

**RELATIONSHIP BETWEEN DIETARY SUPPLEMENTS AND OPTIMAL
PERFORMANCE IN SPORTS**

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CERTIFICATION

We, the undersigned, acknowledge that this research work was carried out by **IBHADON OSEZELE JOEL** in the Department of Human kinetics and sports science, Faculty of Education, University of Benin.

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DEDICATION

This work is dedicated to God Almighty for his Love, Wisdom, Knowledge and Understanding. He has been the source of my strength throughout this program.

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The researcher's gratitude goes to God almighty the giver and sustainer of life for his unending love and grace that kept the researcher till this point in time. The researcher's gratitude goes to his supervisor and the head of the department Dr. Gabriel Arainru, a rare personality and a father figure who in spite of the numerous departmental duties was able to make this work possible and offered helpful suggestions on the content to make this project a success. May the good Lord continue to bless you sir!

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ABSTRACT

Sports success is dependent primarily on genetic endowment in athletes with morphologic, psychologic, physiologic and metabolic traits specific to performance characteristics vital to their sport. Such genetically-endowed athletes must also receive optimal training to increase physical power, enhance mental strength, and provide a mechanical advantage. However, athletes often attempt to go beyond training and use substances and techniques, often referred to as ergogenics, in attempts to gain a competitive advantage. Pharmacological agents, such as anabolic steroids and amphetamines, have been used in the past, but such practices by athletes have led to the establishment of anti-doping legislation and effective testing protocols to help deter their use. Thus, many athletes have turned to various dietary strategies, including the use of various dietary supplements (sports supplements), which they presume to be effective, safe and legal.

CHAPTER ONE

INTRODUCTION

BACKGROUND TO THE STUDY

Sport is expressed as a pedagogical and social effort that develops mental, spiritual and social behaviors, keeping the competition among individuals in the foreground within certain rules (Sunay, 2010). Sports are all kinds of physical activities aimed at improving physical fitness, mental health and social interaction between individuals through organized participation (Sutula, 2018). World Health Organization (2018) stated that regular sports have an important effect on preventing and controlling diseases that threaten human life such as heart disease, stroke, diabetes, cancer and hypertension, and improving quality of life and mental health; stated that physical inactivity negatively affects the health system, quality of life and mental health. From it follow the definition of the basic forms of social manifestation of physical culture, because of concretization of forms of human activity regarding the use of physical exercises.

Thus, modern sport, as a special socio-cultural phenomenon, is a historically determined activity of people associated (directly or indirectly) with the use of physical exercises, which aims to prepare and participate in competitions, as well as individual and socially significant results of such activities. The results of these studies also allowed formulating a consensus definition of "sport" that can be reflected in the following form. Sport, as a special socio-cultural phenomenon, is a historically determined activity of

people connected with the use of physical exercises, which is aimed at preparing and participating in competitions (activity component of the definition), as well as individually and socially significant results of such activity.

Dietary supplements refers to any “product” intended to supplement the diet that contains one or more dietary ingredients such as; vitamins, minerals, herbs, meal supplements, sports nutrition products, natural food supplements, and other related products used to boost the nutritional content of the diet (Burke, Cort and Cox, 2006). The human daily meals are not enough to boost our strength in intense sports activities. Sports supplements can provide an easy way to improve our health and build and maintain muscle mass, endurance, and power. Using carbohydrate diets containing electrolytes can hydrate the body during sporting events. Injury prevention and enhanced recovery are important benefits of using sports nutrition supplements (Dickson, 2002). Many athletes use different dietary supplements for a variety of reasons especially to boost optimum performance. Among the most popular products are ergogenic aids such as sports drinks, minerals, caffeine, Coenzyme Q10, and creatine to enhance physical performance and to tolerate pain (Naylor, Gardner, and Zaichkowsky, 2004). Optimizing training through provision of well-timed nutrients and/or use of various effective nutritional guides can help optimize performance and/or training adaptations as adequate nutritional is characterized with good alertness, excellent natured personality, a well-developed body, with normal weight for height

The pursuit of optimal performance in sports is a constant endeavor for athletes and sports professionals. Alongside training, nutrition plays a critical role in achieving peak performance. In recent years, the use of dietary supplements has gained popularity as athletes seek to gain a competitive edge. Dietary supplements encompass a wide range of products, including vitamins, minerals, amino acids, herbs, and botanical substances, which are intended to supplement an individual's diet.

Several studies have reported the numerous benefits derivable from the participation in sports, although, these benefits have been classified into physical, social and mental benefits. Against this background, learning institutions have continued to emphasize the need for students to participate in inter and intra scholastic physical activities and sports.

Dietary supplements may be beneficial in certain situations, but if used excessively or incorrectly, they may also have the potential to impair athlete performance damage health and inflict athletes with Anti-Doping Rule Violations (ADRV) by containing substances prohibited for use by athletes under the World Anti-Doping Agency's (WADA) Dietary supplements encompass a large and heterogeneous group of products with large variations regarding ingredients, nutritional and performance enhancing effects, health risk and the likelihood that the product contain prohibited substances To develop targeted information for athletes and athlete support personnel on safe supplement use, a better understanding of prevalence and usage patterns of Dietary supplements across athlete groups and sport disciplines is needed 10It is also important to consider not only the potential benefits of supplement use but also the costs and risks (Maughan et al. 2011).

Some supplements are expensive and do not represent a good financial investment for the average athlete. Others may pose a risk to health or performance, while some may cause the athlete to fail a drugs test. The issue of supplements and drugs tests will be discussed in more detail later, but it is clearly difficult for the athlete to make an informed decision on supplement use as many of the issues at stake are unknown. The literature contains an increasing number of reports of adverse health outcomes linked to the use of dietary supplements and in many cases, these relate to the presence of undeclared compounds (Krishna et al. 2009). Sports reasons for supplement use include a belief that the stress of intense training/competition cannot be met by food alone, and that supplements can offer a specific advantage in either training or competition. There is also awareness that successful competitors are using supplements, and the use of supplements is often endorsed or encouraged by influential individuals in the athlete's circle, including coaches and training partners. There is also some evidence – largely anecdotal – that the amount of supplement used by athletes often exceeds the recommended amount. This “more is better” philosophy is encouraged by the belief that rivals are using even higher doses. Even elite athletes may not have access to professional advice, however. Hekkinen et al. (2011) reported that only 27% of the 372 elite Finnish athletes they surveyed in 2009 had an opportunity to consult a sports nutrition professional. 8It is essential that those who consider the use of supplements understand the limitations of the experimental evidence. The margin between first and second in an Olympic final is very small, and even the difference between first and last in an event may be smaller than the sensitivity

of the laboratory tests of performance. Showing that a supplement does not result in a statistically significant improvement in performance does not mean that it may not have worthwhile benefits for some athletes. There is also increasing discussion in the published literature of “responders” and “non-responders” in populations of subjects who participate in any given study. To truly establish whether an individual falls into one or other of these categories, however, requires multiple tests to establish that the response is consistent. Where some individuals improve and some do not in a single test, the explanation is more likely to reflect the random variation in performance that normally occurs. Dietary supplements are any product taken orally. It is intended to promote health and energy, strengthen immunity, reduce the risk of disease occurrence, correct a nutrient deficiency or improve performance (Peeling et al., 2019). Dietary supplements (DS) are consumed without proper instruction from health care professionals. Lack of knowledge about DS consumption and ignorance about side effects associated with inappropriate use among elite athletes and coaches may put their lives at risk. The consumption of supplements among elite athletes can be influenced and controlled by increasing their knowledge therefore, awareness about dietary supplements and their usage must be incorporated into an athlete’s practical and daily life. Well-trained elite athletes differ from the general population in being considerably more physically active and by other lifestyle characteristics including intensive training routines and periodization of their training programs. Hence, adequate intake of energy and nutrients is of great importance to this population to ensure optimal performance and recovery during training or

competition and also to minimize health risks. A consistent dietary intake pattern, in line with the sport-specific recommendations can be difficult to achieve for this group. The specific recommendations are formulated for nutritional intake during and after training or within competition. However, a large variation is seen in dietary intake by athletes. Therefore, the question arises as to what extent athletes meet recommendations and use nutritional supplements in an optimal manner.

Dietary supplements are used by athletes at all levels of sport, reflecting the prevalence of their use in the wider society. About half of the adult US population uses some form of dietary supplements (Bailey et al., 2011) and, though there are regional, cultural, and economic differences, a similar prevalence is likely in many other countries. Athletes describe a range of different reasons for their supplement choices (Fennell, 2004), and products that fit the description of “supplement” can target various roles within the athlete’s performance plan. These include the maintenance of good health by contributing to the required intake of specific nutrients, the management of micronutrient deficiencies, and the provision of energy and macronutrient needs that might be difficult to achieve through food intake alone. Other specific uses of supplements reported by athletes include direct performance enhancement or the indirect benefits that arise from the provision of support for hard training, the manipulation of physique, the alleviation of musculo- skeletal pain, rapid recovery from injury, and enhancement of mood.

Some sporting bodies now support the pragmatic use of supplements that have passed a risk-vs.-benefit analysis of being effective, safe, and permitted for use, while also being appropriate to the athlete's age and maturation in their sport.

STATEMENT OF THE PROBLEM

Dietary supplements are used by athletes worldwide. Millions of us take vitamins and dietary supplements hoping to achieve good health, ease our illnesses or defy ageing. Athletes carry a lot of performance pressure and want to be competitive hence are pronged into regular intake of dietary supplements. Due to the lack of regulations and the increasing consumption of supplements, it is very important to understand behavioral factors that may influence the consumption of these products. Excess intake has been shown to lead to serious health consequences and some supplements have even been implicated as the cause of death and disability when used improperly. Hence, it is Important to ask the question; what is the relationship between dietary supplement and optimum sports performance?

Research Questions:

1. Is there any significant relationship between use of dietary supplements and optimal performance of sports athletes?
2. What are the effects of dietary supplements use among sports athletes?
3. Does gender influence the use of dietary supplements among sports athletes?
4. What reasons could be attributed to the use of dietary Supplements?

Purpose of the Study

The purpose of the study is to examine the relationship between dietary supplement and optimum performance in sports. The study specifically seeks to ascertain if...

1. To determine the relationship between dietary supplement and endurance.
2. To determine the relationship between dietary supplement and body composition.
3. To determine the relationship between dietary supplement and optimum speed.
4. To determine the relationship between dietary supplement and reduced fatigue.

Significance of the Study

This study would be useful in highlighting the relationship between dietary supplement and optimum performance in sports and thus be beneficial to students, athletes, educators, government and policy makers to know why dietary supplements are used by athletes, whether they work and whether they're safe as well as evaluate some of the issues surrounding dietary supplements and sports performance and also to look at a selection of evidence on some of the most popular supplements in use by athletes today.

the significance of the study lies in its potential to positively impact athletes' performance, guide professionals in the sports nutrition field, and contribute to the advancement of sports science. It has the capacity to promote responsible supplement use, foster ethical practices, and ultimately support athletes in their pursuit of excellence in sports, while safeguarding their health and integrity.

Scope and Delimitation of the Study

The study seeks to examine the relationship between dietary supplement and optimum performance in sports. Independent variables addressed by this study are endurance, body composition, optimum speed, reduced fatigue and flexibility while the dependent variable is optimum performance.

The variables for the study include: knowledge of dietary supplements and sports performance; use of dietary supplements to enhance sports performance; and resultant health implications/effects of dietary supplement usage. This study is delimited to the population of sports athletes worldwide, as well as the use and effects of dietary supplements on sports performance.

Definition of Terms

The following terms are operationally defined as used in this study;

Supplement: This refers to something added to complete or make up for a deficiency or extend or strengthen the whole.

Dietary Supplement: These are product intended to alternate diet. They contain vitamins, minerals, plant material. They can be found in pill, capsule, tablet or liquid form and are used to supplement (add to) the diet, but they are not be considered a substitute for food.

Sports: Sport refers to physical activities or games that involve individual or team participation, structured rules, and competition. These activities are often undertaken for leisure, recreation, physical fitness, and skill development, and they can range from

casual games to organized, professional competitions. Sports play a significant role in promoting physical health, mental well-being, social interactions, and teamwork.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The Review of related literature was discussed under the following sub headings.

- Conceptual Framework
- Use and effect of dietary supplements on sport athletes
- Dangers associated with the use of dietary supplements
- Effects of dietary supplements
- Reason for the use of dietary supplements in sports.
- Summary of the review of related literature

Conceptual Framework:

Sports port is a two-edged sword in terms of health and the main role of the evolvement of physical fitness is sports competition (Sharma and Sood 2020). Some people who individual participate in sports have such a stronger level of physical activity. The primary goal of sports is to encourage physical exercise and enhance cognitive skills in order to improve health, efficiency, and social skills (Malm et al., 2019) Sports can be classified into various types, including team sports and individual sports. Team sports involve groups of players competing against each other, such as football (soccer), basketball, baseball, cricket, rugby, and hockey. Individual sports, on the other hand, involve athletes competing alone, such as track and field events, swimming, gymnastics, tennis, golf, boxing, and martial arts.

The objectives of sports can vary depending on the specific activity, but they generally include promoting physical fitness, developing athletic abilities, fostering teamwork and sportsmanship, and providing entertainment for participants and spectators.

Dietary supplements according to Maughan et al. (2018) is A, food component, nutrient, or non-food compound that is purposefully ingested in addition to the habitually consumed diet with the aim of achieving a specific health and/or performance benefit.

Supplements are products that are ingested in addition to the regular diet to provide additional health-promoting nutrients. According to the Dietary supplement health and Education Act (DSHEA), a dietary supplement is a product that is intended to supplement the diet; contains dietary ingredients including vitamins, minerals, amino acids, herbs, and botanicals; is intended to be ingested as a pill, capsule, tablet, or liquid; and is labeled as being a dietary supplement (ODS 2011; Ronis et al. 2018). Dietary supplements are widely used. They are generally taken to improve and maintain overall health. For women in particular, supplements are intended to support bone integrity and prevent osteoporosis.

Dietary supplement can be defined as any vitamin, mineral, chemical substance, herbal product, botanicals, amino acids, or other ingestible preparation that is added to the diet to benefit human health. Dietary supplements are used world-wide and represent a broad category of ingestible products that are distinguishable from conventional foods and drugs (Watson et al. 2010, Berginc and Kreft 2014). Recent review of this area categorizes the commonly encountered performance supplements in terms of their

research support and level of efficacy (Peeling et al., 2018). In addition, the recent International Olympic Committee consensus statement on supplement use by high-performance athletes (Maughan et al., 2018) proposes that only five performance supplements have an adequate level of evidence to suggest marginal performance gains may be possible for elite athletes (a population where such gains are generally harder to obtain) when added to a bespoke and periodized training and nutrition plan. These supplements are summarized with the mechanism of action and the potential application to track-and-field athletics. A few supplements may be helpful to athletes in specific circumstances, especially where food intake or food choice is restricted. Vitamin and mineral supplements should be used only when a food-based solution is not available. Sports drinks, energy bars, and protein – carbohydrate shakes may all be useful and convenient at specific times. There are well-documented roles for creatine, caffeine, and alkalizing agents in enhancing performance in high-intensity exercise, although much of the evidence does not relate to specific athletic events. There are potential costs associated with all dietary supplements, including the risk of a positive doping result as a consequence of the presence of prohibited substances that are not declared on the label. Dietary supplements can have both positive and negative effects on performance in sports, depending on various factors such as the athlete's individual needs, the type of supplement, dosage, and overall diet. Here are some ways in which dietary supplements may impact sports performance:

- **Nutrient Support:** Certain supplements can help address nutrient deficiencies and support overall health and energy levels, which can positively influence performance. For example, vitamin and mineral supplements can ensure athletes meet their increased nutrient demands due to intense training.
- **Muscle Recovery and Repair:** Protein supplements, like whey or plant-based protein, can aid in muscle repair and recovery after strenuous exercise, helping athletes recover faster and reduce the risk of muscle damage.
- **Energy and Endurance:** Some supplements, such as caffeine or creatine, may temporarily enhance energy levels, focus, and endurance during training or competition. They may provide a performance boost in certain sports and activities.
- **Hydration:** Electrolyte supplements or sports drinks can help maintain proper hydration, especially during prolonged exercise or in hot and humid conditions, which is crucial for optimal performance.

Meaning of the topic

The topic "Relationship between Dietary Supplements and Optimal Performance in Sports" refers to the exploration of how the use of dietary supplements may impact athletic performance, aiming to understand whether these supplements can contribute to achieving peak performance levels in sports activities.

Dietary supplement can be defined as any vitamins, minerals, chemical substance, herbal product, botanicals, amino acids other ingestible preparation that is added to the diet to

benefit human health. dietary supplements are used world-wide and represent a broad category of ingestible products that are distinguishable from conventional foods and drugs (Watson et al, 2010; Berginc and Kreft 201 A dietary supplement is a food designed for consumption that includes a ‘dietary component’ intended to give more nutritional content to the diet .according to the US FDA (Garthe and Maugham, 2018; Borges et al., 2022). When the appropriate procedures are followed, dietary supplements are used to cure or prevent nutritional deficiencies, as a handy source of energy, macro- and micro-nutrients, or even to boost performance in sports.

Furthermore we recognize that dietary supplements come in many forms, including the following: functional foods, foods enriched with additional nutrients or components outside their typical nutrient composition (eg, mineral-fortified and vitamin-fortified, as well as nutrient-enriched foods) ,formulated foods and sports foods, products providing energy and nutrients in a more convenient form than normal foods for general nutrition support (eg, liquid meal replacements) or for targeted use around exercise (eg, sports drinks, gels, bars)

"Optimal performance in sports" pertains to the highest level of physical, mental, and technical capabilities an athlete can achieve in their chosen sport. This includes achieving peak strength, power, endurance, agility, and focus, among other performance parameters. Optimal performance allows athletes to excel in their respective sports and attain competitive advantages over their opponents. With such widespread use of supplements in the general population and with the specific focus of athletes on achieving peak performance, it is not surprising that a high prevalence of supplement use is reported in

most surveys of athletes.⁴ Comparisons between surveys are confounded by numerous factors: these include differences in the definition of what constitutes a dietary supplement; ability to capture irregular use; inappropriate sample selection; and the use of non-validated and non-standardized survey instruments.⁵ Nevertheless, surveys generally suggest that supplement use:

1. varies across different sports and activities
2. increases with level of training/performance
3. increases with age
4. Is higher in men than in women, is strongly influenced by perceived cultural norms (both sporting and non-sporting).

Types of dietary supplements

Today, multivitamin, multimineral, vitamin, and mineral supplements are the most widely used dietary supplements (Bailey et al. 2013). Although adequate intake of these micronutrients is required to maintain optimal health, the possibility of toxicity increases with increasing dose (Mulholland and Benford 2007). Because dietary micronutrient deficiency is increasingly rare in developed countries, most supplement consumers actually have excess vitamin and mineral intake. Despite the wide-spread belief that vitamin and mineral supplements are beneficial to health, today, multivitamin, multimineral, vitamin, and mineral supplements are the most widely used dietary supplements (Bailey et al. 2013). Although adequate intake of these micronutrients is

required to maintain optimal health, the possibility of toxicity increases with increasing dose (Mulholland and Benford 2007). Because dietary

Micronutrient deficiency is increasingly rare in developed countries, most supplement consumers actually have excess vitamin and mineral intake. Despite the widespread belief that vitamin and mineral supplements are beneficial to health, recent reviews of vitamin and mineral supplement trials in community-dwelling adults with no nutritional deficiencies have concluded that there is no clear evidence of beneficial health effects. These include primary or secondary prevention of chronic diseases including cardiovascular disease, cancer, and cognitive decline, as well as effects on overall mortality (Guallar et al. 2013; Fortmann et al. 2013). Indeed, there are evidence recent reviews of vitamin and mineral supplement trials in community-dwelling adults with no nutritional deficiencies have concluded that there is no clear evidence of beneficial health effects.

Dietary supplements come in various forms, each serving a specific purpose and providing distinct benefits. Here are some common types of dietary supplements, along with explanations of their functions:

- 1. Vitamins:**

Vitamins are organic compounds necessary for various physiological processes in the body. They play essential roles in energy production, immune function, and metabolism. Vitamins are classified into two categories: water-soluble (e.g., Vitamin C and B-complex vitamins) and fat-soluble (e.g., Vitamins A, D, E, and K). Water-

soluble vitamins are not stored in the body, so regular intake is crucial. Fat-soluble vitamins can be stored in fat tissues, but excessive intake can lead to toxicity. Vitamins are classified based on their in vivo solubility, with A, D, E and K classified as fat-soluble and vitamins B and C classified as water soluble (Fogelholm, 2015).

2. Minerals:

Minerals are inorganic elements that are critical for various bodily functions, including bone health, nerve transmission, and enzyme activation. Common minerals include calcium, magnesium, iron, zinc, and selenium. Athletes, especially those engaged in high-impact sports, may require higher mineral intake to support bone health and prevent deficiencies. Minerals are inorganic substances that support physiological functioning (Fogelholm, 2015). The daily physiological requirements determine the mineral classifications, hence $\sim 100 \text{ mg}\cdot\text{day}^{-1}$ of macrominerals (sodium, potassium, calcium, phosphorus and magnesium) and $\sim 20 \text{ mg}\cdot\text{day}^{-1}$ of trace elements (iron, zinc, copper, chromium and selenium) are required by healthy individuals (Fogelholm, 2015).

3. Amino Acids:

Amino acids are the building blocks of proteins, which are essential for muscle repair and growth. Branched-chain amino acids (BCAAs), including leucine, isoleucine, and valine, are particularly popular among athletes as they may aid in muscle recovery and reduce exercise-induced muscle damage.

4. Protein Supplements:

Protein supplements provide a concentrated source of protein, typically in the form of powders, shakes, or bars. They are commonly used by athletes to support muscle repair, muscle growth, and recovery after intense workouts. A previous study conducted in Italy by Cannataro et al., (2019) with more than 3000 participants, showed that the supplements mostly used by sportsmen and women were whey protein, branch chain amino acids (BCAA), creatine, multivitamins, and “pre-workout” supplements. The main purpose for dietary supplementation was muscle building in males, weight loss in females, and health benefits for both sexes.

5. Creatine:

Creatine is a naturally occurring compound found in small amounts in certain foods. It is a popular supplement among athletes, particularly in strength-based sports, as it may enhance high-intensity, short-duration exercise performance by increasing the body's energy stores. Creatine can either be generated or consumed in the body as creatine monohydrate. Creatine, also known as α -methylguanidino acetic acid, is a nitrogen containing molecule that coexists with phosphocreatine in skeletal muscle. Creatine is among the most widely utilized sports supplements today. A higher dose of this supplement is thought to boost energy potential in anaerobic activity, which is why an increasing number of athletes are utilizing (Apostu, 2014) Creatine is carried out into the muscle and transformed to creatine

Phosphate by enzymes. In the muscle, phosphocreatine offers a readily accessible energy source able of resynthesizing ATP (Adenosine triphosphate) from ADP This process does not create lactic acid because it occurs in the absence of oxygen (Walpurgis et al., 2020)

6. Caffeine:

Caffeine is a stimulant found in coffee, tea, and some dietary supplements. It is known to improve cognitive function, alertness, and endurance, making it a sought-after supplement for athletes engaged in endurance sports. Caffeine use by athletes has grown after the WADA removed it off the list of prohibited drugs in 2004. Caffeine stimulates lipid catabolism and preserves glycogen levels by increasing plasma levels of free fatty acids (Mielgo-Ayuso et al., 2019). The purine alkaloid presents in a range of beverages and foods as chocolate, colas, tea, coffee, soft drinks, capsules, pills, and a variety of sports supplement that relaxing the skeletal muscles while activates the central nervous system (Mathews, 2018). During exercise and rest, this

Supplement has a broad range of changes in the nervous system, which include lowering an individual personal rating of perceived effort, boost cognitive function, increases glycolytic activity, raises blood neither epinephrine levels, metabolic, hormonal, muscular, pulmonary, cardiovascular, and renal functions (López-

Samanes, 2015; López-González et al., 2018) During exercise and rest, this

supplement has a broad range of changes in the nervous system, which include lowering an individual personal rating of perceived effort, boost cognitive function, increases glycolytic activity, raises blood neither epinephrine levels, metabolic, hormonal, muscular,

pulmonary, cardiovascular, and renal functions (López-Samanes, 2015; López-González et al., 2018)

7. Omega-3 Fatty Acids:

Omega-3 fatty acids, found in fatty fish (e.g., salmon, mackerel) and supplements like fish oil are essential for cardiovascular health, inflammation regulation, and brain function. Athletes may use omega-3 supplements to support overall health and reduce exercise-induced inflammation.

8. Pre-Workout Supplements:

Pre-workout supplements are formulated to enhance energy, focus, and performance during exercise. They often contain a combination of ingredients like caffeine, BCAAs, creatine, and nitric oxide boosters.

9. Post-Workout Recovery Supplements:

Post-workout recovery supplements aim to support muscle recovery and replenish glycogen stores after exercise. They typically contain a mix of protein, carbohydrates, and sometimes additional amino acids or vitamins.

It's important to note that while dietary supplements can be beneficial for certain individuals, they are not a substitute for a well-balanced diet. Athletes should consult with healthcare professionals or sports nutritionists before starting any supplement regimen to ensure they are using appropriate products in the correct dosages for their specific needs and goals.

Effect of dietary supplements on sports performance

The use and effects of dietary supplements can vary depending on the type of supplement, individual needs, and specific goals. Here's a general overview of how dietary supplements are commonly used and their potential effects.

Supplements target a range of scenarios of use, so different approaches are needed to assess their effectiveness. Supplements aimed at correcting nutrient deficiencies need to be judged on their ability to prevent or treat suboptimal nutrient status, with the benefit accruing from the removal of the associated impairment of health, training capacity, or performance. The effectiveness of sports foods might be hard to isolate when they are used within the general diet to meet everyday energy needs and nutrient targets. However, benefits may be more easily detected when they are specifically consumed before, during, or after an event or training session to provide nutrients that are limiting for performance (e.g., to provide fuel for the muscle or brain) or to defend homeostasis (e.g., by replacing water and salt losses). Performance-enhancing supplements which are claimed to achieve direct or indirect benefits pose a greater challenge in terms of a sound evidence base. With only a few exceptions, there is a scarcity of research, and many of the available studies are not of sufficient quality to warrant their application to elite athletes.

Substantiating the claims made about performance supplements and sports foods is difficult (Burke & Peeling, 2018). To various audiences, “proof” comes in different forms. For the purposes of this overview, we rely primarily on studies of healthy adults that are relevant to athletes. We recognize that data from studies of elite athletes are almost

entirely absent. We also recognize that mechanistic studies on animal and cell culture models are useful in identifying mechanisms, but a mechanism is not necessary to demonstrate an effect that may be meaningful to an athlete. What we think today to be the mechanism by which enhancement of performance or health occurs might be proved wrong by later studies. It must also be recognized that an individual's habitual diet can affect gene expression and their microbiota, and these, in turn, can affect response to supplementation. While the variation in the genome between individuals is less than 0.01%, the variation in microbiota is significant (80–90%), and emerging data suggests that both these factors could affect athletic performance (Clark & Mach, 2017; Ribeiro et al., 2013). The following sections present an overview of the use of supplements to address different roles in sports nutrition, first by identifying the principles of use and then by examining some of the specific products that have a good or emerging evidence base to support this situation-specific use by athletes. effects from the use of supplements may arise from a number of factors, including the safety and composition of the product per se and inappropriate patterns of use by athletes. Poor practices by athletes include the indiscriminate mixing and matching of many products without regard to total doses of some ingredients or problematic interactions between ingredients. Even commonly-used products may have negative side effects, especially when used outside the optimal protocol. For example, iron supplementation in those with already adequate iron stores can result in symptoms that may begin with vomiting, diarrhea, and abdominal pain, and develop to hemochromatosis and liver failure (Mettler & Zimmermann, 2010).

Bicarbonate may cause gastrointestinal distress when ingested in amounts sufficient to enhance performance; this can impair rather than improve performance and may counteract the benefits of other supplements taken at the same time (Carr et al., 2011a). The “more is better” philosophy, when applied to caffeine, may result in side effects, including nausea, anxiety, accelerated heart rate, and insomnia, which outweighs the performance benefits (Peeling et al., 2018). Unwanted outcomes become more common with caffeine doses ≥ 9 mg/kg body mass, but maximal benefits are usually achieved with intakes of 3–6 mg/kg (Burke, 2008). The possibility of more serious outcomes is illustrated by adverse, and potentially fatal, responses in two separate incidents in which very large doses (up to 30 grams) of caffeine were administered to healthy volunteers participating in laboratory studies (Bodkin, 2017). These incidents were due to errors in the dose calculation—if this can happen in a university research environment with supposed oversight by experienced staff, the potential clearly exist for similar errors by athletes and coaches.

Nutrient Deficiency Correction:

- **Performance Enhancement:**
- Athletes may use dietary supplements to enhance their athletic performance. Creatine, for instance, is popular among strength and power athletes due to its potential to improve high-intensity exercise performance and muscle strength. Caffeine is often used by endurance athletes for its stimulating effects on cognitive function and endurance capacity.

- **Muscle Recovery and Growth:**
- Protein supplements, particularly whey protein, are commonly consumed by athletes to support muscle recovery and growth after intense workouts. Amino acid supplements, especially BCAAs, are also used to aid in muscle repair and reduce exercise-induced muscle damage.
- **Cognitive Function and Focus:**
- Certain supplements, like caffeine and omega-3 fatty acids, are believed to enhance cognitive function, focus, and alertness. They may be used by students, professionals, and athletes alike to support mental performance.
- **Bone and Joint Health:**
- Supplements containing calcium, vitamin D, and glucosamine are often used to promote bone and joint health. These supplements may be beneficial for individuals at risk of osteoporosis or those experiencing joint discomfort.
- **Immune System Support:**
- Certain vitamins, minerals, and herbal supplements are thought to support immune function. For example, vitamin C and zinc supplements are commonly used during the cold and flu season to potentially boost immune defenses.

It's important to note that while some dietary supplements have shown beneficial effects in certain situations, not all supplements are effective or suitable for everyone. Additionally, excessive or inappropriate supplement use can lead to adverse effects or interactions with medications. Consultation with a healthcare professional or a registered

dietitian is essential before starting any supplement regimen to ensure safety and appropriateness for individual needs.

Furthermore, supplements should complement a well-balanced diet, not replace it. The primary source of essential nutrients should come from a varied and nutrient-rich diet, while supplements can be used to fill in specific gaps or address specific needs as advised by healthcare professionals.

Dangers of dietary supplements

While dietary supplements can be beneficial for some individuals under specific circumstances, there are also potential dangers associated with their use. It's crucial to be aware of these risks and exercise caution when considering dietary supplements. Many dietary supplements are made under careful conditions and labeled correctly. But others are not made as carefully. Some companies don't follow the FDA's rules about making claims and labeling supplements correctly. In some cases, when herbal supplements have been tested, they have been found to contain very little or none of the listed ingredient. Some even contain chemicals that could be harmful to certain people. And some supplements contain a larger dose than the label lists. Serious illnesses and even deaths have resulted from these kinds of problems. Some of the dangers of dietary supplements include:

- **Lack of Regulation:** The dietary supplement industry is not as strictly regulated as the pharmaceutical industry. As a result, some supplements may contain

inaccurate ingredient labels, impurities, or undisclosed substances, posing health risks to consumers.

- **Contamination:** Certain dietary supplements may be contaminated with harmful substances, including heavy metals, pesticides, or even banned substances, leading to adverse health effects.
- **Interactions with Medications:** Some dietary supplements can interact with prescription medications, reducing their effectiveness or causing harmful side effects. It's essential to consult a healthcare professional before combining supplements with prescribed medications.
- **Overdose Risk:** Taking excessive amounts of certain supplements, such as fat-soluble vitamins (A, D, E, K) and minerals, can lead to toxicity and adverse health effects.
- **Side Effects:** Many supplements can cause side effects, ranging from mild digestive issues to more severe reactions, depending on the individual's sensitivity and the supplement's dosage.
- **Negative Health Outcomes:** Studies have linked the use of certain dietary supplements to adverse health outcomes, such as increased risk of cardiovascular events, liver damage, and kidney problems.
- **Misleading Claims:** Some dietary supplements make exaggerated or unsupported claims about their benefits, leading consumers to believe they offer miraculous health or performance improvements.

- **Misuse in Sports:** In the sports context, some supplements may be used to enhance performance illegally or without proper understanding of their risks. This can lead to doping violations and damage to an athlete's reputation.

Summary Review of Related Literature:

The review of related literature on the relationship between dietary supplements and optimal performance in sports provides valuable insights into the impact of dietary supplements on athletic performance. Several key themes emerge from the literature, encompassing various types of supplements and their effects on different aspects of sports.

Overall, the review of related literature underscores the potential benefits of dietary supplements in enhancing certain aspects of athletic performance. However, it also highlights the importance of informed decision-making, individualization, and adherence to safety guidelines when using dietary supplements in the sports context.

It is crucial to recognize that while some supplements may offer benefits, they are not a substitute for a well-balanced diet and proper training. Athletes should prioritize a holistic approach to sports performance, incorporating nutrition, training, rest, and recovery to achieve optimal results while ensuring their health and well-being.

CHAPTER THREE

METHODOLOGY

In this chapter is described the research method used in this study and is discussed under the following sub-headings:

- Research Design

- Population of the Study

- Sample and Sampling Techniques

- Research Instrument

- Validity of the Instrument

- Reliability of the Instrument

- Method of Data Collection

- Method of Data Analysis

Research Design

The descriptive survey research design will be adopted as the design of the study. This design was chosen because the study aimed at collecting data and describing them in a systematic manner relating to the characteristics, features or facts about a given population.

Population of the Study

The population includes individuals engaged in both amateur and professional sports, across different age groups and skill levels. Since the study aims to examine the impact of dietary supplements on sports performance, the population should consist of athletes who are actively involved in training and competition. These athletes may participate in a wide range of sports. The population of this study will comprise of registered sport athletes in Edo state. The total population is 296.

The population can be further categorized based on factors like age, gender, training level (amateur, collegiate, professional), and the specific sport they participate in. Including athletes from various sports will help ensure the study's findings have broader applicability and can be relevant to a diverse range of athletic endeavors

Sample and Sampling technique

Sample:

The sample size of 80 Sport Athletes will be selected using the multi-stage sampling techniques.

In the first stage the Stratified sampling technique will be employed. This is because the athletes are in different sports.

In the second stage the proportionate sampling technique will be employed. This will be done by using 20% of the entire number of athletes in a sport. Furthermore, a simple random sampling technique will be used in drawing the desired number of athletes that will make up the desired percentage of student athletes needed.

Research Instrument

The research instrument that will be used for the study is a self-constructed Questionnaire. The Questionnaire comprised of two sections; sections A and B. Section A is designed to collect the demographic data of the respondents while Section B consist of items generated from the research questions raised to which the respondents are expected to provide responses for.

Validity of the Instrument

The instrument was validated by the researcher's supervisor and two other experts in the department of Human Kinetics and Sports Science. Their critiques, suggestions and corrections will form the final draft of the test instrument.

The instrument would be further modified in line with their comments and suggestions. These processes are expected to ensure both content and face validity.

Reliability of the Instrument

The test-retest reliability method will be used to establish the reliability of the instrument. In this method, the instrument will be administered to twenty (20) sport athletes of Edo state team. Who will not be part of the population. After an interval of two weeks, the same instrument will be administered to the same set of respondents under the same conditions. The result from both administrations will be subjected to Pearson's Product Moment Correlation Co-efficient (PPMCC).

Method of Data Collection

The data needed for this study will be collected through the administration of the questionnaire to the respondents by the researcher. The completed questionnaire will then be returned by the respondents to the researcher for computation. The test instrument will be administered to the respondents by the researcher with the help of two research assistants for data collection. Consequently, the respondents will be instructed on how to answer the questions after which the completed questionnaires will be retrieved by the researcher and research assistants on the spot to reduce loss rate and to offer the respondents the opportunity to ask questions in case, they find any item difficulty.

Method of Data Analysis

The data collected from the study will be analyzed using descriptive statistics involving frequency counts and percentages for their bio data while mean and standard deviation will be used to analyze the research questions. The bench mark will be as follows 1.0-2.5 (not accepted) 2.5 and above (accepted).

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter deals with the presentation of results and interpretation of findings collected during the study. This chapter is presented under the following headings.

Demographic information

The data displayed below shows the Sex, Age, and Academic level percentage of respondents who participated and provided responses on the administered questions in relation to the study of the relationship between dietary supplements and optimal performance in sports.

Table 3: Sex of respondents

Sex	Frequency	Percentage (%)
Male	48	58.5
Female	32	41.5
Total	80	100

In table 3 the data shows the sex of respondents who provided responses to the questions administered. The data indicates that 58.5 % of the respondents were male while 41.5 % were females.

Table 4: Age of respondents

Age	Frequency	Percentage (%)
17-20	23	28.8
21-24	11	13.8
25-28	42	52.5
29 above	4	5.0
Total	80	100.0

Table 4, shows that 28.8 % are from age 17-20, 13.8 % are from age 21-24, 52.5% are from age 25-28, and while 5.0% are from age 29 and above. which indicates a greater majority of respondents are from Age 25-28 .

Table 5: Academic level of respondents

Academic level	Frequency	Percentage (%)
100	20	25.0
200	22	27.5
300	18	22.5
400	20	25.0
Total	80	100.0

Table 5, shows that majority of the respondents are from 200 levels (27.5%), 25.0% of the respondents are from 100 levels and 400 levels, while 22.5% are from 300 level.

Section B

Research Question 1: Is there any significant relationship between use of dietary supplements and optimal performance of sports athletes

Table 6: Mean and Standard Deviation of responses on the relationship between dietary supplements and optimal performance of sport Athletes.

Athletes.

S/N	Item Statements	Mean	Std. Dev	Decision
1	There is an association between dietary supplements use and optimal. Performance of sports athletes	3.53	0.711	Agree
2	Dietary Supplements may affect sport athletes performance There is no relationship between dietary supplements use	2.53	0.621	Agree
3	and optimal. Performance of sports athletes	3.18	0.917	Agree
Grand mean		3.16		

The data in table 6 revealed that the mean values ranged from 2.53 to 3.53, while the standard deviation values ranged from 0.711 to 1.091. The responses showed that the respondents agreed to two of three (3) items regarding the relationship between dietary supplements and optimal performance of sports Athletes. The low values of the standard deviation showed that their responses do not deviate far from one another.

Research Question 2: What are the effects of dietary supplements use among sports athletes?

Table 7: Mean and Standard Deviation of responses on the effect of dietary supplements

S/N	Item Statement	Mean	Std. Dev	Decision
4.	The use of dietary supplements may either be harmful or healthful to sports athletes	3.56	0.633	Agree
5.	Dietary supplements may have deleterious Side effects.	3.46	0.594	Agree
6.	Apart from health implications there are also Ethical, social and Financial Implications of dietary supplements use	3.44	0.592	Agree
7.	Dietary supplements Usage can in the long run lead to increased heart rate and Blood pressure	3.54	0.526	Agree
8.	Dietary supplements use may result in liver as well as kidney damage	3.20	0.892	Agree
9.	Dietary Supplements may cause adverse or allergic reactions	3.46	0.594	Agree
10.	Dietary Supplements may result in digestive issues or digestive discomfort	3.18	0.759	Agree
11.	Dietary supplements use can lead to high risk of contamination to sports athletes	3.54	0.526	Agree

use among sports athletes.

The data in table 7 showed that the mean values ranged from 3.18 to 3.56, while the standard deviation values range from 0.526 to 0.892. With an average mean of 3.44, it is seen that the respondents agreed that dietary supplements use possess harmful effects to sports Athletes. The low values of the standard deviation showed that their responses do not deviate far from one another.

Research Question 3: Does gender influence the use of dietary supplements among sports athletes?

Table 8: Mean and Standard Deviation of responses on Does gender influence the use of dietary supplements among sport athletes.

S/N	Item Statements	Mean	Std. Dev.	Decision
16	The male sport Athletes use dietary supplements more than Their female counterparts.	3.73	0.572	Agree
17	The use of dietary supplements is not influenced by gender	2.85	0.956	Agree
18	Female sports athletes are more disposed to dietary supplements Use than the males	1.78	0.936	Disagree
19	There is a relationship between gender and dietary supplement. Use.	2.70	0.990	Agree
20	There is similar prevalence in the use of dietary supplement Among Males and females.	1.81	0.917	disagree
Grand mean		3.03		

The data in table showed that the mean values ranged from 1.78 to 3.73, while the standard deviation values range from 0.527 to 0.990 With an average mean of 3.03, The respondents' view on if gender influence the use of dietary supplements among sports athletes agreed to items 16, 17, and 19 hence they disagreed to items 18 and 20 which revealed that gender does influence dietary supplements use among sports athletes. And the male sport counterpart uses dietary supplements more than the female.

Research Question 4: What reasons could be attributed to the use of dietary Supplements?

Table 9: Mean and Standard Deviation of responses on reasons that could be attributed to the use of dietary supplements.

S/N	Item Statements	Mean	Std. Dev.	Decision
21	I use dietary supplements because it influences the physiological capacity of the Body ,thereby improving performance	3.28	0.826	Agree
22	Dietary supplements remove psychological barriers to my sports performance.	3.23	0.711	Agree
23	I take dietary supplements so as to improve my recovery speed in training and Competition	3.36	0.621	Agree
24	I use dietary supplements so as to gain competitive edge over my fellow opponents/ Athletes	3.44	0.592	Agree
Grand mean		3.30		

The data in table showed that the mean values ranged from 3.23 to 3.44, while the standard deviation values range from 0.592 to 0.826. With an average mean of 3.30, The respondents' view on the reasons that could be attributed to the use of dietary

supplements among sports athletes. showed that respondents agreed to all items attributed with the use of dietary supplements for optimal performance in sports.

Discussion of Findings

The findings for research question 1 and hypothesis 1 showed that there is a relationship between use of dietary supplements and optimal sports performance, this follows the findings of (Burke, Cort and Cox, 2006). Which states that Dietary supplements refers to any “product” intended to supplement the diet that contains one or more dietary ingredients such as; vitamins, minerals, herbs, meal supplements, sports nutrition products, natural food supplements, and other related products used to boost the nutritional content of the diet and overall athletic performance?

The findings of research question 2 showed that dietary supplements have several effects on athletes. In line with this, (Dickson, 2002).emphasized that dietary Sports supplements can provide an easy way to improve our health and build and maintain muscle mass, endurance, and power. Using carbohydrate diets containing electrolytes can hydrate the body during sporting events. Injury prevention and enhanced recovery are important benefits of using sports nutrition supplements

The findings related to research question 3 showed that gender influence the use of dietary supplements among sports athletes although not significantly (Aguilar-Navarro et al., 2020). Research focused on female athletes' intake of supplements found that women utilize supplements for various reasons, including keeping bones strong, preventing bone loss, supporting muscle recovery and growth, improving muscle strength and endurance,

enhancing athletic performance, and improving their overall health. More than 80% of athletes use sports supplements and female athletes use them at approximately the same rate as male athletes, In line with the present findings, most available studies indicated no general difference between male and female athletes in the number of supplement intakes ... In line with the present findings, most available studies indicated no general difference between male and female athletes in the number of supplement intakes

The findings of research question 4 showed that athletes use dietary supplements for various reasons,, Dietary supplement use is common among U.S. adults, according to the National Health and Nutrition Examination Surveys (NHANES), with the prevalence of dietary supplement use in the month preceding the survey reported to be 52% in the 1999-2000 NHANES and 54% in the 2003-2006 NHANES .These surveys show that usage is higher among older adults than among young adults,, and increases as the level of education increases. Most users of dietary supplements say their primary motivation is to improve overall health or wellness or to fill perceived nutrient gaps in their dietary intake

CHAPTER FIVE

SUMMARY

This study aimed to investigate the relationship between dietary supplements and optimal performance in sports. With the increasing popularity of sports and the pursuit of enhanced athletic performance, athletes often turn to dietary supplements in the hope of gaining a competitive edge. However, the efficacy and safety of these supplements remain a subject of debate.

The study examined the relationship between dietary supplements and optimal performance in sports, 3 research questions were formulated to this effect. Various literatures were reviewed in line with the field under study. Descriptive survey method was implemented while random sampling technique was used in selecting a sample size of 80, which represented the total population for the study .Questionnaire was then constructed as designed by the researcher as the instrument for data collection ,which was given proper scrutiny prior to administration to ensure face and construct validity as well as coefficient of reliability to ensure the internal consistency of the instrument using test retest method .The researcher distributed the questionnaire to the respondents and all were successfully retrieved for data analysis .Mean and standard deviation techniques as well as tests Were adopted as statistical tools for Analyzing the obtained data.

Results obtained revealed the following

1. There is relationship between dietary supplements and optimal performance in sports.
2. Dietary supplements use possess harmful effects to sport athletes.
3. Gender does influence the use of dietary supplements amongst sports athletes, as the male counterparts involve in supplements intake more than the female.
4. Improving performance, breaking psychological barriers, increasing recovery speed in training and competition, gaining competitive edge over opponents are major reasons subjected to the use of dietary supplements among sport athletes.

Conclusion

Sports involves physical actives engaged in by individuals for different purposes including competition, extortion of energy, recreation and enjoyment. Optimum performance in sports is primarily dependent on genetic factors in athletes ,with morphologic ,metabolic, physiologic and psychologic trait's specific to performance characteristics vital to their various sports .such generally endowed athletes are forged through supplement intake .The implication is that athletic performances in sports are boosted by attention to nutrimental supplements intake .meanwhile optimal nutrition for health and performance includes the Identification of both the quality and quantity of food and fluids needed to supplement regular training and peak performance. Based on this the study examined the relationship between dietary supplements and optimal performance in sports. Supplements such as caffeine and nitrates do not enhance

endurance performance in the heat, with caffeine also increasing core temperature responses. Some amino acids might offer the greatest performance benefits in the heat. Exercising in the heat negatively affected the efficacy of many dietary supplements, indicating that further research is needed and current guidelines for performance in hot environments likely require revision. Dietary supplements can play a small role in an athlete's sports nutrition plan, with products that include essential micronutrients, sports foods, performance supplements and health supplements all potentially providing benefits. Some supplements, when used appropriately, may help athletes to meet sports nutrition goals, train hard, and stay healthy and injury-free. A few supplements can directly enhance competition

performance. However, it takes considerable effort and expert knowledge to identify which products are appropriate, how to integrate them into the athlete's sports nutrition plan, and how to ensure that any benefits outweigh the possible negative side effects, including the potential strict risk-benefit analysis involving a decision tree approach.

. In conclusion, this comprehensive study shed light on the relationship between dietary supplements and optimal performance in sports. While some supplements demonstrated potential benefits, their usage should be approached with caution. Proper nutrition, training, and individualized strategies remain essential components of achieving optimal athletic performance. Further research is warranted to gain a deeper understanding of the effects of specific supplements and their interactions with various athletic populations.

Recommendations

Based on the findings of the study the researcher recommends that

1. Diet of athletes must be revised to determine nutritional adequacy, dietary

Diversity, energy expenditure and their relationship on optimum performance and endurance levels

2. Athletes and coaches must understand that the consumption of supplements

Even under controlled circumstances, risked the possibility of causing a positive

Test for Banned substances, during doping control

3. Health care professionals should endeavor to ask their athletes patients about

Dietary supplements usage in order to maximize health care services offered to them to enhance flexibility and reduced fatigue

4. Before taking any dietary supplement, use the information sources listed in this fact sheet and talk to your health care providers to answer these questions:

- What are its potential benefits for me?
- Does it have any safety risks?
- What is the proper dose to take?
- How, when, and for how long should I take it?

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