Nutrition for Winter Sports: An Interview with Sports Dietitian Susie Parker-Simmons

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This issue of *IJSNEM* features articles related to the nutrition of figure skaters and alpine skiers. Figure skating and alpine skiing are part of the group of activities known as winter sports, and according to the climate and geography of your country, can either be popular activities for recreation and elite competition or almost unknown. With the 2006 Winter Olympic Games in Torino (Turin) fast approaching, this interview will invite Australian sports dietitian Susie Parker-Simmons to share her experiences of working with winter sport athletes.

*Susie, the early days of your career as a sport dietitian was spent working with a favorite Australian “winter sport”—Australian Rules football. How did your days watching your team Collingwood play in the cold and blustery conditions of Victoria Park in Melbourne prepare you to work with the US Ski Team?*

I thought I knew what “winter” was when I worked with the Collingwood Football Club, after many days standing in Melbourne’s cold, wind, and rain. Now I have a new perspective of cold weather. In my present job at the US Ski Team I spend 7 to 8 months of the year in snow. Some days I ski to a position on the hill or on the cross-country course and stand in temperatures as low as –20° C providing feeds or taking lactates. I wear up to 7 layers of upper body clothing, 2 on my lower body, 2 socks, 2 hats, and 2 pair of gloves when possible. I will never again see Melbourne as a cold city in winter.

*How did you come to gain your present position? What is your role with the US Ski Team? What is the range of activities you undertake?*

Many Americans ask me this question! When I was living in America for a year working on a PhD my husband and I went to watch the National Ski Jumping Championships. At this event I heard that the US Ski Team was looking for a sports dietitian and I applied. I believe I was successful for a few reasons: I had applied experience with elite athletes in contrast to many American sport dietitians who work at universities. Second, I also had exercise physiology qualifications. And finally, and maybe most importantly, the head of sport science was Australian and knew the level of experience sport dietitians have in Australia. My position commenced in a consultancy role and then became full time 6 months prior to the 2002 Winter Olympics.
My position on the US Ski Team is titled sport dietitian and physiologist. I provide individual dietary consultancy to help optimize the athlete’s health, growth, and performance. My job also involves both laboratory and field testing and food service (catering and provision of menu plans). In addition, I monitor training loads and dietary intake while on camps and competitions through tracking, blood testing, and dietary assessment. Finally, coach and athlete education is required as there is presently a lack of structured coaches’ qualifications for skiing. Recently I have taken on a role of helping co-ordinate the Sport Science Department due to the head of the department recently leaving the team.

What does the term “winter sports” cover? What sports and events are part of the Olympic Games program?

Winter sports are sports commonly played during the winter season on snow or ice. Winter sports that are part of the Olympic games include: sledding (bobsleigh, luge, and skeleton); skating (speed and figure); ice hockey; alpine skiing (speed and technical); Nordic (ski jumping, Nordic combined and cross country); freestyle (aerials and moguls); snowboarding (half pipe and freestyle); biathlon; and curling. The US Ski Team is the national governing body for alpine skiing, Nordic sports, freestyle skiing, and snowboarding.

What are the some of the major nutritional concerns of cross-country skiing?

Cross-country skiing is an endurance sport requiring a high aerobic capacity and lactate threshold. Today, cross-country skiing competitions are classified into two different styles: classic skiing and freestyle. The recent technical developments of cross-country skiing have made a large impact on the physiology of the sport, and therefore, the nutritional demands. The sport now involves the harmonic interaction of the whole body and not just the contribution from the arms and legs. This movement pattern results in greater energy demands, with the energy requirements being between 55 to 75 kcal/kg/d and carbohydrate needs, 8 to 12 g/kg/d.

Many athletes have trouble maintaining their ideal body composition during the competitive season. Strength and muscular endurance of the arm and upper body are critical for optimal performance with the freestyle technique and when double poling. Therefore training now places special attention on such development. When the competitive season starts, many athletes have difficulty keeping the upper body girth they have gained during the preparation phase of the year. In addition, some athletes gain body fat during the season as the load of cross-country skiing decreases significantly and some lose weight and body fat due to the stress of competition, cold weather, and difficulty in eating European foods. Maintaining fluid balance is a challenge for sport dietitians working with cross-country skiers. As the environmental temperature is cold, many skiers believe their fluid requirements are very low. This is not necessarily true, however. Skiing also has the complication of often being performed at medium to high altitudes. Increasing altitude escalates urine output and respiratory water loss. A final practical complication is the transportation of a large volume of fluid onto the ski course and keeping the temperature of these beverages at 10 to 20° C. On the ski team, we put warm sports drinks in leak-proof containers that have thermal covers and during the races we deliver the fluid in baby bottles without lids.
Our skiers are now aware of the importance of striving for optimal hemoglobin levels and red cell mass. Most Nordic skiers will experiment with altitude training, live-high and train-low strategies, and/or altitude houses. All methods propose to increase serum erythropoietin (EPO), hemoglobin, and red blood cell mass, which may lead to an increased endurance performance. We test the iron status of our cross-country skiers every 6 wk during the preparation phase of the year and often have to use iron supplementation to obtain a suitable iron status.

**How does a cold environment and altitude affect nutritional requirements of athletes?**

Energy expenditure is increased in a high-altitude environment. Appetite suppression or anorexia have been implicated as causes of weight loss at altitudes greater than or equal to 3500 m. Weight loss as a result of energy deficit has been shown to increase the use of protein as a metabolic fuel, leading to a negative nitrogen balance and loss of lean tissue mass. Altitude exposure also results in an initial reduction in total body water and plasma volume. As explained previously, the main micronutrient of concern to athletes living/training at altitude is iron. Individuals with low iron stores have difficulty producing erythrocytes in sufficient quantity and maturity in response to altitude exposure.

Work in the cold may increase energy requirements, with 10 to 15% of the rise in energy expenditure probably accounted for by the inefficiency of work in heavy snow and shivering. The significant part of the increased energy expenditure incurred in the cold depends on whether thermoregulation via protective clothing, physiologic responses such as vasoconstriction and reduced blood flow to peripheral tissues, or exercise can maintain skin and core temperature. Most of our winter sport athletes compete in suits that provide no insulation and protection from the cold. It has also been shown that carbohydrate oxidation may be elevated up to six-fold during shivering thermogenesis. Fluid requirements are higher in cold compared to temperate environments, as cold air contains less water than warmer air and increases respiratory fluid losses. Thus puts an athlete at risk for dehydration.

**Over what distances are races typically held and how do these athletes refuel and rehydrate during endurance and ultra-endurance length races?**

Elite cross-country skiing competitions are performed over distances ranging from 1.5 to 90 km. At the Olympic Winter Games and World Championships, women compete in 1.5 km sprint, 10 km, duathlon (2 × 7.5 km), 30 km, and 4 × 5 km relay. Men compete in 1.5 km sprint, 10 km, duathlon (2 × 15 km), 50 km, and 4 × 10 km relay. Energy provided for cross-country skiing performance is predominantly supplied by aerobic metabolism and the utilization of carbohydrate and fat. In general, the energy demands for races include the following: high carbohydrate utilization (99%) during 1 km and 10 km ski races (90%) and fairly equal carbohydrate and fat utilization for 30 km and 50 km events. Ingesting fluid and especially sports drink during training sessions and races lasting longer than 15 km is required to help reduce physiological stress. The ingestion of a carbohydrate-electrolyte solution reduces the disruption in fluid balance and helps maintain carbohydrate reserves.
Do you have any figures on typical sweat losses of such an athlete in their usual environment?

Recent unpublished data from American cross-country skiers showed a mean sweat loss of: Winter, (2 to 3 °C, altitude 1666m) — 500 mL/h (312 to 875 mL); Summer, (25 °C, altitude 2500m) — 1000 mL/h (400 to 1502 mL).

Let’s contrast these nutritional issues with those that face alpine skiers. What are the events that fall under the alpine skier banner and what are the main nutritional concerns of the athletes who undertake these events?

Alpine skiing can be divided in technical and speed events. Technical events include the slalom and giant slalom, while speed events include the super giant slalom and downhill. Alpine skiers also have high carbohydrate requirements due to the anaerobic nature of their sport. A day of giant slalom training has been shown to reduce muscle glycogen content by 50%. We recommend that between 7 to 10 g carbohydrates/kg/d may be needed to replenish glycogen stores during alpine skiing training. Fluid, iron, and energy demands also occur with alpine skiers training and competing at altitude. A study of alpine skiers showed that environmental factors such as altitude and cold temperatures exacerbate fluid loss. Monitoring iron status should also be an integral part of the medical supervision in alpine skiers and should serve two objectives: minimizing low iron stores in female athletes and preventing iron overload in male athletes.

There are some nutrition issues that differ from cross-country skiers. Recent findings at the US Ski Team show a significant decrease in zinc status of alpine skiers during 3 months of international travel and high eccentric load. This needs to be verified by research. Finally, the risk of injury in this sport is high and often involves very acute trauma that can lead to intensive care stays and multiple surgeries. Dietary assistance through medical nutrition therapy can decrease the impact of an acute injury and aid in recovery.

I imagine that at major competitions a range of winter sport athletes live in the same hotels or athlete villages. When you are in charge of organizing catering requirements, how do you set a menu that meets the different nutritional needs of each group?

This food service complication only occurs every second year and at the World Championships. On the World Cup circuit most teams compete at different locations throughout the world. Catering for Nordic athletes at the World Championships can be a challenging task as athletes in the three sports (cross-country, Nordic combined, and ski jumping) all live together at one hotel and they all differ in their dietary requirements. The “Winning Diet” for cross-country skiers and Nordic combined athletes includes the consumption of high carbohydrate, moderate protein and low fat foods with plenty of fluids. Average daily energy consumption for cross-country skiers is between 3000 and 6000 kcal and Nordic combined athletes approximately 2500 to 3500 kcal. For ski jumpers, a diet low in energy, sodium, and fiber is required with an average daily energy intake of between 1600 to 2000 kcal. The athletes also compete at different times of the day and therefore food needs to be available from 6 AM until 9 PM. I try to organize a buffet style program with special pre-event meals for the ski jumpers and Nordic combined athletes.