

Nutrition diary analysis of junior ice hockey player

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Abstract

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<p>Ice hockey player's nutrition is usually not the most discussed topic around the sport. Still it has a big impact, and the players are taking it more seriously every year when trying to reach the full athletic potential. The purpose of this thesis was to analyse the food diaries of one junior hockey team. Main factor was the relation between energy consumption and energy intake. The quality of eating, meal timing and drinking of liquids were also key topics in the feedback.</p> <p>The target group were Pelicans Lahti C2 junior team. They are 14-15 year old teenagers, who practices more than five times a week and play in the highest junior level in finnish league. Players filled a food diary during four days, where they put all the foods and drinks they were eating. Also the eating times were written in the diaries. Energy consumption was calculated through the food diary analysing program. Players also wrote in the diary, how much physical activity they had during the day. After that all the numbers were put in the analysing program, which gave the daily caloric numbers and also the daily amounts of proteins, carbohydrates and fats. The food diary of 15 players were analyzed in the process.</p> <p>Results tell, that most of the players are not having enough energy during the day, since the energy consumption is on it's highest peak during this age. Most of the players, with few exceptions, stay also a bit low on getting of carbohydrates, proteins and fats. According the diaries, main reason for that is the absence of one or two healthy snacks during the day. The main meals (lunch and dinner) were decent in the diaries. Some players also left out a proper breakfast, which is very important for athletic teenager. The most positive thing was, that zero player based their nutrition on unhealthy food choices. The players seem to have a good knowledge and motivation towards nutrition.</p>	
<p>Keywords</p> <p>Sports, ice hockey, nutrition, energy consumption, energy intake</p>	

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1 Introduction

Focusing on nutrition is one of the crucial parts on athlete's development path. Individual sports have a long-term knowledge of how and what athlete should eat to make one's performance better. Nutrition planning should be equal as well with the physical training plan. With well-planned nutrition, an athlete can make a difference between reaching the professional level or staying on an average playing level. A talented athlete may never reach one's full potential, if the nutrition part is not handled well. Competition is harder every year, so every part of the athlete development planning should be considered.

Junior ice hockey player's nutrition is the topic of this thesis. In team sports, like ice hockey is, the nutrition has traditionally been considered as "not the most important thing" and the focus has been in different areas. Coaches have focused on team tactics and other game-related things to make the team win and the players better. In hockey team, the nutrition coaching means usually one presentation about nutrition during the season. After that, every player should know, how to eat and drink to make progress during the season. Instead of that, nutrition coaching should happen individually for every player to make the best progress during the season and career.

This work analyzes the nutrition quality of a junior hockey player, since the research group in this case is 14 or 15 year old players. There are three main research questions. Are the players getting enough energy during the day compared to the consumption? How is the eating rhythm and is there a long distance between meals? Do the players get enough proteins, carbohydrates and fats during the day? Energy consumption is very high on a 14 or 15 year old junior player. Carbohydrates, proteins and fats are all important part of the nutrition planning. Energy intake and nutrition quality is very important especially on a young player, because the body needs a proper building material on a path towards adulthood. Important purpose of this process is also to teach players, how to keep and fill a nutrition diary. I am going to analyze the diaries of 15 players. The 4-day-diary consists three practice days and one game day.

2 Physiological demands of ice hockey

Ice hockey is an interval type of ball game, where the major part of energy production, approximately 70%, occur by anaerobic glycolysis. The game is divided into short sprints, which are called shifts. One shift lasts around 45-60 seconds in a game. The intensity during the shifts is high, so that the heart beats 85-90% of maximal heart rate. Normally, there is 3-4 minutes break between the shifts, so the sport requires a lot from both aerobic and anaerobic energy production systems. (Montgomery, 1988.)

The high intensity shifts leads to lactate production in the muscles, which speeds up the muscle fatigue. The body should be capable to perform the shifts by phosphocreatine, which means long enough resting periods (30- 120 seconds) to exhaust the lactate from the muscles. Because of that, the ability to exhaust the lactate should be one part of training plan during the season. The interval working time is usually, depending on the game, 30- 180 minutes. (Nummela, 2007. Accumulation of lactate depends on player's fitness level, nutritional status, blood flow, active muscle mass and state of training. Same variables effect on recovery time and lactate clearance. (Cox, Miles, Verde, Rhodes, 1995, 197.)

The basic strength levels should be on high level in ice hockey, because it helps the players to perform well especially in the battling and 1 on 1 game situations. The lower body strength is one of the most important things in defining the skating speed and endurance. The speed and explosive strength is needed in full speed sprints and turnovers, which both are the essential parts of the hockey game. The core and hip area strength are important for the balance, shooting and hitting the opponent. The upper body strength is needed as well in contact situations and also in skating rhythm. The body of ice hockey player should be powerful and strong overall. (Hakkarainen, 2008.)

The skating ability and speed is one of the most important parts of hockey player's physics. Quickness and reactivity are highlighted constantly in game situations. Genetic factors effect on player's skating speed, but it can also be trained in a right way. Fast skating speed helps the player to perform well in a game. (Twist, 1997, 73-74.)

During the season, some progress is made in anaerobic endurance, whereas the aerobic endurance stays on a same level or increases only slightly. Anaerobic training during the season leads to decrease of muscle mass, so the strength training has to be considered specifically in off-ice training. (Montgomery, 1988, 100.)

The most crucial things in ice hockey are still the game sense and ability to play the game. Well-prepared physiology gives the individual a chance to play on the top of the skill level. Physical strength and endurance helps as well the whole team to play well together in every game during the season. (Lampinen, 2008, 280)

Hockey season in terms of physical training is typically divided into three main phases. That includes the recovery off-season phase, a pre-season combination of aerobic training and resistance training and in-season training, which attempts to maintain the fitness levels gained earlier. Relevant physiological evaluations should define the professional ice hockey training programmes. (Cox, Miles, Verde, Rhodes, 1995, 192.)

3 Basic nutritional needs in sports

Nutrition makes a basis for a physical performance. It gives all the essential building parts for creating new tissues and repairing the existing ones. The biological actions uses the nutrition as a fuel, and it effects on every mental and physical work we do. (Mero, 2007, 145.)

The hydration of body is important, in spite of the age of athlete. Water forms 40-70% of the whole body total weight, depending little bit on gender and body consumption. The athlete should drink 2,5 liter of water daily, without any physical training. Depending on the amount of training, the need of water can be 3-4 times higher compared to resting phase. Failure of water intake causes the decrease of performance level. (Mero, 2007, 173-175.)

Sport increases the energy consumption a lot, compared to a normal physical activity. The biggest amount of energy comes from the carbohydrates, which should be taken right way before and after the physical loading. Athlete, who trains hard, needs also a lot of protein for building up the tissues. The need of fat is the lowest on the athlete, only endurance sport athletes need to focus more on the fat intake from the nutrition. (Mero, 2007,175.)

Total Energy Expenditure is calculated from age, gender, weight, height and the activity factor. The Equations are: $TEE = BEE \times AF$.

For example: $BEE (M) = 66 + 13,7(Wt) + 5,0(Ht) - 6,8(age)$

TEE = Total Energy Expenditure (kcal/d), Age = Age (years), Gender = Gender (Male), Wt = Body Weight (kg), Ht = Body Height (cm), Activity = Activity (factor)
BEE = Basal Energy Expenditure (kcal/d)

(Health 101 education tool, Total energy expenditure, ScyMed 1999-2005)

The main points of well-prepared nutrition are having big amount of vegetables, fruits and berries, eating bread or whole grain products on every meal, fish or fish oil twice a week, using multivitamin products especially on winter time, eating snacks with good quality and having unsaturated fats. Eating unhealthy snacks like candies are is allowed every now and then, but it should not be done in hunger. (Borg, Hiilloskorpi, 2009.)

Development of an athlete builds up from the areas of training, nutrition and rest. Nutrition must be considered equally important with training and recovery. Nutrition is important in keeping the athlete healthy, to have enough strength and to develop constantly. (Finnish Olympic Committee, 2017)

Food is also a response for all the other needs than only the physical one. The joy and satisfaction are important in building a healthy relationship towards eating. Successful athletes and coaches are role models in nutrition wise as well. The food is not only a fuel or construction material for young athlete. (Niinistö, 2017.)

4 Macronutrients

4.1 Carbohydrates

The greatest part of the energy is contracted from the carbohydrates. Carbohydrates are divided into monosaccharides (fructose, glucose and galactose), disaccharides (lactose, maltose and sucrose) and polysaccharides (starch, fiber and different types of glucosismolecyl forms). They absorb and digest in the body by over 90% efficiency, so the energy is usable rapidly and instantly. The normal amount of carbohydrate in the body is 375-475 grams, which consists around 325 grams of muscle glycogen, 90-100% of liver glycogen and only 5% of blood glucose. One gram of glycogen consists four calories of energy, which means that usually the carbohydrate storages have 1500-2000 calories of energy. (Mero, Mutanen, Voutilainen, 2007, 155-157.)

Training with insufficient glycogen supplies is not optimal and can lead to overtraining. Recovery is faster and more effective, when the nutrition contains a reasonable amount of carbohydrates. The need is biggest in endurance sports and ball game sports. Glycogen acts as energy source in high intensity training and it is crucial factor in training tolerance. (Ojala, Borg, Valta, 2017.)

Slowly absorbing carbohydrates are one of the best energy sources in athlete's diet. They maintain a solid level of blood sugar and have a lot of other beneficial nutrients like antioxidants, vitamins and fiber. Fiber keeps the hunger away, maintains the well-being of digestive system and prevents type 2 diabetes. These low glycemic index foods are for instance whole grain pasta, porridge, berries, fruits, beans, peas and yoghurt. (Ilander, 2010, 58-60.)

4.2 Proteins

Proteins constitute of essential and non-essential amino acids. Essential amino acids gain from daily nutrition, because the human body can't build them by itself. However, the body can produce non-essential amino acids, so getting of those from the nutrition is not as vital. (McArdle, 2001, 60.)

The main purpose of proteins is to be involved in protein synthesis. They are needed in building of muscles, enzymes, hormones and neural transmitters. Daily recommend for the athlete is 1,5-2,5 kg/kg protein on a daily basis. Weight training adds up the need of protein significantly. Sports, that causes lot of muscle cell damage, like ice hockey with all the off-ice training, getting of protein is very much needed. (Mero, 2007, 147-152.)

The need of protein is significantly high in age of puberty, because it is the most important building component of muscle tissue and bones. Protein is needed especially, when the goal is to build up more muscle mass. Usually, junior athletes get enough protein despite the high need of it. Animal-based products are the best quality protein sources. Every meal should consist some animal-based, protein rich food. Red meat, chicken, eggs, fish and milk products are examples of high quality protein sources. Protein, that comes from vegetable products, is not qualified as good in this matter, but they are also important by thinking of the need of other vitamins and iron. (Ilander, 2010, 62-64.)

4.3 Fats

Athlete recommendation for the fat is 0,5g-1,5g per total body mass(kg), depending on the amount of training. In other words, that is 20-25% of the total energy expenditure. (Mero, 2007)

Fat holds plenty of important tasks in human body. Important hormones for growing and development are produced from fats. Fat helps nerves and muscles work together in more efficient way. It brings taste for the food, although it is not very effective in keeping the hunger away. All athletes need fat, but getting too much of it gains weight

because of the amount of calories. Even small changes in fat intake have an influence on total energy supply, since the fat consists twice the energy of carbohydrates and proteins.

The quality of fat is an essential thing to consider. Two thirds of fat intake should be unsaturated fat. Only one third of three should be saturated fat. These are also called soft fat (unsaturated) and hard fat (saturated) for instance. Advisable sources for the unsaturated fat are canola oil, peanuts and seeds, olive oil, avocado and fish. Saturated fat consisting foods are for example coconut oil, butter and beef. (Ilander, 2010, 65-66.)

4.4 Water and drinks

Normal daily need of water is approximately 2,5 litre, which consists drinking (1,2 litre), from water that is in the food (1,0 litre) and water from metabolism reactions. (0,35 litre). The air temperature and the intensity and duration of training define, how much water is lost during the activity. Dehydration leads to lack of performance level, especially in endurance. The need of natrium should be considered as well, so that metabolism stays functional. (Mero, 2007,174.)

To make every practice developmental, drinking of water is essential during the day. The athlete should drink water, even if there is no feel of thirst. The meal before practice should include one or two glasses of water. During the training, 3-5 deciliter of water per hour is desirable amount, although long duration or high intensity rises up the need of drinking. Strong sweating, heavy equipment or lack of drinking before practice increases also the need of water, all the way up to one liter per hour.

Water is generally the best liquid during the sport activity, even if the intensity of training is high. Water is also recommendable drink for the young athletes, who practice on high intensity. Sport drinks, that consist 3-6% of carbohydrates, work well when the

practice lasts more than two hours. Having carbohydrates during the practice is beneficial especially in endurance sports and ball games. (Ilander, 2010, 171-174.)

Liquid balance is important in sport performance, because even a few percent dehydration decreases a capacity significantly. The energy production of muscles becomes more difficult, body's thermoregulation weakens and usage of nutrition and oxygen degenerates in working muscles. Dehydration effects in many areas, that define the sport performance quality. (Rehunen,1997, 115-116.)

Energy drinks, which are nowadays in big favor among teenagers, are not favorable part of sport participating teen's nutrition. Energy drinks include a lot of sugar, and caused by that the blood sugar varies a lot. The addiction rises up fast and they don't keep the body hydrated or fix the dehydration. Sports drinks are instead a helpful product during the activity. They consist long-lasting carbohydrates, which are beneficial in energy production. Still, the best drink for the sport is water, since it doesn't have any sourness or sugar. (Ilander, 2010, 117.)

5 Nutritional need of young athlete

The energy storage of young athlete should always be as full as possible. This means especially getting enough carbohydrates every day. They improve the training endurance, strength output and covers muscle tissue from too big stress. Reasonable meal rhythm keeps the weight on a suitable level without restrictions in eating and all the resources are focused into sport itself. (Ilander, 2010, 34.)

The need of nutrition grows during the childhood and puberty and it is highest during the teenage years. The daily need of energy can be even 4000 kilocalories per day on highly active youngster. Even though it is recommended to eat a lot, the quality of food must be underlined because of health, coping with workload and sports. (Ilander, 2010, 35.)

Too hard discipline is not needed in teenager's diet. In worst case it can possibly lead to eating disorders. The feeling of shame should not be involved to eating, because in puberty these kind of things are decisive. The eating habits and routines should be in the middle, when the athlete is trying to gain or drop weight. The amount of kilograms is a secondary thing in weight discussions. The coach should never compliment anything related to young athlete's weight. This kind of discussion must be hold with the parents instead. However, because of high energy consumption, overweight is rarely a problem among teenage athletes. (Ilander, 2010,45.)

When the caloric need is high, like in ice hockey, the athlete can't necessarily eat enough food to cover the need. Regular and good quality nutrition is always a base for the eating, so that the athlete gets enough nutrients. It is sometimes good to use other than sugar free light- products. The vegetable oil, milk products with normal fat percent and salad dressing are all usable in filling of caloric need. Every now and then, the athlete can eat high-caloric snacks like ice cream, milkshakes, puddings and pastry. They are suitable in addition for healthy meals. (Ojala, Borg, Valta, Hiilloskorpi, 2015)

The energy need of child and young athlete varies during growth and individual stage of development. Therefore the differences in nutrition are always individual and it might be hard to give any overall advice in nutrition. The need of nutrition should be always followed on occasion because of different starting points and different phases of development. (Ilander, 2010, 32-34.)

6 Regular meal timing

Well-planned meal rhythm is important for numerous reasons. Regular meal timing helps in keeping the blood sugar steady. This helps also in keeping the training ability high. Frequent eating also downsizes the meals, which eases up the filling of energy need. Regular meal rhythm creates also continuity in recovery. (Ilander, 2010,149.)

Everyday meal planning should consist breakfast, lunch and dinner and also 1-4 snacks and evening snack. Rhythms can differ daily a little bit. Too long breaks in eating cause challenges in controlling of food amounts, which will lead to difficult feelings in training. Training, preparing to games and game day nutrition brings extra challenge in finding of desirable meal timing. (Ojala, Borg, Valta, 2015)

6.1 Breakfast

Breakfast is an essential meal for the day. With good breakfast it is easier to make healthy decisions and avoid unhealthy snacks. Breakfast even have an influence on evening eating and need of delicacy. The most important function of breakfast is to bring nutrients to body after night without eating. Concentrating on carbohydrates is important in controlling of blood sugar. Drinking is also important in the morning, because the liquid balance might be poor after a practice day. Having too heavy breakfast before practice is not favorable, since non-fusible food can disturb the performance. Good choices for breakfast are for example, eggs, muesli, yoghurt, juice, fruits, whole grain bread and vegetables. (Ilander, 2010,151-152.)

6.2 Lunch and dinner

Versatile and plentiful lunch and dinner meals create a frame in nutrition of young athlete. Lunch gives energy to evening practice and it should be composed with food plate model. The food plate model varies little bit due to energy need. The basic version of it is suitable for kids and teenagers, whose energy need is not high. As a sport, ice hockey

sets more into the category of endurance sport instead of accuracy and skill –related sports. Half of the plate should be vegetables, which can be salad or grated food. Adding the vegetable oil dressing is desirable due to healthy fats. Quarter of the plate is then reserved to whole grain rice or pasta, and quarter for fish- or meat food. (Ilander, 2010,154.)

With ball sport athletes, the food plate model can be more energy rich. The choices might be two thirds of whole grain spaghetti, one thirds of minced meat-vegetable sauce, one small plate of salad and grated food, three pieces of bread with margarine and glass of milk, water and juice. (Ilander, 2010,155.)

Figure 1. Food plate model. (Vancouver coastal health)



Figure 2. Athlete’s food plate model. (www.2ksportstraining.com)



Starting time of the practice define the eating of dinner. If the practice starts at 7pm, it is fine to eat the dinner around 4pm. On a regular basis, it is most rational way to practice with the energy from snacks and eat dinner after the sport. This especially, when the practice starts by late afternoon or early evening and there is no proper time for food dissolve.

It is important for the athlete to keep the meal sizes moderate for dinner before practice. After large meal the feeling is tired and it makes the training more difficult. Different kind of creamy and fatty foods should be avoided in meals before practice. Favorable meal example could be fried low fat fish, baked potatoes, small portion of salad with sour cream sauce and two glasses of water. After the practice it is fine to have more heavy dinner meal, also with meat, fat and vegetables. That is the time when the food dissolving is not the first priority. Eating heavily after practice is good for the recovery. (Iländer, 2010,179.)

6.3 Snacks

Snacks complete the energy supply during the day, but they don't replace the main meals in any case. In addition to daily main meals, athlete should eat 1-4 snacks. Eating snacks is important for getting enough and constantly energy and nutrients. (Ojala, Valta, Borg, Hiilloskorpi, 2015)

Snacks should form from quality nutrients. A high quality snack consist colourful food, protein rich food and something with long lasting carbohydrates. Drinking of water is also crucial to remember. During school day, healthy snack choices are usually unavailable. That leads to poor quality eating. Young athlete must concentrate in keeping the snacks healthy. Recently, the snack options are better and now the choice is available from sandwich and juice slot machine. Homemade snacks are advisable, if there is no snack available in school. (Iländer, 2010,160.)

Bread, yoghurt, sour milk, quark, cottage cheese, muesli, porridge, karelian pasty and fruits are healthy snack choices. Suitable timing is individual and the player must find them personally by trying. Sport supporting and recovering snacks consists always carbohydrates for energy and proteins as a building material for cells. (Finnish Olympic Committee, 2017).

Before going to sleep, athlete should eat proper dinner and drink water. This helps tired muscles to get nutrients for the recovery that occur during the sleep. Small evening snack is suitable, if the dinner is after the practice. When the dinner is eaten very late, there is no need for evening snack. Athlete doesn't need to avoid carbohydrates on the evening time, actually it is very important to get them enough. Using milk products is favorable, since the milk protein supplies slowly and is usable for long time. Drinking water is important also on evening snack due to dehydration from the practice day. (Ilander, 2010,179-180.)

6.4 Game day

The meal timing is little bit different on game days than on a normal practice day. Getting excited and nervous before the game can effect on digestion and food melting?. In high intensity sports it is very much necessary to keep the time between lunch and a contest long enough. Even small amount of unmelted food can make the feeling heavy during the contest. Over four hours without eating is usually too long time for the most. The symptoms after that might be exhaustion, feeling of sickness, headache and regular symptoms of low blood sugar. (Ilander, 2010,187.)

When the game starts by midday or early afternoon, it is usually enough to eat proper breakfast and also light, well-fusing snack 1,5-2 hours before the game. In the afternoon games, there is also lunch 3-4 hours before the game. A generous snack can also replace the lunch, if it feels like more natural option. For the evening games it is fine to have a dinner meal. Approximately one hour before the game athlete can also eat a light snack, if it is needed. Preparation for weekday games is almost similar than getting ready to practice. Breakfast and school lunch is yet again important. If the game starts late, the athlete should eat several snacks during the school day and also a dinner after the school. One bottle of liquid during the day keeps the body hydrated. (Ilander, 2010,192.)

Tournament days bring special requirements to nutritional intake. Athlete must have enough energy to play several games during couple of days. Short breaks between the games brings challenges for the quality of food and ways to eat it. In days like this, it is important to fill up the energy supply on the days before the tournament. They allow the body to carry on in the games, even if the eating on the tournament day would be a bit lighter. (Hlander, 2010, 204-205.)

7 The aims and research questions

The process started in January 2018. I had decided to make a research about nutrition in ice hockey. The reason for that is my own interest and own experience as well. When I played hockey, this part was recognized rarely. There was no kind of monitoring for nutrition in that time. That made me curious for the topic. How much the athlete can lose a potential or vice versa gain development if the eating is regular and healthy. The target group was specified through my own personal connections, since the coach of the research team is my old teammate and classmate. The need for this kind of research exists, because in ice hockey environment the nutrition awareness is still one of the biggest areas to develop. The main teaching point is, if the player uses at least four hours a day for training, why not to make everything to gain the full development. Research team players are young, so they can still learn easily healthy and improving nutritional habits. The amount of training is remarkable, so that's why it's important to recognize the purpose of rest and nutrition as well. The athlete rarely reaches the highest level and potential, if the eating is unhealthy and irregular. Proper nutrition is important, even though the junior player didn't want to become a professional athlete. It brings quality and healthiness in life overall, and that's why it is a good thing to learn.

The results are reported to players personally with feedback. This will be done by writing the main points to develop in nutrition and how to make it more suitable for hockey training. The players will know, if they are eating enough food comparing to consumption.

Research questions:

- Are the players getting enough calories compared to their daily energy consumption?
- Do the players get enough protein, carbohydrates and fats?
- How is eating timed? How long are the breaks between eating?

7.1 Food diary as a method

Food diary consists all the eating and drinking of athlete usually from 3-7 days time. The foods, drinks and products are documented as exact as possible. It is also important to know the eating and drinking time. Also the amount of physical exercise is reported in the diary. The food diary is a suitable method, if the test group is cooperative and reliable. Often the diary is still filled up with a lack of motivation. That leads for example in documenting the food choices better than they actually are and also in forgetting to add up all the eaten foods in the diary. The results are analyzed by computer program, which calculates the nutritional ingredients. Interpretation of the results requires knowledge of nutrition science, but also a knowledge about the sport itself. (Sallinen&Mero, 2007, 210-211.)

In this case I trust the juniors to be motivated in filling up the diaries. The players know, that this kind of research help them to get better players. That is why I personally don't believe in any kind of cheating or glorifying of results. Even if there would be actions like that from some individuals, the major group is still honest and reliable, which make the results countable.

7.2 Research group

The research group is Lahti Pelicans C2 junior players. I used 15 diaries to analyze the results. The team plays in a highest level of it's age group series in Finland. Team practices almost every weekday on the ice, and they do also off-ice training before or after every practice. There is also one or two games for one week. Adding in that, the teenagers have physical education in school and some of them also do a school and practice trip by walking or cycling. Like mentioned before, that makes the energy consumption huge. This must be taken into consider in results as well.

7.3 Energy consumption

The energy consumption is divided into three areas, which are resting metabolism, food digestion and physical activity. Resting metabolism takes the most of the energy (50-70%), food digestion covers 10%, physical activity and other small activity like cleaning at home and school trips takes around 20-30%. The resting metabolism value is different on every person. Muscle mass tissue burns more calories than fat tissue. Other factors effecting into metabolism are age, gender, climate and nutrition.

Physical activity and exercise effects on metabolism by two ways: the energy that is burned during the exercise and also on longer range through the muscle mass gaining. The skill to do different activity defines also the amount of energy consumption. When the body gets used to, for example skating, the less energy is burned during it. The duration and intensity are the biggest factors in consumption. (Terveellinen ruokavalio, energiankulutus, 2018)

The players were asked to write down the daily physical activity. This method is directional and once again it depends, how exact the players have filled up the diaries and their activity. The exact value of daily energy consumption is impossible to know, but it will be very close to right numbers. When the average values are calculated from four days, the margin of error is small. In results analyzing, I had to calculate the resting metabolism value on each player (kcal/day) and after that add up the daily physical activity and exercise. The comparison is between the consumption and the energy (kcal), which the players are having.

8 Results

I used Finnish food diary program Sulamo to analyze the results. Sulamo estimates the energy consumption and the amount of carbohydrates, proteins, fats and fiber. By doing this, I got the knowledge of each player's nutrient amounts. The method shows average numbers from each player's 4-day-diary for energy intake, carbohydrates, proteins and fats.

Seeing the energy consumption and nutritional intake (Table 1.), it's recognizable that the differences between the players are big. Only four players (2, 5, 9, 15) out of fifteen can reach the energy consumption by their daily nutrition. Some players (4, 8, 13, 14) have a long way to go for their caloric targets. The main perception is that the players are in very much different phase on their nutritional knowledge. Several players are down by few hundred calories per day.

Energy consumption and nutrition intake/Kcal

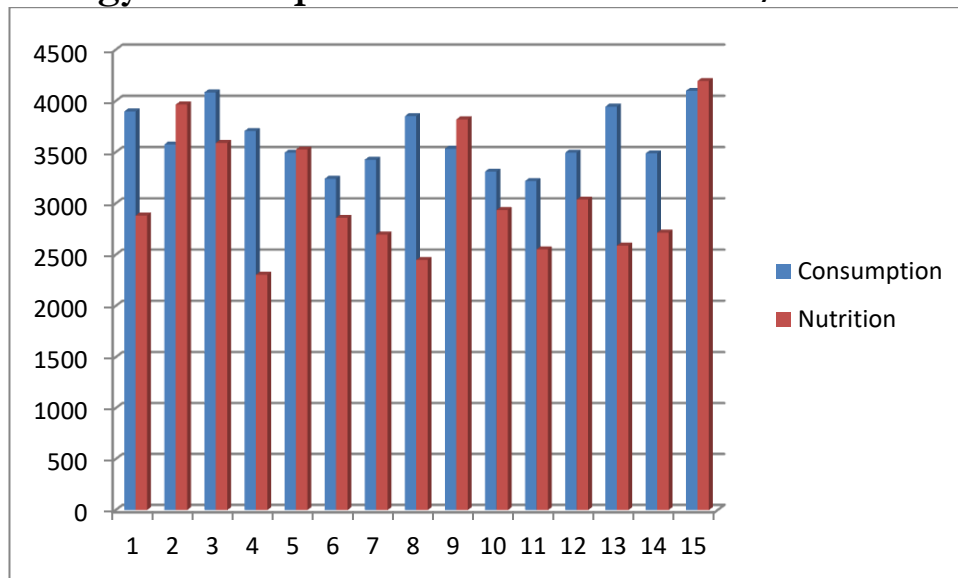


Table 1. Individual 4-day average for energy consumption and nutritional intake.

In carbohydrate intake (Table2.), the amounts vary also a lot between the players. 11 players can reach the amount of 300 grams per day. Player number 9 may have even too big amount of carbohydrates in the nutrition, since the average person recommendation is 5g/kg. Although physical activity increases the need of carbohydrates up to 8kg/weight kilogram/day (Valio, liikuntaravitsemuksen perusteet, 2016.), most of the players are having at least enough carbohydrates.

Some players (4, 8, 13, 14, 15) should pay more attention in their daily carbohydrate intake. They get too small amount of carbs compared to their consumption. The whole group average is still looking fine. Since 50-60% of the daily energy comes from carbohydrates, it is important area of nutrition. Several players should add up the intake for keeping up the good pace in training and playing.

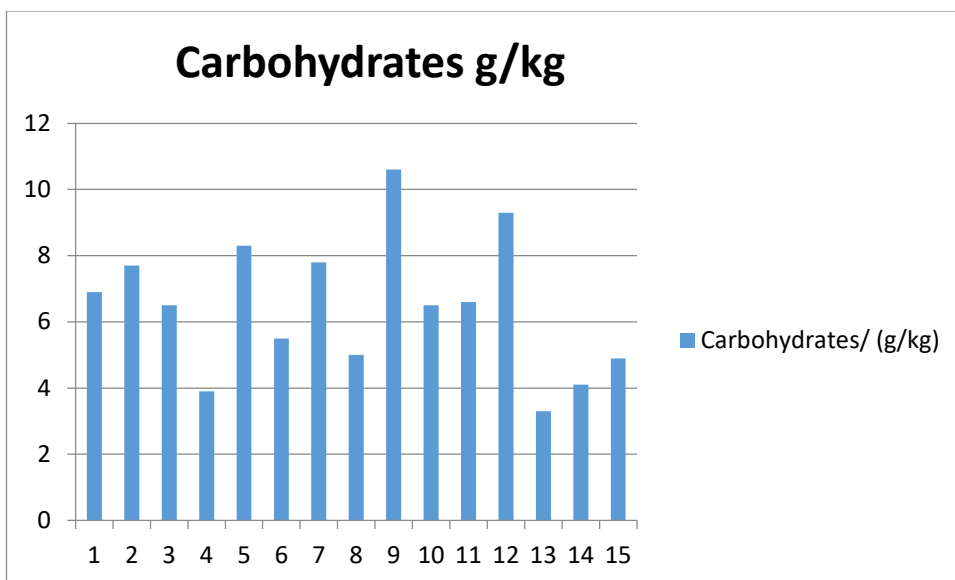


Table2. Individual 4-day average of carbohydrate intake.

Protein intake daily average (Table3.) seems to be on pleasant level for most of the players. Some individuals (2, 9, 11) are having probably even too much of it. The need of protein varies between 1,2-3g/kg daily. If the player's weight is 65kg, the maximum need of protein would be then 195g. Protein need for these young players is not as significant as the need of carbohydrates, but it is still important to cover the need of it. Players 4, 8 and 13 could add up just little bit more protein in their daily nutrition.

The difference in weight and on the need of protein can vary a lot. For example the player number on weighs 55 kilograms, which means that the daily need of protein is 110-130g daily. Player number 15 weighs 86 kilograms, so the need of protein for him is 170-190g daily.

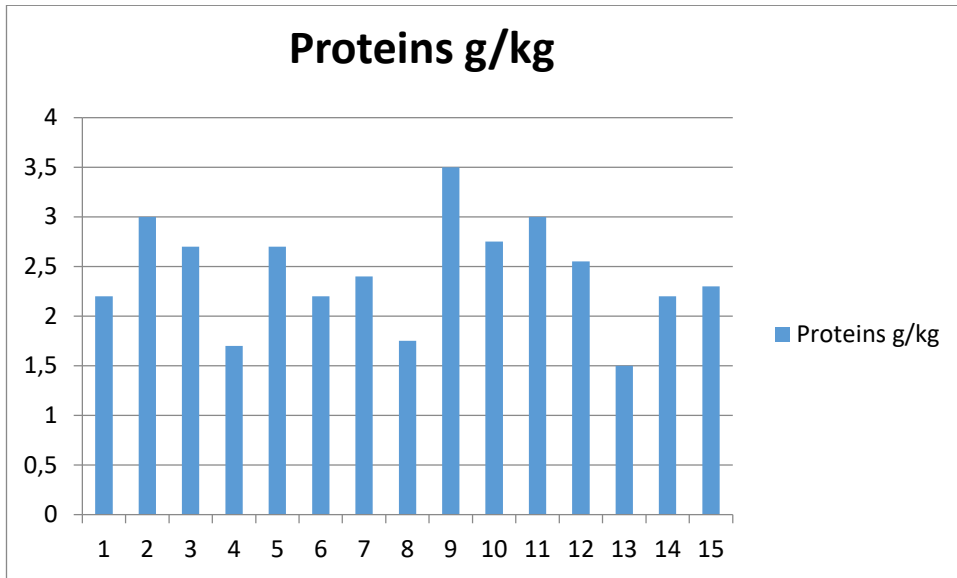


Table3. Individual 4-day average of protein intake.

The amount of daily fat intake (Table4.) average seems to be a bit low for almost every player. The need of fat on highly active people can even be 2 grams per kilogram. For example, player number 1 weighs 55 kilograms. He should have approximately 110-110 grams of fat per day. The basic daily amount for regular people is 1g/kg. In this case it is not calculated, how much of these fat amounts consists from saturated and unsaturated fats.

However, almost every player reaches the need of minimum amount. Players number 4 and 8 should pay attention in their fat intake, since now the amount is under 1g/kg level. Players number 2,9, 11 and 15 have remarkably high amount of fat in their nutrition. All the other individuals stay between 70-100 grams per day, which is very average number. It is enough, but especially on some days the amount stayed under the 1g/kg level. Daily differences were also huge for most of the players. Player number

13, for example, had amounts of 109g, 126g, 74g and 81g. Player number 10 had 83g, 101g, 60g and 113g. That shows the daily changing in nutrition.

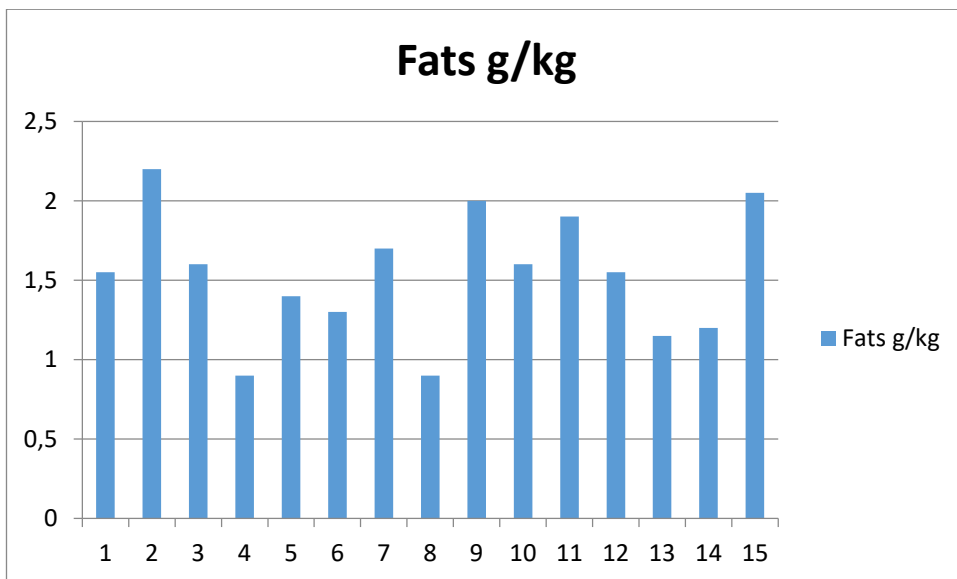


Table4. Individual 4-day average of fat intake.

9 Discussion

Table5. The difference between energy consumption and nutrition intake.

Player	Energy consumption	Nutrition intake	Difference
1	3898	2882,5	-1015,5
2	3576	3966	390
3	4084	3591	-493
4	3707	2305	-1402
5	3496	3526	30
6	3241	2860	-381
7	3427	2697	-730
8	3852	2449	-1403
9	3535	3821	286
10	3311	2936	-375
11	3219	2552	-667
12	3496	3038	-458
13	3945	2589	-1356
14	3489	2716	-773
15	4099	4195	96
Team average	3625	3074	-550

Seeing the table 5., on team average caloric amounts the nutrition intake didn't reach the energy consumption. In other words, the players are not eating enough to keep the development phase fast. More than 10 players did have a proper breakfast, the day started with porridge, yoghurt and bread etc.. It was remarkable, that if the player had a proper breakfast, the eating was solid for the rest of the day. Players, who didn't care about eating in the morning, had big problems in filling the caloric need of the day.

The food choices were regularly good for junior hockey player, and basically every player had at least a good lunch and dinner. They need to get probably more healthy snacks to fill the energy need. Exception was player number 15, who had big plates and also many snacks during the day. Have to remember, that the tallest players are 190cm, when the smallest are 160cm. That makes a huge difference in the caloric need.

The players ate a lot of bread, which is a good source of carbohydrates. Also for most of them, the choice was whole grain or rye bread, which was good to see. One remarkable thing was the drinking of hot chocolate. Some players had it more than 1

litre per day, which could be replaced by plain milk. On the other hand, it consists a lot of calories so necessarily it is not a bad thing for every one of them.

Some players did have very big differences between the diary days. Player 4 had 1481 kcal on the first day and 3363 kcal on a second day. Also player 8 had healthy foods in the diary, but the energy intake stayed very low. Almost every player should have a proper snack on afternoon. For many of them, the choice was to have one fruit or one slice of bread. It could be little bit more, and that daily snack would help them to get enough energy during the day.

One of the positive things is, that players had junk food choices only sometimes. Only few times players ate chips, hamburgers, candy or drank lemonade. There was also no energy drinks in the diaries, which is very fine to see. Based on these diaries, it looks like players have a good basic knowledge of what to eat and when. Only few players needs to have more guidance in food choices.

Thirteen players out of fifteen had a solid meal timing as well, only players number 8 and 11 did have longer breaks than 3 hours in the afternoon. Every player had proper night snack before going to bed. According to diary, only two players drink enough water. All the other got constructive feedback about that. Hopefully they will learn the importance of hydration in their future career.

The main point of this work was to see the difference between the energy consumption and the nutrition intake, so the topic stayed very defined. In this case, there was no need for starting to analyze the intake of vitamins or other more specified data. Calories are the main thing in junior player's nutrition.

The reliability of this thesis is based on the honesty and interest of players and also for the reliability of program, that calculates the energy consumption and all the food ingredients (Sulamo). The exact numbers of energy consumption is challenging to know, since only few players wrote down, what was exactly their daily activity. "1 hour of sports in school" is not necessarily exact enough, but the calculation is done still in a best possible way. One option in this kind of research is to use heart rate monitors,

which calculates the consumption from the heartbeat. This time I didn't see it as a usable option, since it is already challenging enough to make the players fill their diaries. They have a lot to do already in the school and training and there's no need for too much extra work. I could have used also interview or questionnaire as a research tool, but I think the most valuable data comes from food diary. Interview or questionnaire might work better with adult athletes, since the teenagers are more challenging to motivate in not-game-related information. Through the feedback the players will have guidelines to make things better in the future. When they fill the diaries, it naturally creates discussion about the nutrition inside the team.

The guideline was to have three weekdays and one weekend day in the diary. Almost every player observed the guidelines. I received 20 diaries in total and used 15 of them in the analysis. That saved time slightly, since there is a lot of work already in analyzing of one food diary. Surprisingly, there was no big differences in eating on a weekday and on the weekend. Several players did have the routine to eat a little bit less on a game day, which was the last day of the food diary as well.

Players managed to fill the diaries very well. My expectations were to get around half of the diaries properly filled. Every player filled the diary and almost every single one was made properly. Only one player didn't do the diary properly for some reason, so that was naturally left out from the analysis. I felt that the players were interested about their nutrition and hopefully they got effective tools for the future as well.

Food diary or nutrition planning would be a part of every junior hockey team's season planning. It would make the training quality more better and the player's would stay more focused in a practice and games. Almost every other sports are using nutrition coaching as a part of the coaching program, so why not to use it in ice hockey as well? In addition, it is easier to learn the good habits on a young age than in adulthood. I personally know, that this kind of nutrition coaching already exists in some of the biggest clubs in Finland, but it should spread out to the smaller clubs as well.

This research can be an example for a hockey club as an informative tool. We are talking about relatively simple and easy thing to execute. It is far more challenging for a

hockey player to learn the game related skills and game sense, than having a proper nutrition. The next step would be an information about supplements and other additional nutrients. Few players used them in these diaries. More necessary is still to recognize the need of carbs, proteins and fats. They make the bottom for the nutrition and supplements bring the extra value later on, especially when the weight training starts properly.

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Attachments

ATTACHMENT 1

Player feedback in finnish

Example of a feedback, that was handed to a player number 6:

In finnish:

Ravinnonsaanti jää joka mittauspäivältä vähän vajaaksi tavoitteesta kulutukseen nähden. Syöminen kuitenkin yleisesti hyvin hallussa, vaikka välillä lipsahtaa vähän herkuttelun puolelle. Vettä näytät juovan reilusti aterioiden yhteydessä, mikä on hyvä asia. Ruokailuissa ei muuten juurikaan korjattavaa. Ravintoaineita tulee mittauksen mukaan tasaisesti, varsinkin proteiinin saanti täyttyy hyvin.

- + Hyvä rytmi ruokailuissa, ei liian pitkiä välejä
- + Veden, mehun ja maidon juonti
- + Lounaat ja päivälliset sisältävät sopivia ruokia urheilijalle

- Kalorimäärä täyteen, 1-2 välipalaa lisää niin riittää kyllä.
- Aamupalan laatu vaihtelee

Tilastot:

	<u>Kulutus</u>	<u>Ravinto</u>	<u>Prot</u>	<u>Hh</u>	<u>Rasva</u>
Päivä 1	3449 kcal	3335 kcal	195g	438g	79g
Päivä 2	2889 kcal	2073 kcal	87g	298g	50g
Päivä 3	2941 kcal	2671 kcal	122g	213g	142g
Päivä 4	3686 kcal	3359 kcal	173g	487g	66g

ATTACHMENT 2

Player feedback in english

Example of a feedback, that was handed to a player number 6:

In english:

Your energy intake compared to energy consumption stays a bit low during the food diary. The eating is still overall controlled and clean, although sometimes you have a need to eat candies and other unhealthy food. It seems, that you drink a lot of water on your meals, which is a great thing. There is not too much to fix in your eating. Getting of macronutrients is on a good regular level, especially protein intake looks fine.

- + Good meal timing, no long breaks in eating
- + Drinking of liquids
- + Lunches and dinners consists suitable food for athlete

- Energy intake is a bit low, one or two snack should fill the need.
- The quality of breakfast varies

Nutritional statistics:

	<u>Consumpt.</u>	<u>Intake</u>	<u>Proteins</u>	<u>Carbs</u>	<u>Fats</u>
Day 1	3449 kcal	3335 kcal	195g	438g	79g
Day 2	2889 kcal	2073 kcal	87g	298g	50g
Day 3	2941 kcal	2671 kcal	122g	213g	142g
Day 4	3686 kcal	3359 kcal	173g	487g	66g

ATTACHMENT 4

Food diary example

Time	Eaten foods and drinks	Amount	Other things to mention
7.00	Reissumies	2 viip.	
	Becel.pro.activ	2 tl	
	Edam-juusto 24 %	4 viip.	
	Kahvi mustana	2 kup.	
9.00	Kahvi mustana	1 kup.	
	Domino-keksi	2 kpl	
11.30	Lasagne	½ lautasellista	Työpaikkaruokala
	Porkkanaraastetta	2 rkl	
	Salaattia, tomaattia, kurkkua	Reilu annos	
	Salaatinkastiketta	2 rkl	
14.00	Kahvi mustana	1 kup.	
	Täyttekakku	Pieni pala	Työkaveri tarjosi
17.00	Kauraleipä	3 viip.	Kotona
	Lauantaimakkaraa	6 siivua	
	Becel.pro.activ	3 tl	
	Kurkkua	6 viip.	
19-21	Kauraleipää	4 viip.	Napostelua TV:n ääressä
	Becel.pro.activ	8 tl	
	Edam-juustoa 24 %	iso pala	
	Viinirypäleitä	rasia	
	Olut keskiolut	3 pulloa	

Physical activity during a day: 30 minutes warm up, 1h20 minutes ice hockey practice.