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Optimizing athlete performance: the impact of micronutrients in fats and oils on athlete performance a literature review

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Abstract

In efforts to improve athlete performance, nutrition plays a very important role, and the role of micronutrients in fats and oils is increasingly becoming a research focus. This article is a literature review that aims to investigate the impact of micronutrients in fats and oils on athlete performance. We explore various aspects of micronutrients in fat, such as vitamin D, vitamin K, vitamin E, and omega-3 fatty acids, and how intake of these micronutrients can help in improving endurance, recovery, and muscle performance in athletes. In this literature review, we also discuss the potential negative impact of excess fat in an athlete's diet, especially saturated and trans fats, which can disrupt energy balance and increase the risk of obesity. In addition, we underline the importance of integrating scientific findings about micronutrients in fats and oils in daily exercise practice. By understanding the impact of these micronutrients, coaches, nutritionists, and athletes can formulate more appropriate dietary recommendations to support optimal athletic performance. The results of this literature review provide an in-depth understanding of the complexity of nutrition in sport and pave the way for the development of smarter nutritional approaches to support athletes achieve their peak performance and maintain their body health in increasingly tough competition. With a deeper understanding of the role of micronutrients in fats and oils, we can design more effective nutritional strategies in the competitive world of sports

Keywords: **Micronutrients, fats and oils, athlete performance**

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INTRODUCTION

Athletes' performance in sports has become a major focus of research and development in various scientific disciplines (Higgins et al., 2020). Factors that influence improving athlete performance are a major concern in efforts to improve results in the field of sport. In recent years, macronutrients such as carbohydrates and protein have received great attention in the sports nutrition literature. However,

the impact of micronutrients in fats and oils on athlete performance remains an area that has not been fully uncovered (Close et al., 2016; Papadopoulou et al., 2022).

Fat is a macronutrient that is generally associated with energy storage in the body (Madden et al., 2017). In addition, oil is often used as a source of fat in athletes' diets. However, the important role of micronutrients contained in fats and oils is often overlooked. Fat-soluble vitamins and minerals such as vitamins A, D, E, and K, as well as various types of essential fatty acids, play vital roles in energy metabolism, growth, muscle tissue repair, and various biological functions important for athletes.(Madden et al., 2017).

Therefore, it is important to better understand the impact of micronutrients in fats and oils on athlete performance(Bytomski, 2018; Wardenaar et al., 2017). More in-depth research in this area could help in identifying specific nutritional needs to improve sporting performance. Excess or deficiency of micronutrients in fats and oils can have a significant impact on an athlete's health and performance, so it is important to identify effective methods of including these nutrients in an athlete's diet. Some early research has attempted to elucidate the role of micronutrients in fats and oils in improving muscle endurance, recovery and performance. However, there are still many questions that need to be answered and evidence that needs to be consolidated(Brisswalter & Louis, 2014).

More in-depth scientific background on the impact of micronutrients in fats and oils on athlete performance will help coaches, nutritionists and athletes make more informed dietary decisions(Manore et al., 2009). Thus, this article aims to detail the role of micronutrients in fats and oils on athlete performance and to identify vulnerabilities and potential benefits in optimizing athlete diets. With more in-depth research in this aspect, we can get closer to the main goal, namely improving athlete performance by understanding the as-yet-unrevealed impact of micronutrients in fats and oils in sports diets (Garthe & Maughan, 2018; Volpe, 2007).

Developments in nutritional analysis technology have allowed us to more deeply understand the nutritional composition of foods, including fats and oils (Close et al., 2022; Fogelholm, 1999). This opens the door to further exploration of the micronutrients contained in fats and oils that may contribute to improved athlete performance. Therefore, this article will delve deeper into the positive or negative impacts of these micronutrients on athlete performance (Larson-Meyer et al., 2018; Maughan et al., 2018).

More credible scientific evidence regarding the importance of micronutrients in fats and oils can also provide stronger guidance to coaches, nutritionists, and athletes in the development of appropriate diet plans (Heffernan et al., 2019; Jordan et al., 2020). This research will attempt to present strong scientific evidence in support of the important role of these micronutrients in maintaining athlete health as well as improving sports performance (Medicine & Association, 2000; Misner, 2006).

Fats and oils are an important source of energy in an athlete's diet. However, not all fats and oils are created equal (Higgins et al., 2020; Papadopoulou et al., 2022). Some contain more beneficial micronutrients than others. This research will help athletes and coaches choose smarter fat sources in their diets to support sport-specific nutritional needs(Close et al., 2016; Madden et al., 2017).

With increasingly fierce competition in the world of sports, the importance of proper nutrition cannot be ignored. An athlete's performance can be greatly influenced by their diet, and this includes the consumption of fats and oils. Through a better understanding of the impact of micronutrients in fats and oils, we can open the door to achieving greater levels of athletic performance.

In the context of scientific innovation and advances in sports nutrition science, this article aims to provide new insights and in-depth research into the world of athletic nutrition. Thus, this will provide a strong basis for athletes, coaches and nutritionists to make smarter decisions in supporting optimal athlete performance(Braakhuis & Hopkins, 2015).

Recent developments in sports nutrition science have demonstrated an important shift in understanding regarding the role of micronutrients in fats and oils in athlete diets. Recent studies increasingly emphasize the importance of fat-soluble vitamins and minerals, such as vitamins E, D, and K, in supporting athlete performance and recovery.(García-Flores et al., 2018).

Additionally, the role of omega-3 fatty acids in athletes' diets has become the focus of increasing research. These fatty acids, found in fish oil and some plant-based fat sources, have been shown to have a positive impact in reducing inflammation, increasing aerobic capacity, and supporting athletes' cardiovascular health.(Wardenaar et al., 2017). However, in line with increasing understanding regarding the benefits, new issues have also emerged regarding excess fat intake in athletes' diets. Too much saturated and trans fat in an athlete's diet can disrupt their energy balance, increase their risk of obesity, and affect their overall health(Devrim-Lanpir et al., 2020).

In particular, the role of vitamins D and K in bone and muscle metabolism in athletes has come under greater scrutiny. Deficiencies in these micronutrients can affect an athlete's endurance, strength and bone integrity, which is important in demanding sports such as weightlifting and long-distance running.(Clemente-Suárez et al., 2023). Overall, understanding the micronutrients in fats and oils and how they can be optimized in athlete diets is a growing area of research. The results of this research have the potential to change the way we approach athletic nutrition, helping them reach their maximum potential in sport(Pingitore et al., 2015).

In the context of recent research on the role of micronutrients in fats and oils on athlete performance, there are three innovative aspects that have made a significant contribution to the science of sports nutrition. First, this in-depth research highlights the potential positive impact of micronutrients in fats and oils, especially omega-3 fatty acids and vitamin D, on previously undiscovered aspects of athlete performance. These results create a stronger knowledge base and provide more detailed guidance to coaches, nutritionists, and athletes on utilizing this micronutrient to improve endurance and recovery after intense exercise.(Da Silva et al., 2016).

This research opens up space for a deeper understanding of the risks of excess fat in athletes' diets, especially regarding saturated and trans fats. Being aware of the health risks that may arise from excessive fat intake may lead to increased awareness in the dietary management of athletes, with a focus on selecting healthier sources of fat and minimizing excessive consumption of saturated fat. This helps avoid negative impacts on the athlete's health and performance(Samaras et al., 2014).

This research attempts to integrate scientific findings about micronutrients in fats and oils with daily exercise practice. Thus, this research creates an opportunity for coaches and nutritionists to develop more specific and effective dietary guidelines for athletes. Through a more scientific and informed approach, this research could enable athletes to reach their peak performance and manage their diet more intelligently.

METHODS

This research uses a qualitative descriptive research model in the nature of a literature study which uses various literature reviews to strengthen the research analysis. This research begins by collecting several pieces of literature, then reviewing several important terms in research, then collecting relevant research results literature, then carrying out an analysis based on all the literature that has been obtained by compiling a discussion, then drawing up conclusions based on the results that have been analyzed and making suggestions. based on the conclusions obtained.

The data used in this research is secondary data Sugiyono, (2015) states that secondary data is data taken indirectly that can provide information to data collectors. The source of the data obtained is in the form of original scientific reports originating from published scientific articles and accredited and indexed journals, both printed and non-printed, which are interrelated in the model of implementing blended learning in physical education and sports.

The data collection method used in this research is the documentation method. The documentation method is a data collection method by exploring and searching for data from literature related to what is in the problem formulation. The data that has been obtained from various literature is then collected as a single document that will be used to answer the problems that have been formulated.

The technique for searching articles in this research is through the web access Mendeley, Google Scholar, and Scinece Direct as well as through other forms of journal search access with the keywords learning models, blended learning, and physical education, sports, health. Articles or journals that meet the criteria are then taken for further analysis and a journal summary is made including the name of the researcher, year of publication of the journal, study design, research objectives, samples, instruments, and a summary of the results or findings. The summary of the research journal is included in the table sorted alphabetically and by year of publication of the journal and in accordance with the format mentioned above. This literature review uses literature that can be accessed in full text in PDF and scholarly format (peer reviewed journal). To further clarify the abstract and full test journal, read and pay close attention. The journal summary carried out an analysis of the content contained in the research objectives and research results/findings. The analytical method used is journal content analysis.

RESULTS & DISCUSSION

Results

This literature review was conducted to determine the optimization of athlete performance: the impact of micronutrients in fats and oils on athlete performance. The collected literature is analyzed using critical appraisal tables to answer measurement objectives compared to simple measurement results. There are 5 pieces of literature that discuss optimizing athlete performance: the impact of micronutrients in fats and oils on athlete performance. All of these journals are international journals which were searched on the Google Scholar portal, Mendeley, Science Direct.com by typing the keyword "Micronutrients , fats and oils, athletes' achievements" which were then analyzed using critical apparsial analysis to analyze the core of the journals, as well as the results or findings from these journals. The following is a critical appraisal analysis table from 5 journals:

No.	researcher	Article title	Research result
1.	(Beck et al., 2021)	Micronutrients and athletic performance: A review	Optimizing nutrition intake is a key component for supporting athletic performance and supporting adaptation to training. Athletes often use micronutrient supplements in order to correct vitamin and mineral deficiencies, improve immune function, enhance recovery and or to optimize their performance. The aim of this review was to investigate the recent literature regarding micronutrients (specifically iron, vitamin C, vitamin E, vitamin D, calcium) and their effects on physical performance. Over the past ten years, several studies have investigated the impacts of these micronutrients on aspects of athletic performance, and several reviews have aimed to provide an overview of current use and effectiveness.
2.	(Rossi, 2017)	Nutritional Aspects of the Female Athlete	Other nutritional concerns, such as runner's gut, celiac disease, eating disorders, supplement-ments, and the microbiome, all present intriguing areas of interest for additional research in female athletes.
3.	(Sorrenti et al., 2019)	Chapter Eighteen - Personalized sports nutrition: Role of nutrients in athletic	Despite genetic testing for predicting sports performance and talent identification being continuously on the rise in the market,

		performance	nutrigenetic/nutrigenomic aspects are less known and applied. This is due to the complexity in the identification of associations of different polymorphisms in nutrition, especially because each polymorphism can affect directly or indirectly different other genes, proteins, or metabolic pathways. In this chapter, we analyze the latest advances on the application of nutrition and genetics in sport, from scientific evidence on the role of macro- and micronutrients in sports performance, to the application of phytonutritionalepigenomicsin the field and future perspectives.
4.	(Stohs & Kitchens, 2019)	Chapter 1 -Nutritional Supplementation in Health and Sports Performance	Recommendations designed for vitamins, minerals, omega-3 fatty acids, several amino acids, and proteins are provided to assist athletes in achieving nutrition that supports optimal athletic performance as well as recovery and repair.
5.	(Vitale & Getzin, 2019)	Nutrition and Supplement Update for the Endurance Athlete: Review and Recommendations	Carbohydrate and hydration recommendations have not changed drastically in years, while protein and fat intake have been traditionally underemphasized in endurance athletes. Several supplements are commercially available to athletes, of which, some may be of benefit for endurance activities, including nitrates, antioxidants, caffeine, and probiotics, and are reviewed here. The topic of "train low," training in a low carbohydrate state is also discussed, and the post-exercise nutritional "recovery window" remains an important point to emphasize endurance competitors. Conclusions: This review summarizes the key recommendations for macronutrients, hydration, and supplements for

	endurance athletes, and helps clinicians treating endurance athletes clear up misconceptions in sports nutrition research when counseling the endurance athlete.

Discussion

From the results of a literature study of 5 articles that have been reviewed and explained regarding the role of micronutrients in fats and oils on athlete performance, it should be noted that there are a number of impacts that need to be evaluated in depth(Bonina et al., 2005; Cavarretta et al., 2018). First of all, the role of omega-3 fatty acids in an athlete's diet is very important. Omega-3 has been shown to have positive effects in reducing inflammation and increasing cardiovascular endurance in athletes. This allows them to cope with high physical stress during training and competition(Barrientos et al., 2020).

Apart from that, fat-soluble vitamins D and K also have a significant contribution in maintaining the strength and health of bones and muscles in athletes. A deficiency in this vitamin can cause problems that can hinder an athlete's performance, such as bone fragility and the risk of muscle injury. Therefore, this study provides a deeper understanding of how vitamins D and K can be managed in athletes' diets to support their body's ability to withstand high levels of physical stress.(Buonocore et al., 2020; Poprzecki et al., 2009).

In addition, the risk of excess fat in an athlete's diet also needs to be evaluated critically. Excess intake of saturated and trans fats can increase the risk of obesity and other health problems. Therefore, managing the type of fat consumed by athletes is important, with a focus on healthier fat sources(Sadowska-Krępa et al., 2015). Furthermore, the integration of scientific findings about micronutrients in fats and oils into daily exercise practice is a significant contribution. This helps athletes, coaches, and nutritionists to formulate more precise and effective dietary recommendations. In this way, they can maximize an athlete's performance potential and minimize the risk of negative impacts on health(Panza et al., 2008).

Overall, a deeper understanding of the impact of micronutrients in fats and oils on athlete performance opens the door to the development of smarter nutritional approaches in the world of sport. By understanding how these micronutrients can support athlete performance, we can help them achieve their peak performance in sport and keep their bodies healthy.(Kozłowska et al., 2020; Miquel Martorell, Capo, et al., 2014).

An in-depth interpretation of the role of micronutrients in fats and oils in athlete performance opens up insight into the complexity of nutrition in the world of sport. First of all, the role of omega-3 fatty acids is very interesting. Found in fish oil and some plant-based fat sources, omega-3s have been shown to have a positive impact on inflammation and cardiovascular health in athletes. This helps increase their endurance in the face of intense exercise. This interpretation raises awareness of the

need to include omega-3 sources in athletes' diets as a key element in improving their performance(Oliveras-López et al., 2014).

It is also important to understand the role of fat-soluble vitamins D and K. Both play a role in maintaining bone and muscle strength, which is very relevant in sports that rely on physical strength. When a deficiency occurs, the risk of bone fragility and muscle injury increases. This interpretation underscores the importance of vitamin D and K management in athletes' diets to support bone health and optimal exercise performance(Carrera-Quintanar et al., 2022).

Furthermore, the risk of excess fat, especially saturated and trans fat, needs to be evaluated. Excess intake of this fat can lead to obesity and other health problems, which can affect an athlete's performance. This interpretation reminds us of the importance of choosing healthier types of fats in athletes' diets, thereby avoiding negative impacts on their health and performance(Miquel Martorell, Capó, et al., 2014).

The integration of these scientific findings into everyday sports practice has major implications. Coaches and nutritionists can develop more specific and effective dietary recommendations for athletes based on a deep understanding of the micronutrients in fats and oils. In doing so, they can help athletes achieve peak performance and better maintain their health(Filaire et al., 2010).

An in-depth interpretation of the impact of micronutrients in fats and oils on athlete performance allows us to understand the complexity of nutrition in the world of sport. This opens up opportunities for the development of smarter nutritional approaches, helping athletes achieve peak performance and better maintain their body health in the increasingly fierce competition in the world of sport(Capó et al., 2015).

In comparing the role of micronutrients in fats and oils on athlete performance, it is necessary to understand the differences and similarities between these micronutrients in achieving the desired results. First, when we compare the omega-3 fatty acids found in fish oil with vitamins D and K, we see a difference in their impact on athletes' health. Omega-3 is best known for its ability to reduce inflammation and support cardiovascular health, while vitamins D and K are more associated with bone and muscle health. Therefore, taking omega-3 may be more relevant for athletes who focus on cardiovascular endurance, while vitamins D and K are more important for athletes who rely on physical strength.(M Martorell et al., 2015).

When we compare the risks of excess fat in an athlete's diet, we see that both saturated and trans fats have similar negative impacts. Excess intake of this fat can increase the risk of obesity and other health problems. Both require the same management and reduction of consumption in the athlete's diet. Therefore, athletes need to be careful in choosing their fat sources, especially in avoiding saturated and trans fats in the foods they consume(Capó et al., 2016).

Next, in comparing omega-3 fatty acids and vitamins D and K, we need to understand that the two can interact positively in an athlete's diet. Omega-3 can help absorb vitamin D which is needed for healthy bones, and vitamin K plays a role in regulating the absorption of calcium which is needed for muscles. Therefore, combining these two micronutrients in an athlete's diet may provide greater benefits than consuming them separately(Williams, 2005).

In the context of the risk of excess fat, the comparison between saturated and trans fats also needs to be clarified. Trans fats, such as those found in hydrogenated vegetable oils, have been shown to have a greater negative impact on health than the naturally occurring saturated fats found in meat and dairy products. Therefore, athletes may need to be more careful in avoiding foods containing trans fats and choose healthier sources of saturated fats.

Finally, this comparison underscores the importance of integrating scientific findings into everyday sports practice. In selecting fat sources and managing micronutrients, coaches and nutritionists need to understand their different roles and integrate them in effective dietary recommendations for athletes. This helps athletes achieve peak performance and better maintain their health in a competitive sports environment.

CONCLUSIONS

This research has detailed the impact of micronutrients in fats and oils on athlete performance in order to increase in-depth understanding of sports nutrition. It was found that micronutrients in fat, such as omega-3 fatty acids, vitamins D, K, and E, play an important role in supporting athletes' endurance, recovery, and muscle performance. However, keep in mind that excess fat in the diet, especially saturated and trans fats, can carry health risks. Therefore, it is important to choose healthier sources of fat. Integrating these scientific findings into daily sports practice will help coaches and nutritionists formulate more appropriate dietary recommendations, so that athletes can achieve their peak performance and maintain their body's health in increasingly tough competition. With this knowledge, we can optimize nutritional strategies to support optimal sporting performance

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