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The Media and the Message: Providing Reliable, Relevant and Cost Effective Nutrition Information to Varsity Athletes

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ABSTRACT

Varsity athletes lack the basic nutrition knowledge necessary for performance, recovery and health in general. This lack of knowledge puts them at risk of nutrition deficiencies, detrimental to health if not addressed. Furthermore, many universities struggle to find funding to support nutrition education programs that could alleviate this problem. While previous research has focused on identifying varsity athletes' levels of nutrition knowledge and dietary practices, little research has been done on the development and assessment of education approaches for this group.

The purpose of this study was to determine if the Spiral Technology Action Research (STAR) Model could be used to develop relevant, specific, accessible, and cost-effective sports nutrition education materials for MSVU varsity athletes. Using the principles of Participatory Action Research (PAR), and based on the STAR Model, this research also explored the use of Internet-based media to develop and assess nutrition messages created with and for varsity athletes.

With approval from the MSVU University Research Ethics Board, eight MSVU athletes volunteered to participate in focus groups to select the topics for the nutrition education messages and the media for their delivery. Feedback from participants revealed that they liked being a part of the process, and in particular being able to select the topics and the media used. Involving the athletes in the development and planning of the messages, established their relevance, accessibility and specificity. This study was the first to address an alternate approach of providing cost effective nutrition education to varsity athletes.

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PROBLEM STATEMENT

Proper nutrition and hydration practices are critical to peak performance for an athlete (Burke & Deakin, 2006; Maughan & Burke, 2002). It has been recognized that no single factor has a larger effect on optimizing performance than diet (Hawley, Dennis, Lindsay, & Noakes, 1995). Basic nutrition knowledge among athletes is inadequate (Kristiansen, Levy-Milne, Barr, & Flint, 2005; Kunkel, Bell, & Luccia, 2001; Shifflett, Timm, & Kahanov, 2002) and as a result, many misconceptions about vitamins, supplements, and energy sources exist within this population (Jacobson, Sobonya, & Ransone, 2001; Jonnalagadda, Rosenbloom, & Skinner, 2001; Kunkel et al., 2001; Nichols, Jonnalagadda, Rosenbloom, & Trinkaus, 2005; Rosenbloom, Jonnalagadda, & Skinner, 2002).

Although there is abundance of literature outlining nutrition requirements for athletes available through the Internet, libraries and within communities, this information is not effectively reaching them (Kunkel et al., 2001; Shifflett et al., 2002). Most who do seek health information, through the Internet in particular, lack the ability to distinguish reliable sources from unreliable ones (Crespo, 2004). This makes them susceptible to product claims, and easy targets for companies selling fads and diet plans. To eliminate myths, accurate nutrition information must be provided so that performance levels are not compromised.

Most university athletics departments have insufficient resources/funding to provide nutrition counseling to their athletes (Kunkel et al., 2001). Thus, there is a need for the development of a unique approach to provide relevant, specific, accessible, and cost effective nutrition information to varsity athletes.

RESEARCH QUESTIONS

(1) Can the Spiral Technology Action Research (STAR) Model be used to develop relevant, specific, accessible, and cost-effective sports nutrition education materials for MSVU varsity athletes?

(2) Can Internet (webpage, Weblogs and/or Podcasts) be an effective medium for delivering nutrition information to varsity athletes?

DEFINITION OF KEY TERMS

- **Dietary Reference Intake (DRI) =** an umbrella term designed to encompass the four specific types of nutrient recommendations featured in the DRI's.

- **eHealth =** The use of emerging interactive technologies to enable health improvement and health care services. (Eng, 2001)

- **Spiral Technology Action Research (STAR) model** = A model incorporating health promotion principles, behavior change theories, quality improvement and community mobilization practices to create a process that is centered on the user (Skinner, Maley, & Norman, 2006).

- **Participatory Action Research (PAR)** = Systematic inquiry, with the collaboration of those affected by the issue being studied, for purposes of education and taking action of effecting change (Green et al., 2003).

- **Podcast =** A digital recording of a radio broadcast or similar program, made available on the Internet for downloading to a personal audio player. (Barsky, 2006)

- **Vodcast =** A video Podcast.

- **Weblog ("Blog") =** Online journals, published chronologically, with links to and commentary on various issues of interest. (McKean, 2005)

LITERATURE REVIEW

Energy

Introduction

Energy intake directly affects athletic performance, and has been recognized as the number one nutrition priority for athletes (Position of Dietitians of Canada, the American Dietetic Association and the American College of Sports Medicine, 2000). Inadequate energy intake results in loss of strength and endurance, as fat and muscle mass are utilized to compensate for the energy deficiency (Position, 2000). This compromises training efforts and over time can have negative health effects.

Practice & Issues

Low Energy Intake

Low energy intake is common among athletes (Economos, Bortz, & Nelson, 1993; Keith, O'Keefe, & Alt, et al, 1989; Nutter, 1991; Short & Short, 1983; Steen, Mayer, & Brownell, et al., 1995; van Erp-Baart, Saris, & Binkhorst, et al., 1989), and results in loss of muscle mass, menstrual dysfunction, loss or failure to gain bone density and an increased risk of fatigue, injury and illness (Position, 2000). Reasons for low energy intake include: misconceptions regarding ideal body mass/composition and its relation to performance level, dissatisfaction with body shape or body fat level, low appetite due to a busy lifestyle, and making a weight class.

Countless misconceptions exist within the athletic community regarding body weight and the measures used to achieve desired low levels (Burke, 1995). In some sports, there may be a physical or aesthetic advantage to certain body shapes and weights (Burke, Cox, Cummings, & Desbrow, 2001; Burke, 1995). In hopes of attaining these

ideals, athletes often turn to extreme dietary and training measures, and become susceptible to fad diets and disordered eating behaviors (Jonnalagadda, Rosenbloom, & Skinner, 2001; Sykora, Grilo, Wilfley, & Brownell, 1993). Problem eating behaviors are more prevalent in sports depicted by weight requirements or appearance expectations (Burke et al., 2003). Female athletes are more susceptible to these behaviors than males due to a naturally higher body fat percentage and added societal pressures to obtain an ideal physique (Burke et al., 2003; Hassapidou, Fourtounopoulos, Efstratiou, Kitson, & Papakitsos, 2003). The consequences of very low body fat and prolonged low energy intakes include metabolic adaptations, menstrual disturbances, loss of performance, and inadequate nutrient intake (Burke, 1995).

Coaches have been reported to influence and encourage these eating behaviors (Depalma et al., 1993; Heffner, Ogles, Gold, Marsden, & Johnson, 2003). A 1993 study of lightweight football players reported 14% of male athletes perceived themselves as overweight, 26% dieted on a daily to weekly basis, and 18% reported being told by their coaches to modify their weight (Depalma et al., 1993). It is not known if this is still a practice of coaches; however this is still a concern due to the fact that failure to meet these demanding weight loss goals can lead to such extremes as being cut from a team, restricted participation, or elimination from competition (Position, 2000).

Female Athlete Triad

In female athletes, chronically low energy intakes combined with high energy output can interrupt the reproductive cycle and result in amenorrhea. The combination of these two conditions (disordered eating & loss of menses) can lead to a progressive decrease in bone mass, and over time, osteoporosis (Drinkwater et al., 2005). This is

known as the female athlete triad (Drinkwater, Loucks, Sherman, Sundgot-Borge, & Thompson, 2005). Other consequences of eating disorders include electrolyte imbalances, cardiac arrhythmias, and increased musculoskeletal injuries (Drinkwater et al., 2005).

Eating disorders are commonly found within the athletic community. Researchers investigating the prevalence of eating disorders have found an incidence of 15% to 62% in female athletes (Brownell, Rodin, & Wilmore, 1992). Johnson et al. (1999) found 35% were at risk for developing anorexia, 38% for bulimia, and 12% had sub-clinical anorexia or bulimia. Because prevention of eating disorders, and the female athlete triad requires education of not only the athlete but also those involved with, and who influence the athlete's decisions (Drinkwater et al., 2005; Position, 2000) it is critical that information and support resources be available (Drinkwater et al., 2005; Otis, Drinkwater, Johnson, Loucks, & Wilmore, 1997).

Carbohydrate

Introduction

Adequate carbohydrate intake is essential for athletes. During times of high physical activity, it is crucial for the athlete to consume adequate energy and to have macronutrient balance (Clark, 2003). Carbohydrate is of particular importance to maintain body weight, and replenish glycogen stores after activity (Position, 2000). During exercise, the availability of carbohydrate as an energy source for muscle, and the central nervous system determines the performance level of prolonged sessions (greater than 90 minutes), as well as brief high-intensity sport (Burke & Deakin, 2006; Position, 2000). When blood glucose levels are low, the brain may not react as quickly as when it is at a normal level (Burke & Deakin, 2006; Clark, 2003). Precise carbohydrate fueling

even during one event can reduce or delay the onset of fatigue and enhance performance (Burke & Deakin, 2006; Position, 2000).

Practice & Issues

Although the performance enhancing properties associated with a high carbohydrate diet have been well documented, many studies show athletes continue to consume inadequate amounts (Grandjean, 1989; Ingram & Davies, 1996; Keith et al., 1989; Martin, Lambeth, & Scott, 2006; Nutter, 1991; Tilgner & Schiller, 1989; van Erp-Baart et al., 1989). Ingram and Davies (1996) found athletes who train and compete in activities limited by glycogen body stores, often consume diets that may compromise 'optimal' training and performance. Carbohydrate intakes have been shown to range from 40% to 55% of energy intake in male endurance athletes (Brotherhood, 1984; Ellsworth, Hewitt, & Haskell, 1985; Johnson, Collins, Higgins, Harrington, & et al., 1985; Nieman, Butler, & Pollett, et al., 1989) and 46% of energy intake in some team sports (Hickson, Schrader, Pivarnik, & Stockton, 1986). Even lower carbohydrate intakes have been reported in female athletes, ranging from 39% to 54% of energy intake (Grandjean, 1989; Hickson et al., 1986; Short & Short, 1983).

The accuracy of studies assessing the dietary intake of athletes is limited for several reasons. First, many studies use self reported dietary intake methods to assess carbohydrate content. Under and over reporting is often a problem associated with self-reported methods and therefore may not accurately reflect actual intake (Burke et al., 2001). Secondly, carbohydrate measurements are often reported in percent of total caloric intake, and may be misleading in terms of requirements for sport (Position, 2000). This

can occur if someone is consuming a low-calorie diet, or in the case of many athletes, a very high calorie diet, where percent of total intake would not reflect their grams per kilogram body weight requirements. In these circumstances, using the grams per kilogram body weight calculation would provide a more accurate estimation of the athletes' carbohydrate requirements. It is recommended that athletes consume 6-10g/kg/day (Position, 2000). Finally, alterations in normal dietary consumption patterns may occur when individuals are asked to record their intake (Burke et al., 2001).

A lack of understanding regarding the role of dietary carbohydrates and the recommendations for carbohydrate intake exists within this population. Jacobson et al. (2001) found 29% of athletes correctly identified recommended carbohydrate intakes. Ingram and Davies (1996) reported only 6% of participants were able to identify the importance of carbohydrate on performance. Without adequate knowledge, athletes will not consume the proper types and amounts of carbohydrates and will ultimately compromise training efforts and performance levels.

Protein

Introduction

Protein requirements are one of the biggest food myths in today's athletes. Although many individuals believe large quantities of protein are necessary in order to develop strength, this is untrue (Hassapidou, 2001). Protein requirements can generally be met through diet alone if energy intake is adequate to maintain body weight (Otten, Hellwig, & Meyers, 2006; Burke & Deakin, 2006; Position, 2000).

Practice & Issues

Numerous studies have investigated protein requirements for athletes; however controversy still exists among health professionals in the athletic community. Because amino acids are needed to repair muscle fiber damage, supply small amounts of energy during exercise, and to support muscle building, the question remains whether or not athletes' needs exceed the recommended 0.8g/kg body weight for the general population. Some argue that by increasing dietary intake athletes are consequently consuming more protein and thus meeting any additional requirements they may have (Burke & Deakin, 2006). Others believe that protein requirements are unaffected by moderate intensity exercise (Butterfield & Calloway, 1984; Todd, Butterfield, & Calloway, 1984), however may increase for well-trained endurance athletes (Phillips, Atkinson, Tarnopolsky, & MacDougall, 1993; Tarnopolsky, MacDougall, & Atkinson, 1988). The Canadian Dietetic Association recommends that strength athletes consume 1.6-1.7g/kg/day, and endurance athletes 1.2-1.4g/kg/day (Position, 2000). Although researchers continue to investigate actual requirements, studies show the average protein intakes of athletes exceed the recommended intakes (Hassapidou, 2001; Position, 2000).

Uncertainty regarding athletes' protein requirements extends into the athletic community. A 2001 study by Jonnalagadda et al showed 61% of athletes believed that protein is the primary source of energy for muscles, and 52% believed that protein supplements are needed in addition to diet intake for muscle growth and development. Jacobson et al (2001) found that only a small percent of respondents could correctly identify the recommended requirement for dietary protein. It was also found that over two

thirds thought protein should constitute 26% or more of total calorie intake (Jacobson et al, 2001).

Fat

Introduction

Although low-fat diets have been a popular diet trend since the 1990's, dietary fat intake in athletes should not be restricted (Position, 2000). Fat is an important component in athletes' diets because it provides energy, aids in absorption of fat-soluble vitamins as well as provides essential fatty acids (Position, 2000). There is no performance enhancement attributed to consuming a diet with less than 15% energy from fat, compared with the recommended level of 20% to 25% energy from fat (Position, 2000).

Practice & Issues

Athletes' dietary fat intake is associated with the type of sport they are involved in. Whereas endurance athletes and athletes competing in aesthetic sports tend to restrict fat intake (Burke et al., 2003), other athletes have been reported to consume excess amounts (Hassapidou, 2001; Jonnalagadda et al., 2001; Martin et al., 2006; Short & Short, 1983; Tilgner & Schiller, 1989). By increasing the percentage of fat in their diets, they are consequently decreasing carbohydrate intake. Diets high in fat compromise performance levels by altering the body's supply of glycogen to muscles. Long term health status may also be negatively affected due to saturated fat intake contained in high fat foods. Martin et al. (2006) found saturated fat intakes of approximately 11% of total

energy, and Jonnalagadda et al. (2001) reported a heavy reliance on fast foods. It has been shown that although coaches discouraged fast food intake, the majority stopped at fast food restaurants when traveling with athletes (Geik, DiMarco, Nichols, Kudlac, & Sanborn, 2002), thereby encouraging these eating behaviours.

Vitamins and Minerals

Introduction

Low vitamin and mineral intakes is observed in some athletes. Reasons for low intakes include: restricting food intake to maintain low body weight, not enough time to prepare and eat well balanced meals, diets high in fast food items, and athletes who consume few fruits and vegetables (Maughan, 2001). This practice is harmful to athletes due to the various roles of vitamins and minerals in the body, including energy metabolism, protein synthesis, fluid regulation, and the maintenance of healthy tissues.

Practice & Issues

Studies show misconceptions exist regarding the role of vitamins and minerals in athletes' diets. Rosenbloom (2002) found 67% of men and 53% of women believed vitamin and mineral supplements increase energy levels. Jacobson and Aldana (1992) found that 72% of athletes believed they needed additional vitamins, and 77% thought vitamins played a major role in energy levels.

A wide variation in vitamin and mineral intakes exists among athletes (Hassapidou et al., 2003) however, calcium and iron are most commonly low, particularly in female athletes (Cupisti, D'Alessandro, Castrogiovanni, Barale, & Morelli, 2002;

Position, 2000). Chronically low intakes of these micronutrients lead to health problems, described as follows.

Calcium

Calcium is responsible for building and repairing bone tissue. Inadequate intake increases the risk of low bone-mineral density as well as stress fractures (Position, 2000), and is commonly a result of restricted energy intake, dietary extremism, fad diets, and following a vegan diet (Burke, 1995). Education regarding the importance of calcium, along with proper planning and meal balance would eliminate this health risk.

Iron

Athletes are at a higher risk of iron deficiency than non-athletes. This is due to one or a combination of the following: increased physiological iron requirements, inadequate iron intake, poor iron bioavailability, increased iron losses due to exercise (Burke, 1995), and menstrual losses in female athletes (Martin et al., 2006). Consequences of iron depletion for an athlete include decreased performance and exercise endurance (Skinner et al., 2001), and if left untreated can lead to anemia, one of the most prevalent nutrient deficiencies observed in athletes (Position, 2000). Chronic iron deficiency anemia negatively affects performance levels and the athletes' health (Position, 2000).

Studies show the prevalence of iron deficiency in females athletes range from 25 to 35% (Constantini, Eliakim, Zigel, Yaaron, & Falk, 2000; Dubnov & Constantini, 2004; Malczewska, Szczepanska, Stupnicki, & Sendecki, 2001; Malczewska, Raczynski, & Stupnicki, 2000). Iron deficiency is less common in male athletes and varies depending

on the sport. A study by Dubnov and Constantini (2004) reported 15% of male basketball players and 11% of males competing in a variety of sports were iron deficient, while 36% of elite gymnasts were iron deficient (Constantini, 2000). Athletes are often unaware of their iron status, because symptoms of iron deficiency may not be present. Malczewska et al. (2000) found 26% of athletes were iron deficient without symptoms of anemia, and was attributed to inadequate nutrition and menstrual blood losses.

Athletes can also appear to be iron deficient when they are not. Serum ferritin and hemoglobin can mimic iron deficiency due to the stress of heavy training and hemodilution (Dubnov & Constantini, 2004; Spodaryk, 2002; Tsalis, Nikolaidis, & Mougios, 2004; Position, 2000). Due to the complex nature of diagnosing iron deficiency, the Australia Institute of Sport recommends that female athletes be screened at six month intervals, and male athletes screened if clinical symptoms are present (Fallon, 2004).

Supplements

Introduction

Growing interest and research in sports nutrition, has created a thriving market for nutrition supplements (Position, 2000). Manufacturers often try to entice athletes to use their products by claiming they will directly improve their performance (Position, 2000). Unable to decipher sound nutrition information (Kristiansen et al., 2005), athletes become vulnerable to these products.

Practice & Issues

Athletes looking for a competitive edge often turn to supplement use with the belief that they will improve performance (Dunn, 2004; Ronsen et al., 1999). There is evidence suggesting that more than 50% of varsity athletes use supplements, and in some instances this rises to almost 100% (Kristiansen et al., 2005). A study including 211 Canadian varsity athletes found that 98.6% of athletes were using at least one supplement; 94.3% when caffeine was excluded (Kristiansen et al., 2005). More specifically, 76.8% reported using sports drinks, 50% protein supplements, 9.2% used creatine supplements, and one-half to two-thirds reported using vitamin/mineral supplements (Kristiansen et al., 2005). Erdman's 2004 study found 88.4% supplement usage among 582 Canadian high performance athletes. US studies found similar results, with Burns et al. (2004) reporting 88% (n=236) of athletes used one or more supplements, and Ronsen (1999) reported 84% (n=100) supplement usage.

There is a lack of knowledge and understanding regarding the use of supplements within the athletic population (Kristiansen et al., 2005). For example, 65% of intercollegiate athletes incorrectly thought vitamins provide immediate energy, and about 15% thought vitamins increased muscle strength (Burns et al., 2004).

The lack of sound nutrition information on supplement usage puts athletes at risk. Some vitamins have negative or even toxic effects when taken in large doses (Kristiansen et al., 2005). Vitamin supplements are often sold in doses that are considerably larger than the recommended DRI. Athletes may be unknowingly taking a supplement in excess of actual needs and in addition to what they are consuming in their diet (Burke & Deakin, 2006). Unintentional doping is also a risk attributed to inconsistencies in the regulation of

the supplement market (Kristiansen et al., 2005). Some supplements have been found to be contaminated with pro-hormones and stimulants such as ephedrine or other related substances (Burke & Deakin, 2006). By consuming a product that has been contaminated, an athlete runs the risk of a positive doping test, which could mean disqualification (World Anti-Doping Agency, 2006).

According to a 2003 publication from the Canadian Centre for Ethics in Sport, Canadian athletes have identified obtaining reliable, evidence-based information on supplements as a high priority (Ottawa: Canadian Centre for Ethics in Sport, 2003). Kristiansen et al. (2005) also discovered athletes desire to learn more about supplements from reliable sources, and to want more targeted nutrition education. It is therefore critical that athletes receive sound nutrition information on supplement uses, so that informed decisions can be made regarding the safety and necessity of a supplement (Burke & Deakin, 2006).

Dietary supplements are expensive and unnecessary for the most part. With proper education, the money used to buy supplements could be spent on more nutritious foods.

Hydration

Introduction

Dehydration negatively impacts performance and can be fatal (Maughan & Murray, 2001). Exercising in a dehydrated state leads to a rapid elevation of body temperature and can lead to the onset of heat illness (Maughan & Murray, 2001). Low levels of water loss, 1 to 2% of body weight, temporarily reduces the performance level

of the athlete (Burke & Deakin, 2006; Eberle, 2000), and affects their ability to make decisions and perform complex skills (Eberle, 2000). For every 1% loss of body weight there is a 2% reduction in performance levels (Eberle, 2000). Greater losses of 6% to 10% of body weight can lead to life-threatening conditions such as heat exhaustion and heat stroke (Eberle, 2000).

Practice & Issues

Athletes and coaches are aware of the importance of proper hydration strategies yet athletes fail to consume adequate amounts of fluids (Burke & Deakin, 2006, Jonnagaladda, 2001). For example, only 26% of athletes reported consuming more than five cups (1.25 litres) of fluid during a typical training session (Jonnagaladda, 2001), where typical water losses could be upwards of one to three liters. The same study reported 3% of athletes did not consume any fluids during training. Martin et al. (2006) found fluid deficits of approximately 1.2 litres per day.

Some athletes are under the false impression that the body adapts to being in a dehydrated state (Maughan & Murray, 2001). Confusion also exists regarding the role of sports drinks with 71% of athletes disagreeing with the statement that sports drinks are better hydrators than water (Jonnagaladda, 2001), and Martin et al. (2006) found athletes did not regularly consume carbohydrate-electrolyte drinks post exercise. Nichols (2005) found only 52.5% of athletes correctly believed that sports drinks should be consumed when exercising for more than an hour, however 67% reported consuming them when they exercised longer than one hour. Adequate hydration practices could prevent the onset of heat illnesses and prevent the loss in performance associated with dehydration.

Alcohol

Celebration in sport is often associated with excessive drinking, particularly in team sports (Burke, Cox, Cummings, & Desbrow, 1991; van Erp-Baart et al., 1989; Watten, 1995). The number one reason athletes consume alcohol is for social purposes (Martin, 1998), however it has detrimental affects not only to refueling strategies (Burke et al., 2003), but also recovery from injuries (Burke & Deakin, 2006).

Alcohol consumption remains higher in the off-season (Jonnalagadda et al., 2001; Martin, 1998), however studies show many athletes continue to binge drink throughout the competitive season. Martin (1998) reports that 88.2% of athletes consumed alcohol, of which 47% reported binge drinking. Selby et al. (1990) reported 42% of athletes consumed alcohol during the competitive season, which rose to 60% during the off-season. The accuracy of studies on alcohol consumption in athletes is limited however as it is based on self-reported intake, and therefore consumption amounts and frequency is likely to be under-reported.

Nutrition Information

Introduction

Nutrition information is available from a variety of sources, including coaches, athletic trainers, parents, teammates, fitness trainers, supplements manufacturers, and the media (Rosenbloom, Jonnalagadda, & Skinner, 2002). Of these, only a select few provide credible nutrition information (Clark, 1999). Athletes in particular are susceptible to this misinformation due to their constant desire for performance enhancement and the promise of a competitive edge (Jonnalagadda et al., 2001).

Although the benefits of proper fueling for sport have been well documented, few university athletics teams utilize nutrition professionals (Rockwell, Nickols-Richardson, & Thye, 2001). This is primarily due to lack of funding (Lumsden, J., personal communication, Dec. 2006), which may be attributed to the fact that those not directly involved in the athletic community assume athletes, coaches and athletic trainers are knowledgeable about nutrition (Shifflett et al., 2002). Lack of awareness of the need for proper sports nutrition education makes securing adequate funding impossible.

Sources

Athletes primarily turn to parents and family members as a primary source of nutrition information (Cupisti et al., 2002; Shifflett et al., 2002). Cupisti et al. (2002) showed that 64% of athletes received information from family members. Media was reported as a secondary source by 50% of participants, and 38% had received information in school (Cupisti et al., 2002). Jacobson et al. (2001) found that most athletes received nutrition information from sources such as coaches, magazines, family members, friends or television.

Parents and coaches have limited accurate sports nutrition knowledge (Sirota, 1991) and commonly have had no formal nutrition training (Heffner et al., 2003). Relying on questionable sources of nutrition information will compromise athletic performance, and potentially the health of the athlete.

Media and Technology

The use of the Internet has become increasingly popular over the last 15 years. In 2000 more than half of all Canadians over the age of 15 years were using the Internet, with the most users being between the ages of 15 to 29 years (Statistics Canada, 2000). Of those using the Internet, 46% (n=25,090) were searching for health and medical information; 54% of whom live in the Atlantic Provinces (Statistics Canada, 2002). The most commonly visited sites for health information include Health Canada (36%) and other Government sites (16%), along with commercial sites (32%) (Statistics Canada, 2000). Professional health association sites, non-profit agencies and universities were visited by 25% of users (Statistics Canada, 2000).

The Internet as a medium for health education has become increasingly popular in recent years due to its ease of access and relatively low cost. Termed *eHealth*, this method of providing health information to the public has a growing list of advantages, including reduced cost, convenience for its users, timeliness of access to the Internet, and novelty and attractiveness of the Internet to adolescents and young adults (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006). It also provides the capacity to create tailored, customized information and interventions for patients and consumers, along with the ability to quickly update information, all at a cost much lower than its alternatives (Ahern, Kreslake, & Phalen, 2006), such as hiring a private practice professional Dietitian, or visiting an outpatient program. Twenty-four hour access to information, from anywhere in the world, also makes it a great resource for those who are short on time. Disadvantages of the Internet include the cost associated with at home Internet service, lack of access (Dryburgh, 2001), the quality of the information found on many

websites, and the overwhelming amount of information available (Skinner, Biscope, Poland, & Goldburg, 2003).

When searching for health information the issue of *eHealth* literacy or one's ability to seek, find, understand and evaluate health information sources, becomes a problem (Norman & Skinner, 2006). Crespo (2004) concluded that most *eHealth* information seekers seemed to focus on finding information quickly rather than evaluating the content itself. Many students at the university level lack *eHealth* literacy skills that impact their health decisions when using this resource (Crespo, 2004). Students also overestimated their own ability to judge online health information, further putting them at risk (Crespo, 2004).

The Internet as an *eHealth* resource not only provides information in traditional ways (i.e. pdf articles, etc.), but with the release and popularity of mp3 players and iPods, information can be incorporated in non-traditional ways such as Weblogs, Podcasts, and Vodcasts. It is estimated that there are 29 million Weblogs (also known as Blogs) on the Internet (Barsky, 2006), a number that is growing exponentially due to their ease of creation, publishing and updating. While a minority of Internet users (27%) users currently read Weblogs they have the "potential to open a whole new zone for professional practice and communication channels" (Barsky, 2006 p.34).

The growing popularity of iPods makes Podcasts and Vodcasts an ideal way to communicate information to target populations. The real benefit of Podcasting is that it "gives point-of-need access to information and disseminates information in exciting new ways" (pg 18, Eash, April 2006). Forrester Research predicts that 12.3 million US

households will listen to Podcasts by end of decade and Diffusion Group estimates this to be 56 million (Gordon, 2006).

Nutrition Education

Nutrition education is a vital component for the health and performance of an athlete. Numerous studies have identified the need for further nutrition education for athletes (Abood, Black, & Birnbaum, 2004; Hassapidou, 2001; Hawley et al., 1995; Rosenbloom, Jonnalagadda, & Skinner, 2002; Zawila, Steibt, & Hoogenboom, 2003) however; the best method of doing so remains unclear. This can be attributed to a lack of research in the area of nutrition education for varsity athletes (Abood, 2004).

For nutrition education to be effective with the college population, it must focus on relevant problems, be activity based, learner-centered, and most importantly, must involve the target population (Cason & Wenrich, 2002). Education efforts with this population that are most effective are those that are tailored to the athletes' eating habits and physical activity practices (Cason, 2002), show an understanding of the athletic culture (Vinci, 1998), and be efficient (Abood, 2004) due to athletic and curricular time commitments. Several studies have identified Internet-based applications as a potential medium for educating college students. Cousineau (2004) identified online nutrition education as an important resource for students, and an opportunity to provide information in an interactive, engaging way. Cason (2002) acknowledged the possibility of an interactive Website, including a question and answer section, to provide students with up-to-date, accurate information about nutrition. Not only has this information been

shown to be important resources for athletes, but it is also valuable for coaches, trainers, and others directly involved with the athletes (Jonnalagadda, 2001; Burke, 1995).

Summary

Athletes do not have an adequate understanding of fueling for sport and performance. Literature shows many misconceptions exist regarding energy, protein, and supplements. As a result, many consume inadequate amounts of carbohydrates, too much protein, rely on expensive supplements and carry out risky behaviors. These practices not only compromise an athlete's performance, but put athletes' health at risk.

An overwhelming amount of literature on sports nutrition exists on the Internet, in books and magazines, as well as other media. Athletes are unable to decipher sound nutrition information from product claims and therefore often buy into fads. Studies show the primary nutrition resource for athletes is family and coaches however they fail to provide accurate nutrition information. A need for a creative approach to provide specific, reliable information to athletes has been identified.

THEORETICAL FRAMEWORK

The Spiral Technology Action Research (STAR) model developed by Skinner, Maley, and Norman (2006), combines technological development, community involvement, and continuous improvement. Based on the principles of action research, the STAR model incorporates health promotion principles, behavior change theories, quality improvement and community mobilization practices to create a process that is centered on the user and "grounded in the everyday realities of the target population and organizations that work with the population" (pg 408, Skinner et al., 2006).

Participatory Action Research (PAR) is defined as "systematic inquiry, with the collaboration of those affected by the issue being studied, for purposes of education and taking action of effecting change" (pg 419, Green, George, Daniel, Grankish, Herbert, Bowie, O'Neill, 2003). The three essential elements in PAR are collaboration with a community, involvement of the target community and reflection or evaluation of the results (Kelly, 2005). PAR enables researchers and participants to work together to identify and address issues and concerns from the perspective of the participant (Cornwall & Jewkes, 1995). Based on reflection, data collection and action, PAR empowers participants by giving them more control over their lives (Baum, MacDougall, & Smith, 2006), and generates knowledge for action within their community (Cornwall & Jewkes, 1995).

The health promotion approach of the STAR model is based on self-determination theory, defined as a general theory of human motivation concerned with the development and functioning of personalities within social contexts (Ryan & Deci, 2000). It promotes intrinsic motivations (from within) to create change rather than extrinsic motivators

(pressure from 'outside') for change (Skinner et al., 2006). In doing so it creates a feeling of autonomy that is conducive to greater interest, excitement and confidence that results in enhanced performance, persistence and creativity (Ryan & Deci, 2000).

Social Cognitive Theory (SCT) and Trans-theoretical model are behaviour change theories incorporated into the STAR model. SCT paired with Trans-theoretical model (including the stages of change concept) identify individuals' readiness to change and allow the researcher to work at the level of the individual, instead of where the researcher would like them to be (Skinner et al., 2006). Based on building skills and self-efficacy, these theories are conducive to change.

Quality improvements combined with community mobilization are the final component integrated in the STAR model. Involving the target population in the development of the tools, and ensuring ongoing feedback and adjustments guarantees the final tool is client focused. This process begins with dialogue among community members, and determines who, what and how issues are decided, and provides an avenue for everyone to participate.

To ensure the development of a user friendly media, the STAR model also incorporates a technological component. The researcher works with the target population to create a tool that is feasible, accessible, and meets the needs of the intended users.

There are five phases to this cyclical framework: listen, plan, do, study, and act (Figure. 1) (Skinner et al., 2006). The "listen" and "planning" phases involve participants' discussion of the problem and possible solutions to the problem, to ensure the information provided is relevant and accessible, and meets the needs of its intended users. The technological component of the model is also incorporated into these phases,

so participants can discuss and select the tools most suitable to their needs and accessibility. The “do” phase implements the plan decided upon in the previous phase and incorporates ongoing feedback from participants. The “study” phase checks content by reviewing developed materials with participants, and uses rapid-prototyping to ensure changes can be made to the tool before it is launched. Finally, the “act” phase disseminates the information tool and provides the opportunity for feedback (Skinner et al., 2006).

This model will serve as a basis for the development of the study’s information tools. Involving the athletes in the planning and development of the nutrition tools will provide them with a sense of ownership, and a tool that is relevant, specific and easily accessible. Working with the technology providers will ensure a feasible, cost-effective, and sustainable delivery is achieved.

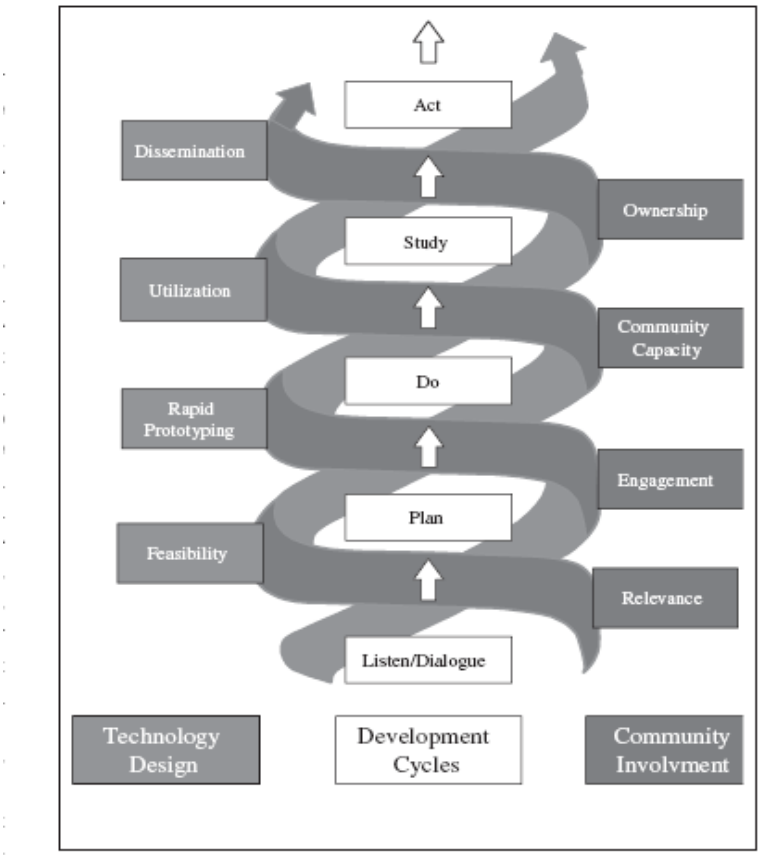

Figure 1. Spiral Technology Action Research Model

METHOD

Research Design

Introduction

As described in the Theoretical Framework, PAR methodology, based on the STAR model, was used to integrate technological development and community involvement, in the development and delivery of the nutrition messages. In doing so, the researcher collaborated with both MSVU Distance Learning and Continuing Education (DLCE) staff and athletes at various stages of the research process, as outlined in Table 1.

Table 1

Technology and community involvement at each development cycle

Technology Design	**Development Cycle**	**Community Involvement**
• Consultation with DLCE to establish feasibility of media	• Listen/Dialogue	• Focus Group to ensure relevant content and accessible media for messages
• Consultation with DLCE in development of messages • Messages communicated via Weblog, e-mail (to be selected by participants)	• Plan	• Engagement of participants through communications and ongoing feedback
• Consultation with DLCE in rapid-prototyping	• Do	• Ongoing feedback from participants; Community capacity
• Dissemination of messages to participants via selected method of communication • Utilization of media	• Study	• Focus Group to gather feedback, tailor messages and provide participants with a sense of ownership
• Dissemination of messages-Launch messages/link on MSVU Website	• Act	• Weblog to encourage ongoing feedback

Subject Selection

Participants included all MSVU varsity athletes who wished to participate in the study and met the following eligibility criteria: (1) the athlete had to have been competing on an MSVU athletic team at the time of study, and (2) the athlete must have been 18 years of age or older at time of study, and (3) the athlete must have agreed to participate in the research by signing a consent form and agreeing to attend focus groups, as well as providing ongoing feedback on the development of the tools through Email, Weblog or focus group discussions (as selected in initial focus group through participant consensus).

Upon approval from the MSVU University Research Ethics Board (Appendix I), the MSVU Athletics Director distributed a letter of invitation (Appendix II) to all MSVU varsity athletes, inviting them to take part in the study. Included with the letter was the date and time of the first focus group session to attend for those interested.

The STAR Model

Listen & Plan Cycles

Prior to the first focus group, a consultation with the Instructional Developer from the MSVU DLCE to discuss the technology design, established possible media for the nutrition messages, as well as the feasibility of each. Inquiries regarding the methods of hosting each medium, and the necessary steps involved for each, provided an understanding of the time commitments and the technological capacity of MSVU resources with regards to equipment, staffing, and financial restraints. Questions guiding the discussion are outlined in Table 2, and were adapted from the STAR Model Development Cycles' Guiding Questions.

A focus group was then held on campus, to provide an opportunity for athletes to discuss their perceived issues/barriers regarding nutrition and sport. The researcher explained the purpose of the study, and the steps involved in the development of the nutrition messages. Participants were given a consent form to sign and return to researcher prior to leaving the focus group (Appendix III). The researcher also asked that they provide contact information, as well as to indicate on the form whether or not they would be interested in participating in the development of the media (i.e. if Vodcasts were selected they could be involved in the videos).

Research questions (outlined in Table 2), adapted from the STAR Model Development Cycles' Guiding Questions, were used to lead focus group discussions to determine athletes' wants, needs and expectations with regards to the media, messages, and the outcome of the study. A research assistant, an undergraduate dietetics student, was present to take notes, and later compiled a summary of the focus group discussions.

During the focus group, participants were presented with a list of nutrition topics from which they could base the nutrition messages (Appendix IV). Participants were not limited to these topics; they were offered as examples in case they found it difficult to think of topics on the spot. This would also ensure that participants considered many different topics before selecting those they felt would be most beneficial to themselves as well as their teammates. Group consensus determined the two topics for the messages, as well as the desired medium for each (Podcasts, Vodcasts, PDF's etc.). This was done to ensure the messages would be relevant, and the technology selected for the media would be accessible. Participants also selected their preferred means of communication, and selected a date and method (focus group, Email, etc.) to discuss the final messages.

Table 2

Summary of questions guiding Listen and Plan Cycles

Guiding Questions- Technological Design	Guiding Questions- Community Involvement
DLCE Questions: (1) How do you create a Podcast/Vodcast? (2) Does MSVU have the resources to create them? (3) How much would it cost to create one? (4) How long would it take to create one? (5) Overall, do you think it would be feasible? (6) How do you create a Weblog? (7) How much does it cost? (8) Does MSVU have the resources to create/host one? (9) How long would it take to create a Weblog? (10) Can a Weblog host Podcasts and/or Vodcasts? **Focus Group Questions:** (1) What are your primary sources of nutrition information? (2) In what media would you most like this information provided? (webpages, Podcasts, Weblogs, etc) (3) At what point would you like to provide feedback on the information tools? (4) What forms of communication are best for you? (Email, focus groups, Weblogs, etc) (5) If you had to choose two or three topics for the information tools, what would they be?	(1) Do you feel any barriers exist preventing you from eating healthy? (2) Have you ever received nutrition information from anyone? (3) If yes, did you find this information useful/helpful? (4) Do you feel sports nutrition is important for performance? (5) Which sports nutrition topics would you be most interested in learning about?
Questions for researcher to consider during development: (1) What are the specific objectives of the tools; content, media, etc? (2) Who will do what and when? (3) Is the production plan feasible in terms of available technological, financial, and human resources? (4) What tools and training are needed?	

Do Cycle

Arrangements were made with DLCE staff to tape the messages, and participants were contacted via Email, and given the opportunity to be involved. The researcher arranged a time to meet with the interested participants to discuss the process and content, as well as tape the messages. Participants were also given a script (Appendix V),

developed by the researcher based on current available sports nutrition information, that would guide the dialogue of the messages during the taping. They were given the opportunity to change the content if they felt it necessary.

Table 3

Summary of questions guiding Do Cycle

Technological Design	Community Involvement
(1) What actions are required to develop tools? (2) What changes, if any, need to be made?	(1) Is the content of the messages relevant? (2) Is there anything they would like to change?

The recording of the messages was completed in the MSVU recording studio, with help from DLCE staff. Editing was then completed during several consultations with the Program Coordinator, and the messages were converted into the appropriate media by the Instructional Developer. Drafts of the messages were then Emailed to participants, to give them the opportunity to provide feedback relating to their relevance, specificity, and ease of use. Based on the feedback received, rapid-prototyping was used to make necessary changes to the messages, to ensure the final products were designed with appropriate content, before their dissemination.

Study Cycle

Participants met with the researcher to view the final messages, and provide comments/feedback, to determine the relevance and ease of use of the tool. Suggestions for changes were documented by the researcher, and were incorporated into the messages/media to ensure tailored messages were created, and to give participants a sense of ownership. Feedback regarding the use of the STAR model was sought using the

guiding question, adapted from the STAR Model Development Cycles' Guiding questions (outlined in Table 4); along with any additional comments relating to the process in general.

Table 4

Summary of questions guiding Study Cycle

Technological Design	Community Involvement
(1) Was the tool cost effective? (2) Was the medium easily accessible? (3) Was the medium user friendly? (4a) Have you ever used Weblogs before? (4b) Why did you or didn't you? (5) Did you download the Vodcasts onto an iPod or mp3 player? (6) If you were to download the Vodcasts onto an iPod or mp3 player, where would you use them? (7) Does anyone own a video iPod?	(1) Did the STAR method foster the development of a relevant, accessible, specific tool? (2) Do you have any suggestions regarding improving the process, messages, or media? (3) Would you have done anything differently?

Act Cycle

Nutrition messages were dissemination online via a link from the MSVU Athletics Department homepage as well as the Department of Applied Human Nutrition's 'Nutrition Information' link. The link was also emailed out to all MSVU athletes and coaches for their personal use. An online feedback method was created so as to provide the opportunity for anonymous comments. In order to provide ample time for athletes and coaches to view the messages and offer comments/suggestions, the researcher monitored online feedback for three months (until the end of June 2007). At the end of this period, online feedback paired with the comments received in the Study Cycle, was compiled by the researcher and conclusions were drawn on the success of the study with regards to the relevance, and ease of use of the messages. The researcher also compared the cost of

development to the cost of the services of a consulting registered dietitian (See Table 5 for a summary of events taking place during the Act Cycle).

Table 5

Summary of events taking place during Act Cycle

Methods
• Researcher monitored Weblog for ongoing feedback until the end of June 2007 • Cycled back to the appropriate stage of STAR model based on results of evaluation • Utilized and encouraged ongoing feedback from athletes via Weblog, and/or Emails, and/or discussion boards • Process evaluation • Recommendations were made based on results of research

Data Collection/Feedback

A research assistant was present to take notes on the topics discussed in the focus groups to ensure relevant themes were captured. The assistant also created a summary of focus group discussions and comments, which were later emailed to the athletes for verification. Ongoing feedback in the form of Email, focus groups or Weblogs were also documented by the researcher, and included in the evaluation. The intent was to record discussion topics for thematic analysis. No names were associated with statements or feedback. Online feedback, through Weblog, was completely anonymous as participants were not asked to provide their names.

RESULTS

Description of Subjects

Eight athletes participated in this study, representing each of the MSVU varsity teams (Table 6). Two of the athletes had a residence meal plan, while the other six lived off-campus and relied on preparing their own meals, including packed lunches from home.

Table 6

Summary of Initial Focus Group Participants

Sport	Number of Men	Number of Women
Basketball	1	2
Volleyball	N/A	2
Soccer	1	2
Total	2	6

*Note: There is currently no men's volleyball team at MSVU

The STAR Model

Listen & Plan Cycles

Message

The first focus group identified a need for nutrition information from a reliable source. There was confusion regarding meal timing and composition, as well as hydration, and weight loss/gain strategies. When prompted with the list of potential topics for the nutrition messages (Appendix III), more information was requested on all topics

listed. 'Healthy Eating on the Road' and 'Tips for Buying the Right Foods' were chosen to be the focus for the messages, and it was agreed that, although not part of the research process, additional information would be provided on the remainder of the sports nutrition topics listed (Appendix IV). Online nutrition information was selected by the researcher to ensure the reliability of sources, with links from the Weblog. This provided a convenient means for the athletes to acquire further information without requiring *eHealth* literacy skills. See Table 7 for a summary of the focus group feedback.

Table 7

Summary of Key Points from Focus Group

Theme	Group Feedback
General Nutrition	• Feel they make poor nutrition choices but try to eat foods that will provide energy before a game • More conscious of what they eat right before a game • Concerned with weight fluctuations and eating the right amount of food • Try to regulate carbohydrate intake but unsure of what foods to eat in particular • Try to balance fruit and vegetable intake but find it hard to get to the grocery store every week for fresh produce • Not a lot of time to cook • Most pack a lunch instead of eating on campus (feel there are less healthy choices available)
Confidence in sports nutrition knowledge	• Most admit they have the information available but they don't always make the best choices • They would eat foods to aid performance if they knew what these foods were • Timing is critical, they do not know what foods to eat at what times • Would like an easy to use resource to know what foods to eat at different times • Unsure if/how sports nutrition differs by sport • Unsure how recommendations vary from one person to the next; size, activity level etc. • Unsure of proper portion sizes
Eating on the road	• Would like to see what choices they have at fast-food places in order to eat better on the road; how to make healthy choices • Budgeting an issue (low food budget on the road)
Sports Drinks	• Unsure of how much fluid they should be drinking pre/during/post game and practice • Questions surrounding caffeine and other caffeinated beverages (i.e. Red Bull), power drinks/sports drinks

Media

Consultations with DLCE determined that all the media options, including Podcasts, Vodcasts, Weblogs, and PDF's, would be feasible based on the resources available at MSVU. Based on the opinions of focus group participants, outlined in Table 8, Vodcasts were selected to deliver the nutrition messages, and a Weblog to host them. It was also agreed that additional nutrition information on the remaining topics (Appendix IV) would be provided on the Weblog (Appendix VI-XX).

Table 8

Summary of Key Points related to Media Options

Media Options	**Comments**
• Podcasts • Vodcasts • Weblog • PDF's	• "Visual aid is good" • Want something to keep them interested • Vodcast would be good for grocery store information and tips for on the road • Weblog would be useful to have information on- don't want too much detail • "Give us the option to have a little or a lot of detail" • Would like information via PDF's for weight loss, hydration, and other topics discussed (see Appendix III)

Communication

As summarized in Table 9, Email was selected for all researcher communications with the group, and participant feedback could either be sent via Email, or left anonymously on the Weblog. A final focus group was selected for the study participants to discuss the media, the messages and the usefulness of the STAR model.

Table 9

Summary of Key Points related to Communication

Communication Options	Comments
• Weblog • Email • Focus groups • Telephone	• Weblog would be a good way to present information and Vodcasts • Would like to use Email for communications between researcher and participants • Would like to have a final focus group to discuss and conclude everything

Do Cycle

The researcher contacted the Instructional Developer and Program Coordinator from DLCE to plan the production of the Vodcasts. Based on their intended use, it was decided that they would be provided in two formats; (1) m4v's, which would allow anyone who owns a video iPod to download the file to their computer and upload it to the portable device, and (2) Real Video (RV) file for streaming (to view the video without having to download it onto your computer). Due to MSVU bandwidth limitations, DLCE arranged for Vodcasts to be hosted on an external server, with a link from the Weblog.

An invitation to take part in the recording of the Vodcasts was sent (via Email) to focus group participants. Two participants responded, however only one showed up for the recording. The researcher met with the athlete prior to recording, to review the Vodcast scripts guiding the dialogue (Appendix V). Scripts were discussed so that changes could be made if necessary, however no changes were required. With help from DLCE, recording and editing were completed, and the Vodcasts were converted into the

appropriate formats (m4v's and RV's). The researcher then posted them on the Weblog. An Email was sent to participants to notify them of such, and encouraging feedback. There were no suggested changes with regards to the Vodcasts; however a few suggestions were made relating to the content of the Weblog, and are summarized in Table 10.

Table 10

Summary of Initial Feedback from athletes on Weblog

Topics	Comments
Aramark Nutrition Information	• Glad to see nutrition information on Website- this was helpful
Carbohydrate PDF	• Did not explain the amount we should be taking in- to make it easier could include a calculator
Carbohydrates	• Add a component to the Weblog to explain the amount of carbohydrate we should be consuming, with a calculator, and link it to carbohydrate PDF
Pre-game meals	• It would be helpful to know what to eat the day before and the day of a game
Terms	• A definition page would be useful to clarify terms used in the PDF's

Cost

Given that the necessary equipment and programs were already available for use at MSVU, minimal costs were accrued. The only direct cost associated with their development was the fee associated with having to externally host the Vodcasts, due to MSVU bandwidth limitations (approximately $20).

Study Cycle

Six athletes were present at the final focus group, along with the MSVU Athletics Director (Table 11). One athlete had a scheduling conflict, and emailed feedback to the researcher in place of attending the focus group. One athlete that participated in the first focus group did not show up for the final focus group. No changes to the Vodcasts were suggested; however several additions were suggested for the Weblog, as summarized in Table 12.

Table 11

Summary of Final Focus Group Participants

Sport	Number of Men	Number of Women
Basketball	0	2
Volleyball	N/A	2*
Soccer	1	1
Total	1	5

*One player Emailed feedback to researcher

Message

Participants felt the messages contained the right amount of information, on the right topics. The group felt this information would contribute to their performance next season. Ideas for additional information to add to the Weblog included information on: food allergies, calculating carbohydrate needs, healthy recipes, and some definitions to clarify terms used (Table 12).

Media

Participants felt the media were a good choice, as having a visual representation kept them interested. Adding to this was the fact that athletes were a part of the Vodcasts. The focus group felt the Weblog was an excellent way to communicate information, because it is accessible anywhere, anytime. It was felt the media used was modern, and they liked that it incorporated the use of technology. See Table 12 for a complete summary of comments from final focus group.

Table 12

Summary of comments from final focus group

Component	Comments
Initial feedback	• Website great- all sections/topics covered • "It's a time saver" • Well organized • Valuable resource, especially for the coming season • Well laid out, to the point, info easy to find and specific
The STAR Model	• The involvement was good, gave them a sense of ownership • Great to have athletes featured in the Vodcasts • Like that they can make suggestions and that it is tailored to them • Wouldn't want to do it any other way (not be involved, or have no input)
Messages	• Not too long, concise, good amount of information • Giving examples of specific food items helps • Liked that the athletes were featured in the Vodcasts • Would like some information on food allergies
Media	• Interesting • Nice to just have to watch and listen, instead of read • Blog is good, but haven't used it yet due to time of year (will use it in the fall to prep for upcoming season) • Would like to have a 'ask the pro' section incorporated • Concerns re: ensuring information is kept up-to-date; someone to monitor the site next year • Would like someone to monitor the comments section to check content • Would like to have audio portion available to download for those who don't have video iPod's • Like using technology- feel it is a modern way to communicate nutrition information
Relevance	• Yes, topics were relevant • Easy to understand, examples were good
Accessibility	• Good, most accessed it directly from original Email link (from researcher) • Like that they can access the information anywhere, anytime • Very well organized, information easy to find • User friendly; time saver • One person had trouble downloading, attributed to not having correct program on computer
Other: • Would you/have you looked for nutrition information yourself? • Have you ever used a blog before? • Other suggestions/ feedback?	• One person had before- "took a really long time, too many sites came up", not sure which sites are reliable • Others- probably wouldn't have looked for it on their own • One person, an IT student was familiar with Weblogs and blogging • Overall excited about this resource • Feel it will help them better prepare for next season • Add definitions to clarify terms used in PDF attachments • Add recipes • Add instructions for use of Vodcasts on all computers • Make sure to inform all MSVU athletes of new resource • Include a list of suggested foods to purchase at the grocery store

Communication

Participants did not use the communication tools to their full potential. The potential uses of the Weblog were reviewed in the initial focus group, however only one person took advantage of the comments section. Several participants communicated through Email although most input/feedback was received through the focus groups.

Act Cycle

With help from the MSVU Athletics Director, an Email was sent out to all MSVU athletes and coaches containing the link to the Weblog. Researcher monitored online (Weblog) feedback for a period of three months (until the end of June 2007), at which time one comment was received. Feedback from all sources was then compiled, and based on this feedback; relevant changes and additions were made to the Weblog contents (Table 12).

DISCUSSION

Varsity athletes lack the basic nutrition knowledge necessary for performance, recovery and health in general. This lack of knowledge puts them at risk of nutrition deficiencies that could be detrimental to health if not addressed. Furthermore, many universities struggle to find funding to support nutrition programs that would alleviate this problem. While previous research has focused on identifying their levels of nutrition knowledge and dietary practices, little research has been done on alternative education methods, particularly at the varsity level. This research study was the first to address an alternate method of educating varsity athletes in a cost effective manor. Using the principles of PAR, and based on the STAR model, this research explored the use of Internet-based media to deliver nutrition messages to varsity athletes.

Subject Participation

Although participants praised the opportunity to be involved in, and make decisions pertaining to the media and the messages, participation in the study was low (n=8), and at times it was difficult to get feedback/responses from the athletes. Due to the limited amount of research available on nutrition education for varsity athletes, it is difficult to compare the level of participation in this study to others. It is possible that the low level of participation was attributed to athletes' demanding schedules and lack of free time. Abood (2004) identified a need for nutrition education with athletes to be efficient. For this reason, the study was designed with minimal time commitments from participants. Focus groups were limited to one hour in length, for a total of two hours, and were scheduled on campus, at a time most convenient for them. Ongoing feedback

necessary during the development cycles was completed online (through Email and/or Weblog) and therefore could be done at participants' convenience.

In order to help increase participation in future studies, researchers could offer incentives beyond those provided in this study (Appendix I), however this would impact the cost-effectiveness of the process. Furthermore, it is likely the low participation is a reflection of a lack of ownership by the athletes, rather than a lack of incentives to participate.

The STAR Model

The first question to be pursued by this research was "Can the Spiral Technology Action Research (STAR) Model be used to develop relevant, specific, accessible, cost-effective sports nutrition education materials for MSVU varsity athletes?". This model was chosen due to its ability to incorporate community involvement and technological development.

When asked about the development of the messages, and the use of the STAR Model, participants indicated that they "would not have done it any other way". They particularly liked the involvement of the athletes at every development stage, as they felt this created a sense of ownership, and final products that were relevant, specific and accessible to their needs. Although the athletes identified the STAR Model as being successful in achieving ownership, the fact that their participation lacked throughout the development process indicates otherwise. Interestingly, the need for accurate, specific, and accessible nutrition information was identified by the athletes in the initial focus group, however the levels of participation suggest they may not have 'bought into' it.

Relevance

Focus groups revealed that several barriers to healthy eating exist within this population, including lack of nutrition knowledge, lack of time for meal planning and preparation, and financial restraints (particularly the budget for eating on the road). This supports the literature, which indicates a number of factors exist that can inhibit the achievement of nutritional goals (Burke, Cox, Cummings, & Desbrow, 2001; Burke, 1995; Vinci, 1998). Through use of the STAR model, and by involving the athletes, these barriers were integrated into the development, content, and delivery of the messages to create a resource that is specific and relevant to its intended users.

Participants felt the messages established relevance by giving them the opportunity to select the topics, and modify them throughout the study. This supports the use of the STAR model for nutrition education with this population, and is consistent with Campbell's (1999) findings that health communications are more likely to be effective when they encompass individuals' concerns, barriers, and motivators.

Although involving the athletes in the development of the messages ensures relevance, it is unknown whether or not they will actually be used. Further research is needed to evaluate the extent to which athletes use the messages throughout the competitive season.

Specific & Accessible

The STAR model allowed athletes to determine not only the content but also the depth of the messages. Although participants felt a need for information on all topics (Appendix III), two were selected, based on the greatest need, for the creation of the

Vodcasts; “Healthy eating on the road”, and “Tips for buying the right food”. It was felt that having these topics accessible through iPod or from personal laptop computer when shopping away from home would be most valuable. This supports Griffith’s (2006) findings that suggested people require information or advice at a time of need, and the access to the Internet was seen as helpful at these times. Interestingly however, when asked if any of the participants owned a video iPod, only one responded ‘yes’. This suggests that either the intent of the athletes was to view the Vodcasts solely on their personal computers, or that participants decided that this would be most useful for their teammates and in the future. Because Vodcasts are a fairly new technology, many people may not have adopted them as of yet, but may plan to do so in the near future. In any case, they were able to recognize the value of being able to download and view the Vodcasts either on their personal computers, or through video iPods.

Internet Media

In the pursuit of developing nutrition messages that were easily accessible and cost effective, the second research question “Can Internet (Website, Weblogs and/or Podcasts) be an effective medium for delivering nutrition information to varsity athletes?” focused on the Internet’s ability to meet these needs. A variety of Internet media were selected for use in this study, including: Email, Website, Weblogs, and Vodcasts. When presented with the media options in the initial focus group, participants did not hesitate to select the most advanced technology. It was evident through their conversations that they wanted something new, innovative and exciting, or else it was likely that they would not use it. Participants were enthusiastic about the endless

possibilities that exist when using the Internet, and were keen to try new technologies they had not used before.

Email

To ensure open communication and feedback from participants, it was critical that convenient communication methods be utilized. Email was the primary method of communication chosen by participants, as established in the initial focus group. Due to busy schedules, typical of a varsity athlete juggling classes, practice and a social life, it was felt that this would be the easiest way to relay information and feedback to and from the researcher during the development stages. Every MSVU student is given an Email address, with multiple sites on campus available to check it, making it accessible and convenient to all participants. This was consistent with Skinner's (2003) findings that Email was considered the most accessible technology.

Website/Weblog

The Weblog, a relatively new Internet medium was set up on www.blogspot.com. Weblogs have the flexibility of being easy to use and have multiple features for posting PDF files, links to other Websites, Podcasts and Vodcasts. For this particular study, permission was granted to provide study information on the MSVU Department of Applied Human Nutrition's Website, as well as a link to the Weblog. The MSVU Athletics Department's Homepage also had a link to the Weblog. These links provided easy 24 hour access to information, not only for the study participants, but for all MSVU students and visitors. The Website/Weblog (www.msvuathletes.blogspot.com) is also the

first site listed when a *Google* search is performed using the key words 'sports nutrition Vodcasts'. Thus relevance and accessibility of the nutrition information and messages was provided to study participants and others.

The main distinctive feature, however, is that Weblogs allow interactive communication, through the comments feature. It was intended that the Weblog comments feature would be the means for participant feedback on the nutrition information and Vodcasts. The Weblog comments may be anonymous if so desired, however only one person used this option for communication. Athletes stated that the competitive season was over but that they were planning on using the Weblog next season. Although Barsky's 2006 study found 27% of Internet users read Weblogs, only one participant, an Information Technology student, had previously used them. Interestingly however, the group chose a Weblog to host nutrition information and messages, and liked the way it provided easy access to information, and the ability to post comments and communicate with each other. The groups lack of Weblog use prior to the study suggests they may not have been ready to adopt this technology, however were able to recognize its potential for supplying information in an easy to use, and accessible manor, and therefore chose this media for such.

Other than the use of the comments feature, the researcher was unable to track the use of the Weblog and its contents. Future studies may want to investigate the possibility of having a system of tracking the number of hits the Weblog receives, and if possible, the number of times the Vodcasts are viewed and downloaded. Furthermore, a follow-up study could be useful in determining the actual use of the Weblog during the competitive season. It is possible that the Weblog use may initially be high, but dwindle as the

novelty has worn off. Additional studies tracking usage patterns would be useful in determining this.

It was suggested by participants that the Weblog contain an "ask the pro" section (Table 13), so that questions could be answered throughout the season, from a reliable source. This is consistent with Cason's (2002) findings suggesting a question and answer section be included in interactive Websites to provide students with up-to-date information on relevant topics. Future studies could also investigate including this feature on a Weblog, and whether or not it would actually be used.

Vodcasts

The uniqueness of Vodcasts, paired with the fact that they can be downloaded to personal laptops, computers and iPods for easy viewing away from home made them the first choice for the study participants. It was felt they would be fun, exciting and interesting to use, because they provide audio and video qualities, instead of reading text from a computer screen.

Significant interest (all but one athlete) was generated when participants were given the opportunity to be involved in the recording of the Vodcasts, however only one participant showed up. A lack of commitment and/or interest in the study was evident during the development cycles; however the final focus group was successful in retaining all but one of the participants. This suggests that although the athletes praised the fact that they were involved in the decision making process, they were not motivated or interested in putting work into the creation of the messages (Vodcasts). It also indicates that although PAR was successful in the creation of relevant and accessible messages, there is

a limit to which participants are interested and have time to be involved. Although excitement and commitment were strong at the beginning and the end, enthusiasm and feedback dwindled throughout the middle of the process.

Ongoing feedback during the development cycles resulted in messages that were tailored to their needs. The length of the Vodcasts were kept to a few minutes, and provided the key messages related to the selected topics. At the end of each Vodcast, viewers are directed to the Weblog for additional information. This was done not only to maintain viewer interest, but also to ensure that the file size would not require too much space on an individual's computer or iPod. Furthermore, for those viewing the messages directly from the Weblog, a large file would require a longer download time and may have resulted in lost viewer interest, and/or abortion of the download altogether. This was not the case in this study; feedback from the participants indicated that the messages were concise, and overall a good length (Table 13). Overall, the tools were found to be easy to use, with the exception of one person, whom had trouble accessing the Vodcasts from their personal computer. This person attributed the problem to having outdated software. Although instructions on how to download/view the Vodcasts were sent in the initial Email containing the Vodcast links, it was suggested that more detailed instructions be included in the future.

As per the STAR methodology, suggestions were sought from the study participants for changes/suggestions to the messages and the media. Fortunately no changes were requested for the Vodcasts as modifications would have been quite a lengthy process, requiring additional taping and editing. It is therefore critical that the researcher have a clear understanding of what the expectations are prior to recording.

Although no problems occurred in this study, it is recommended that future endeavors review the script with all participants prior to taping to ensure a shared vision. Some of the participants indicated they would like to have the option of downloading the audio portion of the messages only (Table 13), indicating that having the format available in both Podcasts and Vodcasts would be beneficial.

Cost Effectiveness

One of the most important components in the development of the nutrition messages was that the process be cost-effective, and therefore a viable alternative for teams that do not possess adequate funding to support more conventional methods (such as employing a Registered Dietitian). In order to determine its cost effectiveness it was necessary to establish the cost of the alternatives for comparative purposes.

The STAR model was successful in creating cost-effective education materials for MSVU athletes, due to the resources and staff already available for use through DLCE. The cost would be significantly higher if the institution did not possess the equipment and staff necessary to produce Vodcasts. A low cost version of the Vodcasts could be produced without these resources, through use of a digital camera and basic computer programs; however quality and clarity of the final product would be compromised. Depending on the institution, additional fees could also be accrued for setting up links to the Weblog from other Websites.

When comparing the average fees charged for a registered, private practice dietitian (upwards of $50 per hour) to the cost of developing the nutrition messages, it becomes evident that this process is a low cost alternative for those who do not have

sufficient funding in place. Additionally, the use of the Internet media to deliver nutrition messages enables athletes to access the information repeatedly whereas, the alternative price would be for a one-time education session from a Registered Dietitian. This cost would be accrued on a yearly basis, in order to continue to provide nutrition education to rookies and any other new players, whereas the only re-occurring cost associated with the Vodcasts is the cost to externally host them (~$20/yr). Recent research also shows *eHealth* initiatives to be considerably lower in cost than its more conventional alternatives (Ahern, Kreslake, & Phalen, 2006; Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006).

There is potential for an entrepreneurial dietitian to provide customized Vodcasts to Universities and other organizations. Assuming that the organization would be responsible for providing the necessary equipment, it would take approximately 10 to 15 hours to develop, record, and post the Vodcasts. Given that the average professional Dietitian charges approximately $50 per hour, the individual could charge $500 to $750 for the production of two Vodcasts, and the Weblog. Once established, regular monitoring and updating of the Weblog would ensure relevant, accurate and up-to-date information be provided, and would promote regular use of the Website. This could be an additional, ongoing source of revenue for the individual.

Nutrition Knowledge & Information

Although the initial research questions were not designed with the intention of gathering information on the level of nutrition knowledge possessed by study participants, focus group discussions provided some insight. The results of this study

indicate that sports nutrition knowledge is lacking among MSVU athletes. Although study participants recognized the importance of proper nutrition for athletes, they were unsure exactly what that entails. This supports the literature, which indicates that sports nutrition knowledge among athletes is inadequate (Kristiansen, 2005; Kunkel, 2001; Shifflett, 2002), and highlights the need for further research on best practices for educating athletes.

Most participants had no previous nutrition education; however all were interested in learning more about nutrition for sport. When asked if they had ever tried to find nutrition information on their own, the few that had, found the experience tedious, time consuming, and, at times, confusing. They felt there was too much information available on the Internet, and it was difficult to decipher accurate from inaccurate information. This is consistent with previous research indicating that one of the main challenges of finding health information on the Internet is determining the quality of information provided (Hansen, 2003). This also supports Crespo's (2004) finding that many university students lack *eHealth* literacy skills. It was decided that information pertaining to the evaluation of Internet sources be supplied on the Weblog, to empower athletes by providing them with the skills necessary to seek additional accurate nutrition information (See page 55 for more information on eHealth literacy).

Numerous studies have shown that athletes rely on coaches, parents and peers to provide them with nutrition information (Cupisti, D'Alessandro, Castrogiovanni, Barale, & Morelli, 2002; Jacobson, Sobonya, & Ransone, 2001; Shifflett, Timm, & Kahanov, 2002); however, these may be unreliable sources for nutrition information (Jacobson et al., 2001). To address this problem, care was taken by the researcher to ensure the

messages developed in this study were accurate, as well as relevant and accessible to the athletes (qualifications of the researcher include an undergraduate degree in dietetics, master's level study with completion of dietetic internship placements, in addition to several years experience working with a Registered Professional Dietitian in a varsity sports nutrition practice).

The link to this information was also emailed out to the MSVU coaches, as well as the Athletic Director. While the Weblog link was provided to the MSVU coaches, it is not known whether or not they accessed and/or utilized the information. Future studies could explore the potential for these resources to be used by coaches, athletics staff, and parents. Alternatively, a separate link, or Website could be created to host information specific to coaches and parents, particularly with younger athletes. A follow-up study may be useful to assess the degree to which MSVU coaches and athletes use these resources throughout the competitive season.

CONCLUSION

Although previous nutrition education strategies have proven effective when educating athletes, many educational institutions are unable to provide sufficient resources to sustain them. This study set out to explore an alternative method to help alleviate this problem, and as a result was able to provide relevant, specific, accessible, and cost-effective nutrition messages for MSVU athletes. It is important to note that although PAR can be used to create social change, it was used in this study for the purpose of knowledge transfer and ownership of the outcome.

Additional research is required to determine if the STAR model, paired with the use of the Internet, would be feasible in an institution without existing IT resources. Further studies are also needed to evaluate the effectiveness of this process, after a period of time has passed, and the novelty has worn off.

This research has advanced the current knowledge related to nutrition education at the varsity level, and supports previous research suggesting the lack of nutrition knowledge for sport. This study also identifies new ways in which dietetic professionals can promote their services to this audience, when financial support is minimal, or does not exist. The media used in this study could also be used to target nutrition messages to other groups within the population.

LIMITATIONS

The study was conducted during the off season for athletes, and therefore the level of participation during the competitive season could differ. Additionally, the study took place at a time when student workload was heavy, and the exam period was about to commence. The degree to which the participation level was affected by these factors is unknown. Future studies could evaluate the degrees of involvement at different times throughout the competitive season.

FUTURE APPLICATIONS

The findings from this study highlight the importance of using PAR, to involve target populations when developing information materials. Additionally, it supports the use of the STAR model when combining community involvement and technology development. It also shows that the Internet can be a successful medium for communication and delivery of nutrition education tools to varsity athletes. Finally, it demonstrates an alternative to more conventional and costly mediums for providing nutrition information to athletes.

While the title of this research implies a focus on the specific media and messages for this target population, the importance of its findings lies in the use of the STAR Model, and the application of diverse technologies when providing information to individuals. The methodology utilized in this study is applicable to various settings, and is not limited to utilizing the newest and/or upcoming technologies. For example, the model could be adapted to work with low income families on developing messages around eating on a budget, and may include providing print media instead of PDF links from a Website that would require easy access to the Internet. The model could also be applied in a corporate setting, by for example, working with their Workplace Wellness Committee to develop health related messages, and hosting them on the company's Intranet. Overall, this process could be utilized in any situation combining community involvement and technology development.

RECOMMENDATIONS

Participants expressed concerns regarding the maintenance of the Weblog. In other words, they wanted to ensure the site would be updated and contents monitored to ensure the appropriate use of the comments sections after the study concludes. Arrangements were made with the Chair of the Department of Applied Human Nutrition at MSVU, for an on-campus student run group, *Student Nutrition Services* (SNS), to take on these tasks in the future. The possible partnership between the Athletics Department and the Department of Applied Human Nutrition is another alternative that warrants consideration. Future research could explore these alternatives.

Future research should carefully plan the timing of the development and dissemination of nutrition messages to begin earlier in the school year, before the competitive season terminates to ensure maximum interest and utilization of the study tools and resources.

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Appendix I: MSVU Ethics Review Form

Research Office- MSVU Ethics Review Application Form

Directions: All proposals submitted for review must have this cover sheet. You must include all relevant supporting documentation in final form (e.g. surveys, interview questions, informed consent forms). To facilitate the referencing of reviewers' comments on the submission, please ensure that the pages are appropriately numbered and that changes made to the proposal are clearly indicated when re-submission is required. Please forward the required number of copies to the Chair, University Review Ethics Board, located in the Research and International Office (RIO).

Note: If you are not sure that your research project requires ethics review, please consult with the Research Office before submitting an application.

The Number of Copies required:

One copy – if the proposal is an Honours Thesis, Directed/Independent Study, or Class Project that has received departmental REB approval and does not exceed minimum risk.
Three copies – for all other proposals that do not exceed minimum risk.
Eight copies – for all proposals that exceed minimum risk.

Note – to complete this form click on the shaded box once to begin data entry

General Information

Date: January 18, 2007
Name of person(s) submitting application: Candace Weaver
Title of project: The Media and The Message: Providing Reliable and Relevant Nutrition Information For Varsity Athletes
Department(s): Applied Human Nutrition
E-mail addresses: [redacted]; linda.mann@msvu.ca
Student: Candace Weaver Supervisor: Linda Mann

Category of Researcher:

☐ Faculty
X Graduate Student - Program of Study/Degree Masters of Science Applied Human Nutrition
Please specify: Graduate Project, Thesis or Independent Study? Thesis
☐ Honours Student
☐ Other (please specify):

Category of Research:

X Minimal Risk - Expedited Review
☐ Exceeds Minimal Risk
☐ Re-review

This project is currently under review by: ☐

Or

This project has already been reviewed by (**attach relevant documentation**):

☐ External agency / specify: ☐

☐ MSVU Committee on Research and Publications

X Thesis Committee (**NOTE**: A copy of the thesis proposal acceptance must be attached to your ethics application prior to review)

☐ Departmental Research Ethics Board

☐ Third party: (e.g., school board, hospital, etc.)

Specify and attach a copy of the approval (s) ☐

Funding/Sponsorship

Has this project received funding (internal or external): ☐ Yes or X No

If yes, please indicate the source of funding: ☐

Agreement: I/we have read the MSVU University Research Ethics Board (UREB) Instructions for Completion and Submission of Ethics Protocol Review, the MSVU Senate Policy on Ethical Conduct for Research Involving Humans, and the Tri-Council Policy Statement on the Conduct of Research Involving Humans and agree to comply with the policies and procedures outlined therein. In the case of student research, as Faculty Supervisor, my signature indicates that I have read and approved the application and proposal, deem the project valid and worthwhile, and agree to provide continuing and thorough supervision of the student(s). I/we have read and will make every effort to meet the requirements of the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans.

Signatures:

For Faculty/Staff Research Projects:

Signature(s) of investigator(s): Date:

For Students or Thesis Research Projects:

Signature(s) of student investigator(s): Date:

Signature(s) of Faculty Supervisor(s) Date:

A. Summary of Proposed Research

Describe the purpose of the research (maximum 500 words). Include enough background information to enable the UREB to understand the rationale for the study. This should be an overview of the proposed research and the purpose of the research: what are you doing and why?

Proper nutrition and hydration practices are critical to peak performance for an athlete (Burke & Deakin, 2006; Maughan & Burke, 2002). Basic nutrition knowledge among athletes is inadequate (Kristiansen, Levy-Milne, Barr, & Flint, 2005; Kunkel, Bell, & Luccia, 2001; Shifflett, Timm, & Kahanov, 2002) and as a result, many consume inadequate amounts of carbohydrates, too much protein, rely on expensive supplements and carry out risky behaviors. These practices not only compromise an athlete's performance, but also put athletes' health at risk.

Although there is an abundance of literature outlining nutrition requirements for athletes available through internet, libraries and within communities, this information is not effectively reaching them (Kunkel et al., 2001; Shifflett et al., 2002). Most university athletics departments have insufficient resources/funding to educate their athletes on nutrition for sport (Kunkel et al., 2001). There is therefore a need for the development of a unique approach to provide relevant, specific, accessible, and cost effective nutrition information to varsity athletes.

The Spiral Technology Action Research (STAR) model (Figure 1) developed by Skinner, Maley, and Norman (2006), combines technological development, community involvement and continuous improvement (see figures 1 and 2). Using action research, the STAR model incorporates health promotion principles, behavior change theories, quality improvement and community mobilization practices to create a process that is centered on the user and "grounded in the everyday realities of the target population and organizations that work with the population" (Skinner et al., 2006).

There are five development phases to this cyclical framework: Listen, Plan, Do, Study, Act (Skinner et al., 2006). The "Listen" and "Plan" cycles involve participants' discussion of the problem and possible solutions to the problem, to ensure the information provided is relevant and accessible, and meets the needs of its intended users. The "do" phase implements the plan decided upon in the previous phase and incorporates ongoing feedback from participants. The "Study" cycle checks message content by reviewing developed materials with participants so changes can be made before the tool is launched (by cycling back to appropriate development cycle based on feedback). Finally, the "Act" phase launches the information tool and provides the opportunity for feedback (Skinner et al., 2006).

Using the STAR model, this study will collaborate with MSVU varsity athletes, through use of focus groups, to develop Internet-based sports nutrition messages that are relevant and specific. The internet as a medium for health education messages has been chosen due to its capacity to create tailored, customized information to patients and consumers, along with the ability to quickly update information, at a cost much lower than its alternatives; in this case, employing a registered dietitian (Ahern, Kreslake, & Phalen, 2006). Its ease of access and relatively low cost, along with its novelty that attracts adolescents and young adults (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006) deem this media appropriate for the target population in this study. The growing popularity of Ipod's and MP3 players, along with their portability make Podcasts a likely media for these messages, however this will be chosen by study participants.

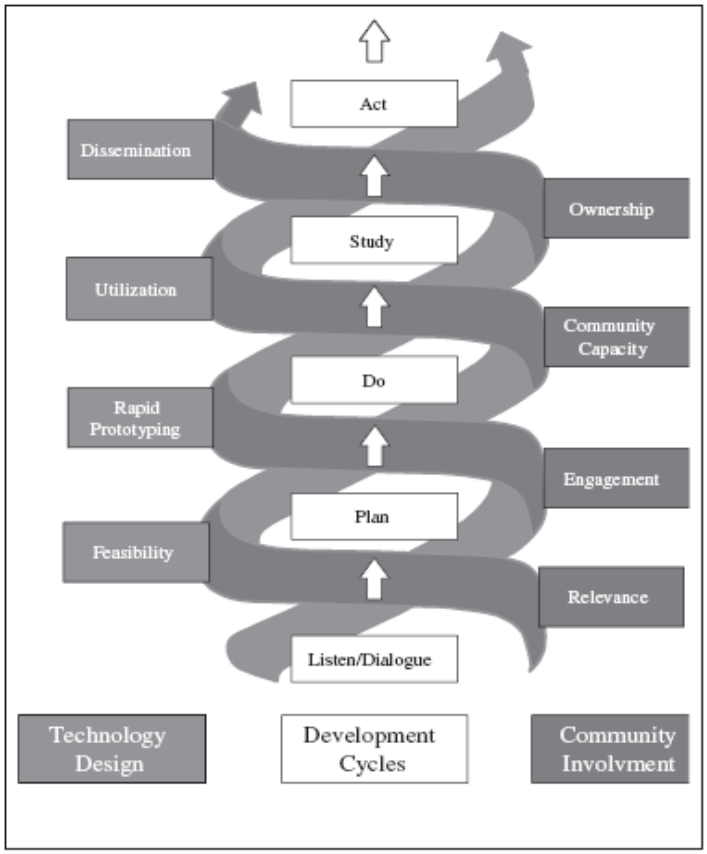

Figure 1. Spiral Technology Action Research Model

(Skinner et al., 2006)

B. Special Considerations

1. If the context of the research is "non-traditional" or specialized in any way (e.g., research in another culture, research with hard-to-access groups), describe the information that the UREB needs to keep in mind when reviewing this application.
2. If the research project is but one component of a larger non-research study (e.g., international development project), describe briefly the larger context of the project.

There are no special considerations.

C. Research Approach or Method

1. Describe your research method. How will you collect the data?

An action research approach based on the STAR model is used throughout the study to gather information in the development process and allow continuous feedback to support

improvement, learning and capacity building (Skinner et al., 2006). Participatory Action Research (PAR) is defined as "systematic inquiry, with the collaboration of those affected by the issue being studied, for purposes of education and taking action of effecting change" (Green et al., 2003). The three essential elements in PAR is collaboration with a community, involvement of the target community, and reflection or evaluation of the results (Kelly, 2005). PAR enables researchers and participants to work together to identify and address issues and concerns from the perspective of the participant (Cornwall & Jewkes, 1995). Based on reflection, data collection and action, PAR empowers participants by giving them more control over their lives (Baum, MacDougall, & Smith, 2006), and generates knowledge for action within their community (Cornwall & Jewkes, 1995).

The STAR model development cycles are incorporated into the research methodology, and are outlined in Figure 2.

Figure 2. Technology and community involvement at each development cycle

Technology Design	Development Cycle	Community Involvement
• Focus Group • Consultation with DLCE and/or IT&S	• Listen/Dialogue	• Focus Group
• Consultation with DLCE and/or IT&S • Weblog, e-mail (to be determined by participants in first focus group)	• Plan	• Ongoing feedback from Key Informants (participants)
• Researcher modifies messages/media based on feedback	• Do	• Ongoing feedback from Key Informants (participants)
	• Study	• Focus Group
• Launch messages on MSVU website	• Act	• Weblog

Listen & Plan Cycles:

Focus group(s) will be held on campus, at a time selected by study participants, to provide an opportunity for athletes to discuss their perceived issues/barriers to fueling for sport. Researcher questions will guide focus group discussions (see Appendix I). Participants will come to a group consensus on at least two nutrition related topics and from the topics determine the numbers of messages as well as the media they feel would be most beneficial to MSVU athletes.

Do Cycle:

Based on the consensus from the focus group(s), a draft of the messages will be developed. The MSVU Departments of Distance Learning and Continuing Education (DLCE) and Information Technology and Services (IT&S) will be consulted as necessary to produce messages in the desired media. The drafts will be given to participants, either through email or

focus group but could also be as a Podcast as part of a Weblog for them to give feedback (to be selected by participants how), and they will be asked to provide feedback regarding relevance, specificity, and ease of use. If required, changes will be made to the messages by researcher based on this feedback.

Study Cycle:

A final focus group will take place with study participants to discuss the final messages and media, to determine the relevance and ease of use.

Act Cycle:

The messages in the form of Podcasts, or whatever media is chosen will be posted on the MSVU Athletics Department homepage. An online feedback method will also be created with Information Technology Services, and/or Department of Distance Learning and Continuing Education, as decided upon by participants (for example a Weblog, where athletes can leave anonymous comments regarding the messages). Researcher will monitor feedback until the end of June 2007 (see Timeline, Appendix II). At the end of this period, feedback from online method, along with that received in the final focus group (Study Cycle) will be compiled by researcher to draw conclusions on the success of the study with regards to the relevance, ease of use of the messages. Researcher will also compare the cost of development (of the messages) to the cost of a consulting registered dietitian.

2. Describe/identify your participants.

Participants will include all MSVU varsity athletes who wish to participate in the study and meet the eligibility criteria for the study. Eligibility criteria include: (1) the athlete must be currently competing on a MSVU athletic team at the time of study, and (2) currently be 18 years of age or older, and (3) the athlete must agree to participate in research by signing a consent form and agreeing to attend focus groups, as well as provide ongoing feedback on the development of the tools through email, Weblog or focus group discussions (as selected in initial focus group through participant consensus).

3. Describe the procedure(s) for recruiting participants.

With help from the MSVU Athletics Director (see attached letter, Appendix VII), who will distribute a letter of invitation (Appendix IV) to all MSVU varsity athletes, athletes will be invited to take part in the development and evaluation of the sports nutrition information messages, and the media; (i.e. Podcasts, Weblogs etc.). Participation is voluntary, and ideally at least one or two representatives from each of the five MSVU varsity teams will be self-selected to participate. If the number of participants interested in participating is below this number (one athlete from every MSVU varsity team), the researcher will meet with each team to discuss the importance, and the result of the study (i.e. to have helped develop customized sports nutrition messages that will help enhance performance and give them a competitive advantage). If there are any individuals who are interested in participating in the study they will be included. If no additional interest is generated, the study will proceed with fewer participants than desired. Participation in the study is voluntary, and participants may withdraw from the study at any point.

4. Outline any particular incentives you are using for participation (e.g., payment).

Incentives to participate in the study include:
- Refreshments will be provided at the focus groups.
- The opportunity to be a part of the development of messages, including having input on the topics for the messages, along with the media for the messages.
- The opportunity to be a part of a Podcast (if this media is chosen) if they would like to do so.
- The opportunity to help create something that will help themselves and their team to enhance performance levels and create a competitive advantage.

Debriefing (if applicable) - Describe debriefing procedures

(1) Debriefing is included in the STAR model as a part of the Act Cycle. The final focus group includes participant discussion of the action research process, along with the content and media of the final messages that have been posted online.
(2) A summary of the study and results will also be posted online with a link from the MSVU Athletics homepage.
(3) Participants will also be invited to attend the Thesis Defence.

D. Third Party Permission

1. If you are using data provided by outside agencies, explain how you will establish agency consent.
2. If data will be collected offsite (e.g., school boards, community agencies, etc.), describe how you will establish consent of third parties. Final approval is contingent upon the researcher's formal confirmation that third party permission has been granted.

Third party permission has been obtained from MSVU Athletics Director, June Lumsden (see attached letter, Appendix VII). Support has also been offered from Carole Sparkes, MSVU Distance Learning and Continuing Education, who attended the thesis proposal and verbally indicated interest and technical support in the development and online launch (posting) of the study's nutrition messages.

E. Research Surveys, Questionnaires, Instruments, Etc.

1. Append of all documents in final form.
2. Indicate the sources of questions (e.g. public domain; developed by the researcher; etc.) and the relationship to the purpose of the study. Need to explain more on the sources of your questions – from the article by Skinner? Other sources? Why are you asking about those topics – from literature? I know you didn't really just make them all up. – And – need to relate the questions to the purpose of the study – tie to the objectives!! UREB will want to know why you are asking the questions you are asking.
3. For instruments under copyright, the onus is on researcher(s) to obtain permission for use.

Appendix I outlines research questions/steps to guide each of the development cycles. These questions have been adapted from the STAR model, and are meant to promote discussion on the

topics directly pertinent to the development of the messages. Discussing questions related to past nutrition education/information they have received and why it was or was not effective will help the focus group to reflect upon and determine what they feel would be the most useful media and messages. The "Plan" and "Do" cycle questions are directed towards the researcher to help determine the feasibility of the selected media. The "study" cycle questions are designed to promote discussion among participants (in a focus group setting), to evaluate the developed messages and their media, as well as the STAR model in general. The "act" cycle steps pertain only to the researcher.

F. Risks

Minimal risk is defined as: "if potential subjects can reasonably be expected to regard the probability and magnitude of possible harms implied by participation to be no greater than those encountered in everyday life."

1. Specify and describe any potential risks to participants, making special note of situations that exceed minimal risk.
2. If there is the potential to incur risk, outline the safeguards that you will put in place to protect participants.
3. Please pay special attention to situations in which the researcher may have dual relationships with participants (e.g., professors using their own students as participants; counsellors whose clients may also be their research participants).

This study will impose minimal risk to participants. Participation is voluntary, and participants will be asked **not** to disclose any information that is shared in the focus groups. Information being sought is of a general nature, and any other information will be discussed on a voluntary basis (will not be asked by researcher).

If email is selected as the desired communication media, the researcher will "blind carbon copy (BCC)" participants so as to not disclose personal email addresses. Feedback received by email will only be accessible by the researcher, and any individual comments will not be disclosed. Any records of feedback either from email or focus group notes will be kept until the thesis defence, at which point they will be deleted (emails), and shredded (any paper notes).

G. Free and Informed Consent

1. Informed Consent Forms must be placed on departmental letterhead and must address the points below.
2. Written informed consent is normally expected. If you believe written consent is impossible or unwarranted, explain why.
3. These items need to be explicit in the Informed Consent Form. These are:
    a. The identity of the researcher(s) and contact information, and supervisor information (if applicable);
    b. An invitation to participate;
    c. A statement of the research purpose;
    d. A description of the tasks to be performed and the expected time commitment;
    e. A description of foreseeable harm and benefits, including limitations to confidentiality
    f. Confirmation that prospective participants may decline participation or withdraw at any time without penalty;
    g. *An arm's length* contact in case of questions about the conduct of the research: "If you have questions about how this study is being conducted and wish to speak with someone who is not directly involved in the study, you may contact the

Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at 457-6350 or via e-mail at research@msvu.ca."

4. Please note that the consent of the participants shall not be conditional upon or include any statement to the effect that, by consenting, participants waive any legal rights.
5. If participants are a captive/vulnerable population, participants must be assured that non-participation will not affect their primary care in any way. For example, students must be assured that refusing to respond to a survey will not affect them academically. When it is not clear that potential participants have the capacity to provide informed consent, or if the research participants are from a population recognized as having diminished capacity to provide informed consent (e.g. children, adults with mental disabilities), informed consent must be obtained from an individual who bears responsibility for decisions concerning the well-being of the participant (e.g. parent, guardian, care-giver). When the participant is able to provide assent for the research (i.e. express their willingness to participate at the time of conducting the research), this should also be sought.
6. If participants are being photographed; videotaped and/or voice recorded, separate letters of consent must be attached to the Informed Consent Form.
7. Researcher(s) should provide a description of the criteria that they will use to judge assent/dissent of a participant in the protocol that they submit for review.
8. Parental consent is required for persons under the age of majority.
    a. Consent of both the child and the parent(s) are required in research studies where children are minors but are 7 years or older.
    b. With children under 7, consent of the parent(s) only is necessary for the child's participation in research.
9. Attach the Informed Consent Form(s) to the application.

Please note that if you provide the above information in a *separate* information letter or introduction letter, it must be repeated exactly the same in the Informed Consent Form.

Describe how you will obtain Informed Consent:

Informed consent will be obtained at the first focus group. Researcher will distribute and collect a signed consent form from all athletes wishing to take part in the study (See Appendix V). A separate consent form will be obtained from those wishing to take part in any of the messages (i.e. Podcast) (see Appendix VI).

Checklist for Informed Consent (On Letterhead)

✓ Introduction	✓ Special Population
✓ Invitation	✓ Obtaining Consent
✓ Research Purpose	✓ Signature area
✓ Researcher Identity	✓ Special Consent for Audio
✓ Tasks Outlined	✓ Separate Consent for Photographs, Video
✓ Time Commitment	
✓ Harms/Benefits	
✓ Decline Participation	
✓ Withdrawal Anytime	
✓ Arm's Length Contact (UREB Chair)	

H. Privacy, Confidentiality, Anonymity

1. How will anonymity and/or confidentiality be maintained?
   - while collecting data (please identify situations in which confidentiality cannot be guaranteed (e.g. abuse; self-harm; etc);
   - after data collection (i.e. storage, disposal of raw data); this is where you need to discuss what you will do with the tapes and notes, etc
   - on resulting publications.
2. If you are utilizing secondary data, state its original source and confirm that the data does not allow for identification of participants.

The intent of data collection is to record discussion topics for thematic analysis. No names will be associated with statements or feedback. Online feedback, through Weblog/discussion board, will be completely anonymous; participants will not be asked to provide their names. If email is selected as the desired communication medium, the researcher will "blind carbon copy (BCC)" participants so as to not disclose personal email addresses. Feedback received by email will only be accessible by the researcher, and any individual comments will not be disclosed. Any records of feedback either from email or focus group notes will be kept until the thesis defence, at which point they will be deleted (emails), and shredded (any paper notes).

I. Dissemination of Results

Describe how participants will be informed of the results of the study.

Results of the study will be discussed in the final focus group, taking place in the "Act" cycle. A summary of the study and results will be posted online, with a link from the MSVU Athletics Homepage. Participants will also be invited to attend thesis defence.

References

Ahern, D.K., Kreslake, J.M., & Phalen, J.M. (2006). What is eHealth (6): Perspectives on the evolution of eHealth research. *Journal of Medical Internet Research*, *8*(1), e4.

Burke, L., & Deakin, V. (2006). In Burke L., Deaking V. (Eds.), *Clinical sports nutrition* (3rd Edition ed.). Australia: McGraw-Hill Australia Pty Ltd.

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Kunkel, M. E., Bell, L. B., & Luccia, B. H. D. (2001). Peer nutrition education program to improve nutrition knowledge of female collegiate athletes. *Journal of Nutrition Education, 33*(2), 114-115.

Maughan, R. J., & Burke, L. M. (2002). In Maughan R. J., Burke L. M. (Eds.), *Handbook of sports medicine and science: Sports nutrition*. Malden, Massachusetts: Blackwell Science Ltd.

Shifflett, B., Timm, C., & Kahanov, L. (2002). Understanding of athletes' nutritional needs among athletes, coaches, and athletic trainers. *Research Quarterly for Exercise and Sport, 73*(3), 357-362.

Skinner, H.A., Maley, O., & Norman, C.D. (2006). Developing internet-based eHealth promotion programs: The spiral technology action research (STAR) model. *Health Promotion Practice, 7*(4), 406-417.

Appendix II: Letter of Invitation

To: MSVU Athletes

You are invited to participate in a research study to develop a nutrition information tool for varsity athletes. This study is being conducted by Candace Weaver as part of a requirement to complete her Masters of Science Degree in Applied Human Nutrition at Mount Saint Vincent University.

Your participation is completely voluntary, and is greatly appreciated. If you agree to participate, you will be asked to attend at least one focus group to discuss problems/barriers to healthy eating for performance. Each focus group will take no longer than one hour, and will be scheduled at a time most convenient to all participants. Focus groups will be held on MSVU campus. You may withdraw from the study at any time.

Athletes will discuss and identify several nutrition topics and the media that will form the basis for the nutrition tools. You may choose to be a part of the Internet-based tool (for example, if Podcasts are the chosen media, you may participate in the recording), however participation is completely voluntary.

You will also be asked to provide ongoing feedback on the messages and media through email and/or online Weblogs as they are being developed to ensure the final products accurately reflect the focus groups' vision.

Benefits:

Benefits of the study are that you will shape the nutrition information media and messages so that they will be specific to your needs as a competitive athlete and help give you and your team a competitive advantage. You will also help to assess the effectiveness of the nutrition information, as a reliable resource when little to no funding exists to employ a registered professional dietitian or nutritionist for personal counseling.

Risks:

There are no risks involved in this study. Focus groups will be informal gatherings in which ideas and opinions will be openly shared.

Compensation:

There is no compensation for participating in the study, however beverages and snacks will be provided at the focus group(s).

Confidentiality:

Any information you provide to us will be strictly confidential at all times. Notes will be taken during the focus group(s) to establish key themes/subject areas for the nutrition information tools. Participants have the option to remain anonymous when giving feedback on the tools.

The intent of data collection is to record discussion topics for thematic analysis. No names will be associated with statements or feedback. Online feedback, through Weblog/discussion board, will be completely anonymous; participants will not be asked to provide their names. If email is selected as the desired communication medium, the researcher will "blind carbon copy (BCC)" participants so as to not disclose personal email addresses. Feedback received by email will only be accessible by the researcher, and any individual comments will not be disclosed. Any records of feedback either from email or focus group notes will be kept until the thesis defence, at which point they will be deleted (emails), and shredded (any paper notes).

Participants' Rights:

Your participation in this study is completely voluntary. You are free to refuse to answer any specific question and/or withdraw at any time.

Questions:

If you have any further questions concerning this study, please feel free to contact Candace Weaver at ([redacted] or Professor Linda Mann (Thesis Advisor) at (902) 457-6146. In case of questions about the conduct of the research and your right as a research participant, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at 457-6350 or via e-mail at research@msvu.ca .

Appendix III: Participant Consent Form

I have read this consent form and this study has been explained to me. I have been given the opportunity to ask questions. I have retained a copy of this consent form for my record. I agree to participate in this study, "The Media and the Message: Providing Reliable, Relevant and Cost Effective Nutrition Information for Varsity Athletes", and to attend focus groups to provide input into the development of a nutrition information tool.

Signature _____ Date _____

Name (please print) _____

Contact Information _____(phone)_____(email)

Participant Consent Form for Messages

The purpose of the media and messages for the nutrition information tools have been explained to me, and I understand they will be posted online from the MSVU Athletics Homepage. I am willing to be a part of the development of the messages by appearing in one or more Podcasts developed by the researcher. I understand my role in this process and have been given the opportunity to ask questions.

Signature _____ Date _____

Name (please print) _____

Contact Information _____(phone) _____(email)

Appendix IV: Sports Nutrition Topics

- Energy Requirements of an athlete
- The role of macronutrients in sport: Carbohydrate, Protein, Fat
- The role and effects of supplements (vitamin & minerals; ergogenic aids)
- Meal timing and hydration strategies for practice and competition
- Nutrition Information Resources
- Eating on a budget
- Eating on the road & tournaments

Appendix V: Scripts for Nutrition Messages

Script # 1: Eating on the road

(Script to be used as a guide)

Intro read by Instructional Developer- "We are here today with Sheila Abriel from the women's basketball team, and joining her today is Candace Weaver, a Graduate student in Applied Human Nutrition"

***Athlete*:** "Competing for a varsity team means that a lot of our games are away from home. Often times we spend long hours traveling on the bus to get to our destination. How can my team better prepare for these situations?"

Researcher: "Well (athlete's name), that's a great question, and one I get asked a lot from athletes. Planning ahead is key when you're traveling…so, packing snacks ahead of time that you can take on the bus with you is a great way to keep your energy levels up, and get you ready to compete. Some great snack examples are: granola bars, dried fruits and trail mix, cereal, fig bars, pretzels, crackers, and bagels. If you have access to a cooler you can also bring things that need to be refrigerated like yogurt, cheese and milk. JUST REMEMBER TO PACK FOODS YOU ARE FAMILIAR WITH SO THAT YOU WON'T HAVE TO DEAL WITH ADDED STRESS FROM STOMACH UPSET"

Athlete: "Those are great ideas, but what about when our team eats out for meals; how can I tell what's healthy, or what will best fuel me to compete/recover?"

Researcher: "Well, I would suggest trying to find out ahead of time where you will be stopping, that way you can have a look at their menu beforehand and have a plan. You can easily find most nutrition information on the restaurant's website. If you don't know where you will be stopping, there are some general guidelines you can follow to make healthier choices…these would include:

- looking for lower fat items, such as choosing tomato-based soups and sauces, and low fat dressings for salads- it also a good ides to ask for these on the side that way you are controlling how much is used
- if you are eating pizza, choose a thick crust for added carbohydrate, and try to stay away from processed meats which tend to be higher in fat- instead, load up on lots of vegetables. The same goes when ordering subs and sandwiches.
- Another great tip is to look at how the food was cooked. This can be a good indicator of the fat content. Try to stay away from foods that are fried by choosing items that have been broiled, baked, steamed or boiled. If you're not sure just ask your server and they should be able to tell you.

***Athlete**:* "Those are some great tips! I just have one more question before you go… Our food budget for traveling is often quite low, what are some ways we can spend less, but still have plenty of healthy foods to fuel us?"

Researcher: "Well, getting together with your teammates and buying larger quantities of the snacks I mentioned earlier will help to save on food cost.

- I would also suggest you check with the hotel you are staying at to see if there is a mini-fridge in your room.

- If there is, you can buy some groceries that will save you from eating out all the time.

- For example, milk, cottage cheese, low fat sandwich meats, yogurt, low-fat dressings, and fresh fruit and vegetables.

- If you don't have access to a fridge, peanut butter, canned fish, bagels, juice boxes and fresh fruit are some good options to keep on hand."

Athlete: "Thanks Candace…I definitely feel like I will be more prepared next time we are on the road!"

***Researcher*:** "It was my pleasure…and don't forget to check out more sports nutrition information online at www.msvuathletes.blogspot.com !

Script# 2: Shopping in the Grocery Store

(Script to be used as a guide)

Intro read by Instructional Developer- "We are here today with Sheila Abriel from the women's basketball team, and joining her today is Candace Weaver, a Graduate student in Applied Human Nutrition"

Athlete: "I have a basic understanding of healthy eating, but find it hard to incorporate that into my meals and snacks. What kinds of foods should I be buying when I go grocery shopping?"

Researcher: "That's something I hear a lot from athletes- they sometimes have the right information, but don't always know how to put it into practice. Well, as you know, carbohydrates should be the focus of your diet, as they are the body's primary source of energy. So buying things like whole grain pasta, rice, potatoes and breads to have on hand is always a good idea."

Athlete: "What about protein? What are some good healthy options?"

Researcher: "Focus on buying leaner cuts of meat, less processed sandwich meats such as turkey and ham, or try some vegetarian protein options like tofu, beans, and lentils, all of which can be easier added into soups, salads, pasta and stir fry's"

Athlete: "Being a student, I find I don't have a lot of money to spend on groceries. Can you suggest any ideas to help me cut down my grocery bill?"

Researcher: "Well, first of all I would suggest making a grocery list and sticking to it. It's easy to get side tracked when shopping, especially if you are hungry, so decide before hand what you need to buy. Most grocery stores post their weekly flyers online, so you can check out which store has the best deals for what you are looking for.

- Next I would suggest shopping the perimeter of the store- that's where you will find most of you staples, like fruits and vegetables, breads, meats, and milk products.

- Remember that while packaged foods do have their place in our diets, we pay for the added packaging and processing of the foods.

- I would also try to buy in bulk when possible, or go splits with one of your teammates, as bulk foods are cheaper, again because there's less packaging.

- Finally, when it comes to fruits and vegetables, try to buy what's in season, for example, local apples in the fall, and local strawberries, blueberries etc. in the summer.

- You can also buy frozen vegetables, which often are less costly and just as nutritious!

Athlete: "That's great Candace, I definitely feel more confident that I can make healthy choices and save a bit of money next time I'm grocery shopping. I'll be sure to share these great tips with my teammates!

Researcher: "Glad I could help out…to find more information on this topic and more, you can visit www.msvuathletes.blogspot.com !

Appendix VI: Contents of Weblog link to *Aramark Nutrition Information*

MSVU Applied Human Nutrition Website
Student Nutrition Services - Menu Nutritional Analysis

All values are approximate

Menu Item	***Nutrition Information***				
Beverages	**Portion**	**Calories**	**Carbs**	**Protein**	**Fat**
Apple Juice	1 cup	119 kcal	29 g	0 g	0 g
Orange Juice	1 cup	116 kcal	26 g	2 g	0 g
Cranberry Juice	1 cup	147 kcal	38 g	0 g	0 g
Orange light Fountain Drink	1 cup	13 kcal	1.8 g	0.1 g	0 g
Tropical punch light Fountain Drink	1 cup	13 kcal	2.6 g	0.1 g	0 g
Peach light Fountain Drink	1 cup	13 kcal	2.5 g	0.1 g	0 g
Nestea Ice Tea	1 cup	70 kcal	18 g	0 g	0 g
Nestea light Lemonade	1 cup	12 kcal	1.6 g	0.1 g	0 g
Milk, chocolate, 2%	1 cup	180 kcal	26 g	9 g	5 g
Milk, white, 2%	1 cup	129 kcal	12 g	8.6 g	5.0 g
Milk, white, skim	1 cup	91 kcal	13 g	8.5 g	0.4 g
Coffee, regular, black	1 cup	5 kcal	1 g	0 g	0 g
Hot Chocolate	1 cup	147kcal	32 g	4 g	2 g
Pop, regular cola	1 cup	107 kcal	27 g	0 g	0 g
Pop, diet cola	1 cup	3 kcal	0 g	0 g	0 g
Pop, regular clear	1 cup	88 kcal	22 g	0 g	0 g
Pop, diet clear	1 cup	1 kcal	0 g	0.3 g	0 g
Bread/Bagels	**Portion**	**Calories**	**Carbs**	**Protein**	**Fat**
100% Whole Wheat Bread	1 slice	150 kcal	29 g	6 g	1.5
White Bread	1 slice	150 kcal	30 g	6 g	1 g
English Muffin	1 muffin	147 kcal	26 g	4.6 g	1.7 g
Plain Bagel	1 bagel	294 kcal	55 g	9.2 g	1.9 g
Whole wheat Bagel	1 bagel	281 kcal	54 g	9.1 g	2.1 g
Blueberry Bagel	1 bagel	294 kcal	56 g	9.1 g	1.8 g
Cinnamon Raisin Bagel	1 bagel	297 kcal	58 g	9.2 g	1.5 g
Sesame Seed Bagel	1 bagel	303 kcal	55 g	9.5 g	3.3 g
Multigrain Bagel	1 bagel	306 kcal	51 g	11 g	5.3 g
Everything Bagel	1 bagel	301 kcal	56 g	9.6 g	2.7 g
Muffins/ Pastries	**Portion**	**Calories**	**Carbs**	**Protein**	**Fat**
Carrot Muffin	1 muffin	386 kcal	54 g	5.1 g	16 g
Blueberry muffin	1 muffin	364 kcal	52 g	6.1 g	15 g

Raspberry yogurt muffin	1 muffin	371 kcal	55 g	6.2 g	14 g
Golden Bran & Raisin muffin	1 muffin	340 kcal	48 g	6.6 g	14 g
Cornmeal muffin	1 muffin	415 kcal	53 g	6.1 g	18 g
Morning Glory muffin	1 muffin	392 kcal	53 g	5.7 g	17 g
Chunks O' Chocolate	1 muffin	402 kcal	55 g	7.4 g	17 g
Double Chocolate slim	1 muffin	343 kcal	62 g	5.6 g	8.3 g
Pralines & Cream	1 muffin	401 kcal	56 g	6.8	17 g
Coffee Cake Swirl	1 muffin	369 kcal	55 g	6.0 g	14 g
Blueberry turnover	1 turnover	360 kcal	36 g	3 g	23 g
Sugared apple fruit stick	1 stick	320 kcal	29 g	3 g	22 g

Breakfast Cereal	**Portion**	**Calories**	**Carbs**	**Protein**	**Fat**
Raisin Bran	1 cup	190 kcal	45 g	5.0 g	1.5 g
Mini Wheat's	1 cup	200 kcal	48 g	6 g	1 g
Cornflakes	1 cup	100 kcal	24 g	2 g	0 g
Harvest Crunch	1/3 cup	143 kcal	20 g	2.9 g	5.7 g
Cheerios	1 cup	110 kcal	22 g	4 g	2 g
All Bran	1 cup	165 kcal	49.9 g	7.9 g	1.3 g
Fruit Loops	1 cup	108 kcal	25 g	1.2 g	0.5 g
Corn Pops	1 cup	120 kcal	28 g	1 g	0 g
Special K	1 cup	110 kcal	22 g	7 g	0 g
Frosted Flakes	3/4 cup	120 kcal	28 g	1 g	0 g

Hot Breakfast Food	**Portion**	**Calories**	**Carbs**	**Protein**	**Fat**
Eggs, Fried	1 egg	91.5 kcal	0.6 g	6.2 g	6.9 g
Eggs, Scrambled	1 egg	101 kcal	1.3 g	6.8 g	7.4 g
Eggs, Boiled	1 egg	77.5 kcal	0.6 g	6.3 g	5.3 g
Eggs Poached	1 egg	74.5 kcal	0.6 g	6.2 g	5.0 g
Balona	1 slice	57 kcal	0 g	4 g	5 g
Bacon	1 slice	36 kcal	0 g	2 g	3 g
Ham	2 oz	103 kcal	2 g	10 g	6 g
Sausage	1 link	180 kcal	3 g	10 g	14 g
Potato Wedges	½ cup	170 kcal	22 g	2 g	9 g
Potato patties	65 g	220 kcal	25 g	3 g	12 g
Hash browns	85 g	193 kcal	28 g	2.3 g	8 g
PomPom Potatoes	85 g	220 kcal	25 g	2 g	10 g
Home Fries	½ cup	172 kcal	17.5 g	2 g	11 g
French toast	1 slice	186 kcal	26.6 g	8.4 g	4.7 g
Pancakes	1 pancake	174 kcal	21.7 g	4.9 g	7.4 g
Waffles	1 waffle	337 kcal	33.2 g	16.6 g	15.1 g
McVincents	1 portion	448 kcal	28.7 g	21.2 g	26.9 g
Hot Cereal	1 cup	163 kcal	33 g	5 g	1 g
Fruit Danish	1 med.	263 kcal	34 g	4 g	13 g
Croissant	1 med.	231 kcal	26 g	5 g	12 g

Soups	Portion	Calories	Carbs	Protein	Fat
Lipton Chicken Noodle	227 ml	68 kcal	10.6 g	3.9 g	1.1 g
Lipton Cream of Chicken	227 ml	175 kcal	16.1 g	4.5 g	9.9 g
Lipton Minestrone	227 ml	80 kcal	15.4 g	3.4 g	0.5 g
Lipton Cream of Potato Leek	227 ml	175 kcal	21.0 g	3.5 g	8.3 g
Lipton Beef Noodle	8 oz	75 kcal	12 g	3.9 g	0.8 g
Lipton Garden Vegetable	284 ml	70 kcal	15 g	2 g	0 g
Lipton Chicken & Rice	8 oz	82 kcal	13 g	3.1 g	2.4 g
Lipton Cream of Vegetable	227 ml	111 kcal	19.6 g	3.1 g	2.4 g
Lipton Cream of Broccoli	227 ml	149 kcal	14.8 g	3.1 g	9.3 g
Lipton Italian Wedding Soup	227 ml	120 kcal	21.4 g	3.8 g	2.0 g
Lipton Vegetable Florentine	227 ml	88 kcal	14.9 g	3 g	1.2 g
Lipton Seafood Chowder	227 ml	182 kcal	20.2 g	5.8 g	8.5 g
Lipton French Canadian Pea	227 ml	148 kcal	22.8 g	7.6 g	2.8 g
Lipton Cream of tomato red pepper	227 ml	103 kcal	17.6 g	3.7g	2.4 g
Lipton Cream of Mushroom	227 ml	160 kcal	15 g	3.3 g	9.3 g
Lipton Vegetable Beef Barley	227 ml	85 kcal	16.3 g	2.9 g	1.0 g

Salad Bar	Portion	Calories	Carbs	Protein	Fat
Carrot	½ cup	45 kcal	11 g	1.0 g	0 g
Cucumber	½ cup	15 kcal	3 g	1 g	0 g
Tomato	½ cup	23 kcal	5 g	1 g	0 g
Asparagus	½ cup	22.5 kcal	4 g	2.5 g	0.5 g
Red Pepper slices	¼ cup	11 kcal	3 g	0 g	0 g
Green Pepper Slices	¼ cup	11 kcal	3 g	0 g	0 g
Olives	5 olives	30 kcal	1 g	0 g	2.5 g
Chic Peas	½ cup	143 kcal	27 g	6 g	1 g
Dill Pickles	1 med.	12 kcal	3 g	0 g	0 g

Express Items	Portion	Calories	Carbs	Protein	Fat
Julienne Salad (Chef Salad)	1 bowl	290 kcal	4.6g	26.4g	18.1g
Tossed salad	1 bowl	65.2 kcal	13.1 g	3.5 g	0.9 g
Chicken BLT salad, no dressing	1 bowl	217 kcal	5.4 g	34.5 g	10 g
Chicken Caesar	1 bowl	360 kcal	15.9 g	43.4 g	12.8 g
Fruit Cup	1 cup	141 kcal	36.8 g	1.5 g	0.3 g
Fruit & Yogurt Parfait	1 cup	270 kcal	37 g	14.7 g	8.1 g
Veggies & Dip	1 cup	85.4 kcal	16.2 g	2.7 g	2.2 g
Jello, sugar free	1 cup	16 kcal	0 g	2 g	0 g
Wraps/Sandwiches – See deli					

Fruit	Portion	Calories	Carbs	Protein	Fat
Apple	1 raw	73 kcal	19 g	0 g	0 g
Orange	1 raw	62 kcal	15 g	0 g	0 g
Pear	1 raw	104 kcal	25 g	1 g	0 g
Banana	1 raw	105 kcal	27 g	1 g	1 g

Pizza	Portion	Calories	Carbs	Protein	Fat
Cheese	1 slice	386 kcal	55.7 g	21.1 g	9.7 g
Pepperoni & Cheese	1 slice	473 kcal	56.2 g	24.8 g	17.3 g
The Works	1 slice	461 kcal	59.5 g	24.9 g	14.9 g
Veggie	1 slice	415 kcal	62.3 g	22.2 g	9.9 g

Grill Works	Portion	Calories	Carbs	Protein	Fat
Hamburger w bun	1 burger	274 kcal	31 g	12 g	12 g
Cheeseburger w bun	1 burger	334 kcal	31 g	16 g	17 g
Veggie burger	1 burger	270 kcal	33 g	15 g	5.5 g
Grilled cheese	1	380 kcal	48.7 g	10.9 g	14.8 g
Veggie hotdog	1 hotdog	179 kcal	24.8 g	11 g	3.7 g
Toasted western sandwich	1 sandwich	279 kcal	35 g	18.3 g	12.5 g
Club sandwich	1 sandwich	472 kcal	52.4 g	30.3 g	15.8 g
Chicken fingers	100 grams	240 kcal	21.4 g	11 g	12.3 g
French Fries	10 fries	131 kcal	20 g	2 g	5 g
Onion rings	9 rings	275 kcal	31.3 g	3.7 g	15.5 g

Montague's Deli	Portion	Calories	Carbs	Protein	Fat
Turkey sandwich on white bread w/ mayo	1 sandwich	346 kcal	42.5g	22 g	9.1 g
Ham sandwich on whole wheat w mustard	1 sandwich	309 kcal	37.9 g	21.4 g	6.6 g
Roast beef sandwich on whole wheat bread w/ mayo	1 sandwich	384 kcal	38.5 g	28.4 g	11.1 g
Cheddar cheese slice	15 g	60 kcal	0 g	4 g	5 g
Mozzarella slice	15 g	39 kcal	0 g	4 g	2 g
Classic cold cut sub w/mayo	1 sub	469 kcal	60.2 g	31.9 g	13.6 g
Chunky chicken salad & bacon sub	1 sub	478 kcal	55.1 g	37.8 g	11.8 g
Cheddar cheese slice	15 g	60 kcal	0 g	4 g	5 g
Mozzarella slice	15 g	39 kcal	0 g	4 g	2 g
Chicken BLT Wrap	1 wrap	496 kcal	54.7 g	40.4 g	12.3 g
Greek Garden Wrap	1 wrap	503 kcal	71.3 g	18.6 g	17.1 g
Chicken Caesar Wrap	1 wrap	521 kcal	50.7 g	55.9 g	9.4 g

Home Zone Hot Meals	Portion	Calories	Carbs	Protein	Fat
Mashed potato	½ cup	121 kcal	19.9 g	2.2 g	4.4 g
Baked potato w/skin	1 med	221 kcal	51 g	5.0 g	0 g
Scalloped Potato	½ cup	105 kcal	13 g	4 g	5 g
Boiled potato	1 med	118 kcal	27.3 g	2.5 g	0 g
White Rice	½ cup	98 kcal	21.6	2.9 g	0.2 g
Brown rice	½ cup	108 kcal	22.5 g	2.5 g	0.8 g
Carrots, cooked	½ cup	54 kcal	12.6 g	1.3 g	0 g
Turnip, cooked	½ cup	15 kcal	4 g	1 g	0 g
Yellow Beans, cooked	½ cup	21.9 kcal	4.9 g	1.2 g	0 g

Green Beans, cooked	½ cup	21.9 kcal	4.9 g	1.2 g	0 g
Cabbage	½ cup	17 kcal	4 g	1 g	0 g
Squash	½ cup	18 kcal	3.9 g	0.8 g	0.3 g
Peas	½ cup	67.2 kcal	12.5 g	4.3 g	0 g
Corn kernels	½ cup	82.9 kcal	20.4 g	2.5 g	0.5 g
Brussel Sprouts	½ cup	34 kcal	5 g	2 g	0 g
Beets	¼ cup	28 kcal	6.0 g	0.8 g	0.1 g
Mixed Veg	½ cup	38.3 kcal	7.5 g	2.1 g	0 g
Cauliflower, cooked	½ cup	15 kcal	4 g	1 g	0 g
Sweet potato	½ cup	129 kcal	29.6 g	2.5 g	0.3 g
Broccoli, cooked	½ cup	25.8 kcal	4.9 g	2.9 g	0 g
Chicken, Baked	4 oz	221 kcal	0 g	32.3 g	9.2 g
Chicken Wings	1 wing	99 kcal	0 g	9 g	7 g
Chicken breast, grilled	5 oz	231 kcal	0g	47 g	3 g
Chicken Legs, BBQ	100 g	178 kcal	0 g	23 g	9 g
Chicken Breast, no skin	1	284 kcal	0 g	53 g	6 g
Cordon Blue Chicken	5 oz	341 kcal	10.9 g	46.1 g	11.2 g
Chicken Kiev	5 oz	311 kcal	9.9 g	34.6 g	14.0 g
Chicken Souvlaki	3.2 oz	93.6 kcal	0 g	17.8 g	2.5 g
Hot Turkey Sandwich	1 portion	348 kcal	35.5 g	34.9 g	7.3 g
Cornish hens w/skin	½ hen	296 kcal	0 g	25 g	21 g
Beef Dip on a bun/Philly Steak Sandwich	1 portion	422 kcal	46.7 g	36.2 g	8.7 g
Lasagna	3 oz	345 kcal	38.3 g	23.6 g	11.4 g
Hot Beef Sandwich	1 portion	328 kcal	34.1 g	30.4 g	5.4 g
Corned Beef (boiled Dinner)	4 oz	203 kcal	1 g	21 g	12 g
Tacos	1 Taco	266 kcal	9.4 g	19.7 g	16.3 g
Peppered Steak	5 oz	296 kcal	0 g	43 g	12 g
Chicken Balls	100 grams	210 kcal	17 g	12 g	11 g
Sausage	1 (100 g)	323 kcal	1.5 g	20 g	25.7 g
Pork Ribs Maple Leaf- Honey Garlic	100 g	170 kcal	0 g	14 g	10 g
Ham, Baked	4 oz	156 kcal	2.8 g	22 g	5.7 g
Roasted Pork	4 oz	243 kcal	0 g	33 g	11 g
Liver & Onions	4 oz	182 kcal	12 g	24 g	4.0 g
Alfredo Sauce	½ cup	354 kcal	33.2 g	24.7 g	13.4 g
Tomato Sauce	½ cup	60 kcal	13.9 g	2.5 g	0.4 g
Rose Sauce	½ cup	378 kcal	58.9 g	10.5 g	12.1 g
Spaghetti & meatballs	1 cup	332 kcal	39 g	19 g	12 g
Gravy	2 oz	21 kcal	3.0 g	0.4 g	0.8 g
Macaroni & Cheese	3 oz	105 kcal	11.4 g	4.7 g	4.5 g
Veggie Quesadilla w/ cheese	1 full tortilla	428 kcal	49 g	18.5 g	15.4 g
Veggie Wraps w/out cheese	11” wrap	283 kcal	60 g	9.9 g	1.6 g
Vegetarian lasagna	3 oz	222 kcal	47.9 g	8.4 g	1 g
Tofu, fried	2 oz	154 kcal	6 g	10 g	11 g
Haddock, Baked	4 oz	127 kcal	0 g	27.5 g	1.0 g
Fish Sticks	28.4 g	77 kcal	7 g	4 g	3 g

Appendix VIII: Contents of *CHO* link from Weblog

ENERGIZE WITH CARBOHYDRATE!
Muscle and Brain Fuel

Here's a handy tool to help you make wise food choices. It is designed to give you an indication of the carbohydrate (CHO) content of common foods. Foods marked * could be high in fat.

0–5 grams of CHO/serving	6–10 grams of CHO/serving	11–20 grams of CHO/serving	More than 20 grams of CHO/serving
GRAIN PRODUCTS	**1 Serving = 1 slice bread or 125 mL (½ c) cooked cereal/pasta/rice or 30g ready-to-eat cereal (check the label for the volume) or equivalent as indicated.**		
	Cream of wheat; taco shell (13 cm diameter); 2 graham crackers (14 g); 2 melba toast (10 g); 4 saltine crackers (12 g); 4 Ritz™ crackers* (12 g); 250 mL (1 c) air popped popcorn; rice cake (9 g); fig bar; oatmeal cookie*; peanut butter cookie* (15 g).	Bread: all types; 125 mL (½ c) croutons; ½ pita (16.5 cm diameter); ½ English muffin; ½ crusty roll; ½ hamburger bun; ½ hot dog roll; tortilla (18 cm diameter); hot oat bran cereal; large flake oatmeal hot cereal; granola bar* (28 g); pancake or waffle (10 cm diameter); wild rice; instant rice; bulgur; couscous.	½ bagel (10 cm diameter); 1 pouch instant cream of wheat; 1 pouch instant oatmeal; bran flakes; cheerios; corn flakes; low fat granola; mini-wheats, muesli; raisin bran; wheatibix; most cereal; macaroni; pasta; long grain rice; 2 fig bars (32 g); date square.
VEGETABLES AND FRUIT	**1 Serving = 125 mL (½ c) or equivalent as indicated. Fruits and juices are based on unsweetened varieties.**		
Alfalfa or bean sprouts; asparagus; broccoli; cabbage; cauliflower; celery; chard; cucumber; green or red pepper; green or yellow beans; lettuce; mushrooms; radish; spinach; zucchini; rhubarb; tomato; turnips; 1 raw apricot.	½ avocado*; beets; Brussels sprouts; carrots; canned pumpkin; coleslaw*; raw onion; snow peas; winter squash; stewed tomatoes; tomato or vegetables juice; raw blackberries, raspberries, strawberries; grapes; ½ grapefruit (9.5 cm diameter); raw peach, plum, tangerine, mandarin.	Green peas; parsnips; potatoes (boiled, hash brown*, mashed); 5 onion rings*; 10 French fries*; applesauce; 60 mL (¼ c) dried apricots, blueberries, cherries, canned fruit cocktail or peaches or pears, nectarine, orange. **Juices**: carrot, apple, apricot, grape, grapefruit, orange, pineapple.	Corn; lima beans; sweet potato; apple; banana; mango; pear; watermelon slice (2.5 cm x 25 cm diameter). 4 dried dates; 2 dried figs; 5 prunes; 60 mL (¼ c) raisins. **Juices**: pear nectar; prune juice.
MILK PRODUCTS	**1 Serving = 250 mL (1 c) or 50 g (1½ oz) cheese or equivalent as indicated.**		
Cheese, dry curd cottage cheese; 50 mL cheese spread*.	Soy based beverage; cottage cheese (0.1–2%).	Milk; 125 mL (½ c) skim milk powder; 175 g plain yogurt; hot cocoa sweetened with aspartame; 125 mL (½ c) frozen yogurt; ice milk or ice cream*.	Chocolate milk; hot cocoa made with milk and sugar; eggnog*; milkshake; 175 g flavoured or fruit yogurt; yogurt beverage; 125 mL (½ c) milk pudding* or sherbet.
MEAT AND ALTERNATIVES	**1 Serving = 90 g (3 oz) cooked, lean meat, fish or poultry (visible fat and/or skin removed) or 250 mL (1 c) cooked/canned legumes (e.g., kidney beans, chickpeas, lentils) or equivalent as indicated.**		
Meat, poultry; fish (unless breaded or battered); 2 eggs; tofu; 60 mL (¼ c) brazil*, macadamia*, pine* nuts, filberts*, pecans*, walnuts*.	30 mL (2 Tbsp) peanut butter*; 60 mL (¼ c) almonds*, cashews*, coconut*, mixed nuts*, peanuts*, pine nuts*, seeds*; 125 mL (½ c) tuna salad*.	Breaded or battered fish fillet*; fish sticks*.	Beans; peas; lentils.
COMBINATION DISHES	**1 Serving = 250 mL (1 c) or equivalent as indicated.**		
	Canned noodle soups; mushroom soup with water.	Chunky soups; minestrone soup; mushroom soup with milk; ⅛ medium pizza; taco*; beef stew; French toast.	Pea soups; 60 mL (¼ c) hummus*; macaroni with cheese*; spaghetti with tomato sauce or with meat balls*; chili con carne; baked beans.
OTHER FOODS CATEGORY	**1 Serving = 15 mL (1 Tbsp) or equivalent as indicated. Other foods can be included in moderation if you have sufficient servings from the other food groups.**		
1 chocolate chip cookie*; 10 pretzel sticks.	10 potato or corn chips*.	Cranberry cocktail; lemonade; popsicle (75 g).	Soft drink (not diet).

SNAC Sport Nutrition Advisory Committee
Comité consultatif sur la nutrition sportive

May 2005

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Appendix IX: Contents of *Energy Drinks* link from Weblog

Energy Drinks:
What you need to know

Gatorade Sports Science Institute

What are Energy Drinks?

Energy drinks are a new product available in Canada. They are often found in small (250 mL) cans and claim to "energize" you and make you more alert. Some examples include:

- Red Bull Energy Drink®
- SoBe Adrenaline Rush®
- SoBe No Fear®
- Hype Energy Drink®
- Red Dragon Energy Drink®
- YJ Stinger®

Are They Safe To Drink?

Unlike most food and beverages, energy drinks are regulated as supplements. Health Canada cautions that children and pregnant or breastfeeding women should avoid energy drinks. Health Canada also cautions that energy drinks should NOT be mixed with alcohol and no more than 500 mL be consumed in one day.

Not all energy drinks that are sold have been evaluated by Health Canada yet. If the energy drink has a NPN (Natural Health Product Number) on the can, it has been evaluated, however this "evaluation" does not guarantee that a particular energy drink is a healthy choice. Check the label.

If you have had a bad reaction to an energy drink you should let Health Canada know at: www.hc-sc.gc.ca

What is in Energy Drinks and Why?

Caffeine Caffeine is a stimulant and can be found on energy drink labels listed as Guarana, yerba mate, or caffeine. Most drinks have 80 mg or more per 250 mL can, which is double that of soft drinks but half that of brewed coffee. This amount of caffeine is probably not harmful for adults, but exceeds recommendations for children. Health Canada suggests no more than 45 mg/day for children 4-6 years, 62.5 mg/d for 7-9 years and 85 mg/day for children 10-12 years.	**Herbs** Many energy drinks contain the herbs *Gingko biloba* and *ginseng*. These herbs do not improve performance and are added to most energy drinks in very low amounts. They can interact with drugs like warfarin and affect blood clotting, however, so be sure to talk to your doctor.
Taurine Taurine is an amino acid and found in the diet in meat and dairy products. Some energy drinks claim that taurine makes you more alert but there is no research to show this. Most energy drinks have 1 gram of taurine per 250 mL can. The safety of such large doses is not known.	**Carbohydrate** Most energy drinks contain twice as much sugar (carbohydrate) as a sports drink. Excessive amounts of sugar consumed during exercise can lead to nausea stomach cramps, and diarrhea in some people. Be sure to practice what and how much you drink during training before competing so that you know what your system can tolerate.

Should I Use Energy Drinks During Exercise?

The best choices during exercise are water or a sports drink. The high sugar content and carbonation of energy drinks can interfere with hydration which makes them a poor choice for use during exercise. Proper hydration is the main concern during exercise, especially in the heat. Furthermore, caffeinated beverages are not recommended for young athletes before, during or after exercise.

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FOR MORE INFORMATION ON THE GATORADE SPORTS SCIENCE INSTITUTE (GSSI) LOG ON TO: www.gssiweb.org or e-mail [redacted]

Appendix X: Contents of *Fad Diets* link from Weblog

MSVU Applied Human Nutrition Website
Student Nutrition Services - The Latest Fad Diets

The Nutrition Action Health Letter, 2004, evaluates the most common diet books that are available today, based on the scientific research (or lack of) that these diets are based on.

Title: The South Beach Diet

Author: Arthur Agatston

Claim: Switching to good carbohydrates stops insulin resistance, cures cravings, and causes weight loss. Good fats protect the heart and prevent hunger.

Foods: Yes: seafood, chicken breast, lean meat, low fat cheese, most veggies, nuts, oils; (later) whole grains, most fruits, low fat milk or yogurt, beans

Foods: Less: fatty meats, full fat cheese, refined grains, sweets, juice, potatoes.

Is It Science Solid? The South beach diet is a healthy version of the Atkins diet that's backed by solid evidence on fats and heart disease.

Is it Healthy? (+) This diet suggests mostly healthy foods.

Worst Feature: Restricts carbohydrates, bananas, pineapple and watermelon.

Most Preposterous Claim: You won't ever be hungry (despite menus that average just 1200 calories per day)

Title: The Ultimate Weight Solution

Author: Phil McGraw

Claim: Foods that take time to prepare and chew lead to weight loss. Other "keys to weight loss freedom" include "no-fail environment, right thinking, healing feelings and circle of support".

Foods: Yes: Seafood, poultry, meat, low-fat dairy, whole grains, most veggies, fruits, (limited) oils.

Foods: Less: Fatty meats, sweets, refined grains, full-fat dairy, microwavable entrees, fried foods.

Is It Science Solid? Tough love manual that relies more on Dr. Phil's opinion than on science

Is it Healthy? (+) Mostly healthy foods. (-) Gives no recipes or advice on how much of what to eat.

Worst Feature: Readers may buy Dr. Phil's expensive, questionable supplements, bars and shakes.

Most Preposterous Claim: " Each of these nutrients (in his supplements) has solid clinical evidence (and a record of safety) behind it".

Title: Dr. Atkins' New Diet Revolution

Author: Robert C. Atkins

Claim: A low carb diet is the key to weight loss (and good health) because carbs cause high insulin levels.

Foods: Yes: Seafood, poultry, meat, eggs, cheese, salad veggies, oils, butter, cream; (later) limited amounts of nuts, fruits, wine, beans, veggies, whole grains.

Foods: Less: Sweets, refined grains, milk, yogurt.

Is It Science Solid? Low carb "bible" overstates the results of weak studies and evidence on supplements (However in recent small studies, people lost more weight after six but not 12 months on Atkins than on a typical diet).

Is it Healthy? (-) Too much red meat may raise the risk of colon or prostate cancer (-) Lack of fibre, vegetables, and fruits may raise risk of heart disease, stroke, cancer, diverticulosis, and constipation.

Worst Feature: Long-term safety is not established.

Most Preposterous Claim: "Only by doing Atkins can you lose weight eating the same number of calories on which you used to gain weight".

Title: Good Carbs, Bad Carbs

Author: Johana Burani & Linda Rao

Claim: Switching from high-glycemic-index foods ("gushers") to low-glycemic index foods (tricklers") aids weight loss.

Foods: Yes: Sourdough breads, beans, most fruits, low-fat dairy, most vegetables, chips, pasta, Special K, pudding, pound cake.

Foods: Less: White bread, sweets, Raisin bran, potatoes, watermelon.

Is It Science Solid? Dumbed-down, sloppy version of the New Glucose Revolution that inflates the importance of the glycemic index.

Is it Healthy? (+) Mostly healthy foods (-) Few recipes, menus, or specifics (-) Some low glycemic index foods are unhealthy (e.g. sponge cake, chips, chocolate bars).

Worst Feature: Dieters may assume that they can eat as many "tricklers" as they want and not gain weight.

Most Preposterous Claim: "…in spite of the title Good Carbs, Bad Carbs, there are no bad carbs.

Title: Enter the Zone

Author: Barry Sears

Claim: Eating the right mix of the right fats, carbs and protein keeps you trim and healthy by lowering insulin.

Foods: Yes: seafood, poultry, lean meat, fruits, most vegetables, low-fat dairy, nuts

Foods: Less: Fatty meats, full-fat dairy, butter, shortening, (limited) grains, sweets, potatoes, carrots, and bananas.

Is It Science Solid? Exaggerates evidence that the zone diet is the key to weight loss and implies that the diet can cure virtually every disease.

Is it Healthy? (+) Mostly healthy foods (-) Few recipes or menus.

Worst Feature: May convince people to use the diet to treat cancer, AIDS, chronic pain, impotence, alcoholism, depression, and arthritis.

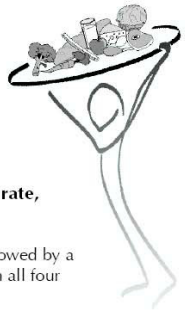
Most Preposterous Claim: " I believe that the hormonal benefits gained from a Zone-favorable diet will be considered the primary treatment for all chronic disease states, with drugs being used as a secondary backup."

Sources

Lieban, B. (2004). Battle of the Diet Books*. Nutrition Action Health Letter*, 31 (1), 6-10.

Appendix XI: Contents of *Fluids and Foods After Training/Competition* link from Weblog

Fluids and Foods *AFTER* Training/Competition



Post-exercise, nutrition provides:

- Energy and nutrients
- Physical comfort; absence of hunger
- Mental alertness

Targets:

- Optimal fluid and electrolyte levels
- Carbohydrate to restore muscle glycogen
- Protein to repair muscle damage
- Nutrients to support health and a strong immune system

Why?

- To replace lost fluid
- To ensure energy and nutrients to recover and prepare for the next event.

For rapid glycogen replacement, consume fluid and carbohydrate-rich foods 15 minutes (or as soon as possible) after exercise. Carbohydrate consumed immediately after exercise moves readily through the blood stream and into muscles to replace glycogen. Within 2 hours, absorption rates slow to normal.

***AFTER* exercise**:

- Drink 1½ L of fluid for every kg of body weight lost.
- Consume some salty fluids and food for electrolyte (sodium) replacement and better fluid retention.
- Eat a high carbohydrate meal/snack which includes rapidly absorbed (high glycemic index*) foods.
- Have some lean protein food.
- Avoid skipping meals. Be sure to eat your next regular meal (breakfast, lunch, or dinner).

* For information about the glycemic index of food, check out the Carbohydrate – Go Food section of Training Diet – Everyday Eating.

The amount of food you consume immediately after exercise will vary according to the amount of time between your training or competition and your next scheduled meal or snack.

Late night *RECOVERY* nutrition:

After an evening training session or competition, it is never too late to eat your recovery meal. Plan a carbohydrate-based meal such as cereal with milk and fruit or a lean meat sandwich with juice.

CONVERSION: 250 mL = 1 cup = 8 oz.

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***AFTER* – Focus on Fluid and Carbohydrate, and Protein**

After exercise, eat a snack immediately, followed by a balanced meal within 2 hours. Choose from all four food groups:

Grain products	Vegetables and fruit
Milk products	Meat and alternatives

Meal ideas – from home or on the go:

Plan foods to carry with you or food outlets where you can buy part or all of a meal.

- Fruit juice, bagel (with jam), yogurt
- Hot or cold cereal, milk, banana, juice
- Egg, ham on an English muffin, juice
- Lean meat sandwich or sub, carrot sticks, milk, oatmeal raisin cookie, fruit
- Minestrone soup, bagel, cheese, vegetable juice
- Chili on a baked potato or with a crusty roll, milk
- Pasta, vegetables and meat sauce, bread roll, juice, applesauce
- Bean burrito with vegetables, chocolate milk
- Thick crust pizza with lean meat, vegetable topping, milk, fruit

Snack ideas: Pack snack items to have on hand. Some snacks can be part of your next meal.

- Cereal/cereal bar, fruit, milk/yogurt
- Pretzels, tomato or fruit juice
- Bagel, peanut butter, jam, chocolate milk
- Yogurt, crackers or cookies, juice
- Pita and/or raw vegetables with hummus, milk
- Canned beans and pita, vegetable juice
- Fruit smoothie (fruit, milk, yogurt) and toast
- Sport or energy bar, fruit, chocolate milk

Snacks for backpack or car:

- Dry cereal
- Cereal, sport, or energy bars
- Juice boxes or fruit cups
- Crackers
- Tuna or beans in cans with pull-off tops
- Dried fruit
- Trail mix with cereal

Avoid bacterial contamination of meals and snacks. Keep cold foods cold and hot foods hot. Bacteria reproduce quickly at room temperature.

Try recovery fluid and food in training to find out what is comfortable for you. Never try new food or drinks if you will be competing again within the next 48 hours.

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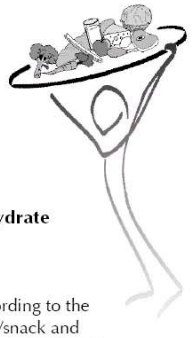
Appendix XII: Contents of *Fluids and Foods before Training/Competition* link from Weblog

Fluids and Foods *BEFORE* Training/Competition



Pre-exercise nutrition provides:

- Energy
- Physical comfort
- Mental alertness

Targets:

- Optimal fluid intake
- High carbohydrate, moderate protein, and low fat

Why?

- To maximize fluid levels and prevent dehydration.
- To supply food that is quickly and easily digested.
- To ensure energy to train or compete.
- To prevent hunger before and during exercise.

Timing and meal/snack size are related.

Generally allow:

- 3-4 hours for a large meal to digest
- 2-3 hours for a smaller meal
- 1-2 hours for a small snack or blender/liquid meal or, whatever your own tolerance indicates

CAUTION: Spicy, gas producing, fatty, and/or fibre-rich foods may cause discomfort. Products containing caffeine may also be problematic.

***BEFORE* exercise**:

- Drink 400-600 mL of fluid 2 to 3 hours prior.
- Drink 150-350 mL fluid about 15 minutes before exercise, depending on your comfort and sport.
- Eat a meal or snack, high in carbohydrate, 2 to 4 hours prior. Ideal carbohydrate foods include whole grains, vegetables, fruit, juices, milk, yogurt, soy drinks, and legumes. Legumes are fibre-rich and can be gas-producing.
- If you have a "nervous stomach" before events, choose lower-fibre grain products, juice, pureed foods, or a meal replacement beverage.

Experiment with fluids and foods in training to find out what, and how much, is comfortable for you.

Never try new foods or drinks before or during competition.

CONVERSION: 250 mL = 1 cup = 8 oz.

***BEFORE* – Focus on Fluid and Carbohydrate**

Meal ideas – from home or on the go:

The amount and type of food will vary according to the amount of time available between the meal/snack and the start of training or competition. Allow time for digestion.

- Toast/bagel with jam, peanut butter, juice, yogurt
- Oatmeal/cereal, milk, raisins, juice
- Pancakes with a little syrup/spread, ham, juice
- Grilled chicken sandwich, juice
- Lean meat sandwich, carrots, milk, oatmeal raisin cookie, fruit
- Minestrone soup, cheese, crackers, vegetable juice
- Chili, bagel, milk
- Pasta with tomato/lean meat sauce, applesauce, chocolate milk
- Lentil soup, crusty roll, salad with a little dressing, soy beverage

Snack ideas:

- Fruit (fresh, canned, or juice)
- Fruit yogurt
- Low-fat muffin, juice, or applesauce
- Yogurt, social tea biscuits, juice
- Pita with hummus, vegetable juice
- Fig or oatmeal cookies, fruit, milk

Snacks for backpack or car:

- Dry cereal
- Cereal, sport, or energy bars
- Juice boxes or fruit cup
- Crackers
- Dried fruit
- Trail mix with cereal

From these guidelines, make a list of the drinks and foods that work for you.

- Plan ahead and be prepared.
- Carry pre-exercise food.

Avoid bacterial contamination of meals and snacks. Keep cold foods cold and hot foods hot. Bacteria reproduce quickly at room temperature.

Before exercise, choose foods which are higher in carbohydrate and lower in protein and fat. This will allow quick absorption of carbohydrate energy from the food into the body. Include protein and fat sources during meals and snacks at other times during the day.

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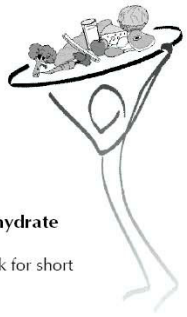
Appendix XIII: Contents of *Fluids and Foods during Training/Competition* link from Weblog

Fluids and Foods *DURING* Training/Competition



During exercise, nutrition provides:
- Energy
- Physical comfort; absence of hunger
- Mental focus for best technique and skill execution

Targets:
- Optimal fluid and electrolyte intake
- Carbohydrate to maintain blood glucose

Why?
- To maximize fluid levels and prevent dehydration.
- To replace fluid losses.
- To ensure energy to train or compete.

Fluid needs vary with your sweat rate, sport, and environment (temperature, humidity, altitude).

***DURING* exercise**:
- Drink 150-350 mL every 15 to 20 minutes.
- Drink more on days when you train harder.
- Drink more during hot, humid weather.
- Drink fluid when training in cold weather.
- When training or competing for more than an hour, consume some carbohydrate (e.g. a sport drink).

Carbohydrate beverages: For sessions longer than an hour, carbohydrate helps maintain focus, technique, and energy.

The recommended solution for optimal fluid absorption during exercise is 40-80 g/L carbohydrate and 0.5-0.7 g/L sodium.
- Sport drinks provide water, carbohydrates, (40-80 g/L) and electrolytes (e.g. sodium, potassium).
- Fruit juice (100-160 g/L carbohydrate) needs to be diluted for rapid absorption during exercise.
- Energy drinks and soft drinks are too concentrated for rapid absorption.

You can make a fluid replacement drink by mixing:
- 500 mL unsweetened orange juice
- 500 mL water
- 1.5 mL salt

One litre = 54 g (5.4%) carbohydrate and 0.5-0.7 g sodium.

Salt – sodium: Either a sport drink or a pinch of salt adds sodium, which is helpful for athletes training or competing for several hours and consuming large amounts of fluid.

To find out how much is optimal and comfortable, always test the **amount** and **type** of fluid and food **in training – never during competition!**

CONVERSION: 250 mL = 1 cup = 8 oz.

***DURING* – Focus on Fluid and Carbohydrate**

Water is an effective fluid replacement drink for short (less than one hour) exercise sessions.

Athletes consume more when the fluid:
- Is easy to access (right beside them).
- Is a flavour they like.
- Is chilled (about 10 degrees C).
- Has sodium added (0.5-0.7 g/L enhances flavour).

Snack ideas *DURING* exercise breaks:

For training sessions lasting several hours and during competition, emphasize fluid and carbohydrate-rich snacks during rest breaks. The amount you consume will vary according to the amount of time available between the snack and the next bout of exercise. Allow time for digestion.

For short breaks (less than 2 hours):
- Diluted fruit juice or a sport drink
- Fruit (fresh, canned, or pureed)
- Bread, pretzels, or crackers and vegetable juice
- Cereal, sport, or energy bars
- Arrowroot, fig, oatmeal, or similar low-fat cookies
- Plain or chocolate milk
- Fruit yogurt

For a longer break (2 to 3 hours):
- Juice and a bagel
- Yogurt, fruit, and water
- A lean meat sandwich and vegetable juice
- Fruit, cookies, and chocolate milk

Ideas for a small meal (about 3 hours):
- Cereal, fruit, and milk
- Vegetable soup, lean meat sandwich, milk, and fruit
- Rice, steamed vegetables, chicken or fish, yogurt, juice

Avoid bacterial contamination of meals and snacks. Keep cold foods cold and hot foods hot. Bacteria reproduce quickly at room temperature.

During breaks between exercise sessions, choose foods that are higher in carbohydrate and lower in protein and fat. This will allow for quick digestion and absorption of fluid and carbohydrate into the body, helping prepare you for the next bout of exercise.

- Plan ahead and be prepared.
- Carry snack items, or know where you can buy them.

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Appendix XIV: Contents of *Healthy eating on a budget* link from Weblog

MSVU Applied Human Nutrition Website
Student Nutrition Services - Healthy Eating on a Budget

Healthy Eating can be achieved on a limited budget. The following are some tips to help you eat a healthy diet without spending a lot of money.

Plan your meals ahead and make a grocery list before going shopping

You can plan healthy meals, ensure variety and avoid impulse purchases at the grocery store.

When it comes to protein, just buy what you need

Meats can be expensive, According to Canada's Food Guide adults need two to three servings of meat per day. A serving of meat is comparable to the size of a deck of cards. Meals such as stir-fry, pasta, chili, and stew can have a serving of meat and lots of veggies. Marinating less expensive cuts of meat is another way to cut down on cost, remain tender, and still have lots of taste. Beans and lentils are a great substitute for meat, they still give you the protein and can make a tasty soup.

Compare prices

Look for savings. Most grocery stores put out flyers; this can help you to save money and can also help you with meal planning. Try store brands and no name products. Check the ingredient list you may be surprised to see that the only difference between a store brand product and a brand name product is the price.

Buy in bulk

When purchasing items such as rice, potatoes, pasta, beans, and spices, bulk is often a way the way to go. For example it is less expensive to purchase a large bag of rice than to purchase several small bags of rice. Buying bulk will save you money, as well as time and gas, as fewer trips will be made to the grocery store. When meats go on sale you can buy in bulk and freeze in reusable containers for future meals. Buying in bulk can save money, but be sure not to buy more than you can use or freeze.

When purchasing convenience foods, choose wisely

It is often cheaper to prepare a meal than to have it prepared for you. Home cooked meals are often tastier, healthier, and can be tailored to your likes and dislikes. When buying items such as cheese it is cheaper to buy a larger amount and grate it yourself, cheese can be frozen and used at a later date.

Make extra portions and freeze them for later

If you're a busy person and find it easier to throw a processed meal in the oven or microwave, when you do have some time to prepare a meal make a large meal and freeze portions for later. This can cut down on the processed meals and increase the nutrition of your diet.

First in, first out

Rotate the foods in your fridge to make sure the older items are being used first. Ensure that food is used by the expiry/best before date. This will cut down on spoilage and give you fresher meals.

When you go out take a bottle of water with you

This may sound funny but buying water or another beverage each time you go out or take a long can add up. This can also work for snacks. If you keep a few healthy snacks in your purse or car it can cut down on high fat snacks and can save you money.

Purchase fresh foods/seafood form local venders

These foods are often cheaper and fresher than local supermarkets.

Take advantage of coupons

Coupons can be found in grocery stores or flyers, take advantage of these as they save you money.

For more information check out these web sites

- Dietitians of Canada
- Home Buyers Information Center

Appendix XV: Contents of *How to tell if a website is reliable* link from Weblog

MSVU Applied Human Nutrition Website
Nutrition Links

Professional health organizations, government health agencies, volunteer health agencies, marketing boards, commodity groups and consumer groups provide reliable health and nutrition information.

- Professional health organizations: Dietitians of Canada, Provincial Dietetic Associations, National Institute of Nutrition (NIN).
- Government Health Agencies: Health Canada, Canadian Food Inspection Agency, Provincial Health Departments.
- Volunteer health agencies: Heart and Stroke Foundation of Canada, Canadian Cancer Society, Canadian Diabetes Association.
- Marketing Boards/Commodity Groups: Canadian Egg Marketing Agency, Canadian Sugar Institute, Beef Information Centre, Canola Council of Canada, Dairy Bureau of Canada, Canada Pork Inc., Provincial Department of Fisheries.
- Reputable consumer groups: Canadian Council of Grocery Distributors, Canadian Partnership for Consumer Food Safety Education, Consumers' Association of Canada, Canadian Biotechnology Advisory Council, Food Biotechnology Communications Network.

Is This a Reliable Website?

- **Who is responsible for the site?**
  Check the three-letter tag that follows the dot in the site's name.

.gov	government	.edu	university
.com	commercial	.org	non-profit organization

- Government, university and non-profit organization sites are generally reliable sources of information. A commercial web site whose main motive is to sell something increases risk of bias.
- **Do the names and credentials of information providers appear?**
  Many reliable sources provide e-mail addresses or other ways to obtain information about the site or credentials of the person(s) providing the information.
- **Are links with other reliable sites provided?**
  Reputable organizations almost always provide links with other similar sites. Be aware that anyone can link a web page to a reputable site without that organization's permission.
- **Is the site updated regularly?**
  Nutrition information changes rapidly. Sites should be updated often.

Some credible websites include:

Dietitians of Canada
www.dietitians.ca

National Institute of Nutrition
www.nin.ca

Health Canada
www.hc-sc.gc.ca

Canadian Food Inspection Agency
www.cfia-acia.agr.ca

Heart and Stroke Foundation of Canada
www.heartandstroke.ca

Canadian Cancer Society
www.cancer.ca

Canadian Diabetes Association
www.diabetes.ca

Canadian Egg Marketing Agency
www.canadaegg.ca

Canadian Sugar Institute
www.sugar.ca

Beef Information Centre
www.beefinfo.org

Canola Council of Canada
www.canolainfo.org

Dairy Bureau of Canada
www.nutritionstuff.org

Canadian Partnership for Consumer Food Safety Education
www.canfightbac.org

Food Biotechnology Communications Network
www.foodbiotech.org

Canadian Biotechnology Advisory Council
www.cbac-cccb.ca

Consumers' Association of Canada
www.consumer.ca

National Council Against Health Fraud,
www.ncahf.org

Tufts University
www.navigator.tufts.edu

Arbor Nutrition Guide
http://www.arborcom.com

Gatorade Sports Science Institute
www.gssiweb.com

American Dietetic Association

www.eatright.org

Public Health Nutritionist Central Health Region (Nova Scotia)
www.gov.ns.ca/health

U.S. Food and Drug Administration (FDA)
www.fda.gov

U.S. Department of Agriculture
www.usda.gov

Nova Scotia Nutrition Council
www.nsnc.ca

Atlantic Health Promotion Research
www.medicine.dal.ca/ahprc

Adapted from: Sizer, F. & Whitney, E. (2000, p. 24). Nutrition Concepts and Controversies. Scarborough, ON: Nelson/Thomson Learning.

Appendix XVI: Contents of *Sports Drinks* link from Weblog

Sports Drinks:
Their role in hydration for athletic performance

Gatorade Sports Science Institute

Why Do I Need to Drink During Exercise?
Anyone who exercises can be at risk for dehydration. When we exercise we produce heat, which our bodies can help to control through sweating. If our core body temperature climbs just a few degrees Celsius, then heat illness, heat stroke and even death can occur. When we sweat we can help cool our bodies but can become dehydrated. Many athletes can lose 0.4 to 2.0 L of sweat (1 to 4 lb loss) in just one hour, especially if exercising in the heat either intensely or for a long time.

How Much Should I Drink During Exercise?
You should drink to replace the amount you lose in sweat. Weigh yourself before and after exercise. Any change will be water weight and that is how much you have left to replace. As a guide, approximately 150-350 mL of fluid should be consumed every 15 to 20 minutes during exercise to minimize the potential of dehydration.

Even as little as 2% dehydration (e.g. a 3 lb. loss for a 150 lb individual) can hurt your athletic performance – but many athletes lose much more than this. You need to be sure to take your hydration seriously.

When Should I Choose a Sports Drink?
Sports drinks are specially designed to replace an athlete's losses and can benefit a wide variety of athletes, including those:

- With very high sweat rates (1L/h or more)
- Exercising either very hard or for a long time including endurance and team sport athletes
- Exercising in hot and humid conditions or while wearing protective sports equipment such as with hockey and football
- To speed up recover after exercise (replaces water, carbohydrates-energy and electrolytes).

What Should I Look for in a Sports Drink?

Water
This is the first and most important ingredient. Make sure your sports drink is not carbonated so that it is easy to drink and doesn't make you feel full or bloated.

Sodium
Sweat contains more than water. Have you ever noticed a white powder on your workout clothes or skin? That is the salt you lose in sweat. Adding salt to a sports drink can not only help to prevent muscle cramps, but it can actually help you to stay better hydrated. Sports drinks should contain at least 500 to 700 mg of sodium per liter although ultra-endurance athletes or athletes prone to cramping may require more.

Flavour
Adding flavour to a sports drink helps athletes drink more than when they are given water alone.

Carbohydrate (sugar)
Sugar improves the taste, helps you drink more, keeps blood glucose from dropping, and helps fuel active muscles so that you can exercise longer and harder. Carbohydrates help to keep you from "bonking" (hitting the wall), which occurs when muscles run out of fuel, usually after 2 or more hours of activity.
Consuming between 30-60 grams of carbohydrate per hour of activity can improve endurance and high-intensity stop and go sport performance, prolong time to exhaustion, improver power output and delay fatigue.
On the other hand, too much carbohydrate can upset your stomach and hurt your performance. To prevent stomach and intestinal upset be sure your drink has no more than 80 grams of carbohydrate per liter (40-80 grams/L is best). Note that juice, pop, and energy drinks like Red Bull all contain more than 100 grams of carbohydrate per litre, so they are not intended for using during exercise.
Look for a combination of carbohydrates, including glucose, sucrose, fructose and/or maltodextrin on the label, which helps to speed absorption versus taking just one type of carbohydrate.

Bottom Line
Many different types of athletes can benefit from the use of a sports drink that contains the appropriate amounts of carbohydrate (40-80 g/L) and sodium (500-700 mg/L) to help improve their athletic performance. It is always better to try a sports drink in training first before using it in competition so that athletes may determine which brands and flavours they prefer. Athletes who are concerned about selecting the appropriate sports drink should consult with a Registered Dietitian who specializes in sports nutrition to help them develop a hydration routine that meets their individual needs.

Heather Petrie, M. Sc, P.Dt.. is a lecturer in the School of Nutrition and Dietetics at Acadia University in Nova Scotia and is an advisory board member of the Gatorade Sports Science Institute Canada.

FOR MORE INFORMATION ON THE GATORADE SPORTS SCIENCE INSTITUTE (GSSI) LOG ON TO:
www.gssiweb.org or e-mail [redacted]

Appendix XVII: Contents of the *Training Diet* link from Weblog

TRAINING DIET

Carbohydrate – Go Food

Question: *(Answer at the bottom of page 2)*

Carbohydrate is an important source of energy for your body.

☐ TRUE ☐ FALSE

Carbohydrate is the most important source of food energy for exercise. In the body, carbohydrate is broken down to glucose. Glucose circulates in the blood and can be stored as glycogen in the muscles and liver. Muscles use this glycogen for energy and the liver uses glycogen to keep the glucose (sugar) level in the blood stable. The human body can store only a small amount of carbohydrate as glycogen. When you over-eat carbohydrate, your body tends to waste this extra energy, frequently by producing more heat. Only in extreme cases is the extra carbohydrate converted to fat.

Carbohydrate → Glucose

- → Circulates in blood to provide energy to cells, especially brain and red blood cells
- → Stored as glycogen in muscles and liver
- → In extreme cases of overeating carbohydrate, excess is converted to fat

Carbohydrate (in the form of blood glucose, liver glycogen or muscle glycogen) is the main source of energy for athletic events requiring intense efforts. For long duration endurance activities, carbohydrate is still an important energy source; but, stored body fat will also be used. The major reason so much emphasis is placed on carbohydrate is that the body has a limited ability to store it.

A high carbohydrate intake is needed for optimal performance. A minimum of 6 grams of carbohydrate per kilogram (kg) body weight should be consumed daily. Athletes training at high intensities for more than 3 hours per day may need to consume 10 or more grams of carbohydrate per kg body weight per day to meet their energy demands.

How can you increase the carbohydrate in your diet?

Question: *(Answer at the bottom of page 2)*

Grain products are the only good source of carbohydrate.

☐ TRUE ☐ FALSE

At meals and snacks, you should choose breads, cereals, rice, pasta, potato, vegetables, fruit, juice, dried peas, beans, lentils, milk, and yogurt. These are good food sources of carbohydrate. The "Energize with carbohydrate!" chart can be used to select foods that have a little or a lot of carbohydrate.

Additional carbohydrate can be found in sport drinks, bars, and gels (see "Evaluating Dietary Supplements"). Such highly refined products lack vitamins, minerals, and other nutrients that are naturally packaged in whole foods.

SNAC Sport Nutrition Advisory Committee
Comité consultatif sur la nutrition sportive

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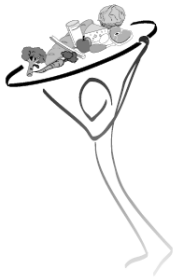
TRAINING DIET

Carbohydrate – Go Food, page 2



Glycemic Index is a method to rank carbohydrate-rich food.

Glycemic Index explains how some carbohydrate foods, when eaten alone, affect blood sugar level. Some carbohydrate foods supply energy over time while other foods increase blood glucose level quickly. High glycemic index foods increase blood sugar levels more quickly than low glycemic index foods. The glycemic index is the body's response to the chemical properties of a food.

Athletes need to select a varied, nutritious diet. Glycemic index is meant to be used with other factors to select appropriate foods, especially before and after exercise.

Limitations of the Glycemic Index

Glycemic index applies only when single foods are eaten. Adding other foods containing carbohydrate, fibre, protein or fat changes how slowly or quickly glucose enters the blood stream.

The glycemic index might be beneficial to athletes for the following situations:

- In the meal before exercise, a low glycemic index carbohydrate food provides energy over a long time.
- Alternatively, an endurance athlete may want to eat less than 60 minutes before exercise. A high glycemic index food will increase blood glucose level. To benefit, the athlete must keep the blood glucose level high by consuming a sport drink until exercise starts.
- During exercise, high glycemic index foods are digested and absorbed quickly, increasing blood glucose.
- In the first few hours after exercise, high glycemic index foods permit rapid muscle glycogen storage. This may be a factor for multiple training days or between events.
- Because blood sugar level influences appetite, foods with a lower glycemic index may satisfy you longer.

Higher Glycemic Index Snacks

- Bread
- Bagel
- Low fat crackers
- Honey graham crackers
- English muffin
- Rice cakes
- Watermelon
- Raisins
- Cantaloupe
- Sport drink

Lower Glycemic Index Meals and Snacks

- Pasta
- Baked beans and meals made using legumes (dried beans, peas, and lentils)
- Fruit (except melons and raisins)
- Fruit juice
- Milk
- Yogurt

The value of glycemic index varies from one sport to another. It is most beneficial to individuals competing strenuously for more than 90 minutes. The effect of glycemic index on exercise performance is still controversial and requires additional research. Coaches and athletes who want more detailed information on food selection for their sport should contact a registered dietitian with expertise in sport. You can contact the dietitian at your Canadian Sport Centre or someone listed under the Sport Nutrition Registry on the CAC website. If there is no dietitian with expertise in sport listed in your area, Dietitians of Canada may list a dietitian near where you live.

In general, you need to select nutritious, carbohydrate-rich foods at meals and snacks so you have plenty of energy for training, competition, growth and health.

SNAC Sport Nutrition Advisory Committee
Comité consultatif sur la nutrition sportive

ANSWERS

1. **TRUE** – Your body needs more carbohydrate than any other nutrient except water! That's why more than half the food we eat should come from carbohydrate foods like whole grains, legumes, fruit, vegetables, and milk. For general good health, eat at least twice as many servings from the Grain Products and Vegetables and Fruit Groups as you do from the Milk Products and the Meat and Alternatives Groups.
2. **FALSE** – Fruit, vegetables, dried peas, beans, lentils, milk, and yogurt also provide carbohydrate.

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[redacted]

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Appendix XVIII: Contents of the *Vegetarian Eating* link from Weblog

MSVU Applied Human Nutrition Website
Student Nutrition Services - Vegetarian Eating

Health Benefits

When a vegetarian diet is appropriately planned it can be lower in fat and cholesterol and higher in fiber. Therefore the eating habits of vegetarians may lead them to lower incidences of certain diseases, such as obesity, type 2 diabetes, high blood pressure, heart disease, gallbladder disease, osteoporosis, kidney stones and certain cancers (Dietitians of Canada, 2003).

There are a number of different vegetarian diets:

Semi-Vegetarian: usually avoids red meats, but may include dairy, eggs, poultry and fish.

Lacto-Ovo Vegetarian: includes eggs and dairy products, but excludes all animal products

Lacto-Vegetarian: includes dairy products, but excludes meat products

Vegan: excludes all animal products.

Vegetarian Health Concerns

Although the vegetarian diet can have many nutritional benefits wise meal planning is important to ensure adequate amounts of all nutrients. Some nutrients that a pure vegetarian could be low in include protein, Vitamin D, Vitamin B12, calcium, and iron (Dietitians of Canada, 2003).

Protein: According to Dietitians of Canada (2004) a carefully planned vegan diet can provide adequate protein from a variety of vegetable protein foods. The combination of grains with legumes, nuts, seeds, and vegetables can help to meet the recommended protein intake. There are many possible combinations; here are a few, lentil soup with crackers or bread, peanut butter and toast, humus and pita bread, baked beans and toast, or beans and rice. Lacto-oveo and lacto vegetarians should receive adequate protein from egg and milk products.

Vitamin D: Direct sunlight allows the body to produce Vitamin D. Adequate vitamin D can be produced by exposing the face and forearms to the sun during the warm months for ten to fifteen minutes per day. During the winter months vitamin D has to come from fortified food sources or dietary supplements. For example milk is fortified with vitamin D (yogurt and cheese do not contain vitamin D). Vegetarians who do not drink milk should select soy or rice products that are fortified (Dietitians of Canada, 2003).

Vitamin B12: Vitamin B12 is found in animal products. There are fortified foods, such as fortified soy beverages, that vegetarians can consume in order to get an adequate intake of vitamin B12. Lacto –ovo vegetarians are able to meet their vitamin B12 requirement by consuming dairy and egg products (Dietitians of Canada & American Dietetics Assoc, 2003).

Calcium: According to the National Institute of Health Osteoporosis & Related Bone Diseases calcium is needed for proper functioning of our heart, muscles and nerves as well as development of our skeleton and blood clotting properties. Complications such as low bone mass and increased incidence of bone fractures have been associated with a low intake of

calcium throughout the life cycle. Calcium is abundantly found in dairy products. However dairy products are not the only sources of calcium as many other foods contain calcium. For example bok choy, broccoli, collards, turnip greens, nuts, seeds, fortified foods and beverages and soybeans all provide calcium with a high bioavailability. For those that are unable to meet the recommended intake of calcium, supplements are available.

Iron: When planning a diet that excludes meat consideration must be given to the amount of iron in the diet. According to Dietitians of Canada and Manitoba Association of Home Economics (2003) iron deficiency is a common deficiency in both vegetarians and non-vegetarians. It is recommended that vegetarian consume a higher amount of iron as non-vegetarians due to the lower bioavailability of the iron in a vegetarian diet. Good sources of iron include beans, tofu, split peas, lentils, other legumes, figs, dried fruit, nuts, enriched and fortifies foods, dark green leafy vegetables. Consuming vitamin C at the same meal can enhance iron absorption.

See the Vegetarian Food Guide

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Calcium & Vitamin D: Important at every age. (2003). Retrieved October 23rd, 2004 from http://www.osteo.org/newfile.asp?doc=r301i&doctype=HTML+Fact+Sheet&doctitle=Calcium+%26+Vitamin+D%3A+Important+at+Every+Age

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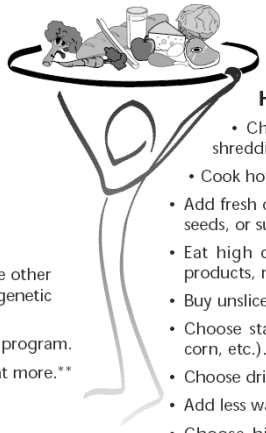
For further information check out these web sites:

- Vegetarian Resource Group
- Vegetarian Nutrition Dietetic Practice Group

Developed by Lindsey Young in partial fulfillment of her administrative dietetic internship placement with Aramark Campus Services – MSVU in Fall 2004 and in collaboration with Student Nutrition Services. Aramark supports the Applied Human Nutrition (Dietetics) Internship Education program at Mount Saint Vincent University.

Appendix XIX: Contents of the *Weight Gain* link from Weblog



GAINING WEIGHT FOR ATHLETES

Four factors affect weight gain:

- Genetics
- Food Intake
- Exercise
- Rest & Recovery

Your genetic make-up will influence the effect of the other three factors. Remember, you cannot change your genetic make-up.

- Include a progressive resistance strength-training program.
- Ensure adequate food intake. You may need to eat more.**
- Ensure adequate rest & exercise recovery.

PROMOTE MUSCLE GAIN NOT FAT GAIN!
SET REALISTIC GOALS. **

** Consult a registered dietitian/sport nutritionist to assist you in planning a nutritious meal plan.

HOW ARE YOU PROMOTING WEIGHT GAIN?
TIP THE SCALES IN YOUR FAVOUR

Are you following a progressive resistance strength-training program?

Muscle gain is gradual. Rarely will an adult athlete gain as much as 10 lb. of muscle mass per year.

- Consult a certified strength and conditioning specialist.
- Allow sufficient rest and recovery time between workouts.
- Get adequate sleep.

YOU NEED EXTRA ENERGY TO BUILD MUSCLE

You need more Calories from carbohydrate, protein, and fat.

Carbohydrate helps promote growth of muscle protein.

- Choose high energy, nutrient-dense foods from the four food groups.
- Increase portion sizes of foods and beverages.
- At meals, choose high-energy foods first, have salads and soup last.

Are you managing your daily schedule to include time to eat?

- Plan ahead (meals/snacks, exercise/rest)
- Don't skip meals, especially breakfast.
- Eat frequently throughout the day **- at least 3 meals and 3 snacks each day.**

Are you drinking high-energy fluids?

- Drink juices, milk, milkshakes, or meal replacement drinks.
- If fluids make you too full at meals, try drinking between meals.

High energy, nutrient-dense suggestions:

- Choose high-energy cereals (such as muesli, granola, shreddies, shredded wheat, raisin bran) or energy bars.
- Cook hot cereals with milk.
- Add fresh or dried fruits (such as apricots, raisins, dates, figs) nuts, seeds, or sugar to cereals.
- Eat high quality protein foods: meat, poultry, fish, eggs, soy products, milk products, etc.
- Buy unsliced bread and slice it thick.
- Choose starchy vegetables (such as peas, potatoes, lima beans, corn, etc.).
- Choose dried fruit often (raisins, dried apricots, pears, etc.).
- Add less water than suggested to frozen juices.
- Choose higher energy juices (such as grape, apricot nectar, pineapple, apple) or cranberry cocktail.
- Add powdered milk/instant breakfast to milk or to fortified soy beverage.
- Use flavoured milk or make milkshakes with ice milk/yogurt/ice cream, and fruit.
- Add fruit and granola to yogurt.
- Eat ice milk/sherbet/ice cream for dessert.
- Snack on "trail mix" (nuts, sunflower seeds, dried fruit).
- Add peanut butter, jam, jelly, and honey to muffins, bread, and biscuits, etc.
- Eat snacks such as milk pudding and custards, oatmeal raisin cookies, date squares, banana bread, frozen dairy products (ice cream, ice milk, frozen yogurt), fresh/dried fruit, trail mix.

Simple SNAC suggestions:

1. A piece of fruit and granola topped with yogurt.
2. Peanut butter and banana sandwich with milk.
3. Meat, lettuce, and tomato sandwich with milk.
4. Graham crackers/bagel/English muffin with peanut butter.
5. Milkshake: milk, ice cream, and fruit.
6. Trail mix: raisins, peanuts, chocolate chips, dried fruit, banana chips, dates, pretzels, and cereal.
7. Cheese and vegetable pizza (10" with thick crust).

DON'T BE DISCOURAGED
GAINING WEIGHT TAKES TIME!

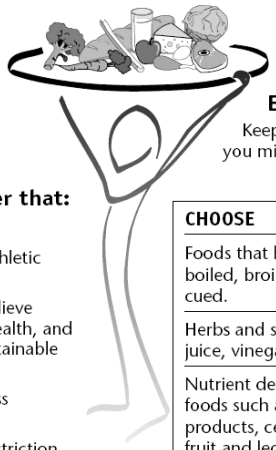
** Consult a registered dietitian/sport nutritionist to assist you in planning a nutritious meal plan. The Coaching Association of Canada ([redacted]) can identify a qualified nutritionist with sport experience who lives near you.

SNAC Sport Nutrition Advisory Committee
Comité consultatif sur la nutrition sportive

aussi disponible en français *December 2002* www.coach.ca

Coaching Association of Canada
([redacted])

Appendix XX: Contents of the *Weight Loss* link from Weblog



LOSING WEIGHT FOR ATHLETES

Before attempting weight loss consider that:

- Desirable weight loss means fat loss.
- Fat loss is desirable only if it leads to improved athletic performance and maintains good health.
- Many athletes already at their optimal weight believe they are too fat and sacrifice muscle, strength, health, and performance in a futile attempt to reach an unattainable body weight.
- Excessive calorie reduction can lead to muscle loss and slower metabolism.
- Rapid weight loss by dehydration and/or fluid restriction is water loss and can reduce strength, endurance, and overall athletic performance.

A balanced meal plan and an appropriate training program are the keys to success. If you must lose weight, consult a registered dietitian/sport nutritionist.

Goals

1. To reduce body fat.
2. To maintain existing muscle mass.
3. To allow for normal growth and recovery.
4. To provide adequate fuel for training and normal metabolic functions but to create a minor caloric deficit.
5. To maintain a healthy intake of nutrients and fluids.
6. To provide a balanced diet that contains familiar and satisfying food.

Guidelines

1. Allow sufficient time to achieve fat loss goals by planning fat reduction well in advance of any major competitions.
2. Ensure that you eat a high carbohydrate, moderate protein, and fat diet by selecting appropriately from all the food groups. This will provide plenty of fuel for training.
3. Drink plenty of fluids, especially water. Remember that weight loss from dehydration and/or fluid restriction is not fat loss and is dangerous to health and detrimental to performance.

Emphasize Quality

Keep a food record each day and check to see which foods you might substitute for others. Here are some suggestions:

CHOOSE	USE SPARINGLY
Foods that have been steamed, boiled, broiled, baked or barbecued.	Foods prepared in fats and oils i.e., fried, deep-fried, sautéed.
Herbs and spices, garlic, lemon juice, vinegar, fruit.	Butter, margarine, gravies, sauces, bacon bits, mayonnaise.
Nutrient dense carbohydrate foods such as: whole grain products, cereals, vegetables, fruit and legumes.	Foods high in fat and/or sugar with few nutrients.
Lower-fat dairy products such as skim or 1% milk, lower-fat yogurt, cottage cheese, frozen yogurt, partly skim milk cheese, etc.	Higher fat dairy products, i.e., butter, cream, ice cream, etc.
Lean well-trimmed meats, fish, skinless poultry, and meat alternatives such as beans, etc.	Fatty cuts of meat, bologna, salami, sausage, bacon, wieners, luncheon meats, etc.
Snacks such as: whole grain muffins, oatmeal cookies, fresh fruit, lower-fat frozen yogurt, hot air popcorn, fig Newton's, rice cakes, vegetables sticks, etc.	Foods low in nutrients such as: candy bars, potato chips, candy, cake, pastries, Danishes, table sugar, syrups, soft drinks, honey, etc.
Nuts, seeds, and oils (such as olive, canola, soy) in small amounts.	

Helpful Hints

1. Eat frequent meals and snacks to help control hunger and to avoid over eating.
2. Have breakfast, even if you get up late.
3. Eat most of your food during the day.
4. If you are hungry near bedtime, snack on nutrient dense foods such as: vegetables, fruit, whole grain cereal, skim milk or lower-fat yogurt.
5. Plan your food intake for the day. Prepare and pack appropriate foods rather than relying on canteens and fast food outlets.
6. Eat meals slowly, chewing your food thoroughly. Enjoy your food!
7. Learn to eat only to the point of satisfaction. Don't eat until you're stuffed.
8. Drink plenty of water. Don't dehydrate your body to lose weight.
9. Prepare and stick to a shopping list. Don't shop when you are hungry.

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Coaching Association of Canada

Appendix XXI: Vodcast Outlines

Topics:

(1) Eating on the road
(2) Grocery store guidelines

Introduction:

- video clips of MSVU teams playing (from previously recorded games)
- Song like "Eye of the Tiger" or another up-beat song chosen by athletes

Concept:

- MSVU athletes discussing nutrition problems/concerns with their sports nutritionist
- Opening clips: athlete could be discussing problems related to performance etc…
- Closing remarks: refer to them to website for more information on these topics and more

Conclusion:

- athlete thanking sports nutritionist for helping them get their competitive advantage
- fade out with more clips of teams playing