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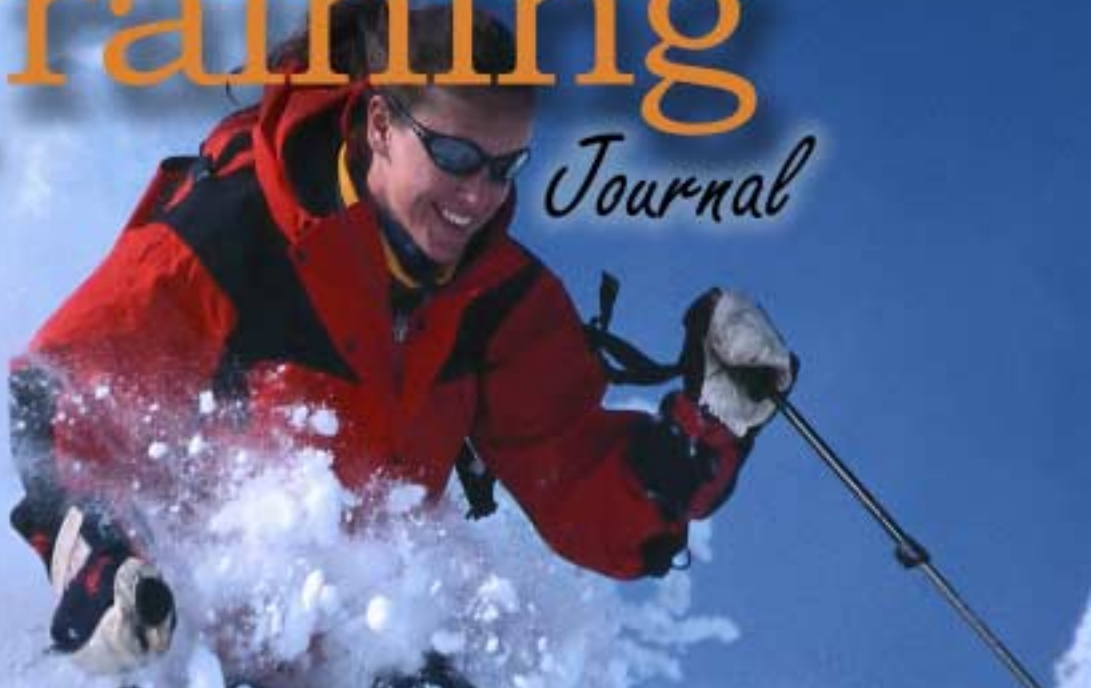

Keep Your New Year's Resolutions

Winter Sports Conditioning

Eat Right for Exercising in the Cold

NSCA™

Volume 3, Number 1

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NSCA's Performance Training Journal

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FitnessFrontlines

G. Gregory Haff, PhD, CSCS

Does adding protein to your carbohydrate supplement increase endurance?

A new study by researchers at the University of Texas at Austin suggests that adding protein to your carbohydrate supplement can increase your time to exhaustion during aerobic exercise. According to the study published in the International Journal of Sport Nutrition and Exercise Metabolism, individuals who consume a mix of carbohydrates (7.75 g) and protein (0.30 g) can exercise an average of 7.2 minutes longer during a test to exhaustion, after performing 180 minutes of cycling, when compared to those who consume just carbohydrates (7.75 g). Both the carbohydrate + protein and the carbohydrate supplement treatments resulted in longer durations (carbohydrate + protein = 14.2 minutes longer; carbohydrate = 7.0 minutes longer) of exercise than consuming just water. The results of this study suggest that endurance athletes can significantly augment endurance performance by using a combination of carbohydrates and protein supplementation during aerobic exercise.

Ivy JL, Res PT, Sprague RC, Widzer MO. (2003). Effect of a carbohydrate-protein supplement on endurance performance during exercise of varying intensity. *International Journal of Sport Nutrition and Exercise Metabolism, 13(3)*:383 – 395.

Are you a vegetarian athlete?

Researchers at the Department of Human Kinetics at St. Francis Xavier University in Nova Scotia, Canada recently published a study looking at the effects of creatine supplementation in vegetarians. In this investigation the researchers compared the effects of creatine supplementation (0.25 g creatine/kg bodymass for 7 days followed by 49 days of supplementation at 0.0625 g creatine/kg body mass) coupled with an 8-week resistance-training program between non-vegetarians and vegetarians. Overall vegetarians who consumed creatine experienced significantly greater increases in 1) muscular stores of creatine, 2) lean body mass, and 3) total work performed during an isometric test after the 8-weeks of training than non-vegetarians who consumed creatine. The data also suggested that the inclusion of creatine supplementation might increase muscle area associated with resistance training when compared to a placebo regardless of being vegetarian or non-vegetarian. Therefore the results of this study suggest that athletes who are vegetarians may augment the performance benefits associated with a resistance program by including creatine supplements.

Burke DG, Chillibeck PD, Parise G, Candow DG, Mahoney D, Tarnopolsky M. (2003). Effect of creatine and weight training on muscle creatine and performance in vegetarians. *Medicine & Science in Sports & Exercise, 35(11)*:1946 – 1955.

Do you use HMB and creatine supplements in an attempt to improve performance?

In a recent study published in the Journal of Sports Medicine and Physical Fitness, researchers from the Institute of Sport and Exercise Science at James Cook University in Australia examined the effectiveness of HMB and creatine supplementation in highly trained athletes. Six weeks of supplementation were utilized in an attempt to see if creatine (3 g creatine/day) or creatine+HMB (3 g/d HMB + 3 g creatine/day) resulted in significant improvements in aerobic or anaerobic performance. Aerobic performance was measured with a multistage aerobic capacity test consisting of timed 20 m sprints to predict maximal aerobic power. A 60-second cycle ergometer test was used to determine each subject's anaerobic capacity. Results of this study suggest that six weeks of HMB or the combination of creatine+HMB do not result in any alterations in aerobic power or anaerobic capacity. Therefore the researchers concluded that the HMB or the combination of HMB and creatine supplementation results in little ergogenic benefit for highly trained athletes.

O'Conner DM, Crowe MJ. (2003). Effects of b-hydroxy-b-methylbutyrate and creatine monohydrate supplementation on the aerobic and anaerobic capacity of highly trained athletes. *Journal of Sports Medicine and Physical Fitness, 43(1)*:64 – 68.

A single light set after a training bout can alter hormonal responses to resistance training

Adding a light set after a training bout has been shown by researchers at the University of Tsukuba, Japan to result in significantly greater growth hormone secretion. Researchers examined the effects of adding a down set (lighter set) after a target workout protocol of five sets of repetition performed to muscular failure at 90% of 1 repetition maximum (RM) on growth hormone production. Three different down sets were tested, 90%, 70%, and 50% of 1 RM with each set performed for as many repetitions as possible. Results indicated that the greatest number of repetitions was performed in the 50% down

set and the least in the 90% down set (number of repetitions: 50% > 70% > 90% RM). Interestingly the 50% down set resulted in the greatest increase in growth hormone production. Therefore athletes participating in resistance training might be able to magnify the anabolic response to a resistance-training bout by simply adding a down set to their training regime.

Goto K, Sato K, Takamatus K. (2003). A single set of low intensity resistance exercise immediately following high intensity resistance exercise stimulates growth hormone secretion in men. *Journal of Sports Medicine and Physical Fitness, 43(2)*:243 – 249.

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.

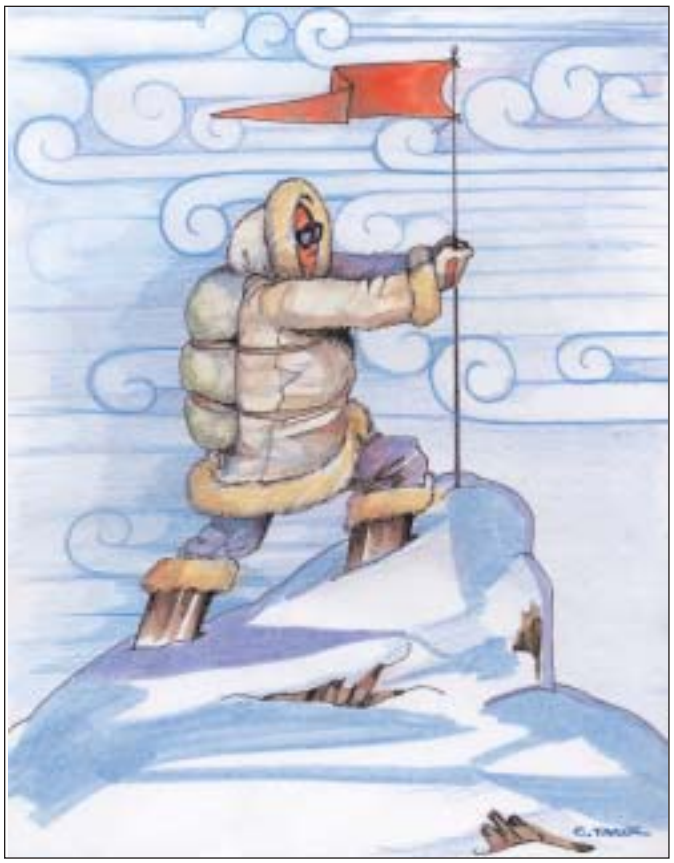
MindGames

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

Staying Committed to Your New Year's Resolution

A New Beginning

January 2004… a fresh start. The new year triggers a desire for many people to set New Year's resolutions in an attempt to change a behavior, to become a better person, to work on bad habits, or to add positive habits. While there is nothing inherently special about January 1st, it is a good time to reflect back on the past year and look ahead to the upcoming year.



New Year's resolutions are not a recent tradition, as one might assume. They actually originated over 4000 years ago with the Babylonians. These people held a belief that what a person does on the first day of the year has an influence throughout the year. Given this belief, the start of the new year became an especially important time to "do right" or "do good" so this could be maintained throughout the year. Have you, like the Babylonians of ancient times, set a resolution for the New Year, something you want to "do right" this year? It is not too late to set one now if you haven't done so already.

Now we move forward into February 2004—one month into the new year. How are you doing on keeping your New Year's resolution? If you are a member of a gym or health club, you've probably noticed the New Year's resolution trend and, in fact, may be part of the trend. During the first few weeks of January, the place is packed as individuals have rededicated themselves to maintaining their health and fitness. By the end of January, the hustle and bustle of just a few weeks prior has subsided. There is no longer a wait to use a machine or get a lane in the pool. What started off as good intentions somehow falls by the wayside. Whether you are one who has been unsuccessful in keeping your resolution, hasn't yet set a resolution, or are sticking to it so far, you can probably benefit from a few tips to help you achieve your resolution.

Strategies for Keeping New Year's Resolutions

Setting a resolution is, in essence, setting a goal. New Year's resolutions are often related to something you want to accomplish, attain, or achieve such as working out every day, losing weight, running a marathon, or quitting smoking (sounds a lot like a goal, right?). Therefore, to identify strategies to help you in your efforts to stick to your resolution, it is appropriate to tap into information on effective goal setting—information that has been discussed in previous Mind Games articles. Additionally, work on exercise adherence and research that has looked specifically at factors that

predict success in keeping New Year's resolutions can provide useful information. Based on work in these areas, the following are suggested strategies to keep you true to your resolution:

Make a Commitment

First and foremost, a commitment to make a change is required. Ask yourself whether you are willing to do what it takes to stick with your resolution. Part of your commitment should also be acknowledging that it won't be easy. Are you willing to get up at the crack of dawn to go to the gym? Are you willing to train in the snow? As Vince Lombardi said, "Once a man has made a commitment, nothing will stop him short of success."

Have a Plan

Your resolution or goal tells you where you want to be; you also need to figure out how you are going to get there. What is required for you to be successful? How, specifically, are you going to lose weight, quit smoking, or train for a marathon?

Expect Setbacks

You're not perfect. You may have a lapse where you miss a training run, eat dessert, or opt to sleep in instead of going to the gym. Don't equate a minor setback with failure. Get yourself back on track instead of tossing in the towel at this point (which we often do). Expecting to have minor setbacks makes them much easier to handle.

Enlist Support

Surround yourself with people who support your efforts to change. Tell your spouse, kids, parents, trainer, nutritionist, or others that are significant in your life, or are critical to your success, what you are trying to do and what you need from them. After all, won't you be more likely to go for your 5:30am workout if your spouse encourages you to go rather than complains about your alarm going off so early?

Keep Track of Your Progress

Hold yourself accountable for achieving your resolution—do so by monitoring and evaluating how you are doing. Seeing progress can serve as a motivator as well as build your confidence that you really can be successful.

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

Winter Sports

As you gear up for the cold winter months, winterizing your car, your house, your garden, or your wardrobe—have you thought about your winter exercise and diet plans? Outdoor sports and activites, like boarding, downhill and cross country skiing, skating, and snowshoeing are great ways to stay fit during the winter, but before you head for the mountains, the meadows, or the ice, prepare yourself. Winter sports are physically demanding and to perform optimally, avoid injury, and enjoy yourself, you must not only invest in the right equipment, but in understanding how to fit in good nutrition when you are on-the-go. Here are some suggestions.

Plan.

Plan what, when, where, and how. Schedule time to eat, just like you schedule your meals at home. Busy travel schedules mean planning and compromising. You can compromise on time without compromising on nutritional quality. Plan breakfast by bringing hot or cold cereals, fruits that are easy to pack (apples, oranges, bananas, etc.) to the slopes or to your cabin so that you are not left at the top of a big mountain with no energy to get started properly. Develop a list of lunches that you can prepare ahead of time and eat at the lodge while you warm up. Most often, ski lodges offer few choices for the healthy consumer.

Snack.

Snacking is also a great way to "take 5," re-energize, and warm up. Always have nutritious snacks on hand to munch on. Choose nutrient dense foods to fill in the gaps in your diet. If, for example, you have difficulty meeting your daily calcium requirements, choose yogurt, pudding, low fat cheese, or low fat milk for snacking. Bring these in a small cooler. Snacking helps you re-fuel and protect you from injury. Some other healthy examples include: mixed nuts and a single serving can of tomato juice (choose low sodium), dried apricots, apples, nectarines, etc., low-fat milk and a homemade or store-bought low-fat, whole grain muffin (avoid jumbo-sized muffins), low fat crackers and part-skim mozzarella cheese, chopped vegetables such as red and green bell peppers, jicama, carrot and celery sticks, snow peas, button mushrooms, and broccoli with non-fat ranch dressing.

Don't skip meals.

Skipping meals not only causes you to miss nutrients important for your health and performance (mental and physical) it also can lead to injury. When you are tired, you may become unintentionally lazy, and this can mean the difference between a great last run, and one that sidelines you for a great while.

Calculate your energy needs

Energy (calorie) needs will vary with age, sex, body weight, body composition, and most importantly by the intensity, frequency, and duration of your exercise. Adults can refer to the following energy estimates to figure out their additional energy needs.

On an ordinary day with light activity

- An average male (23 – 50 years old, 154 lbs.) needs 2,500 – 2,900 calories.
- An average female (23 – 50 years old, 120 lbs.) needs 1,800 – 2,200 calories.

Additional calories needed for activities

Hiking

Backpacking with a 40 pound pack burns about 6 – 7 calories/minute (about 350 – 410 calories per hour).

Hiking at 4 mph burns about 6 – 7 calories/minute (about 340 – 415 calories per hour).

Mountain climbing burns about 8 – 10 calories/minute (about 500 – 600 calories per hour).

Skiing

These estimates are for a full day of skiing, which is approximately 10 downhill runs averaging 18 minutes each for a total of 180 minutes (2½ hours), 1 hour of skiing at race pace, or 4 hours of cross country skiing.

Downhill:

Leisure skiing (beginner/intermediate) burns about 6 – 7 calories /minute (about 1100 - 1250 calories for a full day of skiing).

Moderate speed skiing (intermediate with some mogul work) burns about 11 calories/minute for women, and 15 calories/minute for men (about 1900 – 2700 calories for a full day of skiing).

Maximum speed skiing burns about 18.6 calories/minute (about 1800 calories for a full day of racing).

Cross country:

Average speed (4 miles per hour) burns about 10 – 12 calories /minute (about 2400 – 3000 calories for a 4 hour course)

Suggested Reading

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Lipetz J, Kruse RJ. (2000). Injuries and special concerns of female figure skaters. *Clinics in Sports Medicine, 19(2)*: 369 – 380.

Rosenbloom C. (2000). *Sports nutrition, a guide for the professional working with active people, third edition.* The American Dietetic Association, Chicago.

Sjodin AM, Andersson AB, Hogberg JM, Westerterp KR. (1994). Energy balance in cross-country skiers: a study using doubly labeled water. *Medicine & Science in Sports & Exercise, 26(6)*:720 – 724.

Ziegler PJ, Jonnalagadda SS, Nelson JA, Lawrence C, Baciak B. (2002). Contribution of meals and snacks to nutrient intake of male and female elite figure skaters during peak competitive season. *Journal of the American College of Nutrition, 21(2)*: 114 – 119.

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) and the author of SNaC Pack: The Health Professional's Guide to Nutrition.

Functional Exercises for Enhancing Snowshoe Performance

Tami Dick, CSCS, PT

Initially, snowshoes were developed as a means of winter transportation. They were large platforms designed for carrying heavy loads. More recently, lightweight metal and carbon fiber versions have evolved, including asymmetric designs to allow easier running. Whether you choose recreational snowshoe hikes, or aim to compete in a snowshoe race by the end of the season, proper conditioning will allow you to accomplish your goals while increasing your endurance base for next summer.

Functional Strength Training for Snowshoeing

While snowshoeing uses the same lower extremity muscles as hiking, running, or cycling, there is added work to lift the leg and clear the snowshoe with each step. This is especially true in deep soft snow, as well as when breaking trail. Thus, strengthening the hip flexors and quadriceps (to lift the leg), and hamstrings and gluteals (to ascend hills) is very important.

The following exercise program utilizes exercises from a standing position. Even though traditional weight machine exercises (such as leg press and hamstring curls) will strengthen these muscle groups, performing these standing exercises for the lower extremities has the added benefit of improving your balance at the same time. As with all exercises, proper technique is crucial to avoid injury. This includes both proper body position and exercise speed, as described below:

An eccentric (or lowering) muscle contraction is one that lengthens muscle fibers and resists gravity. Examples of this are: slowly lowering a gallon milk jug from an elbow bent to elbow straight position (for the upper extremities), or controlled hiking downhill (for the lower extremeties). Eccentric strength of the quadriceps is necessary to absorb both impact and body weight as you run, decreasing the possibility of injury. When eccentric strength is lacking, impact forces are not absorbed and are instead transmitted to the joints, especially the knees. With these facts in mind, apply the following rules when performing lower extremity exercises:

- Keep pelvis level, with the knee in a vertical line over your second toe of the same foot.
- Do not allow your knee to go forward beyond your toes as you bend the hip and knee.
- Slowly lower your body weight.
- Only lower as far as you can without knee pain while maintaining toe-knee-pelvis alignment (to avoid having your knee move forward beyond your toes, sit back with your hips as if you were sitting down to a chair).
- Increase the difficulty of the exercise by lowering your body weight (in proper alignment) through a greater range of motion. For example: on the lateral step down, begin with a 4″ step height and progress to a 6″ then 8″ step as strength and balance improve.

It is recommended that you avoid holding on to fixed or stationary objects to steady yourself. Instead, focus on single leg balance and progress to higher step increments gradually.

The Program

This exercise program targets key muscle areas in the upper and lower extremities as well as the abdominal muscles. The focus of this program is on functional activities that directly relate to joint and muscle actions that will be used during snowshoeing. Many of these exercises rely on body weight for resistance; thus not all persons performing this program will accomplish the same number of repetitions for a given exercise. In general, when you can perform 2 to 3 sets of 15 repetitions of a given exercise while maintaining proper form, you can progress. Specific examples of how to progress are given for each exercise, and may involve controlling your body weight through a greater range of motion or moving to an unstable surface. Each exercise should be performed 3 to 5 days per week to gain maximum benefit

from this program. Aerobic conditioning, while not covered under the scope of this article, is also important and will enhance overall performance and enjoyment while snowshoeing.

Lower Body Exercises

High Step Up (Figures 1 – 3)

While standing on the floor, place your left foot on a stair, plyometric box, or weight bench (roughly 14″ – 17″ in height). Your left hip and knee should be at approximately 90°. Use the left leg to lift yourself up to a full standing position, and then slowly lower back down to floor. Avoid pushing off the ground with the right leg. Repeat 15 repetitions, and then switch to right leg.

Figure 1: High Step Up —Start Position (upper left)

Figure 2: High Step Up —Mid Position (upper right)

Figure 3: High Step Up —End Position (lower left)

Lateral Step Down (Figure 4)

This exercise focuses on controlled eccentric quadriceps action to lower your body weight. Begin by standing on a low step or sturdy platform about 4″ in height with your left leg off the edge of step. Contract your right quadriceps and slowly lower your left leg to the floor with knee straight. Do not allow your right knee to go forward of the right toes. Just touch the left foot lightly to the floor and use your right leg to straighten both hip and knee, returning to an upright stance. Repeat only as long as you can maintain proper alignment and balance, up to 15 repetitions. Switch to left leg.

- If performing 15 repetitions (with good form) is easy and pain free, progress to a 6” step.

As step height increases, you have to sit back with your hips even more. Once 15 repetitions are achieved at a 6″ height, progress to a maximum step height of 8″ for 15 repetitions per set.

Figure 4: Lateral Step Down

Walking Lunges (Figure 5)

Step out with the left leg in front of right, and slowly lower your body weight down, centered between both feet. Body weight is split roughly 50/50 to front and back feet. Lower down until each knee is bent 90°, and use both legs to raise your torso up again. Stride out with the right leg and repeat this sequence as you “walk” down the gym or hallway (15 steps on each leg equals one set). If knee pain occurs, recheck knee to toe alignment, and bend knee only as far or as deeply as you can without pain.

Figure 5: Walking Lunges

Another variation on walking lunges is the wide lunge walk. Your shoulders and hips stay facing forward, but step each leg out roughly 45° to the side, toes facing forward. Repeat 15 steps on each leg for one set. This requires inner thigh (adductor muscle) strength and control.

As these base strength exercises become less challenging, increase difficulty by adding more balance demands. Some options are listed below:

- Single leg squat with medicine ball (Figure 6)
- Single leg squat on mini trampoline (Figure 7)
- Single leg squat on mini trampoline with cone touch (Figure 8)

Figure 6: Single Leg Squat with Medicine Ball

Figure 7: Single Leg Squat on Mini Trampoline

Figure 8: Single Leg Squat on Mini Trampoline with Cone Touch

Upper body Exercises

The scapular muscles of the upper back work to extend the thoracic spine and rib area, and provide added stability to the shoulder joints. Using poles while snowshoeing can be beneficial to aid in balance in hilly terrain and will also increase overall calories used due to increased muscle use. These exercises replicate the poling motion used while snowshoeing, and provide stability to the shoulder joints. Use caution and seek trained assistance with these exercises if you have known low back disease.

Prone stability ball extensions (Figures 9 & 10)

With toes on the floor and abdomen over a weight bench or stability ball, hold a 3 to 5 pound weight in each hand. Raise arms from the shoulders, lifting the weights from the floor to the hips, with elbows slightly bent. Extend the upper back keeping the head in a neutral position, eyes roughly 45° ahead. Avoid hyper-extending the neck. Stabilize the abdominal muscles by lifting your belly button to your spine. Repeat 15 times.

Figure 9: Prone Stability Ball Extensions (beginning position)

Figure 10: Prone Stability Ball Extensions (ending position)

Push-ups (Figures 11 & 12)

An often overlooked exercise, push-ups are great for building upper extremity strength, while working on core abdominal stability at the same time. They also maintain balance between the posterior extensor/pulling muscles and anterior pectoral/pushing muscles, unlike bench or machine exercises, which isolate these motions.

With your hands on the floor roughly shoulders width apart, raise your body off the floor, keeping a straight line between your heels and shoulders. Keep your abdominal muscles contracted, pulling your belly button toward your spine. As you bend the elbows to lower your body toward the floor, keep your body in a line so your low back does not hyper-extend. As your body weight provides resistance for this exercise, perform only as many repetitions as you can do with good alignment. Increase to 20 repetitions per set, 2 to 3 sets per day. It should also be noted that push-ups are an excellent exercise for people who travel for work, as they require no special equipment.

Figure 11: Push-ups (bottom position)

Figure 12: Push-ups (top position)

Core Stabilization Exercises

As with all movements, snowshoeing requires good core body strength and stability. A wide variety of stabilization activities are available, and this article offers only a few options. However, these base exercises are chosen because they require no special equipment, and can easily be progressed as strength improves. As with the previous exercises, if you have known low back disease, use caution and seek qualified assistance.

Supine Bridge (Figure 13)

Begin by lying on your back on the floor, knees bent and feet on the floor. Place the fingers from one hand on the lower abdomen, while the fingers on the opposite hand are on the apex of your ribs. As you perform the exercise, maintain a constant distance between the fingers of each hand. Perform the bridge by slowly lifting your buttocks, then lumbar spine off the floor, up to the shoulder blade area. Lower down "segmentally," beginning from the area just below your shoulder blades and working down the spine, so your buttocks return to the floor last. Keep your pelvis level as you lift and lower. Progress to 15 repetitions, then progress by trying the options listed below:

Figure 13: Supine Bridge

- **March with Legs (Figure 14):** Once the hips are lifted to the bridge position, keep the pelvis level as you alternate lifting one foot then the other a few inches off the floor.
- **Single Leg Bridge (Figure 15):** Hold the left leg out straight from the hip at a 45° angle to horizontal. Right leg is still bent with the foot on the floor. Perform the bridge using only your right leg for support, keeping the left leg extended out straight and your pelvis level. Repeat using the left leg to support.
- **Single Leg Bridge with Abduction (Figure 16):** This exercise is performed the same way as the Single Leg Bridge, but this time the straight leg is moved out away from the centerline of your body. This increases the lever arm that your abdominal muscles have to stabilize against. The further out you angle your leg, the greater the difficulty. Be sure to maintain a level pelvis. Repeat with opposite leg support.

Figure 14: March with Legs

Figure 15: Single Leg Bridge

Figure 16: Single Leg Bridge with Abduction

The basic bridge, or any of these options, can also be performed with your feet on a stability ball or 6" foam roller to further increase difficulty.

Again, proper technique is crucial. Because these exercises utilize body weight for resistance, modify difficulty by increasing the number of repetitions you perform. It is better to perform a limited number of properly executed repetitions than to continue exercises with poor form, loss of balance, or if pain is present.

Plank (Figure 17)

Begin by lying on your stomach on the floor, with elbows directly under your shoulders and forearms forward on the floor, palms down. Lift your body off the floor, keeping abdominal muscles contracted. You are supported on the balls of your feet and your forearms. Hold this stable position for 20 to 60 seconds depending on your strength.

Figure 17: Plank Position

About the Author

Tami S. Dick, PT, CSCS graduated from Washington University (St. Louis, MO) Physical Therapy program in 1987, and obtained her CSCS® credentials from the National Strength and Conditioning Association in 1996. She currently works as a physical therapist at the Boulder Center for Sports Medicine in Boulder, Colorado where she also performs medical bicycle fit analysis for a range of athletes from recreational to professional road/mountain cyclists and triathletes. After six years of competitive road bicycle racing, she now participates in snowshoeing to train for summer triathlons.

Photo Credits

Photos by Robert Montez

High Step Up, Lateral Step Down, Stability Ball Extensions, Push Ups, Plank, Single Leg Squat with Medicine Ball, Single Leg Squat on Mini-Trampoline with Cone Touch

Photos by Christy Barth, PT, CSCS

Walking Lunge, Bridge, Bridge with Marching, Single Leg Bridge, Single Leg Bridge with Abduction

Winter Sports Conditioning

Kathleen Leopardi-Anderson, CSCS

Winter is an opportune time to get out and enjoy the great outdoors. With proper dress and equipment, there are many winter sports that can be explored and enjoyed. Aerobic winter sports include snowshoeing and nordic skiing, while anaerobic winter sports include snowboarding and downhill (alpine and telemark) skiing. Adequate physical training for these sports will allow the participant to progress with the sport, reduce the chance of injury, and increase the enjoyment of one or each of these exciting winter activities.

Snowshoeing has evolved quite a bit in the last few years due to the changing technology of the equipment. Lightweight aluminum and streamlined design have brought the sport of snowshoeing into the spotlight. The learning curve for snowshoeing is brief; if you know how to walk, then you can learn how to snowshoe. It is an aerobic activity, as well as a great lower body muscular endurance challenge, especially when hiking hills. For those "summer only" recreationalists, snowshoeing is good way to get out and enjoy the winter, and stay fit in the process.

Another great winter activity that has an easy learning curve is cross-country or nordic skiing. For the novice enthusiast, "classic" cross-country skiing requires little experience, and provides an excellent aerobic workout. It is the kick and glide, straight track type of skiing. Skate skiing is another type of nordic skiing that is also an excellent aerobic activity. Skating is a bit more technical than its "classic" contemporary. Instead of a "kick and glide," it is a lateral step and glide, while the arms reach and push with long poles. Even though the learning curve is simple, the aggressive athlete can be worked to the bone from a hard-core session of nordic skiing.

Snowboarding has increased in popularity within the last 10 years. The learning curve is "bumpy," but once the toeside turn is perfected, a novice snowboarder can have a great time learning how to rip the slopes. This quick learning curve has brought snowboarding into the spotlight as one of the fastest growing winter sports.

Alpine skiing is the landmark of winter activities. With the evolution of the "shaped" ski, skiing has become much easier for beginners to learn, and more fun for advanced skiers. "Fat" skis have made it easier to establish rhythm and timing when powder skiing. The larger surface area and side cut allow for more buoyancy in the deep snow.

Telemark skiing is a cross between nordic (free-heel) and downhill skiing. Telemark skiing is a challenging alternative to alpine skiing. Once mastered, it is a fun way to rip down the slopes.

Functional Training

The general focus of a winter conditioning program includes the following components: cardiovascular conditioning, metabolic training, strength training, power training, balance and stabilization, plyometrics, and stretching. Although each of the above mentioned winter activities differs in movement, and required energy and muscle demands, a conditioning program using a variety of exercises can combine training requirements for each sport. For example, mixing a snowboard specific movement with a nordic specific movement, one can increase anaerobic power while developing muscular endurance.

Cables and exercise bands are ideal tools because a variety of planes and vectors against gravity allow one to mimic a given sports movement pattern. If the movement of skiing or snowboarding can be mimicked in a "dryland" setting, the result will be stronger and more efficient "on-snow" action.

Cardiovascular Conditioning

A sound cardiovascular base is essential for overall fitness. Some activities such as snowshoeing and nordic skiing require good aerobic fitness because of the large leg muscle action during the activity. Although downhill skiing and snowboarding are not aerobic activities, a good conditioning base makes for better overall performance.

Elliptical machines are a great conditioning tool because they mimic the action of snowshoeing more than any other type of cardiovascular equipment. Variations of speed, incline, and direction demand action from the gluteals, hamstrings, and quadriceps. Skate and classic skiers can benefit as well because the lower leg musculature of the tibialis anterior, gastrocnemius, and soleus (calves) really burn during an intense cross-country session. These muscles are activated and worked while on the elliptical trainer.

Metabolic Training

Alpine skiing, telemark skiing, and snowboarding are classified as anaerobic activities, so it is important in the conditioning program to work towards buffering the wastes in the lactic acid environment. This buffering refers to the muscles' ability to work with lactic acid present[1]. Progression and variation of exercises such as wall sits, tuck walks, and tuck jumps help to prolong the onset of fatigue and improve the ability to perform in a fatigued state. The overall "on hill" goal is to do a non-stop run on a deep powder day.

Strength Training

Another essential conditioning goal is to increase one's overall strength. Although strength demands differ for varying winter activities, a general program will increase one's basic strength, while involving the trunk and extremities to create a well-oiled machine. For nordic skiers and snowshoers, the strength training goal is to use low-weights with high repetitions to improve muscular endurance.

Cross-Country Skier (Figure 1)

A. Using a cable-cross machine, stand with feet slightly wider than shoulder width and handles held in an overhand grip.

B. Pull one arm back (keeping arm straight) and look at the hand that pulls back. Keep your feet firmly planted on the floor; this allows for more torso rotation.

C. Pull the other arm back as the first moves back up. (alternating arms.)

D. Begin with 50 seconds then work up to 2 minutes over 6 – 8 weeks, 2 – 3 times a week. Set weights accordingly.

Figure 1: Cross-Country Skier

Figure 2: Donkey Kick (glut-hamstring kick)

Donkey kick (glut-hamstring kick) (Figure 2)

A. Using a low-pulley cable machine and a 2 – 4 inch step, wrap cable around one foot holding that leg in a bent knee position. Stand on the edge of the step with the other foot.

B. Hold onto machine with one-hand while driving the heel straight back into knee extension.

C. Slowly return leg back into knee flexion.

D. Progress into performing the exercise without holding on, and then progress into mimicking cross country or skate ski pole action.

E. Begin with 50 seconds, working up to 2 minutes over 6 – 8 weeks, 2 – 3 times a week. Set weights accordingly.

3-Way Band (hip flexion, abduction, and extension) (Figure 3)

A. Using a 2 inch wide rubber band or tubing, wrap around both ankles.

B. Pull one leg forward for hip flexion.

C. Pull one leg outward for hip abduction.

D. Pull one leg backward for hip extension.

Figure 3: 3-Way Band (hip extension)

E. Begin with 20 seconds for each leg in all three directions. Progress to 50 seconds over 6 weeks, 2 – 3 times a week.

Skiers' and snowboarders' strength requirements are different than those for the aerobic sports. Anaerobic sports require increased weights and decreased repetitions. The above-mentioned exercises can be done focusing on increased resistance with fewer repetitions. Exercises for good strength development are wall sits, squats, lunges, split squats, tele lunges, and glut-ham kicks.

Core strength is very important because in skiing and snowboarding, the power of the turn comes from the center of mass or core. The advanced technology of the shaped skis and boards are wider and shorter. A strong core will allow the rider to stay in the fall-line at a faster speed, thus producing a more

powerful carve. Abdominal crunches, reverse crunches, hip ups, and cross crunches are all great exercises to build the core. Back extensions performed on the floor work extensor muscles along the spine. Back extensions done with a stability ball work not only the back extensors, but also the hamstrings and gluteals.

Power Training

For the more aggressive skier and freestyle snowboarder, explosive power development is a must. Powerful movements are demanded on the hill with variable terrain, jumps, and variable conditions (hard packed, powder, crud). Therefore, the conditioning program should recognize these demands by incorporating fast, resistive movements. Group stationary lunges and lateral band hops together to increase time to fatigue.

Lateral band hops

(Figure 4)

A. Wrap a 2-inch rubber band or tube around your ankles.

B. Jump laterally from side to side.

C. Begin with 30 seconds, progressing to 50 – 60 seconds over 6 – 8 weeks, 2 – 3 times a week.

Figure 4: Lateral Band Hops

Balance and Stabilization

Balance exercises increase one's stability, therefore improving performance and reducing chance of injury. Single foot balance squats and balance step-ups on unstable surfaces such as wobble boards, balance cushions, or half-dome balls increase the stability of knees and ankles. Foam roller exercises are also great unstable training tools.

Balance Tele Lunges

(Figure 5)

A. Using a 3-foot foam roller half, place one foot on the front of roller and the other foot on the back end.

B. Slowly go into a lunge, while looking ahead and counter-balancing with the arms out in front.

C. Do 10 – 12 repetitions, progressing to 20 – 30 repetitions over 6 – 8 weeks, 2 – 3 times a week.

Figure 5: Balance Tele Lunges

Snowboard Stance to "Fakie" (Figures 6 & 7)

A. Stand sideways in board rider's position.

B. Look over front foot (the "downhill" side).

C. Once balance is maintained, jump and twist the lower body so the reverse foot moves to become the front foot. (Keep looking "downhill" while arms are extended out for counter-balance.)

D. Can also be performed on a 3-foot foam roller half.

Figure 6: Snowboard Stance to "Fakie"

Figure 7: Snowbard Stance to "Fakie" on Foam Roller

Plyometrics

Jumping drills or plyometrics are a great way to increase metabolic demands of the conditioning workout, as well as placing greater demands on leg strength. Plyometrics are very demanding early in the conditioning program, so start with short time intervals and small movements. Gradually progress to increase the time to fatigue.

For nordic skiers and snowshoers, power skipping with arm action is ideal. For snowboarders and skiers, box jumps (both straight up and from the side), tele jump lunges, and tuck jumps will get the heart rate up to the anaerobic zone. Sport specific movements with unstable surfaces and benches add instability, which is perfect in mimicking the outdoor environment.

Bench jumps w/ twist (Figure 8)

A. Use two poles (ski poles) and a 4 – 8 inch box.

B. While looking straight ahead, jump up on the box while twisting lower body.

C. Make contact and immediately jump back to the floor.

D. Repeat, twisting the other direction.

E. Begin with 30 seconds, progressing to 50 – 60 seconds over 6 – 8 weeks. Perform 2 – 3 times a week.


Figure 8: Bench Jump with Twist


Figure 9: Bench Squat Jumps

Bench squat jumps (Figure 9)

A. Stand on a 4 – 8 inch box.

B. Jump down with the feet on both sides of the box, landing in a tuck position.

C. Jump back up to the box, landing in a tuck position.

D. Begin with 30 seconds, progressing to 50 – 60 seconds over 6 – 8 weeks. Perform 2 – 3 times a week.

Lateral hops on half dome ball (Figure 10)

A. Stand on the floor with a half dome ball 2 – 3 feet to the side.

B. Jump laterally, landing on the edge of the half dome ball.

C. Absorb the impact with the leg, then spring off, jumping laterally back to the floor.

D. Begin with 30 seconds, progressing to 50 – 60 seconds over 6 – 8 weeks. Perform 2 – 3 times a week.


Figure 10: Lateral Hops on Half Dome Ball

Stretching

Keeping muscles loose and flexible is ideal for sound recovery and injury prevention. Stretching the upper and lower extremities throughout the workout keeps blood from pooling in a fatigued muscle, and helps regenerate the muscles to perform intense activity once again. After an intense power exercise or plyometric drills, stretch the hamstrings, quadriceps, and calves for 15 – 30 seconds.

After the workout, allow the heart rate to come down before sitting or lying down. Then do a full body stretch of the upper body, core, and lower extremities. Post-workout stretching allows the body to fully relax, and prevents muscles from feeling too stiff after the intense conditioning workout.

Conclusion

Benefits from this type of a conditioning program can be achieved quickly and improvement in one's performance will be noted early on. Metabolic training takes little time to do, but must be continued 2 – 3 times a week for the benefit to linger. Balance training also takes little time to notice improvements because muscle memory takes place with repetitive training. The true benefit of all of the work will be noticed when the snow falls and one can get out and enjoy the white stuff without huffing and puffing, and the legs feeling like wet noodles.

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About the Author

Kathleen Leopardi-Anderson, CSCS graduated in 1992 from the Exercise and Sport Science Department at the University of Utah. Her background includes ski racing, coaching, and instructing. As an alumnus of the Alf Engen Ski School at Alta, UT, Kathleen taught skiing and coached the Alta Youth Club for 10 seasons. In the spring of 2000, she was the official trainer and judge at the World Extreme Skiing Championships in Valdez, Alaska. Currently, Kathleen owns and operates "Fitness...When it Matters," a personal training business in Salt Lake City, UT. Every autumn, Kathleen teaches outdoor ski conditioning clinics to encourage skiers to get and stay fit for outdoor activities. For questions or comments, email Kathleen at kleopardi@earthlink.net.

Preparing for Cold Weather Exercise

Todd Miller, PhD, CSCS

For many, the coming of winter marks a season where we reluctantly confine ourselves to our homes, offices, malls, cars, or any other enclosure that can generate enough heat to keep us comfortable. Too often the simple phrase, "It's too cold out," is the first uttered when the notion of winter exercise creeps into our thoughts. For most of us, the inability to tolerate the cold is due more to a lack of preparation, than it is to an inability to stay warm. A basic understanding of how the body generates, retains, and dissipates heat can assist us in preparing for winter's worst, and help us to take advantage of a host of unique outdoor activities. As is the case with hot weather activities, exercise in the extreme cold carries with it physiological consequences that must be understood and addressed in order to maximize performance and ensure a safe exercise experience.

Production of Heat During Exercise

Like all machines, the human body is not 100% efficient. In fact, during walking, cycling, and running, the body only uses about 20-30% of its energy output for mechanical work, with the remaining energy expenditure being liberated as heat[3]. Depending on environmental conditions, the body tries to either retain or dissipate this heat, in order to keep the body core temperature at a constant 37°C. Heat is removed from the body by a combination of the following mechanisms:

Table 1

Mechanisms of Body Heat Loss

Mechanism	Explanation
Conduction	Heat transferred from a warmer body to a cooler body through direct contact
Convection	Removal of heat from a body by movement of air or water over the body, thus replacing warmed air or water molecules with cooler ones
Radiation	Electromagnetic transmission of heat from a warmer body to a cooler body
Evaporation	Water vaporizing from the skin (sweating) and through respiration

Conduction

Heat exchange by conduction involves transfer of heat between molecules that are in direct contact with one another. These molecules can be present in the form of liquid, solid, or gas. For example, muscle tissue that becomes heated from the friction of contraction will transfer this heat through adjacent structures via conduction to the skin, where air molecules in contact with the skin are then heated, thus resulting in heat loss.

Convection

Once air molecules in contact with the skin are heated via conduction, they must be replaced by cooler air molecules for effective heat transfer to the environment to continue. If warm air molecules are not exchanged, which is desirable during cold weather, they act as an "insulating layer" and prohibit further conductive cooling. Convection describes the process by which these warm air molecules are replaced by cooler air molecules. Exercise on a windy day, during running or cycling, or stationary exercise in a room with a fan will result in a greater heat loss since cooler air is constantly replacing the warm air molecules that are in contact with the skin.

Radiation

Heat loss by radiation describes the emission of electromagnetic waves to cool solid objects in our surrounding environment. In the same way that our bodies receive heat from the sun through radiation, our bodies emit heat to our surroundings. Similarly, if the objects in our surroundings are at a higher temperature than our bodies, we will absorb heat that is radiated from those objects.

Evaporation

The major mechanism by which heat is removed from the body during exercise is evaporation. Water is continually vaporizing from the skin and respiratory passages, thus transferring heat to the environment. Evaporation of sweat has a cooling effect on the skin, which in turn cools the blood in the skin via conduction.

Effects of Cold on Exercise Performance

Whether exercise performance in the cold is compromised is dependent on a multitude of factors, such as air temperature, wind chill, clothing selection, body composition, and type of exercise. Generally exercise performance will not be compromised, unless a significant amount of energy is expended on shivering, which can significantly increase oxygen consumption during exercise. This is particularly the case during swimming, where heat is removed from the body more rapidly through conduction in the water (about 25 times faster than air). Exercise in cold water produces greater oxygen consumption than exercise of identical intensity in warmer water[2]. Heat loss via convection is also increased during swimming, as water molecules in contact with the skin are continually being replaced as the individual moves through the water.

Moderate intensity land-based exercise typically generates enough heat to maintain the body's core temperature in environmental temperatures as low as -30°C (-22°F), without the need for excessive heavy clothing, or increased shivering[3]. Furthermore, individuals who posses a higher amount of body fat will retain a greater amount of body heat than leaner individuals[4]. Therefore, leaner individuals will typically require greater insulation in the form of clothing than those with a greater degree of body fat.

In addition to the issue of heat loss during cold weather exercise, a significant water loss can be incurred through sweating, and respiration. Air is typically very dry in the winter months, and this air is warmed and humidified in the bronchial passages during inspiration. This constant humidification of incoming air often results in dryness and irritation of these passageways. Wearing a scarf or facemask over the nose and mouth during exercise will trap heat and water vapor in the fibers during exhalation, which will in turn serve to assist in warming and humidifying the next incoming breath.

Clothing Selection for Cold Weather Exercise

The primary function of clothing is to assist the body in maintaining a core temperature of 37°C, regardless of environmental conditions. During hot weather, clothing serves to prevent radiant heat gain from objects in the surrounding environment, while during cold weather it serves to prevent heat loss through convection and conduction. Clothing provides a barrier of air between the clothing and skin, as well as a physical barrier to the surrounding environment. Wearing multiple layers of thin clothing creates a larger air barrier above the skin, which is optimal for preventing heat loss. Furthermore, wearing multiple thin layers, as opposed to one thick layer, gives one the option of removing individual layers to adjust the level of insulation during exercise.

Additionally, the layer of clothing closest to the skin should be made of a material that "wicks" moisture away from the skin to the next layer of clothing for subsequent evaporation. Natural fibers such as silk and wool, and synthetic fibers like polyester and polypropylene, do an excellent job of wicking moisture away from the skin, drying quickly, and insulating well. Absorbent materials such as cotton are a poor choice as first layer, as they will lose their insulating properties if they become wet through sweating, and will actually increase conductive heat loss. Wool does an excellent job retaining its insulating properties even when wet, and makes a good choice as an outer-layer garment as well. Several manufacturers make undergarments of fabrics that are a silk and wool blend, which serve as an excellent first layer. Because of wool's insulating properties, a wool hat is a very good choice during cold-weather exercise, as 30 – 40% of body heat is lost through the head.

A combination of a polypropylene sock liner and a wool sock is a good choice for stop-and-go activities such as hunting, where the feet may sweat considerably during walking, then become much cooler when sitting for extended periods. In this situation cotton is a poor choice for socks, as they will lose their insulating properties when wet, and result in rapid heat loss from the feet by conduction. Consideration should also be given to the weight of a garment relative to its insulating properties. For example, a fleece outer layer may have insulating properties similar to wool, but less weight, making it a more efficient garment overall.

It should be noted that prevention of air exchange between the environment and the warm air barrier created by clothing is a primary determinant of the clothing's insulating effectiveness. Because warm air rises, turtlenecks do a good job of preventing a chimney effect, and subsequent loss of body heat via convection. Baggy, loose fitting clothing generally provides more opportunity for air exchange with the environment. During exercise where a high degree of pumping of the arms and legs occurs, a "bellows effect" is created, and warm air can be forced out through the large openings provided by loose clothing.

Table 2

Clothing Recommendations for Cold-Weather Activity
First layers constructed of "wicking" materials such as polyester, polypropylene, silk, or wool.
Multiple thin layers provide better insulation and greater comfort control than a single thick layer.
Clothing should be snug fitting to prevent air exchange with the environment (chimney & bellows effects)
Wear a hat. 30 – 40% of body heat is lost through the head.
Sock and glove liners should be a synthetic material such as polyester to ensure wicking of moisture from the extremities, which are most susceptible to frostbite.
Chemical heat packets can be stuffed wherever necessary to provide immediate auxiliary heat.

Warning Signs for Cold Related Injuries

The most common type of cold related injury is frostbite, which occurs when the temperature of the extremities falls to dangerously low levels. This is most likely to happen when a person is participating in stationary activities such as ice fishing or hunting, where body heat production is relatively low. If one's clothing does not adequately maintain core temperature during these types of activities, blood flow to the extremities will drop dramatically, resulting in skin temperatures that can become dangerously low. The toes are especially susceptible to frostbite if one's feet get wet either through sweating or poor footwear, which significantly increases conductive heat loss. Early warning signs of frostbite include numbing or tingling sensations that typically occur in the fingers, toes, nose and ears.

Providing some type of external heat to the torso[1] or directly to the extremities is an excellent way to prevent frostbite during stationary activities. Disposable chemical heat packs are a safe, convenient, and inexpensive way to keep warm during cold weather activities. When exposed to air, these heat packs reach a temperature of approximately 104°F, and will operate for up to 18 hours depending on size.

Summary and Recommendations

The body loses heat through the mechanisms of evaporation, conduction, convection, and radiation. Moderate levels of activity generally produce enough heat to maintain a constant body core temperature. However, stationary or stop-and-go activities can pose a significant risk of cold related injury. During cold weather exposure, our best defense against heat loss is clothing, and proper selection of clothing relative to the activity at hand is essential to ensure a safe, enjoyable outdoor experience. One must recognize that different activities will require different clothing selections, with the degree of required insulation generally being inversely related to the intensity of the exercise performed. Multiple thin clothing layers provide a larger air-insulating zone between the skin and environment, and allow one greater control over the degree of insulation than a single thick layer. Layers immediately adjacent to the skin should be constructed of materials that wick moisture to outer layers for evaporation. This is especially true for socks, where frostbite is a primary concern.

Winter weather provides a multitude of opportunities for one to participate in unique outdoor experiences. Whether these experiences are enjoyable or disastrous, is primarily dependent on preparation for the activity. A basic understanding of how the body regulates temperature, combined with the knowledge of how to make wise clothing choices, will ensure a safe and enjoyable cold-weather exercise experience.

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