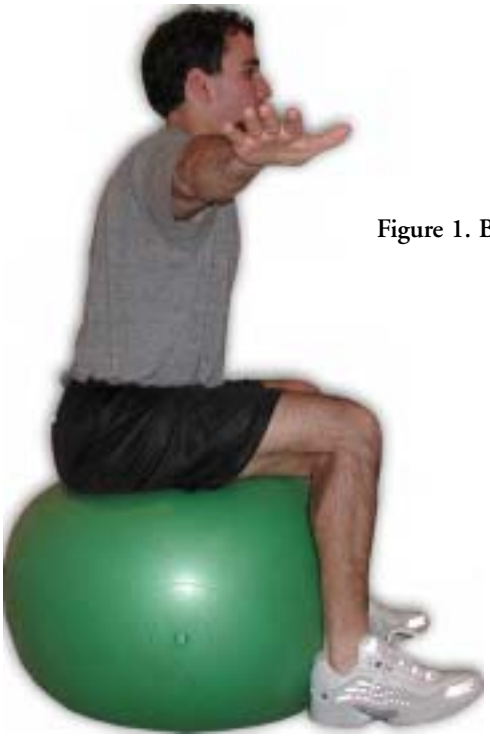


**Figure 1. Balanced Sitting**

**Figure 2. Elbow Bridge**

**Figure 3. Side Bridge**

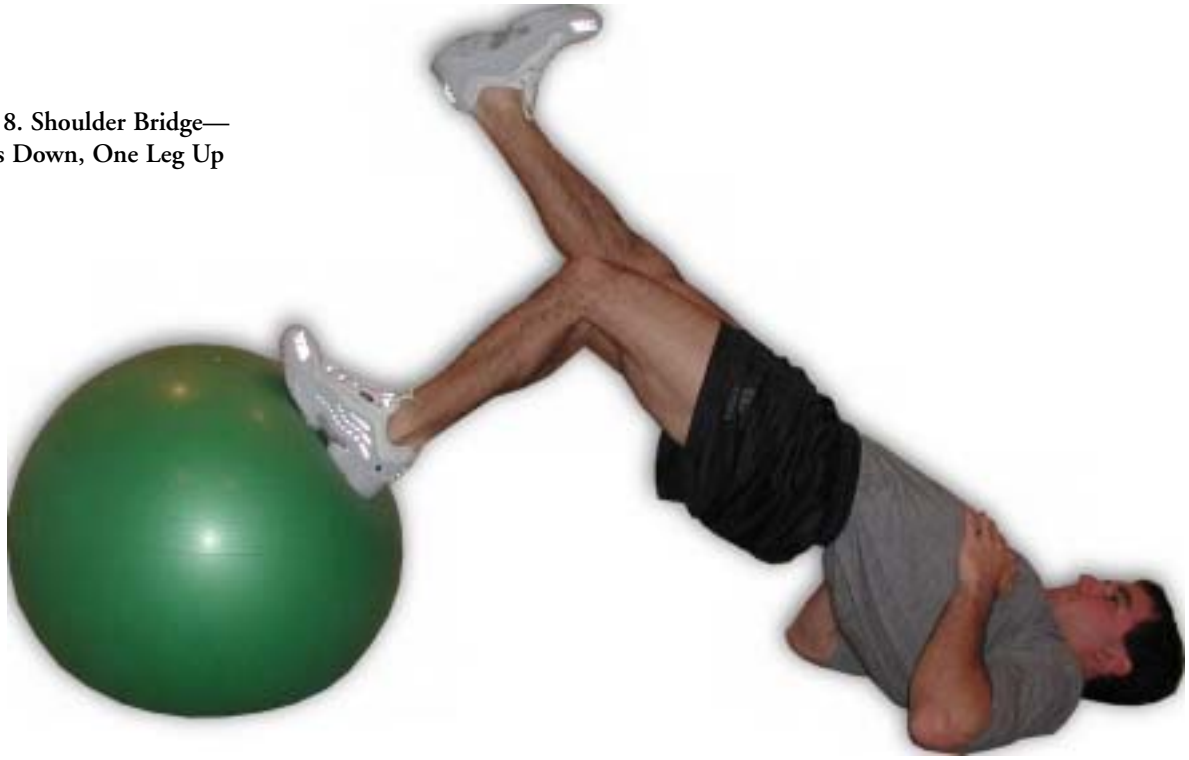
**Figure 4. Heels on Ball Elbows Down**

**Figure 5. Heels on Ball Arms Across**

**Figure 6. Hands on Ball**

**Figure 7. Shoulder Bridge—Both Feet Down**

**Figure 8. Shoulder Bridge—Elbows Down, One Leg Up**



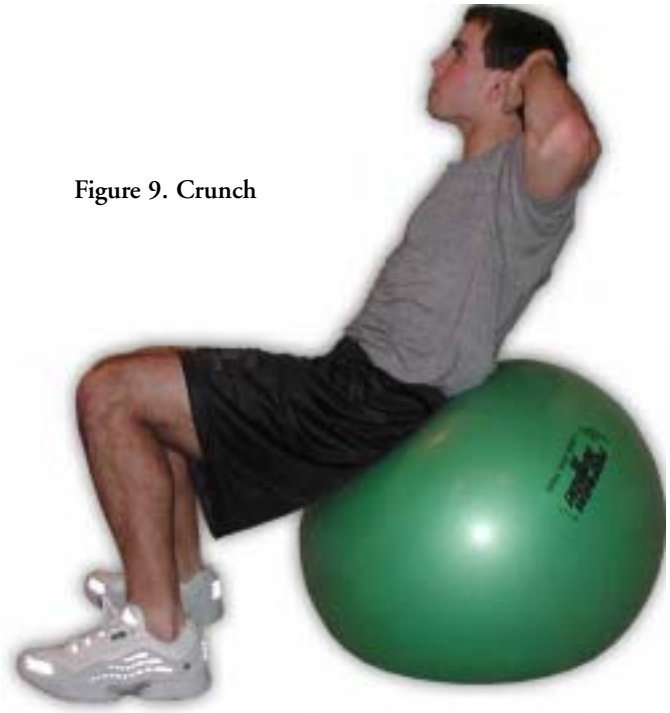


Figure 9. Crunch

Figure 10. Heel Grab Crunch

Figure 11. Reverse Hyper Extension (part 1)

Figure 12. Reverse Hyper Extension (part 2)

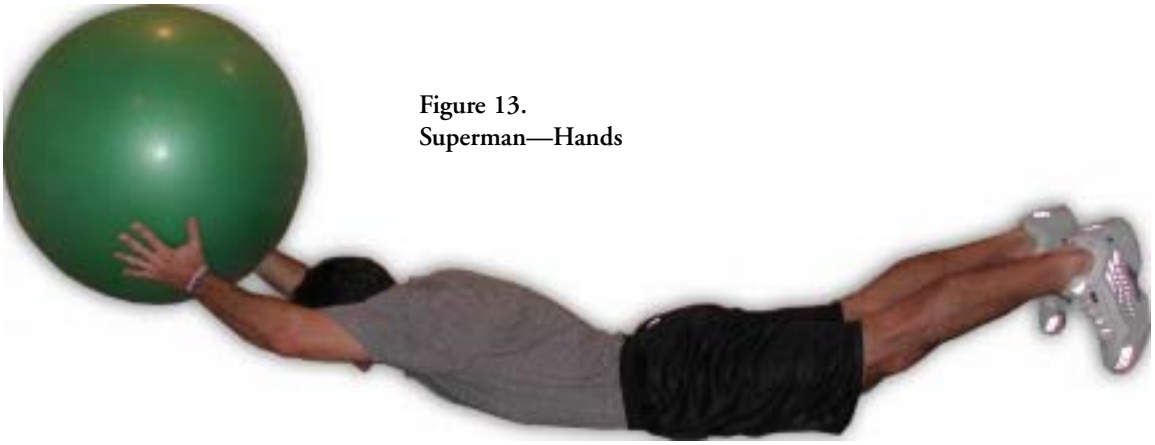


**Figure 13.**
**Superman—Hands**

**Figure 14. Leg Rotations**

**Figure 15.**
**4 Point Kneeling**

**Figure 16.**
**2 Point Kneeling**

**Figure 17. Heels on Ball One Leg Off**

**Figure 18. Hip Bridge—One Leg Up**

**Figure 19. Pikes**

**Figure 20. Diagonal Crunch**

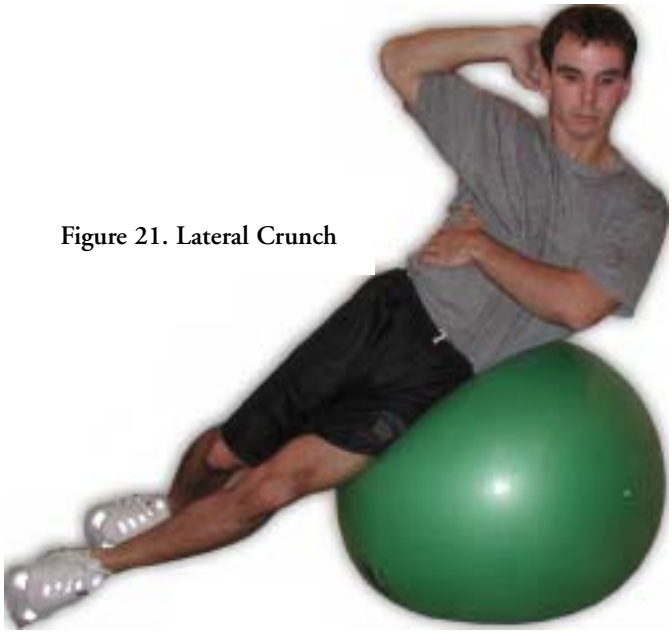


**Figure 21. Lateral Crunch**

**Figure 22. Crunch with Hip Extension (part 1)**

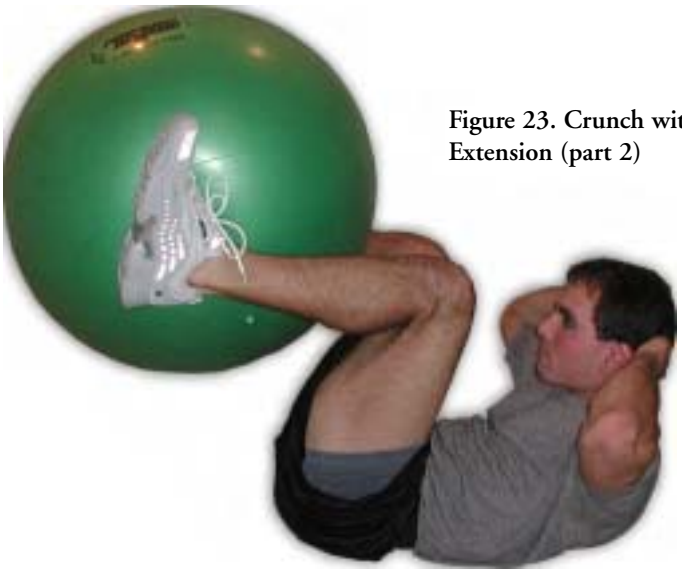


**Figure 23. Crunch with Hip Extension (part 2)**

**Figure 24.**
**90 Degree Pike**

**Figure 25. Superman—Ankles**

**Figure 26. Rollouts Feet Up**

**Figure 27.**
**Hamstring Curl**
**(part 1)**

**Figure 28.**
**Hamstring Curl**
**(part 2)**

**Figure 29.**
**Hamstring Curl—Single Leg**
**(Part 1)**

**Figure 30.**
**Hamstring Curl—Single Leg (Part 2)**

**Figure 31.**
**Single Leg Pike**

**Figure 33.**
**Back Extension—Rotation**

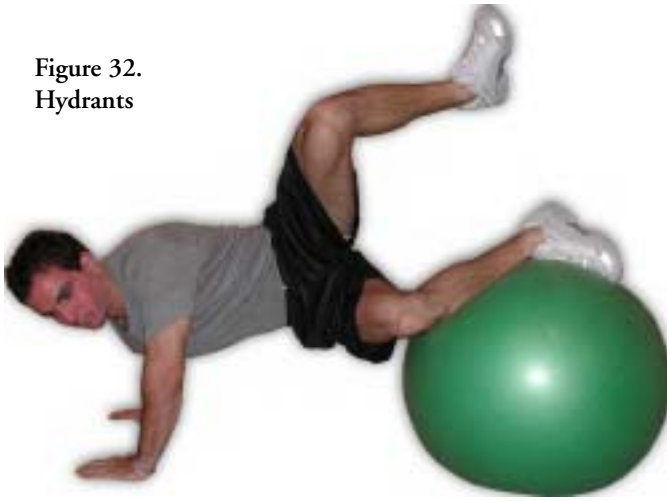


**Figure 32.**
**Hydrants**

# Core Training for Improved Performance

Tracy Morgan Handzel, CSCS

Core training has penetrated a variety of fitness and performance related fields. Health clubs offer core training group exercise classes. Physical therapists prescribe core training programs to rehabilitate a variety of injuries. Personal trainers incorporate core training during one-on-one sessions. Even the armed forces have included core training into their regimes. Core training is not a fleeting trend, and should not be ignored.

## Evolution of Core Training

Coaches and athletes have long understood the value of a strong core in improving performance and reducing injuries on the playing field. This knowledge has served as the greatest support and reasoning behind Olympic movements (the clean and jerk and the snatch), plyometric exercises, and medicine ball throwing programs. These training modalities have been the mainstay in performance enhancement training for years.

However, a variety of factors have allowed core training to develop into a more specific and universal training tool not just for athletes, but fitness enthusiasts as well.

- **Increased interest in the core:** The core has become the focus of interest among biomechanists, kinesiologists, and physiologists. These experts agree that the core plays a significant role not only in athletic movements, but everyday activities as well. Furthermore, research has revealed that crunches and back extensions- once the standard for increasing core strength- are not the most effective movements to ensure a strong and stable core. Instead, specific and functional type movements are proving to be most beneficial.
- **Functional Training:** Incorporating exercises that are specific to one's goal and that require the involvement of many muscle groups in more than one plane is the basic premise of functional training. As this focus on function becomes more prevalent, its methods continue to improve and evolve. Coaches and personal trainers are incorporating functional training for the core in ways that are goal oriented, innovative, and can be performed using a wide array of equipment.
- **Equipment manufacturers:** Training equipment and tools are mirroring the functional training trend. New products continue to be introduced to assist with training the core, while traditional products are being used in new ways. This allows coaches, physical therapists, personal trainers, and fitness enthusiasts to incorporate functional based core training into programs that meet individual needs and abilities.

## What Is the Core?

It has been called "the hub of the wheel," "the power zone," and "power house." It is where the body's center of gravity is located and more importantly, from which all movements are initiated. Furthermore, the core is responsible for developing power, maintaining balance and stability, and improving coordination during movement.

Muscles of the core include the **abdominals** *(rectus abdominus, transverse abdominus, internal and external obliques)*, **hip** *(psoas, rectus femoris, sartorius, tensor facia latae, pectinius, gluteus maximus,medius and minimus; semitendinosus; semimembranosus; biceps femorus; adductor brevis, longus, and magnus; gemellus superior and inferior; obturator internus and externus; quadratus femoris; piriformis)* and **back** *(erector spinae; quadratus lumborum; paraspinals; trapezius; psoas major; multifidus; iliocostalis lumborum and thoracis; rotatores; latissimus dorsi and serratus anterior).*

These muscles are responsible for supporting postures, creating motion, coordinating muscle actions, allowing for stability, absorbing force, generating force, and transmitting forces throughout the body. This means that regardless of the movement or activity, the center of your body is responsible for the process and outcome. Whether swinging a golf club, throwing a softball, diving into a pool, carrying groceries, moving furniture,

or performing your favorite exercise, the muscles of your core are acting concentrically, eccentrically, and/or isometrically in a variety of planes to successfully complete a movement or movement pattern.

## Benefits of a Strong and Stable Core

Because the core plays such a significant role during motion, it makes sense to ensure its strength and stability. The benefits of a strong and stable core include:

### Increased Power Development

Power is the predominant component of many sports. Golf, tennis, baseball, football, and track and field events are only a few examples of power related sports where the combination of speed and strength make all the difference in performance outcomes. Whether changing direction, or accelerating one's body, limb, or implement, power can be the determining factor between movement success and failure. A strong and stable core allows power to be generated and transferred through the kinetic chain.

### Improved Stability and Efficiency

Most major muscles of the upper and lower body attach to the spine or pelvis. Strengthening this anchor helps to provide a stable platform, allowing more powerful and efficient movements of the limbs. Baseball players, tennis players, and other athletes who rely on a racket or other implement to impart power must have strong and stable core muscles in order to be successful.

### Improved Balance

When the spine and pelvis serve as a strong anchor and stable platform, perturbances to balance are less likely. A stronger core helps the spine and pelvis maintain stability while the muscles of the shoulders, arms, and legs are active. Consider the offensive lineman whose success depends on his ability to withstand forces from defensive lineman without collapsing at the spine or falling off center. A stronger core will help prevent being placed in an off-balance position.

### Reduced Risk of Injury

Experts theorize that a weak core can lead to an overload on the extremities, causing injury in certain situations. Increasing one's ability to generate power while maintaining stability and balance leads to a reduced risk of injury. The muscles of the core when strong, stable, and efficient are better able to absorb and translate force, putting less stress on extremities.

The benefits of core strength and stability are interrelated. That is, without improved stability and balance, power cannot be generated at great rates, and movement efficiency suffers. Thus, strength, stability, and balance must be addressed when creating a core training program.

## Getting Started

Incorporating effective core training into an existing strength training program is easy. However, it should be a progressive process starting with one or two simple movements. As you obtain mastery of those movements, more specific and challenging movements can be added to any program. To begin try the following:

### Get Up

Perform some of the exercises you currently do in a seated position, in the standing position. For example: Instead of performing the seated row to improve back strength and posture, do the same exercise on a cable apparatus, in a standing position. Examples of other exercises that can be performed in a standing posture include chest press (on a cable apparatus) and shoulder press. Keep in mind that in the standing position, the resistance that can be used to perform the movement correctly may be reduced. Maintain a balanced position by placing your feet parallel or in a staggered stance with feet hip width apart, knees and hips flexed.

### Get Functional

Isolative movements, that is movements that occur about one joint, target only one muscle. Involve the core in your exercises by using functional movements—those that involve multiple muscle groups, and are more specific to the demands of your life and sport. The lunge is a functional movement that is specific to tennis, football, soccer, and baseball. Perform it laterally or at a 45-degree angle to make it more specific to your sport and life demands.

### Move About the Spine

Flexion and extension alone are not enough to fully strengthen and stabilize the spine. Rotational or diagonal movements are more specific to athletic and everyday movement demands. Try chopping exercises, performed on a cable apparatus or with medicine balls.

### Challenge Balance

Perform activities on one leg or on unstable surfaces (balance boards, foam pads/rollers, or stability balls) to improve your balance and thus effectively improve your core stability. Single leg squats can be an effective movement that challenges balance, thus targeting the core while improving leg strength as well.

## Sample Core Training Program

Add the following movements to your current program to ensure the core is receiving the appropriate attention.

### Day 1

#### *Single Leg Squat*

Stand with one leg resting on a low bench or step behind you, the other placed on the floor in front of you. Your stance should

be wide enough that when you squat, your front heel remains on the ground and your knee stays aligned behind your shoelaces (see Figures 1a & 1b). Use dumbbells as resistance.

Increase the challenge:

- Rest your back foot on an unstable surface like a stability ball
- Forgo the resistance, and rotate about the spine by performing a punching motion with the opposite arm

**Figure 1a.**
**Single Leg Squat**

**Figure 1b.**
**Single Leg Squat**

### *Chopping*

Grab the upper cable handle with both hands with arms extended over one shoulder (see Figure 2a). Initiate the movement by pulling the handles downward and across your body keeping your arms extended (see Figure 2b).

You should finish with your arms extended at the opposite hip. Use a medicine ball to emphasize power development.

Increase the challenge:

- Perform the motion as described above while squatting
- Perform the motion as described above while standing on one leg

**Figure 2a.**
**Chopping**

**Figure 2b.**
**Chopping**

## Day 2

### *Standing One Arm Row*

Stand facing the cable apparatus, grasping the lower handle in one hand with arm extended in front of you. Maintain a balanced position and perform a one arm row (see Figures 3a & 3b).

Increase the challenge:

- Perform the motion described above while standing on the opposite leg.
- Perform the motion described above with rotation. That is, position your body with your arm extended across the center of your body, shoulder slightly rotated. Perform the rowing motion rotating your shoulders as you pull. Stand on one leg (the opposite leg) to make this even more challenging.

**Figure 3a. Standing One Arm Row**

**Figure 3b. Standing One Arm Row**

### *Plank*

Maintain stability through your core in the prone position with your weight on your elbows and toes. Imagine that your body is a table and you must not only maintain balance, but keep your body in a straight line from your heels to your head (Figure 4).

Increase the challenge:

- Increase the amount of time that you hold this position
- Alternate lifting one foot off the ground at a time, being sure to maintain the 'stable table' position.

**Figure 4. Plank**

## Day 3

### *Medicine Ball Pullover-Throw*

Lay on your back on the floor or a wide bench with your knees bent, feet flat. Hold a medicine ball over your head with your arms extended. Sit up and throw the medicine ball against a wall. Catch the ball as it rebounds off the wall and return to the lying position and repeat. This can also be performed with a partner who catches the ball and throws it back to you instead of a using a wall (see Figures 5a & 5b).

Increase the challenge:

- Perform the exercise while lying on an exercise ball
- Using a lighter medicine ball, perform the exercise with one arm at a time

**Figure 5a. Medicine Ball Pullover-Throw**

**Figure 5b.**
**Medicine Ball Pullover-Throw**

### *Squat Jump Throw*

Hold a medicine ball at your chest while standing in a stable, hip width stance (see Figure 6a). Squat slightly, but rapidly, and jump as high as you can into the air, while throwing the medicine ball as high as you can (see Figure 6b). Catch the ball and repeat.

Increase the challenge:

- Perform the exercise in a split/staggered stance
- Perform the exercise on one leg

**Figure 6a.**
**Squat Jump Throw**

**Figure 6b.**
**Squat Jump Throw**

## Conclusion

The importance of training for a strong and stable core cannot be ignored. Reduced risk of injury as well and improved overall performance can be achieved by incorporating even just a few core training movements into your current program. Keep in mind that core training is not a replacement for all other training regimes. Strength training that focuses on increasing the rate of force development is essential. Furthermore, training to induce hypertrophy and increased maximal strength may be warranted for certain individuals and training goals.

For the greatest success, incorporate core training movements that are functional and specific to your goals and sport demands. And remember to progress slowly when making core training more challenging.

## About the Author

*Tracy Morgan Handzel, CSCS is the owner and head Performance Coach of Train for the Game in Atlanta GA. She currently trains elite and professional tennis players and writes training related articles for various trade publications. Tracy has served as assistant director at the International Performance Institute and assistant strength and conditioning coach at the University of Washington, San Diego State University, and the University of California San Diego.*