NATIONAL COACHING INSTITUTE

Task 4

(Nutrition)

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Basketball Nutrition

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LEADING OFF...

PEANUT BUTTER AND JELLY SANDWICHES PART I

"I eat a peanut butter and jelly sandwich before every game. Whoever invented that was smart. That's got to be one of the best sandwiches ever."

- Ben Gordon, Detroit Pistons

People have psychological ties to food and athletes may find that consuming a specific type of food or drink helps them mentally prepare for the game. Ben Gordon's favourite sandwich may not provide sufficient nutrients but if eating one reduces his anxiety and puts him into his Ideal Performance State, it is beneficial since athletes require energy for their mind and body.

However, a young athlete would want to consume a more balanced diet than one comprised entirely of peanut butter and jelly sandwiches.

ATHLETE PROFILE

In the past five years, I have coached senior boys' high school and men's university basketball in Toronto. The athletes in this report will be an Elite Male Youth team, similar to the team evaluated in my Task 1: Energy Systems Assignment (Abdelkrim, El Fazaa, & El Ati, 2007, p. 70).

Description of Different Positions

Characteristic	All Players	Guards	Forwards	Centres
Age (years)	**18.2**	18.2	18.2	18.2
Height (m)	**1.89**	1.83	1.88	1.93
Body mass (kg)	**90.3**	76.2	77.4	87.2
Body fat (%)	**8.2%**	6.1%	7.8%	10.4%
B.M.I. (kg/m^2)	**21.7**	22.7	21.8	23.6

ENERGY SYSTEM CHARACTERISTICS OF AN ELITE YOUTH BASKETBALL TEAM

Aerobic Base by Position

Characteristic	All Players	Guards	Forwards	Centres
VO_2max (ml/kg per min)	**52.8**	52.8	53.4	51.4

Forwards and Centres tend to be taller and heavier than guards. Centres have a higher body fat percentage and a lower VO_2max score. A variety of studies have found various ventalitory threshold values, ranging from 50.4% to 77.6% of VO_2max, but more study is

required to improve the quality of the data. Throughout the season, bench players have trouble maintaining the VO_2max score, likely because of lower practice intensity and fewer minutes during games (Ziv & Lidor, 2009, p. 553).

STRENGTH AND POWER CHARACTERISTICS

During the season, there are significant differences in strength values depending on playing time (starters are stronger than reserves). This can be attributed to the fact that coaches since taper their training programs as the season progresses, starters receive more repetitions than reserves. In a post-season one rep max bench press test, starters have a mean of 104.2 kg and reserves 98.0 kg. High-skilled players reported less fatigue after peak power tests than lower-skilled players indicating that those who play less often might be in worse physical condition (Ziv & Lidor, 2009, p. 554).

Power by Position

Characteristic	All Players	Guards	Forwards	Centres
Sargeant Jump	**60.6**	63.3	58.8	57.9

If weight and size is taken into account, there is no strength difference between guards and forwards. When the absolute maximal strength value is divided by body weight, guards have a higher rating than forwards and centres. In a vertical jump test, guards and forwards tend to have a higher capability than centres. Forwards and centres showed more anaerobic power than guards (Ziv & Lidor, 2009, p. 555).

AGILITY AND SPORT-SPECIFIC SKILLS

Guards are faster than forwards in a forty metre sprint but there is no difference in a twenty metre agility 'T' test. Sport-specific tests, such as control dribble, speed dribble, shuttle run, and dribble shuttle run, are negatively correlated with body fat percentage. Evidently, the typical guard is more co-ordinated than the average centre due to the lower body fat rating (Ziv & Lidor, 2009, p. 558).

THIS IS IMPORTANT BECAUSE...

NUTRITION FOR ADOLESCENTS

Obviously, nutrition is critical throughout a person's life but it is especially crucial for teenagers because of their increased rate of growth and development. Youth coaches should be watchful because of the additional energy required for sports participation at a high level. Inadequate energy and nutrient intake can curtail athletic performance and elevate the risk of injury. There are also long-term effects, such as an increased risk of disease later in life. (Casciano, 2008, p. 46).

NUTRITION FOR SPORT

Athletes should follow good nutrition habits to improve their physique in preparation for a long season, fuel their bodies in preparation for peak performance, repair tissue that has been broken down from competition, reduce active recovery time and lower the chance of injuries, and recover from travelling.

N.B.A. trainer Drew Clearly believes that the length of professional careers is strongly correlated to nutrition and fitness habits (Cleary, 2005, p. 58). Dieticians do not feel that high school and collegiate athletes possess the sophistication to alter their diets without the intervention of coaches or nutritionists (Nowak, Knudsen, & Schultz, 1988, p. 578).

TALENT IDENTIFICATION

A study in Australia compared elite male players at the National Level with players at the State Level. During the two years of study, National Level showed only a small improvement in their shuttle run score and no improvement in their sprint time and vertical jump score. State Level athletes showed significant improvement during the same time period (Drinkwater, Hopkins, McKenna, Hunt, & Pyne, 2008, p. 115).

Since coaches value fundamental movement skills (running and jumping) and sport-specific skills (which are correlated to body fat percentage), it is possible that National Level players were selected because they had a better fitness level at the time of their initial evaluation. National Under-16 Coach Roy Rana and Provincial Under-17 Assistant Coach Ajay Sharma caution that coaches focus on what a player can do and could do, instead of what they cannot (Rana & Sharma, 2009). Poor nutrition could prevent an athlete from reaching their best and it could be easily adjusted over time.

LONG-TERM ATHLETE DEVELOPMENT

During the introduction of a fitness program, young athletes typically experience the majority of their improvement during the initial adaptation phase. As the season continues, fitness levels remain stable and might decline as the intensity level is tapered in response to more frequent competitions (Drinkwater, Hopkins, McKenna, Hunt, & Pyne, 2008, p. 107).

In fact, the Bruce treadmill test shows that time to exhaustion decreases as the season progresses. Even with some nutritional improvement, VO_2max uptake does not improve during the collegiate season. This not affects basketball players but ice hockey players and skiers (Bolonchuk, Lukaski, & Siders, 1991, p. 170).

Athletes across the globe may play too many games. As one season blends into another, there is little time for recovery and training. In Ontario, the high school season lasts from October to March, followed by the club season from March to May, which overlaps with the Citywide League from March to June, then the Elite Development Season throughout

June and July and the Provincial Team phases during July and August. Elite athletes will also attend camps, national team tryouts, and the Centre for Performance workouts.

Ontario Basketball wishes to move from a tournament based club system to a league based model to permit for more training and less competition but this is not imminent at all (McKibbon, 2009). Accordingly, athlete nutrition is paramount in order to recover from exercise and replace nutrients that have been lost.

HOW COACHES CAN LEAD...

THE BASICS

With regards to nutrition, the primary role of a youth coach is the establishment of positive habits. Coaches need to teach players about eating right and counteract the effects of the media and peer pressure. Regrettably, it seems that high school male varsity teams do not consume enough water, energy, or nutrients (Casciano, 2008, p. 49).

AT-RISK STUDENTS

High school athletes are susceptible to many bad influences, ranging from the media to peer pressure to convenience. At Eastern Commerce C.I., many of the student-athletes come from at-risk homes and many do not eat breakfast at all. At lunch, they may choose to eat lunch with friends at Square Boys or Dominos Pizza and choose a meal that is high in sodium, sugar, and fat, which may lack the carbohydrates they need to perform that afternoon. Worst of all, they may stop at 7-11 to replace the missed breakfast and grab a high sugar drink. Ignoring sport participation, these habits lower their energy level and degree of focus in the classroom.

Personally, I avoid Square Boys and Dominos Pizza for two reasons: it is the social domain for all students and their place to escape staff members and it is important to model good choices. Marsallis' Market will make a fresh sandwich with fresh produce, protein (meat and cheese), and whole wheat bread for about $2.50. It is hard to serve as a "reminder" without modelling the way and providing an affordable alternative.

Coaches have attempted to combine team study hall with the school's free breakfast program but this has not engendered more participation in the program when attendance is not mandatory. To date, the goal of improved nutrition for all students, not just athletes, has not been reached at Eastern Commerce.

MACRONUTRIENT GROUPS

Energy intake for basketball should be balanced between carbohydrates, proteins, and fats (Ziv & Lidor, 2009, p. 561). Each food group provides different amount of energy but it is also important to consider the body's construction and replace what has been lost during exercise (Williams, Energy Needs of the Athlete, 2008).

The macronutrient which is burned during exercise depends on the intensity and duration of the activity, the athlete's sex, and prior nutritional status. When exercise increases, carbohydrates will be metabolized the most. As the exercise continues, the fuel source will shift from the muscle glycogen pool to circulating blood glucose.

Fat is also metabolized during exercise, at about the same rate throughout the range of activity. At intense levels of exercise, carbohydrates contribute a higher percentage of fuel. For energy, protein contributes at the lowest rate of all three macronutrient groups. Protein is mostly consumed after training to repair torn tissues.

As the duration of exercise increases, protein maintains blood glucose levels through gluconeogenesis in the liver. Whenever blood glucose levels cannot be maintained, the intensity of exercise will decrease (Dietitians of Canada, the American Dietetic Association, and the American College of Sports Medicine, 2000, p. 184).

Breakdown by Energy Source

Macronutrient	Recommended Intake	Energy
Carbohydrates	55-58%	4 kcal/g
Proteins	12-15%	4 kcal/g
Fats	25-30%	9 kcal/g

CARBOHYDRATES

Athletes must ensure that they eat enough carbohydrates. Different carbohydrates are digested differently so athletes must ensure that they eat the right type, depending on their activity schedule (Williams, Nutrition Basics, 2008).

Type of Carbohydrates

Type	Glycemic Index	Time Consumed	Characteristics
Complex	Low	Before Exercise	• slow and steady absorption • stable blood levels
Simple	High	During or After	• quick absorption • blood sugar spike

Carbohydrate consumption should match the level of training and athletes should be mindful of the densities of each type of carbohydrate. The higher the density, the harder it is for the body to break down the carbohydrate (Cleary, 2005, p. 59).

Carbohydrate Density

Density	Type of Protein	Characteristics
Highest	• Potatoes • Bread	• high glycemic index • consume after heavy workloads • do not consume in the evening.
High	• Whole Wheat Pasta • Brown Rice	• do not overcook (serve al dente) • unrefined has more fibre than refined (brown > white)
Medium	• Fruit	• good source of fibre but also includes fructose
Lowest	• Yellow Vegetables	• corn, squash, carrots
Low	• Green Vegetables • Salad	• beans, broccoli, peas, spinach • do not overcook the vegetable • ask for salad dressing on the side

Carbohydrates eaten before competition contribute to the initial level of muscle glycogen at the beginning of the activity (Williams, Nutrition Basics, 2008). The average length of a F.I.B.A. basketball possession is fifteen seconds, relying upon the Anaerobic Lactic system which is fuelled by muscle glycogen.

Recommended Carbohydrate Consumption

Phase	Training Level	Daily Consumption
Recovery Period	• Moderate Duration • Low-Intensity	5-7g/kg
Off-Season or Pre-Season	• Heavy Training	10-12g/kg
In-Season	• Moderate to heavy	7-10 g/kg

Carbohydrate consumption is important during the second day of back-to-back games or during tournaments, especially at the end of the season. In the Spanish Elite League 12.7 percent of players take a daily carbohydrate supplement (of about sixteen grams) and 21.8 percent use sport drinks with additional carbohydrates (Schröder, Navarro, Mora, Seco, Torregrosa, & Tramullas, 2002, p. 356).

PROTEINS

During the season, a basketball player should consume 1.4 to 1.7 grams of protein for every kilogram of body weight (Campbell, et al., 2007). If the player wished to add muscle mass, they should consume between 1.7 and 2.0 grams, compared to 0.8 grams for a sedentary person (Beck, How to eat like an Olympian, 2004).

If athletes do not consume enough protein fuel, they will burn lean muscle mass and not make the athletic progress that they expect (Williams, Energy Needs of the Athlete, 2008). A common error when is insufficient carbohydrates consumption. An athlete

may be training but the additional protein that they are ingesting is being used for energy instead of adding muscle mass (Beck, How to eat like an Olympian, 2004).

When basketball players seek to add muscle, they chiefly work on legs (the quadriceps femoris is an agonist muscle for movements like shooting and rebounding) and back and chest (the pectoralis major is the agonist for passing). Core exercises (abdominals and hips are very important) and arms and shoulders (the triceps are an agonist muscle for shooting and dribbling).

Basketball players would usually not lift weights on a game day. On a non-game day, players may arrive at the arena in the late morning lift weights, practice, and shoot.

High-protein meals would be consumed in the afternoon or evening after the weight lifting session. Protein densities should match the intensity of the exercise. After high intensity training, dense proteins should be consumed (Cleary, 2005, p. 62). Food should be prepared healthily, for example the low-fat benefits of skinless chicken breast is lost when breaded or the Omega-3 benefits of fish are outweighed if the fish is fried.

Types of Protein

Density	Type of Protein	Characteristics
Highest	• Red Meat	• highest density meat • consumed after legs workouts • high in saturated fat but worth the trade-off • get the leanest cut possible
High	• Chicken • Pork • Turkey	• second-highest density • low in fat (when skinless) • white and dark meat
Medium	• Fish • Shellfish	• include Omega-3 fatty acids • should not be fried • salmon and tuna are good choices
Low	• Eggs • Cheese	• suitable for snacks • not a meal replacement
Lowest	• Beans • Tofu	• suitable for snacks • beans provide carbohydrates

It is important to consume quality proteins which will provide enough energy. When possible, the protein should come from whole foods (Campbell, et al., 2007). When it is not possible to get the recommended daily intake from whole foods, supplements may be used. However, protein shakes are derived from eggs and beans and are a poor choice for a meal replacement (Cleary, 2005, p. 62).

Branched-Chain Amino Acids (B.C.A.A.), for example leucine, isoleucine, and valine, constitute one third of skeletal muscle proteins. When taken during aerobic exercise, these supplements can decrease the rate of protein degradation. Whole foods and quality protein powders contain twenty-five percent B.C.A.A.s but low quality powders do not

(Campbell, et al., 2007). To get enough protein, 14.5 percent of Spanish players use an amino acid supplement (about two grams) and 12.7 percent consume extra protein, with an average amount of ten grams (Schröder, Navarro, Mora, Seco, Torregrosa, & Tramullas, 2002, p. 356).

FATS

Fat provides energy, fat-soluble vitamins, and fatty acids. The recommended daily intake is twenty-five to thirty percent of calories. There is no benefit from diets that are extremely high or low in fat content (Dietitians of Canada, the American Dietetic Association, and the American College of Sports Medicine, 2000, p. 2).

Fats are usually difficult to digest and should not be consumed before activity. They are best used during the post exercise meal to repair damaged tissues. Athletes should choose to ingest healthy fats, which help the body repair itself instead of unhealthy trans fats that clog arteries and restrict blood flow (Heart Stroke Foundation, n.d.).

Types of Fat

Type of Fat		Examples
Healthy	Mono-unsaturated Fats	• Olive Oil • Canola • Peanut Oils • Nuts • Seeds • Avocados • Non-Hydrogenated Margarine
	Poly-unsaturated Fats • Omega-6 Fat • Omega-3 Fat	• Sunflower and Corn Oils • Non-Hydrogenated Margarine • Nuts and Seeds • Fattier Fish (Mackerel, Herring, Trout, Salmon, Swordfish, Cod, Bluefish, Tuna) • Canola and Soybean Oils • Flax Seeds • Omega-3 Eggs • Walnuts, Pecans, and Pine Nuts
	HDL-cholesterol (High Density Lipoprotein)	• Olive oil • Avocados • Corn • Nuts • Fish
Unhealthy	Saturated Fats	• Fast Foods • Fatty Meats • Butter and Lard • Full-Fat Milk • Hydrogenated Vegetable Oil
	Trans Fats	• Fast Foods and Many Convenience Foods • Hydrogenated Vegetable Oil or Shortening
	LDL-cholesterol (Low Density Lipoprotein)	• Fast food • Fried food

The recommended intake in 1.2 to 1.3 grams per kilogram of body weight, which should be broken into small portions (Williams, Nutrition Basics, 2008).

Due to the prevalence of "bad fats," coaches need to plan ahead and encourage athletes to do likewise. When travelling, team meals should be taken at sit-down restaurants. It is worth devoting a portion of the team budget to proper nutrition.

If athletes are living on their own, they may find that preparing multiple servings at once saves time and avoid reliance on convenience foods. If athletes live in a student residence, they should take extra snacks, such as fruits and whole wheat breads for after practice or late at night.

Fat-soluble vitamins include Vitamins D and E, which reduce muscle damage over the course of a high intensity season (Zoppi, et al., 2006, p. 43)

ENERGY REQUIREMENTS

Young athletes must ingest enough nutrients to balance the energy that they spend each day. Each person requires a unique amount of calories based on their basal metabolic rate (calculated using the Harris-Benedict Method), the thermal effect of food (between one hundred and two hundred kcal daily), their daily activities (about six-hundred kcal daily), and their sport activity (varies widely depending on the level of the activity and how often the player practices, trains, or competes).

When any of these components increase (for example, moving up to the provincial level of competition), the amount of energy consumed must be increased to avoid an energy deficit (Williams, Energy Needs of the Athlete, 2008).

HARRIS-BENEDICT EQUATION

To estimate how many calories should be consumed, first calculate the Basal Metabolic Rate (B.M.R.). Then, multiply the B.M.R. by the level of activity. This is a starting point and any advice should be tailored to the unique needs of the athlete. The nutritionist should get feedback from follow-up appointments and adjust the calorie intake as required. If an athlete is clearly above or below their recommended requirement, changes should be made gradually over the course of several weeks.

Basal Metabolic Rate Calculation

B.M.R. Calculation		Weight			Height			Age	
Men	66 +	13.7	**x** weight (in kg)	+	5.0	**x** height (in cm)	-	6.8	**x** age (in years)
Women		9.6			1.8			4.7	

Daily Calorie Intake Calculation

Exercise Level	Description	Daily Calorie Intake
None	little to no exercise	B.M.R. **x** 1.2
Light	1-3 days per week	B.M.R. **x** 1.375
Moderate	3-5 days per week	B.M.R. **x** 1.55
Heavy	6-7 days per week	B.M.R. **x** 1.725
Very Heavy	twice per day, extra heavy workouts	B.M.R. **x** 1.9

ENERGY REQUIREMENTS FOR ELITE BASKETBALL

In 1988, a collegiate basketball team in Australia played twenty-eight games and practiced eighty times (Nowak, Knudsen, & Schultz, 1988, p. 576).

Average Daily Nutrient Intakes

Sex	Weight (kg)	Energy Intake (kcal)	Carbohydrates		Protein		Fat	
			kcal	G	Kcal	g	kcal	G
Male	83.4	3,558	1,748	437	636	159	1,251	139
Female	71.7	1,730	916	229	272	68	567	63

1988 Analysis

Well this is a good starting point, the information is no longer current. Relative to today, there was probably less time devoted to energy systems and strength training, especially for female players. The energy percentages are similar to what is recommended today, although the Australians could ingest more carbohydrates. It was the belief of the study's authors that the players were ingesting too must cholesterol (Nowak, Knudsen, & Schultz, 1988, p. 577).

The women's team may exhibit under-fuelling or an eating disorder. A typical elite female player in Canada may require 3,550 calories per day, which is almost twice what the Australian women received in 1988 (Williams, Energy Needs of the Athlete, 2008)

2009 Update

Using information from the Athlete Profile section of this chapter and materials for nutrition lectures at the National Coaching Institute, I have recalculated the energy requirements for an elite collegiate team.

Elite Youth Basketball Team Basal Metabolic Rate

Position		Weight		Height		Age		B.M.R.
Guards	66 **+**	76.2 kg	**x** 13.7 **+**	183 cm	**x** 5.0 **-**	18.2 yr.	**x** 6.8	1,901.2
Forwards		77.4 kg		188 cm		18.2 yr.		1,942.6
Centres		87.2 kg		193 cm		18.2 yr.		2,101.9

Energy Requirements throughout the Season

Position	B.M.R.	Pre-Season		In-Season	
Guards	1,901.2	Very Heavy Training **x** 1.9	3,612.3 kcal	Heavy Training **x** 1.725	3,279.6 kcal
Forwards	1,942.6		3,690.9 kcal		3,351.0 kcal
Centres	2,101.9		3,993.6 kcal		3,625.8 kcal

These figures are still guidelines. Depending on the intensity of the training schedule, coaches should advise athletes to consume more food and water. Throughout the season, the daily calorie intake for an elite youth basketball player should be about 3,500 to 4,000 calories. If there were any symptoms of under-fuelling, nutritionists should increase the calorie intake.

Energy Requirements by Macronutrient Group

Position	Weight (kg)	Energy Req. (kcal)	Carbohydrates		Protein		Fat	
			58% x kcal	x 10 g/kg	17% x kcal	x 1.8 g/kg	25% x kcal	x 1.3 g/kg
Guards	76.2	3,279.60	1,902.2	609.6	557.5	121.9	819.9	91.4 g
Forwards	77.4	3,350.99	1,943.6	619.2	569.7	123.8	837.7	92.9 g
Centres	87.2	3,625.78	2,103.0	697.6	616.4	139.5	906.4	104.6 g

BODY COMPOSITION

Male basketball players have a medium body fat percentage (Dietitians of Canada, the American Dietetic Association, and the American College of Sports Medicine, 2000, p. 6). Reducing this percentage, especially among larger players, could lead to an improvement of sport-specific skills.

The body fat percentage of guards in a National Men's Youth League - who possess the best skill sets of their age group (eighteen to twenty years old) - is 6.1% and almost falls into the lowest group in the table below (Abdelkrim, El Fazaa, & El Ati, 2007, p. 70).

Level of Body Fat Percentage

Body Fat Range	Percentage	Sports
Low	≤5%	• Middle-distance running • Long-distance running • Body Building
Medium	6-15%	• **Basketball** • Cycling • Gymnastics • Triathlon • Sprinting • Wrestling
High	≥16%	• Football • Hockey • Rugby

Since it is difficult to add mass during heavy training periods, body composition changes are best achieved during the transition (off-season) and general preparation phase (Williams, Energy Needs of the Athlete, 2008). Basketball seems to be typical of most sports in that intensity is tapered as the season progresses.

Without off-season training, decreases in body fat percentage and skinfolds can be lost (Drinkwater, Hopkins, McKenna, Hunt, & Pyne, 2008, p. 122).

MICRONUTRIENTS

The consumption of multi-vitamins and other supplements can help prevent vitamin imbalances caused by the frequency and duration of training sessions, travel, and poor food selection (Ziv & Lidor, 2009, p. 561).

CAFFEINE

Caffeine is not a recommended supplement but many student-athletes consume the product anyways. Students do not hesitate to ingest coffee or cola before class and players have been known to do likewise before games.

Breakdown by Energy Source

Product	Serving	Amount of Caffeine
Coffee	8 oz	118 mg
Tea	8 oz	43 mg
Cola	12 oz	46 mg
Chocolate Milk	8 oz	8 mg
Chocolate Bar	1.5 oz	10 mg
Cold Remedy	1 tablet	15-30 mg
Headache Reliever	1 tablet	30-32 mg
Stimulants	1 dose	100-200 mg

Red Bull	8.2 oz	80 mg

Since caffeine is everywhere, athletes should be aware of its effects. The recommended daily intake is three hundred milligrams of caffeine. Medium doses of caffeine (≤200 mg) cause short term alertness, happiness or sense of well-being. Larger doses (over 200 mg) nervousness, anxiety, stomach troubles for up to six hours. Any amount of caffeine will cause sleep disruption and excessive caffeine can leach calcium from the bones. The effects vary based on each individual's sensitivity (Health Canada, 2003).

Signs of caffeine withdrawal include headaches, fatigue, inability to concentrate, depression, and anxiety and disappear after a few days. Anyone who is consuming too much caffeine should cut back slowly (Health Canada, 2003).

Caffeine is a diuretic and exacerbates fluid lost during activity, although the total effect decreases over time as the user becomes accustomed to the supplement.

CALCIUM

Inadequate dietary calcium increases the risk of low bone density and stress fractures. Female athletes are especially at risk because low calcium levels can lead to osteoporosis, a corner of the Female Athlete Triad. Athletes should consume about 1,500 milligrams of calcium. Vitamin D is used to help absorb calcium but the supplements do not need to be consumed at the same time (Beck, Good for your bottom and your bones, 2009). In the United States, youth have been drinking less milk and replacing it with soft drinks and non-citrus juices (Cavadini, Siega-Ritz, & Popkin, 2000, p. 21).

DIETARY FIBRE

Over the years, teenagers in America have been consuming enough fibre. Since 1965, youth have received less energy from fibre and more from fat because they do not consume enough whole grains, pasta, and rice. As a result, they do not benefit from the anti-oxidant effects of dietary fibre as much as in the past (Cavadini, Siega-Ritz, & Popkin, 2000, p. 23).

Coaches should monitor how much dietary fibre is consumed by players and at what times. The recommended daily intake for a basketball player would be between thirty and thirty-five grams. To facilitate digestion, athletes should avoid insoluble fibre snacks before a competition, like potatoes and whole grains. Fibre supplements can be taken to meet the daily recommended intake.

IRON

Iron deficiency - with or without anaemia - compromises physical and mental performance. Iron depletion lowers level of the level of haemoglobin in the blood and reduces Anaerobic work capacity (Karamizrak, et al., 1996, p. 17). A high prevalence of iron deficiency was found on adults and adolescents on eight national basketball teams (Dubnov & Constantini, 2004, p. 30).

Iron Deficiency and Anaemia

Condition	Total	Male	Female
Iron Depletion • plasma ferritin below 20 µg/L	22%	15%	35%
Anaemia • low hemoglobin and hematocrit concentrations	25%	18%	38%
Iron Deficiency Anaemia • Plasma ferritin below 12 µg/L and the presence of anaemia	7%	3%	14%

Coaches of female teams should be more mindful of the signs of iron deficiency, but all athletes in all sports are at risk. Testing plasma ferritin (below 30 µg/L) is an effective indicator of low iron levels even if there is no visible loss of performance at that time. Although the majority of athletes had sufficient serum ferritin levels, there were instances of low levels and iron deficiency in all sports (Karamizrak, et al., 1996, p. 17).

Average Ferritin Ratings of National Team Members (Turkey)

Gender	Control	Athletes	Professional Soccer	Amateur Soccer	Basketball
Male	87.3 µg/L	70.4 µg/L	60.4 µg/L	75.6 µg/L	**77.9 µg/L**
Female	33.2 µg/L	32.6 µg/L	-	-	-

Gender	Running	Swimming	Wrestling	Body Building	Handball
Male	64.5 µg/L	58. 4 µg/L	79.5 µg/L	81.1 µg/L	-
Female	97.7 µg/L	35.7 µg/L	-	-	13.6 µg/L

Heme iron, found in red meat is the most type of iron which is most easily absorbed so vegetarians may be at risk. Sources of non-heme (plant) iron include iron-fortified breakfast cereals and energy bars, dark green leafy vegetables, dried fruits, nuts, seeds and legumes, such as beans, peas, and lentils (Langley, Body Image, Eating Disorders, and Vegetarians, 2005). Athletes with Inflammatory Bowel Syndrome may have difficulty absorbing iron and require a supplement.

Oral iron supplements, such as ferrous sulphate (red iron pills) or ferrous gluconate (green pills), are effective in treating iron depletion over a ten week period (Karamizrak, et al., 1996, p. 18). Iron deficiency can take up to six months to correct (Dubnov & Constantini, 2004, p. 37).

MULTI-VITAMINS

In total, 50.9 percent of Spanish professional basketball players consume a multi-vitamin supplement, a comparable rate to other professional athletes and twice the rate of collegiate players. About 29.1 percent of the players take a daily supplement and 21.8 take a weekly one (Schröder, Navarro, Mora, Seco, Torregrosa, & Tramullas, 2002, p. 357).

Most high school athletes do not meet their recommended intake of Vitamins, B, C, and E (Casciano, 2008, p. 51). The younger the athlete, the more the coach should monitor that there are receiving enough vitamins. Usually, a multi-vitamin includes enough micronutrients to top up most deficient. Anyone who takes a vitamin supplement should ensure that they do not exceed the recommended daily allowance (National Institute of Health, 2009).

Daily Recommended Intake for Youth Basketball Players (Vitamins)

Vitamin	Type	R.D.A. Male	R.D.A. Female	Sources
A	cell regenerator	1,000 µg	800 µg	green and yellow vegetables, milk, and whole eggs
β-carotene	anti-oxidant precursor to Vitamin A	part of Vitamin A consumption		carrots and orange vegetables and green leafy vegetables
B-1	thiamine converts blood sugar into energy	2.0 mg	1.5 mg	cereals, whole-wheat flour, and pork
B-3	Niacin anti-oxidant	20 mg	16 mg	leafy green vegetables, poultry, lean meats, and fish
B-2	Riboflavin anti-oxidant	1.2 mg	1.0 mg	leafy green vegetables, dairy products, and legums
B-5	pantothenic acid cell regenerator	6 mg	6 mg	whole grains, avocados and broccoli
B-6	anti-oxidant	1.3 mg	1.2 mg	meats, whole grain products, vegetables, and nuts
B-9	folic acid red blood cell production protein sysnthesis	200 µg	180 µg	leafy green vegetables, broccoli, asparagus, mushrooms, fortified juices, and fortified cereals
B-12	red blood cell production protein sysnthesis	2.5 µg	2.5 µg	fish, eggs, and dairy
C	anti-oxidant ascorbic acid	75 mg	70 mg	citrus fruits, tomatoes, peppers, berries, potatoes, and spinach
D	fat-soluble facilitates use of Calcium	40 µg	40 µg	sunlight, fish, and dairy products
E	fat-soluble anti-oxidant	15 mg	15 mg	spinach, and broccoli, mangos, almonds, and peanuts
K	blood-clotting	80 mg	70 mg	dark green leafy vegetables, tea leaves, and cheese

Daily Recommended Intake for Youth Basketball Players (Other Micronutrients)

Micronutrients	Type	R.D.A. Male	R.D.A. Female	Sources
Flavonoids	anti-oxidant	15 mg	15 mg	citrus fruits, onions, parsley, and tea leaves
Glutathione	anti-oxidant	50 mg	50 mg	oatmeal, yogurt, fruits, and vegetables
Selenium	anti-oxidant	60 µg	60 µg	nuts, cereals, meat, fish, and eggs

Many vitamins have anti-oxidative properties. Oxidative stress is related to the aging process, cell damage, muscular fatigue, and overtraining. As the volume and intensity of exercise increases, the body uses more anti-oxidants (Ziv & Lidor, 2009, p. 562). No study has found any performance benefits to taking additional supplements of anti-oxidants, although the vitamins do reduce muscle damage and increase recovery (Zoppi, et al., 2006, p. 43).

POTASSIUM

Potassium is important in brain and nerve function. The recommended intake is four thousand milligrams. It can be found in avocadoes, bananas, citrus fruits, tomatoes, and broccoli (National Institute of Health, 2009). Unfortunately, potassium supplements do not reduce muscle cramping due to dehydration (Casa, Clarkson, & Roberts, 2005, p. 120). If a potassium source is taken as an energy source, it should be consumed forty-five minutes to an hour before the activity for maximum benefit.

SODIUM

Many Canadians consume too much sodium at it leads to hypertension and increased risk of heart attack, stomach cancer, kidney disease, asthma, and osteoporosis. It is found often in the preservatives used for processed foods. Children and youth who consume too much sodium also drink more and tend to drink more sugary drinks and cola (Weeks, 2009). Athletes who consume excessive sodium are more prone to dehydration.

Sodium Consumption by Age Group (Male)

Age Group	Recommended Daily Intake	Daily Limit	Actual Intake
9-13 years	1,500 mg	2,200 mg	3,515 mg
14-18 years	1,500 mg	2,300 mg	4,130 mg
19-30 years	1,500 mg	2,300 mg	4,066 mg

Athletes can avoid excess sodium by eating fresh vegetables instead of canned ones and taking the time to make their own meals (and control the salt content).

SUGAR

Basketball players need to maintain a certain level of blood glucose in order to participate in practices and competitions. While the blood glucose level of collegiate athletes does change much during the season, certain athletes were found to be prone to large fluctuations in their blood sugar level, possibly due to an erratic eating schedule. This can lead to poor physical performance and a lack of mental focus (Croom, 2005).

Athletes should be consuming complex carbohydrates early in the day and after competition, not high-sugar soft drinks. Coaches need to consistently model good personal fitness and nutrition so that players make good choices during the season.

Ribose is an integral part of the energy production system. It is used by cells to convert nutrients into adenosine triphosphate (A.T.P.) in both fast-twitch and slow-twitch muscles by 3.4 to 4.3 times. Since ribose helps energy production after high intensity exercise, many players take daily maintenance doses of two milligrams after the activity (Kalman & Campbell, 2004, p. 64).

ZINC

Zinc is an important part of the cellular metabolism system and is required for physical and mental performance. The recommended daily intakes for zinc are eleven milligrams for men and eight milligrams for women. It is present in meat and poultry. Surpassing fifteen milligrams daily can lead to zinc poisoning (National Institute of Health, 2009).

EATING SCHEDULE

To keep the metabolism moving at a high rate and maintain high levels of blood glucose, athletes should eat every two to four hours. This avoids physical and mental fatigue, cravings (and poor food decisions), and irritability (Williams, Nutrition Basics, 2008).

MEALS

During the season, a basketball player should focus on making easy meals out of high quality ingredients. Drew Cleary's outline of an N.B.A. meal schedule in F.I.B.A. *Assist* Magazine doesn't mention fats but he writes about how they are a part of all meals but players should avoid saturated and trans fats and control the amount that they consume. Water should be served with every meal (Cleary, 2005, p. 59).

Basketball Meal Schedule

Meal Time	Macronutrients	Suggestions
Breakfast	• 90% Complex Carbohydrates • 10% Protein *Fuel for the rest of the day*	• Oatmeal • Cereal with Fruit • Yogurt • Peanut Butter and Flax Seed Bread
Lunch	• 60% Simple Carbohydrates • 40% Protein *Recovery from the morning work and fuel for later*	• Chicken with Whole Wheat Pasta and Vegetables • Fish with Brown Rice and Salad (dressing on the side)
Dinner	• 90% Protein • 10% Complex Carbohydrates *Recovery from the day's work*	• Lean Steak Fajita with a Whole Wheat Tortilla Green Peppers, and Guacamole • Boneless, Skinless Turkey Breast with a Baked Potato

Athletes should not skip meals. Performance of moderate to high-intensity exercise for forty-five minutes is enhanced by consuming moderately high carbohydrate, low fat, and low protein meal three hours before (Kalman & Campbell, 2004, p. 63).

SNACKS

A snack consumed before exercise should contain sufficient fluid to maintain hydration and be low in fat, protein, and complex carbohydrates that are difficult to digest. The snack should consist of simple carbohydrates that will maintain blood glucose levels and replenish glycogen stores. Snack ideas include fruits, vegetables, and grains, such as a Nutri-grain or granola bar.

The snack should be familiar to the athlete to avoid indigestion. High school athletes should keep snacks in their locker to avoid the temptation of high sugar at the convenience store. Student-athletes should bring plenty of snacks with them on road trips and to tournaments. Food for sale at sporting events is usually high in sugar, sodium, and saturated fats.

Afterwards, the recovery snack should include some protein and carbohydrates to replenish what has been lost. Examples include chocolate milk, bananas, carrots, and bagels. Fruit-juice is high in fructose but it is preferable to a soft drink. Often, the best fluid to consume after exercise is water.

CANADIAN INTERUNIVERSITY SPORT SCHEDULE

Sample Practice Day (Monday)		Sample Game Day (Friday)	
8:00	Wake Up ● **Breakfast (Focus: complex carbs)** ● Get Ready ● Travel to Class	8:00	
9:00	Class	9:00	Wake Up ● Get Ready **Breakfast (Focus: complex carbs)**
10:00		10:00	Travel to Venue
11:00	Travel to Gym ● **Snack (focus: simple carbs)** ● *Lift Weights*	11:00	**Snack (Focus: simple carbs)** Watch Tape
12:00	*Shooting & Individual Drills*	12:00	*Game Day Shoot Around*
13:00	Travel **Lunch (focus: simple carbs - protein)**	13:00	Travel **Lunch (focus: simple carbs - protein)**
14:00	Class	14:00	Free Time: Study, Nap, Mental Preparation
15:00		15:00	
16:00	**Snack (focus: simple carbs)** Travel to Gym ● Taping ● Warm Up	16:00	**Pre-Game Light Meal or Snack (focus: simple carbs)**
17:00	*Practice*	17:00	Travel to Venue
18:00		18:00	**Snack (focus: simple carbs)** Watch Women's 1st Half
19:00	**Snack (focus: protein)** ● Cool Down ● Skill Work for Reserves ● Showers	19:00	Taping ● Pre-Game Meeting Warm Up
20:00	Travel Home ● **Recovery Meal (focus: protein - complex carbs)**	20:00	*Game*
21:00	Study	21:00	
22:00	Flexibility Work (Stretching) **Night Snack (focus: simple carbs)**	22:00	**Snack (focus: protein)** ● Cool-Down ● Post-Game Meeting ● Showers
23:00	Free Time	23:00	Travel Home ● **Recovery Meal (focus: protein - complex carbs)**

Coaches should keep track of the intensity of their workouts on their Master Practice Plan so they can estimate how much energy is required by athletes and avoid overtraining (Stapleton, Cook, & Dignard, 2008). C.I.S. coaches want to have hard practices early in the week in order to peak for games on the weekend. Peak periods on the macrocycle level would be the end of November when the first divisional games are played and conference and national play-offs which occur in late February and early March.

LOOSE ENDS...

UNDER-FUELLING

When coaching male athletes, I've found that under-fuelling is more common than an eating disorder. Symptoms include low overall energy, poor performance, lack of concentration, irritability, and slower recovery time (Williams, Energy Needs of the Athlete, 2008). The main reasons that I have observed for this problem are:

- **Personal Taste:** Athletes may not like the "healthy" choices that have been prepared and want to have comfort foods. Consequently, they do not eat enough of the "healthy" choices. Coaches, nutritionists, and athletes should work together to find menu items that are healthy and attractive to the team members.
- **Lack of Knowledge:** Athletes may not know what foods are the best choices or how to prepare them. Devoting time early in the season to formally discuss nutrition or using a twenty-four hour diet recall survey throughout the year can increase the team's knowledge base and monitor the results.
- **Lack of Initiative:** Food should be easy to prepare. Athletes should prepare multiple portions when they have the time. Players should also avoid eating late at night when they are tired; this increases the temptation of eating fast food or a convenience food, which are high in fat and sodium.

EATING DISORDERS

I have yet to encounter a serious nutrition related problem but I am still mindful of the prevalence of eating disorders in high performance sport. In addition to the same symptoms as under-fuelling, signs include a poor self-image, pressure to make it to the next level, or external pressure (Williams, Energy Needs of the Athlete, 2008).

Team meals during road trips allow coaches to monitor food intake during road trips and provide all players with good dietary role models. If the coach does not have the best relationship with a particular player, an assistant coach could take leadership of the issue and speak to the athlete about their self-image and nutrition habits.

PEANUT BUTTER AND JELLY SANDWICHES PART II

Ben Gordon can still have his favourite peanut butter and jelly sandwich before each game but he could alter the recipe to provide more energy.

Component	Old Sandwich	New Sandwich
Bread	White or Brown	Flax Seed or Whole Grain
Topping	2 Tablespoon Peanut Butter 2 Tablespoon Grape Jelly	2 Tablespoon Peanut Butter Sliced Banana
Side Dish		1 Cup Grapes
Total Energy	**more from fat**	**more from dietary fibre**

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Dehydration

LEADING OFF...

MY PERSONAL RULES

All players should bring their own personal (labelled) water bottle and towel to practice. Players are free to step out of the drill at anytime to drink from their bottle. Never drink on the court itself and clean up any spills before returning to practice.

I do not schedule "water breaks" into practice but I strongly encourage athletes to drink during the many "active recovery" periods. With younger athletes, I would schedule specific time for "water breaks" to develop positive hydration habits.

MODELING THE WAY

Coaches should explain the dangers of dehydration, encourage fluid intake, and ensure to drink enough appropriate fluids themselves.

MY HYDRATION HABITS

I consume one to two 500ml water bottles during practice and at least two water bottles (or sport drinks) during games. Since I usually wear a suit and tie during games, I am aware of my own temperature to I do not sweat excessively. Unfortunately, one of my vices is the consumption of large amounts of coffee (500ml in the morning and the afternoon).

THIS IS IMPORTANT BECAUSE...

HYDRATION IS INTEGRAL TO THE HUMAN BODY

The human body is comprised of roughly sixty percent water. Water is used to cool the body, carry oxygen and nutrients to the working muscles, remove toxins from organs, cushion joints, and moisten skin (Beck, The power of positive drinking, 2009). It is necessary to maintain a baseline hydration level for day to day training safety and performance of athletes (Casa, Clarkson, & Roberts, 2005, p. 115). A study of male high school basketball players reported that forty-two percent did not drink enough water (Casciano, 2008, p. 49).

CAUSES OF DEHYDRATION

When muscles are working, they produce heat and the body sweats to lower temperature. Sweating primarily expels water and sodium from the body. Acute fluid loss at a faster rate than fluids can be ingested leads to dehydration and the body will use water in the blood to replace required fluids. Consequently, blood volume can drop severely, causing

the effects of Cardiovascular Drift, a gradually increasing heart rate that carries less oxygen in each stroke (Archer, 2009).

SWEAT LOSS DURING BASKETBALL

Sweat Loss Calculation (Sample)

Step	Activity	Results
A	Weight before Exercise (after going to the bathroom) (kg)	96.1 kg
B	Weight post Exercise (before going to the bathroom) (kg)	95.2 kg
C	Activity-based Weight Loss (A - B)	0.9 kg
D	Fluid Consumed during Activity (litres)	1.0 l
E	Total Fluid Loss (C + D)	1.9 kg
F	Exercise Duration (hours)	1.75 hr
G	Sweat Rate (E / F)	1.086 l/hr

The game intensity was high (80-100%). It was an adult pick-up game that was very competitive since many of the players had elite high school, post-secondary, or professional experience. The subject plays regularly with former university players.

Subject Characteristics

Age	28	Height	2.05 m
Body Mass Index	22.6	Normal Weight	95 kg

THE EFFECTS OF HEAT DURING GAMES

Most gyms are not air-conditioned. Several facilities have poor air circulation which contributions to high levels of humidity. During the spring club season and summer elite development programs or camps, the temperature in the building may exacerbate fluid loss due to sweat (compared to playing during the winter high school season).

When both the microclimate (the athlete) and the macroclimate (the environment), athletes may suffer from heat stress, heat exhaustion, heat stroke. Coaches should be aware of the signs and symptoms of heat stress (Specialized Professional Services of the Occupational Health and Safety Branch, 2009).

The effects of excess heat and dehydration are inter-connected, as high body temperature also has the capacity to raise heart rate. Cardiovascular Drift occurs in basketball because of the length of the activity (60 to 90 minutes) and the possibility that athletes may be dehydrated. Dehydration during exercise may reduce body weight (and blood volume) by three to five percent (Coyle & González-Alonso, 2001, p. 91).

Heat-Related Illnesses

	Heat Exhaustion	Heat Stroke
Signs and Symptoms	• body temperature over 38°C • heat cramps • extreme thirst • weak pulse • rapid breathing • nausea or vomiting • dizziness or blurred vision	• body temperature over 41°C • headaches • person feels weak • rapid pulse • person is confused or acting strangely • passing out and convulsions
Treatment	• remove person to a cool and shaded area • loosen clothing • fan or spray with cool water • seek medical attention if condition worsens	• ***call 911*** • remove excess clothing • spray cool water on the person • offer sips of water if conscious

THE EFFECTS OF DEHYDRATION

The entire process is inter-connected, as high body temperature also has the capacity to raise heart rate. Cardiovascular Drift occurs in basketball because of the length of the activity (60 to 90 minutes) and the possibility that athletes may be dehydrated. Dehydration during exercise may reduce body weight (and blood volume) by 3-5%.

Without proper hydration, there is a progressive decrease of blood pressure throughout the body and stroke volume accompanied by a progressive increase in temperature and heart rate. A study, which consisted of two hours of moderate-intensity exercise, showed that the increase in core temperature and heart rate was directly related to the degree of dehydration (McGregor, Nicholas, Lakomy, & Williams, 1999, p. 895).

PHYSICAL SYMPTOMS OF DEHYDRATION

Athletes who are dehydrated may suffer from: excessive thirst, dry mouth, loss of appetite or nausea, muscle cramps, increased body temperature, increased heart rate, dark coloured urine, flushed or dry skin, and fatigue. At five percent dehydration, symptoms will intensify. It is necessary to get medical attention if the dehydration rate reaches ten percent or symptoms become severe (Casa, Clarkson, & Roberts, 2005, p. 118).

Severe muscle cramps are related to large losses of salt (sodium) in sweat and muscle fatigue. Ingesting additional fluids to alleviate muscle cramps *when they occur* is *too late to relieve the problem for that particular match*. Proper warm-ups may assist athletes prone to cramping and stretching or massage may reduce the discomfort. Athletes should choose snacks to replace sodium during training camps or tournaments (Langley, Introduction, 2004). There is no evidence that potassium, magnesium, or quinine supplements reduce the effects of cramps (Casa, Clarkson, & Roberts, 2005, p. 120).

REDUCED ANAEROBIC PERFORMANCE

Studies involving soccer, which has a similar energy system profile to basketball, can substitute if no comparable basketball articles are available (Fox, Bowers, & Foss, 1993).

Energy System Breakdown

Sport	ATP-CP & LA	LA-O2	O2
Basketball	60	20	20
Soccer	50	20	30

In a trial involving repeated anaerobic shuttle run, players without fluids took longer to complete each run as the task continued. Furthermore, fifteen metre sprint times conducted after the last shuttle run were longer for the non-fluid control group. Those who drink a carbohydrate-free solution perceived less exertion as the activity wore on (McGregor, Nicholas, Lakomy, & Williams, 1999, p. 901).

SPORT-SPECIFIC CONSEQUENCES

In a study of male basketball players aged 17 to 28, dehydration led to impaired vigilance related attentional performance. Also, when dehydration passes a threshold of two percent, a progressive decline in basketball skills may occur (Ziv & Lidor, 2009, p. 561). Therefore, it is imperative for coaches to monitor their players for the symptoms of dehydration and encourage them to drink fluids.

HOW COACHES CAN LEAD...

HYDRATION SCHEDULE

Athles should drink beyond thirst. By the time an athlete feels thirsts, dehydration has already affected the athlete's performance (Sports Nutrition Advisory Committee, n.d.). The recommended fluid intake for adult males is three litres daily (2.2 litres for females) and teenagers should drink 1.8 litres for girls to 2.6 litres for boys (Beck, The power of positive drinking, 2009).

Hydration Schedule

Time	Amount of Fluid
Two hours before workout	400 to 600ml (14 to 22 oz)
During workout	150 to 350 ml (6 to 12 oz) every 15-20 minutes, depending on player
After workout	475 to 650 ml (16 to 24 oz) for every pound lost due to perspiration

BEFORE THE GAME

The average person should ingest forty to fifty millilitres per kilogram of body weight. Twenty percent of that will come from food. Still, athletes must drink more to account for the fluids lost during activity.

Athletes should take small servings of fluid. Large amounts of fluid can lead to a "sloshing" feeling while running up and down the court. High carbohydrate drinks (over 8%) should be avoided because of potential digestive problems during the physical activity (Archer, 2009). Ingesting fluid before and at regular intervals during exercise delays fatigue and increases work capacity when heat stress occurs (Casa, Clarkson, & Roberts, 2005, p. 119).

DURING THE GAME

During exercise, intermittent consumption of sport drinks (or other carbohydrate solutions) appears to improve performance. A study of male adolescent basketball players showed that euhydration with a 6% carbohydrate solution improved both shooting skills and on-court sprinting compared to a placebo (Ziv & Lidor, 2009, p. 562)

Fluids consumed during the workout should not be refrigerated. If the drink is at room temperature, the body can begin absorbing fluids immediately. If the drink is chilled, the stomach must first heat the drink to the correct temperature, using additional energy and delaying the digestion process (Langley, Introduction, 2004).

AFTER THE GAME

All athletes and coaches should have plenty to drink after the game.

It is necessary to replace carbohydrates used as fuel during the game. In addition to a health snack like a banana, bagel, or Nutri-grain bar, athletes should consider high carbohydrate drinks such as milk or chocolate milk. Avoid the temptation for soft drinks or sugary fruit juices and drink water instead. A fruit juice drink (500ml) contains fifty games of sugar and a soft drink can (355ml) contains nine teaspoons of refined sugar plus artificial flavours, preservatives, and phosphoric acid (Beck, The power of positive drinking, 2009).

Athletes often wait until mealtime to fully replace water and electrolyte losses. Potassium, magnesium, and other minerals can be replaced by a balanced diet. During the regular season - when competitions are twenty-four hours apart - this is sufficient but during a training camp or tournament, additional fluid replacement is necessary (Casa, Clarkson, & Roberts, 2005, p. 118).

LOOSE ENDS…

VOLUNTARY DEHYDRATION

Young basketball may experience "voluntary dehydration" because they do not ingest sufficient fluids. It is not possible to monitor the fluid intake of all athletes but over a season, the adept coach will observe patterns such as poor performance or increased fatigue. These players require additional encouragement to drink.

Although a coach may permit water bottles in practice, players may be unable to afford sufficient provisions. With at-risk athletes, coaches often need to supply water bottles themselves and could seek sponsorship. Ted Catton, science teacher and cricket coach at Eastern Commerce C.I., always generously purchased extra cases of water bottles during his regular shopping trips to Costco for distribution to players on the school cricket team.

DEHYDRATION WHILE TRAVELLING

Travelling can occur during long flights (over four hours) to tournaments or training camps. Try to consume 500ml of fluid every three to four hours. Avoid the temptation of sugary soft-drinks on the flight and purchase additional water bottles after passing security (Williams, Planning for Healthy Athletes, 2009). Dehydration during a flight can lead to fatigue and a poor performance during practice or the first game.

DIURETICS

Alcohol should be avoided because it increases the rate of dehydration (Williams, 2009). Caffeine is also a diuretic but its effects are mild and diminish as the body adapts to daily consumption (Beck, The power of positive drinking, 2009). If coffee is part of a post-secondary or adult athlete's Ideal Performance State, they should consume the drink forty five minutes to an hour before competition so the body can metabolize the caffeine.

HYPONATREMIA

Drinking too much water - also known as hyponatremia or water intoxication - causes blood sodium to fall tremendously, leading to rapid brain swelling which can trigger a coma or death (Beck, The power of positive drinking, 2009). It is unlikely in basketball because of the length of the games (two hours) would require extreme fluid consumption. The risk may increase during a tournament when multiple games are played on the same day and athletes may over-hydrate during break periods. Truly, hyponatremia remains a condition that is more of a concern to endurance athletes than basketball players.

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Personal Diet

National Coaching Institute
Task 4 (Nutrition)

Toronto, Ontario, Canada
August 2009

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THREE DAY DIET REPORT

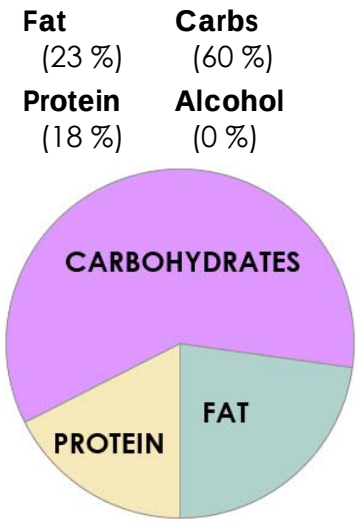
03 August 2009 to 05 August 2009

	Monday	Tuesday	Wednesday
Morning Meal	• 3 cups Corn Flakes with milk • 1 banana	• 3 cups Corn Flakes with milk • 1 banana	• 3 cups Corn Flakes with milk • 1 banana
Snack	• 500 ml coffee	• 500 ml coffee	• 500 ml coffee
Midday Meal	• Veal sandwich with eggplant, peppers, and tomato sauce • 2 cups mango juice	• 6 oz. beef gyro on a pita with a tomato • 2 cups mango juice	• Two 3 oz. bacon lettuce and tomato sandwiches • 2 cups mango juice
Snack	• 500 ml coffee • 2 cups green apple juice • 1 banana	• 500 ml coffee • 2 cups green apple juice • 1 banana	• 500 ml coffee • 2 cups green apple juice • 1 banana
Evening Meal	• 12" capicola pizza with cheese, and peppers • 500 ml skim chocolate milk	• 3 beef burritos with beans, salsa, and guacamole • 500 ml skim chocolate milk	• 3 beef burritos with beans, salsa, and guacamole • 500 ml skim chocolate milk

ANALYSIS

Average Daily Intake (Macronutrients)

	Grams	Calories	%-Cals
Calories		**3,441**	
Fat	88.5	789	23 %
Saturated	28.3	253	7 %
Polyunsaturated	15.8	140	4 %
Monounsaturated	32.3	288	8 %
Carbohydrate	524.7	2,062	60 %
Dietary Fiber	37.8		
Protein	148.3	606	18 %
Alcohol	0.0	0	0 %



Average Daily Intake (Micronutrients)

Micronutrient	Amount		RDA	% RDA	Micronutrient	Amount		RDA	% RDA
Vitamin A	1,179.7	µg	900.0	131	Manganese	4.2	mg	2.3	181
Vitamin B6	6.3	mg	1.3	485	Niacin	54.6	mg	16.0	341
Vitamin B12	18.3	µg	2.4	763	Pant. Acid	10.5	mg	5.0	209
Vitamin C	112.4	mg	90.0	125	Phosphorus	2,522.2	mg	700.0	360
Vitamin D	15.0	µg	5.0	300	Potassium	6,522.2	mg	4,700.0	139
Vitamin E	7.4	mg	15.0	49	Riboflavin	6.5	mg	1.3	501
Calcium	2,030.4	mg	1,000.0	203	Selenium	172.8	µg	55.0	314
Cholesterol	267.8	mg	--	--	Sodium	5,340.4	mg	1,500.0	356
Copper	2.2	mg	0.9	239	Thiamin	4.7	mg	1.2	389
Iron	46.4	mg	8.0	580	Water	3,882.2	g	--	--
Magnesium	506.0	mg	400.0	126	Zinc	21.8	mg	11.0	198

SELF-EVALUATION

I have a relatively good breakdown between the three macronutrient groups (carbohydrates 60%, protein 18%, and fat 23%). I could consume more mono-unsaturated and poly-unsaturated fats and more complex carbohydrates, especially early in the day.

Due to my Crohn's Disease, blood tests show that I am slightly anemic even though I consume plenty of iron so I have recently doubled by Ferrous Sulphate supplement..

A strong point of my diet is the fresh ingredients that I get at the St. Lawrence Market and other locations. I could prepare a lunch ahead of time instead of going to the market but I enjoy the freshly prepared food. It is very difficult to avoid sodium these days.

As part of my afternoon snack, I have started to eat high-glycemic-index foods like bananas and green apple choice more frequently. This has given me much more energy on the basketball court after work.

I should try to reduce my caffeine intake and drink more water instead of it is easier said than done and I very much enjoy my coffees after breakfast and lunch.

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Conclusion

HOW MY PHILOSOPHY CHANGED

MATCH RECOVERY NUTRITION TO INTENSITY OF PRACTICE OR WORKOUT

After an intense practice, coaches should counsel players to ingest more fluids and nutrients because they burned more energy. It is customarily easy to differentiate between a hard workout and a light workout but the intensity of practice may depend on whether the drills are primarily part method or whole method. Players work harder during small group work compared to activities that involve the entire team (Ziv & Lidor, 2009, p. 553). Subconsciously, coaches have likely known this to be true, which is why there is more whole method work as the season progresses.

Workout Intensity

Drill	% Heart Rate Max	% VO_2 Max
2 on 2	92.1	79.0
3 on 3	88.2	73.5
5 on 5	69.0	69.0

Personally, I find that 3 on 3 drills are the best method for isolating a specific skill and performing multiple repetitions.

TREAT STARTERS AND RESERVES DIFFERENTLY

Firstly, coaches should conduct mid-season training in small groups or plan individual routines so no particular team member falls behind. Providing extra work for bench players after practice could provide more repetitions. As shown by the table above, part method drills with bench players will effectively maintain VO_2max levels.

Psychologically, these reserves will compete especially hard because they are seeking to impress the coach with whom they are working out in order to increase their minutes.

Secondly, individual nutrition plans should consider that players who play many minutes will require more nutrients and energy.

LONG-TERM ATHLETE DEVELOPMENT

Since Basketball Australia, which possesses a relatively forward-looking and modern sport department, may have overlooked potential in favour of current fitness levels when selecting players for their elite development program, players should always give coaches their best effort.

It's never too early to teach proper eating and hydration habits to a youth team in order to give players a good chance should they wish to advance to the next level. Coaches

should be mindful of the nutrition habits of each player when selecting a squad and could make a nutrition instruction part of their basketball camp.

COACH PARENTS AND GUARDIANS AS WELL AS PLAYERS

Canada Basketball established the National Elite Development Academy for youths aged sixteen to nineteen years old. In the words of Women's Head Coach Christine Stapleton, "not all billets are created equal." When players live with their parents or with billets, it is also necessary to convince the adults in the household to prepare fresh meals and avoid convenience foods that are high in fat (Stapleton, Cook, & Dignard, 2008).

Handouts sent home or a parental meeting held as players are dropped off for practice may be effective if there is "buy-in." In those cases, parents are likely willing to buy high quality ingredients and make changes to the family meal plans.

If parents and guardians are unavailable or unwilling to participate, the coach's role is more challenging. The coach will need to be flexible, make the issue simple, and provide alternatives. I personally believe that a frank and factual argument is best. Players should be told exactly why skipping breakfast is bad and given options for a quick breakfast on the go.

The coach may want to buy some snacks in bulk to provide before and after practice for at-risk students. This initiative may require additional fundraising but the benefits of a good diet clearly outweigh the costs.

COACH WITH PERSPECTIVE

At the University of Toronto Schools, I crossed paths with the administration because a student threw up during the Twenty Metre Leger Beep Test. To me, this wasn't the end of the world. I had told the player not to eat a large pizza slice shortly before practice, provided simple carbohydrate alternatives, and again urged him not to eat the pizza.

When he performed poorly on the test and threw up in the waste basket, the Athletic Director was dismayed but I didn't mind. If a graphic lesson like that case encourages the entire team to improve their eating habits (and the only injury is suffered to somebody's pride), it will raise individual and team performance later in the season.

Obviously, teenagers and young adults will cheat on their diets and take shortcuts. A school team is not going to be perfect in this regard and a coach must be tolerant. Even at a high school level, a coach should be fair and advise players of the upcoming schedule. Since the coach knows that a Beep Test is coming, they should remind the players and suggest good food choices that will maximize performance.

CONSIDER THE CULTURE

At the recent Ontario Basketball Boys' Midget Development Camp, the food provided by Humber College was excellent (with the exception of one meal when plastic "display" apples were inexplicably placed next to the real apples). Camp organizers insured that it would give players the healthy energy they needed for a five day camp. However, many of the athletes from the Greater Toronto hated the food because it wasn't what they were used to eating at home.

Many players on the Central East team wanted more West Indian fare and under-fuelled themselves. My inclination is to side with the player who figured out that there was a West Indian food stand in a neighbouring building and ate there. Unfortunately, experience always teaches me that not everyone can solve problems by themselves.

When coaches propose a diet to their players, the sample menus should suit the players' culture and include their favourite foods. It is a small superficial adjustment that will pay large dividends.

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"To be what we are, and to become what we are capable of becoming, is the only end of life."

- Robert Louis Stevenson