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Sport-Specific Training

Features

Developing Your Soccer Conditioning Program

*Robert Taylor, Jr,
CSCS,*D,
NSCA-CPT,*D*

At the Core of a Pitcher: Increasing Strength and Power for a Softball Pitcher

*Patsy Toman
and
Juan Gonzalez,
PhD, CSCS*



about this PUBLICATION

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Editorial Office

1885 Bob Johnson Drive
Colorado Springs, Colorado 80906
Phone: +1 719-632-6722

Editor

Keith Cinea, MA, CSCS,*D,
NSCA-CPT,*D
email: kcinea@nsca-lift.org

Sponsorship Information

Richard Irwin
email: rirwin@nsca-lift.org

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AUTHOR

Suzie Tuffey Riewald 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.

It's the “Doing” That is Tough

Recently, I received an email from an athlete looking for resources to guide him in the “how” of mental skills training. He indicated that he knows about various mental skills and their importance but has trouble actually “doing it”. This echoes comments I’ve heard from a multitude of coaches and athletes and confirms observations of athletes; that is, mental skills/sport psychology concepts are relatively easy to understand (there probably is not a coach or athlete who is not familiar with concepts such as concentration, self-confidence, goal setting, or motivation), but these same concepts are tough to learn and consistently implement.

Think for a minute about a tennis player who yells at herself to “focus before your blow this match” after dropping the first set on a double fault. Can this athlete, who knows about focusing and the importance of keeping her mind in the game, effectively implement a refocusing strategy in the middle of a contentious match? She knows that she should, but can she ‘do’ and ‘do’ effectively? Ask yourself whether you have learned and developed the mental skills necessary for success in your sport or whether the tennis player example rings true for you.

Over the next several issues of the NSCA’s Performance Training Journal, we are going to address the doing part of the equation where the focus will be on putting into action specific mental skills (and less on the knowing part of the equation).

Let us begin this pursuit with the skill of goal setting. Most athletes already set goals so the challenge is probably not in setting goals. Rather, the challenge is in setting goals that will influence behavior—setting effective goals. To do this well, we need to figure out a way of incorporating or applying scientifically-derived goal setting principles. Research on goals tells us that the following factors consistently enhance the effectiveness of goal setting (1):

- Goals should be specific (versus general or “do your best” types of goals),
- Goals should be moderately difficult so as to challenge,

- Short- and long-term goals should be set,
- Goals that relate to both outcome (e.g., Win, achieve a specific time) and the process of performance (“explode out of the blocks”) are important,
- Set goals in practice and competition,
- Goals need to be recorded and evaluated.

That seems like a lot of things to think about and incorporate. But wait, read the list again as the reality is that a lot of these principles most athletes are incorporating already.

The following exercise is one way of how to “do” goal setting effectively. Keep in mind that there is no best way to do this, but there probably is a best or certainly better way for you. Your job is to adapt it to your unique situation. While you will read quickly through the following section, it is meant for you to come back to when you have time and can really put some thought into your responses.

1. Write down your season goal.

Notice the first word—WRITE. Commit this to paper to make it “real” and also enable you to honestly evaluate this and ensuing goals. Is your goal challenging yet realistic for you to accomplish with hard work and dedication? If you are like most athletes, you did not hesitate identifying your goal, as such a long term goal is often at the forefront and serves as a motivational force behind daily training. We are not done as this long term goal tells you where you want to go, but is not enough as you need a path to get there.

2. Identify the primary skills and abilities you need to achieve this goal.

Your long-term goal may be to win State or qualify for Nationals, but what is needed to accomplish this? Some skills and abilities you may need could include developing greater strength, increasing flexibility, improving a specific aspect of technique or enhancing your emotional control during games.

3. List, specifically, the things you can and need to do to develop these skills and abilities.

For example, suppose you need to develop core strength if you are to achieve your goal of running a sub-11 seconds 100 meters. You will need to identify the specific core exercises and proper progressions to develop this strength. It may be helpful to solicit input from your coach as to specific skills and abilities that will lead to long-term development and success.

4. Based on this goal breakdown, identify one thing you are going to work on today to help you reach your long-term goal. Then, do the same tomorrow and the next day.

Is the goal for practice specific enough such that you (or your coach) will know if you accomplish it? While your daily goal may seem far removed from where you want to be at the end of the season, it is a necessary step to get there.

Goals, when set effectively, can provide direction, enhance training motivation, and build confidence as you see success and improvement (that may otherwise go unnoticed). Time for you to get to work on the "doing" of setting goals. ■

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about the AUTHOR

G. Gregory Haff is an assistant professor in the Division of Exercise Physiology at the Medical School at West Virginia University in Morgantown, WV. He is a member of the National Strength and Conditioning Association's Board of Directors. He is a Fellow of the National Strength and Conditioning Association. Dr. Haff received the National Strength and Conditioning Association's Young Investigator Award in 2001.

What is the Best Predictor of 5000-m Run Performance?

Recently researchers from Australia and New Zealand investigated the physiological determinants of 5000-m run velocity before and after 6-weeks of structured endurance training. Thirty nine untrained subjects participated in this investigation which included measurements of running economy, maximal oxygen uptake, final velocity at maximal oxygen uptake, and the lactate threshold. After 6-weeks of training the maximal oxygen uptake, final treadmill velocity, and running velocity at the lactate threshold all increased. Additionally, after 6-weeks of training the average velocity during a 5000-m run increased significantly. Interestingly running economy was not shown to improve. When looking at the factors that are related to the average 5000-m run velocity only the lactate threshold, maximal oxygen uptake at the lactate threshold, and maximal oxygen uptake were all related to performance. The single best predictor of 5000-m run performance was found to be the treadmill velocity at maximal oxygen uptake. Thus suggesting that the highest velocity that can be achieved during a maximal oxygen uptake assessment gives the greatest indication of 5000-m running ability in both trained and untrained individuals.

Stratton, E, O'Brien, BJ, Harvey, J, Blitvich J, McNicol AJ, Janissen D, Paton C, Knez W. Treadmill Velocity Best Predicts 5000-m Run Performance. *Int J Sports Med* 30:40 – 45. 2009.

Lipid Oxidation is Elevated After Performing High Intensity Intervals

Recently the effects of high intensity interval training was compared to moderate intensity continuous training to determine the effects of each type of training on post-exercise lipid metabolism. Twelve fit men were recruited as subjects and performed three tests. The first test was a high intensity interval bout in which 1-minute intervals were performed at 80% of maximal aerobic power with 1-minute and matched to the total work undertaken during the continuous training bout. The continuous training bout was performed at 45% of maximal aerobic power and lasted for 60-minutes. The third bout consisted of a 65-minute control test with no exercise. Carbohydrate

metabolism was found to be significantly greater during the high intensity interval session than the continuous session even though there was no difference in the total energy used during each session. During the post exercise period both the continuous and high intensity interval sessions produced significant elevations in lipid oxidation. Based upon this study both interval and continuous training have the potential to increase post exercise lipid oxidation.

Malatesta D, Werlen C, Bulfaro S, Cheneviere X, and Borrani F. Effect of high-intensity interval exercise on lipid oxidation during postexercise recovery. *Med Sci Sports Exerc* 41:364 – 374. 2009.

High Intensity Interval Training Increases Fat Metabolic Capacities in Skeletal Muscle

High intensity interval training has recently received a lot of attention for being a time efficient method of training. With high intensity interval training all out efforts are repeated. Recently researchers for Canada examined the effects of high intensity interval training on fat oxidation. Using untrained subjects they examined the effects of 6-weeks of high intensity interval training consisting of 1-hour of 10 x 4 minute intervals performed at 90% of peak oxygen consumption separated by 2-minutes of rest. The interval training regime was performed 3-days per week. After the completion of the 6-week training program the subject's peak oxygen consumption was increased by 9% and their power output was elevated by 21%. Additionally, it was noted that after training there was a reduction in glycogen metabolism, a decrease in lactate accumulation, a 2-fold increase in time to exhaustion, a significant increase in fat oxidation. Ultimately this study demonstrated that 6-weeks of high intensity interval training has a powerful effect on the muscles ability to oxidize fat. The results of this study lend support to the idea that high intensity interval training is an effective method for increasing oxidative capacity and fat oxidation.

Perry CG, Heigenhauser GL, Bonen A, and Spriet LL. High-intensity aerobic interval training increases fat and carbohydrate metabolic capacities in human skeletal muscle. *Appl Physiol Nutr Metab* 33:1112 – 1123. 2008.

Whole Body Vibration Does Not Enhance Recovery Following a High-Intensity Interval Training Session

Recently researchers from New Zealand examined the effects of whole body vibration at 12 Hz on recovery. Nine well trained men served as subjects and participated in a constant pace run at 60 and 80% of the velocity achieved at peak oxygen consumption after which they performed a 3000-m time trial and 8 x 400 meter high intensity interval session. The entire test battery was performed two times. One time was a control condition while the other utilized 2 x 15minutes of 12 Hz whole body vibration. Twenty four hours after the completion of the vibration or control therapy the subjects performed the constant pace runs (60 and 80%) and the 3000-m

time trial. There were no improvements in performance for the 3000-m time trial as a result of the whole body vibration. Additionally, there were no positive effects of whole body vibration on blood lactate levels, oxygen consumption, or markers of muscle damage. Based upon these results it appears that whole body vibration at 12Hz is ineffective as a recovery modality.

Edge J, Mundel T, Weir K, and Cochrane DJ. The effects of acute whole body vibration as a recovery modality following high-intensity interval training in well-trained, middle-aged runners. *Eur J Appl Physiol* 105: 421 – 428. 2009. ■



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about the AUTHOR

Rob Taylor has been the Head Strength and Conditioning Coach at Loyola College in Maryland since the 2003 – 2004 athletic seasons. Rob is a graduate of Lock Haven University, where he was a three year starter for the baseball team. He has worked with professional organizations such as the Anaheim Angels, Tampa Bay Buccaneers, Tampa Bay Mutiny, and San Antonio Silver Stars.

Developing Your Soccer Conditioning Program

Robert Taylor, Jr, CSCS,*D; NSCA-CPT,*D

When designing strength and conditioning programs appropriate for soccer, there are many components to consider. Sports nutrition, rest and recovery techniques, body composition education, performance flexibility routines, muscular strength/power components, agility/reaction training, skill/speed development, and cardiovascular fitness are just a few that make up a year round, comprehensive program. This article will focus on how we condition our soccer players at Loyola College in Maryland, how we utilize our heart rate training program, and how to help prepare athletes for the demands of game day.

The four primary conditioning methods that we utilize throughout the year are long, slow distance training (LSD), high-intensity continuous exercise (HICE), interval training, and special speed-endurance (SSE). There is controversy that exists as to which of these training methods results in the greatest improvement in $VO_2\max$. We also overlap these training methods to help get the most out of our players. Depending on the time of year, one or all of these methodologies may be incorporated into their weekly regimen. Our players are continuously educated that they must train at a level of effort that will stimulate the body to make improvements. Once improvements have occurred, the work must become progressively harder to force further improvements. Therefore, our conditioning program is designed similarly to our strength program, where the focus is overload and progression.

Beginning in November at the end of most college soccer seasons, a group of athletes may be assigned to the LSD training group. Our LSD workouts involve exercises at low intensities (i.e., 70 – 80% of an athlete's maximum heart rate). The athlete will be responsible for completing up to two workouts per week that are normally greater in length than normal competition distance (i.e., 6 – 8 miles in most cases). Research suggests that

this technique is inferior to short-term, high intensity exercise in improving $VO_2\max$ (14). However, the low intensity training helps our athletes to improve their body composition while recovering from a physically demanding season. Our progressive heart rate program gives the athlete the freedom to choose his or her own modality to achieve the weekly conditioning goal.

It used to be a common belief that an improvement in aerobic capacity, fitness, or endurance was proportional to the distance ran (a.k.a. volume). A common myth within the coaching field is that "more must be better." Costil and colleagues contradict this belief. In a study comparing a group that trained for 3 hours and another for 1.5, the results indicated that the 1.5 hour group performed as well as the 3 hour group. In fact, the 3 hour group performed more poorly than the 1.5 hour group in some events. Therefore, the volume of training required to reach the benefits associated with LSD needs to be considered (5).

The second phase of the conditioning program begins in January. Our HICE program is the second component that we expose our athletes to and is used from January through the end of the season. It is believed that training at 80 – 90% of $VO_2\max$ may be optimal for most athletes. Training at or slightly above the lactate threshold provides excellent improvement in maximum aerobic power and thus is a useful guideline for planning training programs (18).

By the end of March, our interval training program is introduced to the team. It is believed that high intensity intervals lasting longer than sixty seconds are more effective in improving aerobic power, and perhaps lactate threshold, than low intensity intervals (11). Multiple modalities are used throughout this program. Treadmills, climbers, and cranks are all used along with our running and swimming pool program.

Developing Your Soccer Conditioning Program

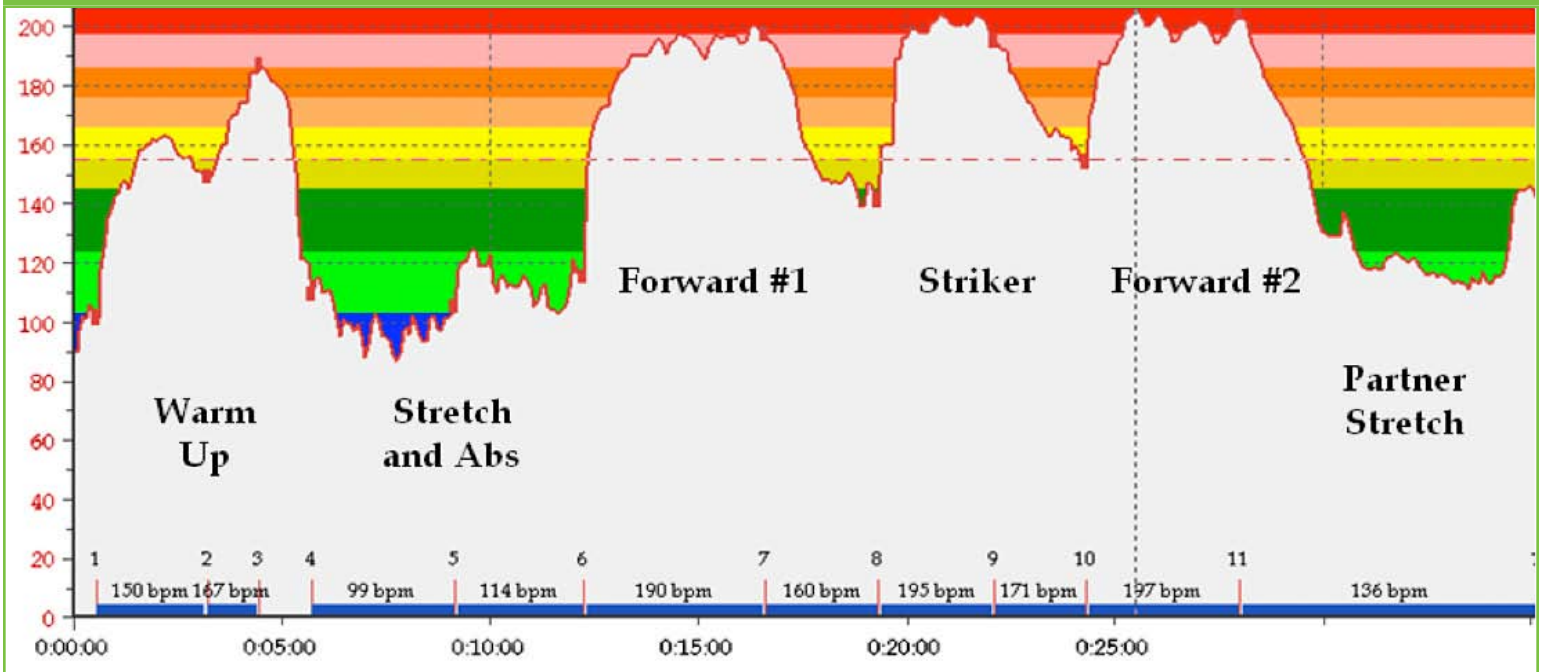


Fig1 Athlete's heart rate responding to our forward and striker workouts

The rest-to-work ratio in our conditioning programs is dictated initially by the time of year. As our programs approach the pre-season, we are looking for the athlete to be able to repeat high effort performances at full speed with limited-to-no mental breakdown. From January to March, we break into four groups and have a 3:1 rest-to-work ratio. From spring break through June, we use three groups or a 2:1 ratio. From July through pre-season, we ask the athletes to perform at a very high level with limited recovery and generally only use two groups (1:1).

A guideline similar to the rest-to-work ratio helps us identify individuals who need more or less attention. From January to March, the interval workouts are evaluated as a "success" if the athlete exceeds more than 80% of their maximum heart rate (MHR) during the work phase, and can recover to less than 70% during the rest period. From spring break through June, the expectation is moved up to 85% and 75% respectively. Then, from July through pre-season, we are trying to replicate the cardiovascular stress that the player will incur during a game. We use 90% during the work phase and 80% for our rest. During the season, we expect to have more than 80% of the total duration of our small sided games or

fitness sessions spent above 80% of the athlete's MHR.

The final component to our conditioning program is our SSE program (a.k.a. simulated game), which is introduced to our team in June. This component duplicates the position-specific activities the athlete performs in competition. This program helps facilitate the transition from running in a straight line to performing the physical demands of each position. We ask that each sprint is run at full speed. The athletes are allowed to jog back to the starting point when and where appropriate. We use heart rate response and a stop watch to monitor progress. Our SSE program is broken up by position and the demands are tailored to how each individual plays the game. Our center backs are expected to make 80 or more high intensity runs, center midfielders more than 90, forwards 100 or more, outside backs greater than 120, and our outside midfielders over 140 in a typical workout prior to the start of the season. The distances of the runs can change due to position, game simulation, and formation responsibility within our system of play. We break up the number of runs into two halves to simulate a half-time break as well. See figure 1 (above) for an example of how an

athlete's heart rate responds to our forward and striker workouts.

During a soccer game, an athlete will sprint for only a minor part of game time. But, sprinting accounts for a huge part of the physiological demands of soccer. The ability to recover from high intensity efforts is a significant factor in performance at the highest levels. Therefore, conditioning for soccer has to be appropriate for the game of soccer. The demands of running a series of sprints are different from running in a game situation (20).

In the beginning of researching how we were going to administer the four components we felt were necessary for our athletes to have a successful program available to them, we questioned how we would hold them accountable. With VO_2 max testing taking time, money, and space, we felt that was not a feasible option. Athletes need a non-evasive means of evaluating exercise intensity that provides instant feedback.

For example, our HICE program is based on a study which recommends using an alternative to laboratory testing to determine lactate threshold. It indicates to have athletes train at a

Anaerobic Maximum	Improve anaerobic system, improve PCr and glycolytic pathways, and lactate threshold
Anaerobic Sub-Maximum	Initiate intermittent training, improve recovery abilities, and blood lactate metabolism
Aerobic Maximum	Improve aerobic system, increase oxidative capacity, and enhance intermittent training
Aerobic Sub-Maximum	Utilize fat mobilization, oxidative capacity, and improve running economy
Recovery	Clear waste products, and increase blood flow

Table 1

Defining Heart Rate Training Zones

fixed percentage of their MHR. Weltman and colleagues (21) suggest that if lactate threshold is to be used as the appropriate exercise training intensity for HICE, athletes should exercise above 90% MHR for 25 to 50 minutes per workout. As the body adapts to this stress, an even greater amount of stress can be placed on the body in order to maintain a 90% MHR reading.

It is known that a 90 minute match will be played 10 to 30 beats below a player's MHR. Therefore, we break up our heart rate feedback into five main zones: Anaerobic Maximum (100 – 96% MHR), Anaerobic Sub-Maximum (95 – 90% MHR), Aerobic Maximum (89 – 85% MHR), Aerobic Sub-Maximum (84 – 80% MHR), and Recovery (79 – 75% MHR). When educating our athletes on the importance of each zone, we try to touch on physiological principles. Refer to table 1 (above) for some of the principles we use within our heart rate program.

In order to compare athletes to their own individual effort history, those who play the same position, and the team as a whole, we have established a points system (a.k.a. exertion). A study by Shimojo (19) was used to help justify the grading scale. The slope of lactate accumulation was used to structure the progressive exertion evaluation. For each minute in the Anaerobic Maximum zone, 7.0 points are earned. As effort decreases, so does the point value of each zone (Anaerobic Sub-Maximum: 4.5/min, Aerobic Maximum: 3.3/min, Aerobic Sub-Maximum: 2.2/min, and Recovery: 1.7/min).

At the end of each week, exertion points are summed for each individual and a weekly team average is calculated. Players falling below one standard deviation (SD) are given extra conditioning. Those players above one SD are closely monitored for overtraining and commonly receive alternative conditioning. This may include bike sessions, pool workouts, film sessions, a session off, or even complete days off. Additionally this system rewards our players for giving their maximum effort at practice, which is our goal during the periods of time we are allowed to practice as a team.

After determining the exertion during a workout, that score is divided by the length of time that the data was analyzed. This number is considered "intensity" and allows us to make comparisons within any component of our conditioning package regardless of modality by giving us a value relative to points per minute. Each of our practices is analyzed from warm-up and team training to additional fitness when necessary. Following a team training session, each athlete is compared for the same duration (i.e., start of practice to the end of practice) to allow for a fair intensity comparison amongst the team per training session. Our fitness sessions have an intensity score of 4.9 – 3.2, and our walk through practices the day prior to competition are our lowest scoring session with a score of 2.0 – 1.1 as team averages. We provide tangible feedback to our athletes to help them learn the type of effort that is necessary at practice in order to be successful on game day. Our live competition scores range from 3.7 – 3.0 as a team average with this exertion points system. ■

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about the
AUTHOR

Kyle Brown is a health and fitness expert whose portfolio includes everything from leading workshops for Fortune 500 companies and publishing nutrition articles in top ranked fitness journals, to training celebrity clientele—from pro athletes to CEOs to multiplatinum recording artists. Kyle's unique approach to health and fitness emphasizes nutrition and supplementation as the foundation for optimal wellness. After playing water polo for Indiana University, as well as in London, Kyle became involved in bodybuilding and fitness for sport specific training. Kyle is the creator and Chief Operating Officer for FIT 365—Complete Nutritional Shake (www.fit365.com).

Agility Training in the Gym for Sport-Specific Results

Over the past decade, the notion of athletes leaving the practice field and heading to the gym for diversification in training has become common place. However, most athletes focus on the universal big three results for gym training of getting bigger, stronger, and faster. But a new term is emerging that transcends nearly all sports and all positions within sports: agility.

Agility is the ability to rapidly change the body's position without losing balance; and requires a combination of coordination, speed, reflexes, strength, endurance, and stamina. In sports, agility is described in terms of response to an opposing player or moving target. As with other fitness components, agility is specific to a particular movement pattern. (1)

Benefits of Agility Training

Agility training improves quickness, reaction time, acceleration, proprioception, balance, and coordination. Moreover, as it strengthens the muscles and tendons of all major joints it will aid in preventing injuries by improving body control through repetition of proper movement mechanics.

Two multifunctional pieces of gym equipment for agility training are the agility ladder and the half dome stability ball. Below are sample agility exercises to jumpstart your agility training in the gym.

Agility Ladder Exercises

Lateral Shuffle

Start at the end of the ladder with your hips square facing perpendicular to the ladder. Shuffle through the ladder by ensuring both feet touch the inside of each square. As you shuffle, pump your arms to mimic a running motion. Keep tall and don't look down while performing drill.

Single Foot In and Outs

Start at the base of the ladder and hop on one foot outside of the ladder and then back inside of the ladder into the subsequent steps to the end.

2 In 2 Out

Start at the base of the ladder and bring each foot individually into the square then outside of the square individually. Continue this sequence as you move up the ladder.

Half Dome Stability Ball Exercises

Alternating Plyo Lunge On Half Dome Stability Ball

Begin with one foot on top of the device, the other foot lunging back. Jump up and switch so that the other foot lands in the middle of the device and the other foot lunges back. Repeat for desired repetitions.

Side to Side Shuffle Over Half Dome Stability Ball

Begin beside the device with one foot and the other foot to the side. Laterally jump up so that the foot on the side lands on top of the device and the foot on top of the device lands on the opposite side. Reverse direction and repeat for desired repetitions.

Toe Touches On Top of Half Dome Stability Ball

Start facing the device with the ball of one foot on top of the device and the other to your side. Jump and switch foot positions and repeat for desired repetitions. ■

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about the
AUTHOR

Debra Wein, is a faculty member at the University of Massachusetts Boston and adjunct lecturer at Simmons College. Debra is the President and Co-founder of Sensible Nutrition, Inc. (www.sensiblenutrition.com), a consulting firm established in 1994 that provides nutrition services to athletes, individuals, universities, corporate wellness programs and nonprofit groups. Debra is certified as a Specialist in Sports Dietetics (CSSD) through The American Dietetic Association. Her sport nutrition handouts and free weekly email newsletter are available online at www.sensiblenutrition.com.

Clueing in on Carbs

Despite the ebbs and flows in the popularity of various high protein diets, we know that diets rich in grains, vegetables, and fruits (nutritious, high-carbohydrate foods), help prevent disease, maintain body weight and optimize athletic performance. There is no substantial evidence that would support a change in that recommendation. According to the Institute of Medicine, individuals should consume between 45 – 65% of total calories from carbohydrates (1,8), with athletes requiring the higher end of that recommendation (2,6,7). Carbohydrates remain the best and most consistently studied ergogenic (performance enhancing) aid. Read on to find out why carbs still matter and to figure out how much you need in your diet.

Why Do Carbs Still Matter?

Carbohydrates are stored in limited amounts as glycogen in muscles and in the liver. The muscle glycogen is the fuel for your muscles, while liver glycogen maintains a normal blood sugar level to fuel the brain. If your body runs out of glycogen, as in the later stages of a marathon, and you can barely lift your legs you “hit the wall”. If your blood sugar drops too low, your brain becomes fatigued and struggles to control the active muscles. As a result, you experience mental fatigue and “bonk” or “crash”. Athletes require more carbohydrates than sedentary individuals. (1,8)

Are You Getting Enough?

First, estimate your carbohydrate need using Table 1 and then compare your needs with your intake based on some common carb foods in Table 2. Make any adjustments necessary for optimal athletic performance and overall well being.

Some Suggestions

Here are some creative suggestions to help keep your plate interesting and your muscles fueled.

- If you are bored with white potatoes - try baking sweet potatoes or acorn squash.
- Slice boiled new potatoes over salads for a filling lunch.
- Try raw sugar snap peas for a cool summer snack.
- Explore the world of beans - there are over 20 different varieties which, coupled with a grain-based food such as pasta or rice, makes a protein packed, high carbohydrate dish.

- Try wild rice, brown rice, Spanish rice or long grain rice for a change from white.
- Experiment with all the different shapes, sizes, colors and flavors of whole wheat pasta that are available.
- Enjoy different whole grain and multi-grain breads spread with jam, honey or fruit butter.
- Try fruit on top of pancakes or waffles instead of syrup or add raisins, berries, or diced fruit to the batter.

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Table 1

Estimating Your Carbohydrate Needs

Daily Calories Required	55% Calories (grams of carbohydrates)	65% Calories (grams of carbohydrates)
1500	206 grams	244 grams
2000	275 grams	325 grams
2500	344 grams	406 grams
3000	413 grams	488 grams
3500	481 grams	569 grams

Table 2

High Carbohydrate Foods

Vegetables	Carbs (grams)	Total Calories
Baked potato (1 large)	55	240
Stuffing (1 cup)	40	220
Spaghetti, macaroni, noodles (1 cup)	40	200
Rice (white / brown) (1 cup) – parboiled	35	160
Corn (1/2 cup)	18	80
Winter squash (1/2 cup)	15	65
Carrots (1, Medium)	10	60
Peas (1/2 cup)	10	40
Tomato sauce (1/2 cup)	10	18

Dairy	Carbs (grams)	Total Calories
1% Milk (1 cup)	12	102
American Cheese (1 slice)	0	114
Lowfat yogurt – plain (8 oz.)	16	143
Cottage cheese (1 cup)	6	183

Selected Cereals	Carbs (grams)	Total Calories
Grape nuts (1/2c)	48	200
Raisin Bran (1 cup)	45	190
Shredded wheat (1 cup)	40	160
Waffles (2)	36	259
Oatmeal (1 oz.)	18	102
Pancakes (2)	35	183
All Bran (1 cup)	45	159
Cream of wheat (1 oz.)	18	86

Legumes	Carbs (grams)	Total Calories
Baked beans (1 cup)	50	330
Lentils (1 cup)	40	215
Split-pea soup (11 oz)	35	220
Kidney beans (1 cup)	33	204
Lima beans (1 cup)	28	140
Garbanzo beans (1 cup)	27	28

Fruits	Carbs (grams)	Total Calories
Raisins (1/2 cup)	60	240
Fruit yogurt (1 cup)	50	250
Dried apricots (8 halves)	30	120
Banana	26	105
Apple sauce (1/2 cup)	26	97
Ice milk (1/2 cup)	22	120
Apple or Orange	20	80
Grapes (1 cup)	16	58

Grains	Carbs (grams)	Total Calories
Sub roll (8 inches)	60	280
Bran muffin (large)	45	320
Bagel	30	210
Corn bread (large slice)	29	198
Whole grain (2 slices)	25	150
English muffin (1)	25	130
Graham crackers (2 squares)	11	60

Sources: 3,4,5



about the AUTHORS

Patsy Toman is a Senior Exercise Science Major at Schreiner University in Kerrville, Texas.

Juan Gonzalez is an Associate Professor in the Exercise Science Department at Schreiner University in Kerrville, TX.

At the Core of a Pitcher:

Increasing Strength and Power for a Softball Pitcher

Patsy Toman and Juan Gonzalez, PhD, CSCS

The core of an athlete plays a significant role in nearly all sport-related movements. This is especially true for softball pitchers. Most fast-pitch softball pitchers use a windmill motion. During this motion instability occurs due to the re-distribution of body weight. At the beginning of the pitch all the weight is on the back leg. Once the lead foot hits the ground the weight shifts and most of it is distributed to the front leg (figure 1). This instability places an emphasis on the core muscles of the pitcher. Rotation of the hips is also an important aspect of a good windmill pitch. A strong core provides stability, balance, and power for rotation.

The core is typically described as being comprised of the: rectus abdominis, external obliques, internal obliques, transverse abdominis, and erector spinae. The core is essential in generating power and is the center of gravity for the body (1). Strengthening the core improves the pitch on many levels. First of all it increases rotational power, which provides more power behind

the pitch. It also increases stability and balance making the pitch a more fluid motion, which relays that the muscles are being more productive in producing power. Consequently, there is less wasted movement and all the concentration is on the proper pitching mechanics. The core serves as a link between the upper and lower body. Stable core muscles serve as a base in which the upper and lower extremities can accelerate and transfer power effectively (3). Lastly, a strong core helps reduce the risk of injury, "The muscles of the core when strong, stable, and efficient are better able to absorb and translate power, putting less stress on the extremities" (1).

A strong core can be very beneficial to a softball pitcher. With the proper core strengthening exercises a pitcher can become more productive on the mound.

Stability Ball Weighted Crunch (figure 2)

Lie with your back on the ball and feet flat on the ground. Knees bent at 90 degrees. Raise your arms toward the ceiling holding a weighted medicine ball. Have a posterior pelvic tilt during the exercise. Slowly curl up from a hyper-extended position and push the ball backward so that your buttocks are on the ball. Repeat for 2 sets of 10.



Fig1 Once the lead foot hits the ground the weight shifts and most of it is distributed to the front leg.



Fig2 Stability Ball Weighted Crunch

Stability Ball Rotation (figure 3)

Lie with your back on the ball and feet flat on the ground. Knees bent at 90 degrees. Holding a light to medium size medicine ball in your hands, rotate to one side while keeping your feet in a stationary position. Allow the ball to rotate across your back while keeping your hips under you. Rotate to both sides and repeat for 2 of 10.



Fig3 Stability Ball Rotation

Stability Ball One-leg Sit-ups (figure 4)

Lie with your back on the ball. Have one foot on the ground with the knee bent at 90 degrees and the other leg extended out. Slowly curl your trunk, lifting your shoulder and upper back off the ball to a sitting position. Then slowly return to starting position. Repeat for 2 sets of 10 on each leg.



Fig4 Stability Ball One-leg Sit-up

Stability Ball Leg Rotations (figure 5)

Lie down with your back flat on the floor and arms extended out to your sides. Place the ball between your calves, squeezing with your legs to hold the ball in place. Rotate your legs and hips so that your feet are now above and below the ball. Rotate to both sides and repeat for 2 sets of 20.



Fig5 Stability Ball Leg Rotations

Stability Ball Alternating Superman (figure 6)

Lie face down with your stomach on the ball. Feet should be shoulder width apart with your toes and palms touching the ground. Raise one leg and the opposite arm. Keep the arms and legs straight and reaching out. Hold for a few seconds and then switch to the other arm and leg. Repeat for 2 sets of 10.



Fig6 Stability Ball Alternating Superman

Floor Bicycles (figure 7)

Lie down with your back flat on the floor. Arms should be bent at the elbows and placed with your finger tips by your ears. Legs are together and extended outward 45 degrees to the floor. Pull one leg into your chest by flexing your knee and keeping the other leg extended. At the same time, crunch up and diagonally bring the opposite elbow to the flexed knee. Alternate knees and elbows in a cycling manner. Repeat for 2 sets of 25.



Fig7 Floor Bicycles

Side Touch with Medicine Ball (figure 8)

Sit on the floor and lean back 45 degrees. Keep your feet off the floor. Move the medicine ball from side to side by twisting your trunk. Touch the medicine ball to the ground on each side. Repeat rapidly for 2 sets of 30.



Fig8 Side Touch with Medicine Ball

Stability Ball V-Ups (figure 9)

Get in a push up like position with the ball below the thighs and knees. Pike the hips up as high as possible, keeping your legs straight. Lower back down controlled. Repeat for 2 sets of 15.



Fig9 Stability Ball V-Ups

Table Tops (figure 10)

Make a bridge position using the feet and the elbows. Squeeze the abdominals and keep contracted. Keep the back straight and hold the position for 45 seconds for 2 sets.



Fig10 Table Tops

Two Point Kneeling on Ball (figure 11)

Place both knees and hands on the ball. Slowly try to remove hands and balance with just your knees on the ball. This may take some time to master. Once balancing on the ball with knees hold for 45 seconds or as long as you can for 2 sets.



Fig11 Two Point Kneeling on Ball

Stability Ball Push Ups (figure 12)

Get in a push up position with hands on the ball and feet on the ground or on a box. Hold push up position by squeezing with the abdominals. Hold position for 45 seconds for 2 sets. Once you have mastered this exercise you can begin to actually do push ups on the ball.



Fig12 Stability Ball Push Ups

Kneeling Medicine Ball Throw (figure 13)

Kneel on one leg and keep on the other foot on the ground at a 90 degree angle. Hold the ball with both hands and bring back as in a wind up. Accelerate the ball forward and throw the ball. Repeat on both sides for 2 sets of 10 (2).



Fig13 Kneeling Medicine Ball Throw

Single Leg Medicine Ball Throw (figure 14)

Stand on one leg and hold the medicine ball with both hands. Bring the ball back by rotating backward. Rotate forward explosively and release the ball. Repeat on both sides for 2 sets of 10 (2).



Fig14 Single Leg Medicine Ball Throw

The core muscles are critical in not only stabilizing but in transferring power to the throwing motion of the softball pitch. Translating power from the core and trunk into the pitch is ultimately what every softball pitcher wants and needs. Following these routines the pitcher will also minimize the chances of shoulder injuries by utilizing as much of full body momentum instead of just shoulder strength. ■

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The graphic features a dark blue background with a night view of the Paris Hotel & Casino in Las Vegas. A large, illuminated hot air balloon is visible on the right. On the left, there are three circular inset photos: a man and a woman smiling, a woman performing a medicine ball exercise, and a man speaking into a microphone. The NSCA logo is prominently displayed in the upper left.

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about the
AUTHOR

Jason Brumitt is an instructor of physical therapy at Pacific University in Hillsboro, Oregon. He is a board certified sports physical therapist, an athletic trainer, and a certified strength and conditioning specialist with distinction. He may be reached at jbrumitt72@hotmail.com.

Lower Extremity Strengthening for Soccer Players

A majority of the injuries sustained by soccer athletes occur in the lower extremities (1). Some of the more common lower extremity soccer injuries include muscle strains, medial tibial stress syndrome, ankle sprains, and foot pain. While some traumatic are caused by direct player contact, many of the overuse or minor traumatic injuries may be avoidable when a lower extremity strength training program is performed. The purpose of this article is to present a functional lower extremity strength training program (table 1) to reduce the risk of injury in soccer athletes.

The Leg Press

The leg press, although not seen as a “functional” exercise, can help build leg strength in the untrained athlete. In general, athletes should start in a 90° – 90° hip and knee position (figure 1). When performing the press, attempt to fully extend the legs without hyperextending the knees (figure 2). As one’s strength improves, progress to lunges and squats.



Fig1 Leg Press Start



Fig2 Leg Press End

Table 1

General Lower Extremity Strength Training Program for Soccer Athletes

Leg Press	3 sets x 8 – 10 reps
Squats	3 sets x 8 – 10 reps
Forward Lunge	3 sets x 8 – 10 reps
Backward Lunge	3 sets x 8 – 10 reps
Inverted Hamstring	3 sets x 12 – 15 reps
Side Plank with Hip Abduction	3 sets x 20 reps each side

Forward Lunge

This functional exercise strengthens the lower extremities and helps to enhance core stability. Stand with hips shoulder width apart. Step forward (lunge) flexing the lead hip and knee. Be watchful of your alignment; the lead knee should be aligned with the hip and foot (figure 3, next page). The body is lowered towards the floor to the point that the trailing knee almost contacts the ground. The lunging sequence is repeated with the opposite leg stepping forward.



Fig3 Forward Lunge



Fig5 Side Plank with Hip Abduction

Backward Lunge

The backward (or reverse) lunge is performed in the same manner as the forward lunge except that the trailing leg steps backwards to initiate the exercise.

The Squat

Stand with feet shoulder width apart. The bar should be positioned across the upper back resting on either the trapezius muscle or the trapezius and deltoids. The squatting motion should be initiated by flexing at the hips. Ensure that the knees do not fall in front of the feet. Lower to a position of almost full hip and knee flexion, where the thighs are parallel to the floor (figure 4). Maintain a neutral spine posture throughout the squat; avoid rounding or hyperextension in the lower spine. Return to the starting position by extending the hips and knees.

Inverted Hamstring

The inverted hamstring exercise addresses hamstring tightness, core stabilization, and incorporates balance training. Balance on one leg while maintaining optimal posture. Next bend at the hips (not the waist) while maintaining a neutral spine. Hold the arms to the sides to assist with balance. While leaning forward, a stretching sen-

sation should be felt in the hamstrings. Hold for count then return to the starting position.

Side Bridge with Hip Abduction

Begin in the side plank pose position (supporting the body by the feet and a forearm). While maintaining an abdominal isometric contraction, abduct (lift away) the upper leg from the bottom leg (figure 5).

Conclusion

Undertrained soccer athletes risk a variety of lower extremity injuries. The inclusion of a comprehensive functional lower extremity training program may help to reduce some of that risk. ■

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Fig4 Squat



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