



Nutritional impact on athletic sports performance

The difference between animal-based and plant-based diets

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Thesis for BS degree
Faculty of Health Promotion, Sport and Leisure Studies



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Abstract

Nutrition plays a significant role in people's health. Every day people consume foods that influence their health in both positive and negative ways. Choice of food is not solely made because of health concerns and certain foods are favoured because of traditions and culture.

Proper nutrition is necessary to maintain good health and healthy lifestyle as well as for athletic success.

The motivations for following a plant-based diet may include numerous reasons, such as environmental concern, health interest, religion and economy. Concerns for health, animals and the environment are among the most common reasons for following a plant-based diet.

This essay will examine scientific evidence showing what types of diets are suitable for enhancing athletic performance. We will also discuss the different effects of animal-based and plant-based diets on athletic sports performance.

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This thesis was written solely by me, the undersigned. I have read and understand the University of Iceland Code of Ethics (https://english.hi.is/university/university_of_iceland_code_of_ethics) and have followed them to the best of my knowledge. I have correctly cited to all other works or previous work of my own, including, but not limited to, written works, figures, data or tables. I thank all who have worked with me and take full responsibility for any mistakes contained in this work. Signed:

Reykjavík, 11. May 2020

Ignacio Edvard

1 Introduction

Most individuals have been raised in a home where animal-based food is consumed on a daily basis, in countries where animal-based foods are promoted and advertised everywhere. Although meat is the most consumed food around the globe and part of our evolutionary heritage, one might wonder if it is necessary for the human body (Guarnaccia, Vivar, Bellows & Alcaraz, 2012).

An estimated two billion people worldwide live on an animal-based diet, while an estimated four billion people live primarily on a plant-based diet (Pimentel & Pimentel, 2003). The reason why more people live on a plant-based diet rather than on an animal-based one is the shortage of fresh water and energy resources (Pimentel & Pimentel, 2003). The rapid growth of the human population is accompanied by increased land productivity and a consequent increase in the production of plant-based foods compared to animal-based ones (Pimentel et al., 2010). The production of animal-based food generally requires more land than the production of plant-based food.

In the twentieth century, not many individuals accepted veganism, vegetarianism, and a plant-based diet as a healthy diet, even though people knew eating more vegetables was essential for better health (Larsson & Johansson, 2002). Numerous individuals do not eat animal-derived substances but ceasing to eat meat could be difficult when it has been part of someone's diet for many years.

The growth of social media brought an increase in awareness regarding diet-related issues (Schultz, 2000). However, it is unclear whether meat has a positive impact on strength and is essential for better performance in sport (Fogelholm, 2003). If that is not true, then we could all be living in a better environment, where animals are not slaughtered just for our satisfaction and we would also keep the same qualities in sports (Clark, 2006).

2 Nutrition and fitness

2.1 Nutrition and its impact on health

Following a certain or specific type of diet does not mean it is healthier or better than other diets; it is healthy as long as the diet is properly balanced and nutritionally adequate (Marangoni et al., 2015). Good nutrition is part of leading a healthy lifestyle, which helps individuals to maintain a healthy weight and reduces the risk of chronic diseases (Williams & Patel, 2017). Foods with high caloric intake, fats, salts and sugar leave an individual at a higher risk for health problems, such as type 2 diabetes and heart diseases (Fraser, 2009). Reducing salt intake helps lower blood pressure, which is a major cause of cardiovascular diseases (Freeman et al., 2017). The American Heart Association recommends consuming no more than a teaspoon of table salt per day to reduce the risk of cardiovascular diseases (Whelton et al., 2012).

Proteins are essential nutrients the body needs to build and repair muscle tissues which are important for athletes (Thomas, Erdman & Burke, 2016). The recommended daily intake of protein differs according to the type of sport and the athlete's goal depending on whether they need more strength and muscle growth or more endurance and stamina (Campbell et al., 2007). The reference for protein intake per day for athletes ranges from 1.2 to 1.6 grams of protein per kilogram of body weight (Pilis, Stec, Zych & Pilis, 2014).

The number one cause of death in the United States of America is heart disease (Harding et al., 2018). More than three hundred and fifty thousand die annually from coronary heart disease (CAD) (Greger & Stone, 2016). CAD is caused by fatty deposits in the blood vessels that supply blood to the heart. This is linked with high cholesterol in foods including eggs, cheese, fish and meat (Greger & Stone, 2016). Modifying lifestyle patterns for example by increasing physical activity could lower the risk of heart attack (Cordain, 2005).

2.2 Nutrition for athletes

The diet influences athletic performance, both positively and negatively. An athlete's performance depends on good nutrition (Williams & Patel, 2017). Food needs to be adequate in regard to the need for energy, micronutrients and fluids since it provides a source of energy required to perform the activity (Lupton et al., 2002).

The American College of Sports Medicine (ACSM) along with dietitians of Canada reported that optimal nutrition enhances an athlete's performance (Thomas, Erdman & Burke, 2016). Athletes' performance and condition are determined from the selection of foods, fluids and supplements (Williams & Patel, 2017). Carbohydrates and protein are essential nutrients to fulfil the body's needs during high physical activities (Cotugna, Vickery & McBee, 2005). Protein is vital for building and repairing protein tissues and maintain a healthy body weight (Thomas, Erdman & Burke, 2016). Approximately 50% of the total caloric intake ought to be carbohydrates, to restore glycogen stores, burn fat and supply glucose to the brain along with at least 20% that ought to be protein for body maintenance and to fuel the muscles (Cotugna, Vickery & McBee, 2005). Fat intake is also important to provide energy for athletes, to maintain weight, and to protect the organs (Thomas, Erdman & Burke, 2016).

Vitamins and minerals also play an important role in peak performance (Mahurkar, 2019). Although it is possible to take supplements for vitamins and minerals to meet the body's requirements, the micronutrient needs can be met without these supplements with the help of a balanced diet and with high energy intake (Cotugna, Vickery & McBee, 2005).

Although every athlete reacts differently depending on the sport, they should consume adequate food and fluids before, during and after exercise to maximise performance (Thomas, Erdman & Burke, 2016).

3 Plant-based diet

3.1 What is classified as a plant-based diet?

Motivations for eating less animal-based foods depend on several factors including beliefs, religion, personal health or concerns for animals (de Boer, Schösler & Aiking, 2017). Further reasons and motivations could likewise be as simple as saving money or aiming to lose weight. In other parts of the world, like Asia and the Mediterranean, a plant-based diet is part of the mainstream culture (Tuso, Ismail & Bartolotto, 2013).

A plant-based diet involves mostly or entirely food obtained from plants, vegetables, beans and grains that are generally low fat (Yadav et al., 2016). Even though the concept of a plant-based diet is broad and has various definitions, it is interpreted depending on the diet that individuals follow. It might be by minimizing some processed animal foods or excluding all animal products, as well as including or excluding dairy products and eggs (Williams & Patel, 2017).

Research shows that a plant-based diet tends to be lower in protein, fat, iron and vitamins compared to animal-based diets (Gibson et al., 2000). This does not mean that animal-based diets are better than plant-based diets, as many other factors also determine the quality of a diet (Rogerson, 2017).

A plant-based diet is often confused with the vegan diet. Nevertheless, a plant-based diet includes foods derived from plants with a few or no animal products, while vegan diet excludes all animal products (Turner-McGreivy, Davidson, Wingard, Wilcox & Frongillo, 2015).

3.2 What does it entail?

Research indicates that individuals on a plant-based diet have a lower rate of chronic illness, for instance, heart disease, and cardiovascular risk, compared with people on animal-based diets and semi-vegetarian diets (Williams & Patel, 2017). Several studies have shown that plant-based dietary combinations consisting of vegetables, legumes, fruits and herbs have particular benefits for cardiovascular health (Greger & Stone, 2016). Going on a low-fat, vegetarian diet, along with other healthy lifestyle changes, such as exercising, has been proven to

reverse arterial plaque (Crowe, Appleby, Travis & Key, 2013). This does not imply that a plant-based diet is better or healthier than a western diet, but rather that it includes more unsaturated fats and whole grains as the main source of carbohydrates, which contributes to overall physical health (Williams & Patel, 2017).

Plant-derived foods also provide physical and environmental health benefits (Friedman & Brandon, 2001). Individuals generally consume several plant-based protein sources daily, including vegetables, grains (wheat, rice), nuts and seeds (chia). In adequate amounts and quality, plant-derived proteins can fulfil the same requirements as animal-derived ones (Williams & Patel, 2017). Consuming plant-based proteins is also more environmentally friendly as less water, land, and natural resources are needed to produce a similar quantity of protein in comparison to animal-derived proteins (González, Frostell & Carlsson-Kanyama, 2011).

Despite minor differences, there are hundreds of different types of diets. Diets are defined by what they exclude (Tuso, Ismail & Bartolotto, 2013). Below are a few definitions of common diets, all of which can be adequate sources of protein.

- *Omnivorous diet*: Diet consisting of all kinds of foods, including both meat and plants (Tuso, Ismail & Bartolotto, 2013).
- *Semi-vegetarian diet*: Diet that includes small amounts of animal products such as meat and fish, while focusing mainly on vegetarian food, like vegetables, grains and fruits (Tuso, Ismail & Bartolotto, 2013).
- *Pescatarian diet*: Diet plans that cut out meat but still include fish, similar to whole foods, plant-based (Tuso, Ismail & Bartolotto, 2013).
- *Vegetarian diet*: Diets that do not include meat or fish but still include dairy products and eggs (Tuso, Ismail & Bartolotto, 2013).
- *Vegan diet*: Diets that exclude all animal products. Especially meat, dairy products and eggs (Tuso, Ismail & Bartolotto, 2013).

4 Animal-based diet

4.1 Standard western diet

The current animal-based diet (standard western diet) was brought by the Neolithic Revolution, which was a wide transition for many cultures which included a limited set of food-producing techniques. This included domesticated meats, sugar and dairy products (Weisdorf, 2005). The western diet, which is low in potassium and high in fats and simple carbohydrates, is generally characterized by a high intake of processed meat, red meat, fried foods and high-fat products (Cordain, 2005). It is well known that consuming fast foods, which generally contain high fat and salt, is a major cause of obesity in western societies (Manzel et al., 2014).

The risk of developing obesity and the likelihood of a disease increases with a westernized diet, on account of poor nutritional quality (Manzel et al., 2014) as it contains inadequate fruits, vegetables, whole grains, fish and low-fat dairy products (Cordain, 2005). Strong evidence suggests that the western diet is associated with an increased risk of heart disease, hypercholesterolemia, diabetes, obesity and colorectal cancer (Carrera, Fontes, O'Keefe, Lindeberg & Cordian, 2011).

According to Lynch, Johnston and Wharton (2018) the majority of the population believes that meat, animal-derived proteins, are essential to succeed in sports. From a young age, certain parents along with those that have an impact or influence on individuals, such as TV advertisements, have implied that meat is necessary and good for the human body, a good protein source, especially for athletes (Nadathur, Wanasundara & Scanlin, 2016).

5 The difference between the plant-based diet and the animal-based diet

5.1 Effects of a different diet on endurance performance

A previous review study compared endurance and strength athletes between two groups with different diets, a plant-based and an animal-based diet. Among eight studies that were included in the review, three were on strength athletes, four on anaerobic and aerobic athletes, and one on endurance athletes. They found no significant difference in strength, anaerobic nor aerobic athletes based on those two different diets. However, they reported that the athletes on a plant-based diet had a higher oxygen consumption, which indicates higher cardiorespiratory fitness and endurance capacity in exercise performance compared with those on an animal-based diet (Lynch, Johnston & Wharton, 2018).

The Institute of Sports Medicine, a medical university in Germany, did a short-term research to evaluate runner athletes' exercise capacity (Nebl et al., 2019). A three-day study was conducted to establish the maximal capacity with active athletes that trained three to five times per week. From the seventy-six participants, between 18 and 35 years of age, 24 were vegans, 26 vegetarians and 26 on an animal-based diet. There were at least 48 hours between each experimental day. These individuals had been on a vegan, vegetarian or an animal-based diet for at least half a year. Before the research started there was a 24-hour dietary recall, to determine nutrient intake, with a comparison of total energy and protein intake between the three diet groups. However, there were no significant differences in maximum exercise capacity between the three diet groups. This short-term research indicates that all three diets can be a suitable for endurance training (Nebl et al., 2019).

A plant-based diet may offer performance advantages since it includes a fair amount of grains, and it consists of increased consumption of carbohydrates and legumes low in saturated fats. This has a positive effect on a leaner body mass and ease of glycogen storage (Nieman, 1999).

5.2 Chronic diseases

A plant-based diet has been well-known to have several health benefits (Williams & Patel, 2017). Comparing individuals that are on an animal-based diet with individuals on a plant-based diet, results show that those who are on a plant-based diet are 32% less likely to develop coronary heart disease (Crowe, Appleby, Travis & Key, 2013). Individuals who consume more dietary fibre and little or no animal fat, such as by following a plant-based diet, have significantly lower cholesterol levels than those who eat meat daily (Gardner et al., 2005). Those on a plant-based diet also have low mortality caused by heart diseases, diabetes, and obesity (Esselstyn, 2001). The possible reason could be the lower intake of saturated fat and cholesterol and a higher intake of vegetables, fruits and dietary fibre compared with other diets (Greger & Stone, 2016).

5.3 Nutritional quality

In 2012, a three-month survey was launched to compare the diet quality, diversity and nutritional balance of the vegan, vegetarian, pescatarians and animal-based diets (Clarys et al., 2014). The survey used the Healthy Eating Index (HEI) as an indicator, a measure of diet quality and scoring system to evaluate a set of foods in the United States (Kennedy, Ohls, Carlson & Fleming, 1995). The survey reported that vegans had a lower energy intake, compared to other diets, while there was no significant difference between the energy intake of semi-vegetarians and pescatarians. Saturated fatty acids, dietary cholesterol and protein intake were found lowest in the vegan group. Compared with the animal-based group, all three groups had a lower body mass index, and a higher intake of carbohydrates. This nutritional quality comparison study concluded that the vegan was the healthiest group of all four diet groups regarding body weight as a result of a lesser amount of saturated fats and a higher intake of carbohydrates (Clarys et al., 2014).

5.4 Switching on the diet

Athletes who change their diet from an animal-based diet to a plant-based diet typically improve their overall nutrition status (Grant, 2012). The explanation for this is that fruits, vegetables and beans tend to be high in vitamins, minerals and fibre, and also low in saturated fat (Chiuves et al., 2012). Athletes are commonly concerned about whether a diet without meat provides sufficient protein for their bodies. They might worry about altering their diet because of a possible negative impact on their performance but with a bit of research, they will see that the difference is insignificant. Research shows that protein intake is slightly lower in diets without meat (Millward, 1999) and that plant-based foods easily provide sufficient amounts of the adequate amino acids athletes require (Ostaszewska et al., 2010).

A plant-based diet reduces the relative risk for many chronic diseases, and it may be adopted for improved health and physical performance (Rogerson, 2017). Plant-based diets are getting popular, especially among the younger generation of athletes. However, it may prove difficult to stop eating meat when it has been in someone's diet for many years (Larsson & Johansson, 2002).

6 Conclusions and discussions

There is a vast misconception about protein amounts in various foods as viewed by the public. Animal-based foods are usually advertised as the top standard for maximum protein absorption, which puts a shadow over other protein-rich plant-based foods (Daly et al., 2014). Marketing has a lot to do with this as it is a strong driving force for selling foods such as meat, which usually has a high premium over rice and beans (Hopkins, 2015).

Less risk of diseases is a strong point of a plant-based diet as it negates any harmful bi-products that our bodies absorb after consuming animal-based foods (Williams & Patel, 2017). This indicates that a healthy lifestyle accompanied by a balanced diet is the most important factor for health. Based on various external and internal factors, people will opt for or lean towards a certain diet because of their ethnicity, religion and so forth. Certain people may perhaps struggle to digest higher amounts of animal-based or plant-based foods which can lead to their permanent decision to stick to one type of diet (Basu, Devaray & Jialal, 2006).

Environmental concerns are another reason why the push for a plant-based diet is rising rapidly in the world. Plant-based food generally requires less oil, less land and makes it unnecessary to slaughter animals. Plant-based food also helps to restore the ozone layer and contributes to other factors important to human existence (González, Frostell & Carlsson-Kanyama, 2011).

The possibility for a plant-based diet to improve an athlete's performance is increased by its effect on blood flow, body composition and glycogen storage, which are the most important factors for increasing athletic performance (Thomas, Erdman & Burke, 2016). A plant-based diet can help introduce more vegetables and fruits to someone's diet (Yadav et al., 2016). This is very helpful as we, as species, should consume various foods and more variety provides all the vital nutrients we need (Yadav et al., 2016). An omnivore could positively enhance his overall diet by introducing new plant-based foods that contain minerals and vitamins that the body had been lacking (Grant, 2012). An animal-based diet may not provide sufficient amounts of natural nutrients (Grant, 2012).

In conclusion, it is unlikely that plant-based diets provide athletes with advantages in sports performance, while at the same time, they appears to have no disadvantages. Compared to an animal-based diet, a plant-based one reduces the risk of developing numerous chronic diseases.

For overall physical and environmental health, the plant-based diet seems to be a suitable option for athletic performance.

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