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## **Nutrition Strategies for Optimizing Performance and Health in Young Athletes**

Kinga Woźniak, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: kinga966@outlook.com, ORCID: 0009-0007-9802-5888

Patryk Hedesz, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: p.hedesz@gmail.com, ORCID: 0009-0006-1886-0916

Aleksandra Żuk-Łapan, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: aleksandrak11@gmail.com, ORCID: 0009-0009-5580-1001

Magdalena Jung, University Clinical Hospital in Opole, 26 Wincentego Witosa Avenue, 45-401 Opole, e-mail: magdalenamehel@gmail.com, ORCID 0009-0000-8328-1917

Monika Gardian-Baj, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: mgardianbaj@gmail.com, ORCID: 0009-0001-6513-9594

Justyna Popczyńska, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw email: jpopczynska@gmail.com ORCID: 0009-0008-7654-932X

Aleksandra Doryń, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: aleksandradoryn@gmail.com, ORCID: 0009-0009-1389-5724

Maximilian Jung, University Clinical Hospital in Opole, 26 Wincentego Witosa Avenue, 45-401 Opole, e-mail: max.jung@wp.pl, ORCID: 0009-0003-1041-1831

Emilia Babula, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: ebabula@op.pl ORCID: 0009-0009-0343-6233

Aleksandra Włodarczyk, Szpital Miejski Specjalistyczny im. Gabriela Narutowicza w Krakowie, email: olawlo15@wp.pl, ORCID: 0009-0003-5455-9483

Andrzej Taras, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warsaw, email: andrzejtaras1993@gmail.com, ORCID: 0009-0001-4868-7281

Correspondence: kinga966@outlook.com

### **Abstract:**

**Introduction:** The increasing participation of young individuals in sports necessitates a comprehensive understanding of the intricate relationship between nutrition and athletic performance during the critical adolescent years. This introduction sets the stage for an exploration of the dynamic nutritional needs of young athletes, emphasizing the pivotal role of nutrition in supporting growth, energy metabolism, and overall athletic achievement.

**Current State of Knowledge:** The current state of knowledge encompasses an in-depth analysis of key nutritional considerations for young athletes. Examining energy and macronutrient requirements, micronutrient considerations, hydration strategies, and optimal timing of nutrition, this section synthesizes existing research to provide evidence-based guidelines. Furthermore, it addresses the unique challenges posed by different sports and the importance of tailored nutritional approaches for diverse athletic endeavors. The evolving landscape of sports nutrition is also explored, with a specific focus on the benefits and potential risks associated with protein and creatine supplementation.

**Summary:** In summary, this article serves as a comprehensive resource for athletes, coaches, and parents seeking to navigate the intricate intersection of nutrition and young athletes. By elucidating evidence-based strategies and addressing the potential drawbacks and risks associated with certain supplements, the article aims to empower stakeholders with the knowledge needed to make informed decisions regarding the nutritional well-being of young athletes. It underscores the importance of individualized approaches, recognizing the diversity of young athletes and advocating for adaptable nutritional strategies that contribute to both immediate performance gains and sustained health and athletic success.

**Key words:** Nutrition, Young Athletes, Sport nutrition, Dietetics, Performance nutrition

## **Introduction**

The surge in youth engagement in sports and physical activities has brought to the forefront the necessity of addressing the multifaceted aspects of young athletes' well-being. One integral component of their holistic development is nutrition, a factor that plays a pivotal role in supporting growth, energy requirements, and overall athletic performance. The adolescent years are characterized by rapid physical and physiological changes, making the nutritional needs of young athletes unique and dynamic. As these individuals navigate the intricate balance between school, sports, and social life, it becomes imperative to unravel the complexities of their dietary requirements. This article delves into the critical intersection of nutrition and young athletes, aiming to provide a comprehensive overview of evidence-based strategies that not only optimize performance on the field but also foster long-term health and well-being. By examining key aspects such as energy and macronutrient requirements, micronutrient considerations, hydration, timing of nutrition, and special considerations, this article seeks to empower athletes, coaches, and parents with the knowledge needed to make informed decisions regarding the nutritional foundation of young athletes. Additionally, in recognizing the evolving landscape of sports nutrition, the article explores the nuanced topic of supplements, delving into protein and creatine supplementation while addressing potential drawbacks and risks associated with their use. As we navigate this scientific exploration, it is essential to underscore the importance of individualized approaches, acknowledging the diversity of young athletes and the need for adaptable nutritional strategies that contribute not only to immediate performance gains but also to sustained health and athletic success.

## **Current state of knowledge**

### *Energy and Macronutrient Requirements [1-5]:*

Meeting the energy and macronutrient demands of young athletes is crucial for sustaining growth, optimizing performance, and supporting long-term health. The unique physiological changes during adolescence, coupled with the energy expenditure associated with intense training, require careful attention to dietary composition.

## **1. Energy Requirements:**

- Adolescents undergoing growth spurts and engaging in regular physical activity have elevated energy needs. Balancing energy intake with expenditure is essential to support optimal growth and development. The American Academy of Pediatrics recommends an energy intake of 30 to 40 kcal/kg/day for most adolescents, with variations based on activity levels and individual requirements.

## **2. Carbohydrates:**

- Carbohydrates are the primary energy source for active individuals. Adequate carbohydrate intake is crucial for replenishing glycogen stores and sustaining energy during exercise. The American College of Sports Medicine recommends that 45–65% of total daily calories come from carbohydrates. Whole grains, fruits, vegetables, and legumes should constitute the majority of carbohydrate sources.

## **3. Proteins:**

- Protein plays a pivotal role in muscle repair, growth, and overall tissue maintenance. Athletes engaged in regular training may require a slightly higher protein intake, ranging from 1.2 to 2.0 grams of protein per kilogram of body weight. Emphasizing high-quality protein sources such as lean meats, dairy, eggs, and plant-based proteins ensures the provision of essential amino acids.

## **4. Fats:**

- Dietary fats contribute to energy stores, support hormone production, and aid in nutrient absorption. While total fat intake should be moderated, emphasizing sources of unsaturated fats, such as avocados, nuts, seeds, and olive oil, is crucial. The American Academy of Pediatrics recommends that 25–35% of total daily calories come from fats.

## **5. Timing of Nutrition:**

- Optimizing the timing of nutrient intake is vital for young athletes. Consuming a balanced meal 3-4 hours before exercise and a smaller snack 30-60 minutes

prior helps ensure adequate energy availability. Post-exercise, a combination of carbohydrates and proteins aids in glycogen replenishment and muscle repair.

Balancing energy and macronutrient intake requires individualized approaches based on factors such as age, sex, activity level, and training intensity. Regular assessments and adjustments to dietary strategies are crucial to meet the evolving needs of young athletes.

### *Micronutrient Considerations [6-13]:*

Optimal performance and long-term health in young athletes hinge not only on macronutrients but also on a spectrum of essential micronutrients. The adolescent growth spurt, coupled with increased physical activity, places a heightened demand on key vitamins and minerals crucial for bone health, immune function, and overall well-being.

#### **1. Calcium and Vitamin D:**

- Adequate calcium intake during adolescence is pivotal for optimizing peak bone mass, thereby reducing the risk of osteoporosis later in life. Vitamin D, working synergistically with calcium, aids in bone mineralization. A deficiency in these micronutrients can compromise bone health, increasing susceptibility to stress fractures and other skeletal issues. Daily allowances for calcium range from 1300-1300 mg for adolescents, and vitamin D is recommended at 600 IU for those aged 9-18.

#### **2. Iron:**

- Iron is critical for oxygen transport and energy metabolism, making it indispensable for young athletes. Particularly in female athletes, who may experience iron losses through menstruation, ensuring sufficient iron intake is essential to prevent iron-deficiency anemia and maintain optimal performance. Daily allowances for iron range from 8-11 mg for adolescents.

#### **3. Zinc:**

- Zinc plays a crucial role in immune function, wound healing, and protein synthesis. Intense physical activity can increase zinc losses through sweat, underscoring the importance of meeting recommended daily allowances to

support immune resilience and recovery. Daily allowances for zinc range from 8-11 mg for adolescents.

#### 4. **Antioxidants:**

- Intense exercise generates oxidative stress, necessitating an increased intake of antioxidants such as vitamins C and E. These micronutrients help neutralize free radicals, reducing oxidative damage and inflammation. Including a variety of fruits and vegetables in the diet is key to ensuring an adequate antioxidant intake. Daily allowances for vitamin C range from 45-75 mg, and for vitamin E, it is 15 mg for adolescents.

#### 5. **B Vitamins:**

- B vitamins, including B6, B12, and folate, are vital for energy metabolism, red blood cell formation, and neurological function. Ensuring adequate intake is crucial for sustained energy levels and overall health. Daily allowances for vitamin B6 range from 1.2-2 mg, for vitamin B12, it is 2.4 mcg, and for folate, it is 400 mcg for adolescents.

Proactive monitoring of micronutrient status through regular assessments and tailored dietary strategies is paramount for young athletes. However, it's essential to strike a balance, avoiding unnecessary supplementation and promoting a diverse and nutrient-dense diet.

#### *Hydration* [14-22]:

Hydration is a cornerstone of optimal performance and long-term health for young athletes. Proper fluid balance is essential for temperature regulation, nutrient transport, and overall physiological function. Inadequate hydration can compromise cognitive function, increase perceived effort during exercise, and impair recovery. Additionally, young athletes are often more susceptible to dehydration due to higher sweat rates and increased training intensity.

Research emphasizes the importance of personalized hydration strategies. The American Council on Exercise recommends athletes consume 17-20 ounces of water 2-3 hours before exercising, 8 ounces 20-30 minutes before, and 7-10 ounces every 10-20 minutes during exercise. Electrolyte-rich beverages can be beneficial for those engaging in prolonged, intense activities, helping to replace sodium lost through sweat.

Consideration of environmental factors is crucial. Hot and humid conditions increase fluid needs, and athletes should be educated on adjusting their intake accordingly. Dehydration not only compromises immediate performance but, when chronic, may impact kidney function and long-term health.

Promoting a proactive rather than reactive approach, education on recognizing thirst cues is vital. Relying on thirst can be an effective strategy for preventing overhydration, a condition known as hyponatremia, where low sodium levels in the blood can lead to serious health issues.

In summary, maintaining optimal hydration is paramount for young athletes. Tailoring hydration plans to individual needs, considering environmental factors, and educating athletes on recognizing thirst cues are integral components of long-term health and sustained athletic performance.

Timing of Nutrition: [1-4;]

Strategic timing of nutrition is a critical component in optimizing the performance, recovery, and overall well-being of young athletes. The interplay between nutrient intake and exercise sessions significantly influences energy levels, muscle repair, and glycogen replenishment. Consideration of pre-, during, and post-exercise nutrition is paramount for supporting the unique demands of adolescent athletes.

#### **1. Pre-Exercise Nutrition:**

- Consuming a balanced meal approximately 3-4 hours before exercise provides a source of sustained energy. This meal should include a combination of carbohydrates, proteins, and healthy fats. For those with limited time before exercise, a smaller snack 30-60 minutes prior, rich in easily digestible carbohydrates and a moderate amount of protein, can enhance energy availability.
- A "smaller snack" in the context of pre-exercise nutrition refers to a light and easily digestible meal or snack that is consumed relatively close to the time of exercise, typically 30 to 60 minutes before the activity. This type of snack is designed to provide a quick source of energy without causing discomfort

during physical exertion. The composition of this snack usually includes carbohydrates, with a moderate amount of protein and minimal fat.

- Examples of smaller pre-exercise snacks may include:
  1. Banana with Nut Butter: Combining the natural sugars from the banana with the protein and healthy fats from nut butter provides a quick energy boost.
  2. Greek Yogurt with Berries: Greek yogurt offers a protein source, and berries contribute easily digestible carbohydrates for energy.
  3. Energy Bar: Choose a bar that has a good balance of carbohydrates and some protein. Look for options with minimal added sugars.
  4. Whole Grain Toast with Jam or Honey: The carbohydrates from the toast and the simple sugars from jam or honey can provide a quick energy release.
  5. Fruit Smoothie: Blending fruits with yogurt or milk can create a nutrient-dense and easily digestible snack.
- The goal of a smaller pre-exercise snack is to provide readily available energy without causing digestive discomfort during physical activity. It's important to consider individual preferences, tolerance, and the specific demands of the upcoming exercise session when choosing and timing these snacks.
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## **2. During Exercise Nutrition:**

- For prolonged and intense exercise lasting more than 60 minutes, particularly in endurance sports, consuming carbohydrates during the activity can help maintain blood glucose levels and delay fatigue. Sports drinks, energy gels, or easily digestible snacks provide a quick source of energy. Adequate hydration is also crucial during exercise to offset fluid losses through sweat.

## **3. Post-Exercise Nutrition:**

- The post-exercise period is a critical window for replenishing glycogen stores, initiating muscle repair, and promoting recovery. Consuming a combination of



carbohydrates and proteins within 30 minutes to 2 hours after exercise is recommended. This can be in the form of a balanced meal or a recovery snack. Including a source of high-quality protein supports muscle protein synthesis, while carbohydrates replenish glycogen stores.

- Examples of recovery snacks:
  1. Chocolate Milk: Combines carbohydrates and protein in an easily digestible form, with the added benefit of fluid for rehydration.
  2. Greek Yogurt with Fruit: Provides a balance of protein and carbohydrates, along with the hydrating effect of yogurt.
  3. Peanut Butter and Banana Sandwich: Combines carbohydrates from bread and banana with protein and healthy fats from peanut butter.
  4. Protein Smoothie: Blending fruits with a protein source, such as whey or plant-based protein powder, and adding yogurt or milk.
  5. Trail Mix: A mix of nuts, seeds, and dried fruits can offer a combination of carbohydrates, protein, and healthy fats.

#### 4. Hydration [14,15]:

- Proper hydration is an ongoing consideration throughout the day and during exercise. Adequate fluid intake before, during, and after exercise is essential for preventing dehydration, maintaining performance, and supporting recovery. Monitoring urine color and body weight changes can serve as practical indicators of hydration status.
- Pre-Exercise: it is essential for young athletes to consume an adequate amount of fluids. Aim for 16-20 ounces (about 500-600 mL) of water or a sports drink 2-3 hours before exercise to commence the activity in a well-hydrated state.
- During Exercise: Continuous fluid intake during exercise is crucial to replace fluids lost through sweat and prevent dehydration. The recommendation is to consume 7-10 ounces (about 200-300 mL) of water every 10-20 minutes during exercise. For prolonged or intense activities lasting over an hour, a sports drink containing electrolytes and carbohydrates can aid in replenishing lost fluids and providing additional energy.

- **Post-Exercise:** Rehydration after exercise is critical for recovery. Young athletes should aim to replace fluid losses within two hours of completing the activity. The general guideline is to consume 24 ounces (about 700 mL) of fluid for every pound (0.45 kg) of body weight lost during exercise. Water is usually sufficient for moderate activities, while a sports drink can be beneficial for intense or prolonged exercise to restore electrolyte balance.
- **Monitoring and Adaptation:** Regularly monitoring signs of dehydration, such as urine color and body weight changes, is crucial. Athletes should also adapt their hydration strategies based on environmental conditions, considering factors like temperature and humidity, which can impact fluid needs. Encouraging consistent fluid intake throughout the day, not just around exercise times, contributes to maintaining optimal hydration levels.

#### **5. Individualized Approach:**

- It's crucial to emphasize the individualized nature of nutrition timing. Factors such as the type and intensity of exercise, personal tolerance, and overall dietary habits influence the effectiveness of nutrient timing strategies. Young athletes should experiment with different approaches and adjust based on their unique responses.

#### **6. Practical Considerations:**

- Balancing nutritional needs with practical considerations, such as school schedules and training times, is key. Providing easily accessible snacks, planning meals in advance, and ensuring hydration stations are available during training sessions contribute to the seamless integration of optimal nutrition practices.

Ensuring young athletes understand and implement effective timing of nutrition strategies contributes not only to immediate performance gains but also to long-term health and sustained athletic success.

Special Considerations: [2; 23-27]

In the realm of young athletes' nutrition, an in-depth understanding of the specific sport and individual positions within that sport is crucial. The demands placed on the body can vary significantly based on the nature of the activity, ranging from endurance and agility sports to strength-focused endeavors. Moreover, individual positions within a team sport can introduce unique challenges and nutritional requirements.

### 1. **Endurance vs. Strength Sports:**

- Young athletes participating in endurance sports, such as long-distance running or cycling, have distinct nutritional needs compared to those engaged in strength-focused sports, like weightlifting or gymnastics. Endurance athletes may benefit from a greater emphasis on carbohydrate-rich diets to sustain prolonged efforts, while strength athletes may prioritize protein intake for muscle repair and development.

### 2. **Interval and Burst Sports:**

- Sports characterized by intermittent bursts of high-intensity efforts, such as soccer or basketball, pose specific challenges. These athletes require a mix of energy substrates to support both quick bursts of activity and sustained endurance. Balanced nutrition, incorporating carbohydrates, proteins, and fats, is essential for meeting the dynamic demands of these sports.

### 3. **Position-Specific Needs:**

- Within team sports, the position an athlete plays can significantly impact their nutritional requirements. For instance:
  - **Midfielders and Endurance Positions:** Athletes covering large distances in sports like soccer may benefit from additional carbohydrates to sustain energy levels throughout a match.
  - **Strikers and Sprint Positions:** Positions requiring frequent sprints and explosive movements may benefit from increased carbohydrate intake for quick energy release.

- **Goalkeepers and Power Positions:** Athletes in power-intensive positions may focus on adequate protein intake to support muscle strength and recovery.

#### 4. **Nutrition for Technical Sports:**

- Sports that demand high levels of technical skill, such as figure skating or gymnastics, may require specific attention to nutrition for strength, flexibility, and precision. Adequate intake of nutrients like calcium, vitamin D, and protein is crucial for supporting bone health and muscle function in these athletes.

#### 5. **Adapting Nutrition to Training Phases:**

- The training phase, whether it's pre-season, in-season, or off-season, can impact nutritional needs. Pre-season training might require additional focus on endurance and stamina, while off-season periods may prioritize recovery and strength-building. Nutritional plans should be flexible to adapt to these varying training phases.

#### 6. **Dietary Restrictions in Young Athletes:**

- Addressing dietary restrictions in young athletes involves careful consideration of individual needs, allergies, intolerances, and lifestyle choices. It's essential to ensure that athletes with specific dietary requirements receive adequate nutrition to support their training, performance, and overall well-being.
- **Food Allergies and Intolerances:** For athletes with food allergies, avoidance is critical to prevent allergic reactions. Common allergens include peanuts, tree nuts, dairy, eggs, soy, wheat, and shellfish. It's crucial to educate coaches, teammates, and those involved in the athlete's care about the allergy, and have an emergency action plan in place. [28]
- **Vegetarian and Vegan Diets:** Athletes following vegetarian or vegan diets need careful planning to ensure they receive adequate protein, iron, zinc, calcium, vitamin B12, and omega-3 fatty acids. Plant-based protein sources, fortified foods, and, in some cases, supplements are essential. [29]

- **Gluten-Free Diets:** Athletes with celiac disease or non-celiac gluten sensitivity must strictly adhere to a gluten-free diet. Gluten-free alternatives and careful label reading are crucial to avoiding gluten-containing foods. Ensuring adequate intake of essential nutrients is essential. [30]
- **Halal and Kosher Diets:** Athletes adhering to halal or kosher dietary practices need access to appropriate food options. Ensuring that training facilities and competition venues accommodate these dietary restrictions is important. Athletes may need to plan their meals, bring their own food, or collaborate with sports nutrition professionals for suitable options.[31,32]
- **Lactose Intolerance:** Athletes with lactose intolerance may need to avoid or limit dairy products. Choosing lactose-free alternatives or incorporating lactase supplements can help meet calcium needs without causing digestive discomfort. [33]
- **Nut and seed allergies** require careful scrutiny of ingredient lists, as these ingredients are common in various foods, including energy bars and snacks. Athletes should be diligent in avoiding these allergens and ensuring that their dietary choices align with their specific restrictions.

*Long-Term Health Implications:*

Promoting long-term health is a priority in the development of young athletes. Evidence-based recommendations are provided to guide athletes, coaches, and parents in making informed nutritional choices. As young athletes embark on their sporting journeys, the choices they make regarding nutrition during adolescence can have far-reaching implications for their long-term health. One critical aspect is bone health, a foundation laid during the adolescent years. Proper nutrition, particularly sufficient intake of calcium and vitamin D, is essential for maximizing peak bone mass. Inadequate nutrition during this period may compromise bone density, potentially increasing the risk of osteoporosis later in life. [34]

Hormonal balance is another pivotal consideration, as nutritional choices can impact endocrine function. Female athletes, in particular, face challenges associated with the Female Athlete Triad, which includes disordered eating, amenorrhea, and osteoporosis. Addressing

nutritional needs is crucial in mitigating these risks and supporting overall hormonal health.[35]

Beyond immediate athletic performance, the long-term cardiovascular health of young athletes is influenced by nutritional habits. Dietary patterns established during adolescence can contribute to the development of cardiovascular risk factors, such as hypertension and dyslipidemia, which may persist into adulthood. Hence, promoting heart-healthy nutrition from an early age is imperative for mitigating cardiovascular risks in the long term.[13]

Furthermore, the role of nutrition in immune function cannot be overstated. The demands of intense training and competition, coupled with the potential stressors of adolescence, make young athletes susceptible to immune system compromise. Ensuring adequate intake of immune-supportive nutrients, such as vitamins C and E, zinc, and antioxidants, is crucial for maintaining robust immune function and reducing the risk of illness both in the short and long term.[36]

In summary, the long-term health implications of nutrition for young athletes extend beyond the immediate performance arena. Nutritional choices made during adolescence lay the foundation for bone health, hormonal balance, cardiovascular well-being, and immune function throughout life. Recognizing the interconnectedness of nutrition and long-term health underscores the importance of a holistic approach to dietary practices, one that goes beyond optimizing athletic performance to safeguard the overall well-being of young athletes as they transition into adulthood.

#### *Supplements for Young Athletes [37-41]:*

The use of dietary supplements is a prevalent topic in the realm of sports nutrition, and it holds particular relevance for young athletes. While a well-balanced diet should ideally provide all necessary nutrients, certain situations may warrant the consideration of supplements to bridge nutritional gaps. Commonly discussed supplements for young athletes include vitamin D, omega-3 fatty acids, and iron. However, it is imperative to approach supplementation with caution, emphasizing whole food sources as the primary means of meeting nutritional needs. Additionally, young athletes, their parents, and coaches should be aware of the potential risks and benefits associated with supplement use, seeking guidance from healthcare professionals to ensure safety and efficacy.

In the context of young athletes, protein supplementation has garnered attention for its potential role in supporting muscle growth, repair, and overall performance. Adequate protein intake is crucial for young athletes, especially during periods of rapid growth and increased training intensity. While obtaining protein from whole food sources is ideal, there may be instances where supplementation is warranted to meet elevated protein requirements. It is important, however, to approach protein supplementation judiciously, considering individual needs and preferences, and consulting with healthcare professionals or sports nutrition experts.

Creatine supplementation is another area of interest, particularly for its well-established benefits in enhancing high-intensity, short-duration activities. Despite being extensively researched in adult populations, limited studies have specifically focused on the effects of creatine supplementation in young athletes. Therefore, caution is advised, and careful consideration of potential risks and benefits should precede any decisions on creatine supplementation in this demographic. [42,43]

While protein and creatine supplements are generally considered safe and effective for many individuals, it's important to acknowledge potential drawbacks and risks associated with their use. It's crucial to consult with a healthcare professional or a registered dietitian before incorporating any supplements into your routine. The hazards of protein and creatine supplementation are described in Table 1 and Table 2.

Drawbacks/Risks of Protein Supplementation:
1. <b>Digestive Issues:</b> Excessive protein intake, especially from supplements, can lead to digestive discomfort such as bloating, gas, and constipation.
2. <b>Kidney Strain:</b> Individuals with pre-existing kidney conditions should exercise caution with high protein intake, as it may exacerbate kidney strain. However, there is limited evidence to suggest that high protein intake can cause kidney damage in healthy individuals.
3. <b>Caloric Intake:</b> Relying heavily on protein supplements without considering overall caloric intake and macronutrient balance may lead to an imbalance in the diet, potentially affecting other essential nutrients.
4. <b>Quality of Supplements:</b> The quality of protein supplements can vary, and some may contain contaminants or inadequate amounts of the stated ingredients. Choosing reputable brands and consulting with a healthcare professional can help mitigate this risk.

Table 1. Drawbacks/Risks of Protein Supplementation

Drawbacks/Risks of Creatine Supplementation:
1. <b>Gastrointestinal Issues:</b> Some individuals may experience gastrointestinal discomfort, including cramping and diarrhea, when taking creatine supplements.
2. <b>Weight Gain:</b> Creatine supplementation can lead to an increase in water weight due to enhanced water retention in muscles. While this is not harmful, individuals pursuing weight-sensitive sports may need to consider this effect.
3. <b>Kidney Function:</b> Although numerous studies suggest that creatine supplementation is safe for healthy individuals, those with pre-existing kidney conditions should consult with a healthcare professional before using creatine.
4. <b>Interactions with Medications:</b> Creatine may interact with certain medications, and individuals on medication regimens should seek advice from their healthcare provider.
5. <b>Unknown Long-Term Effects:</b> While short-term studies support the safety of creatine supplementation, the long-term effects of extended use are not well-documented.

Table 2. Drawbacks/Risks of Creatine Supplementation:

#### General Considerations for Supplements:

1. **Not a Substitute for Whole Foods:** Supplements should complement, not replace, a well-balanced diet rich in whole foods. Whole foods provide a variety of essential nutrients and bioactive compounds that supplements may lack.
2. **Individual Variability:** Responses to supplements can vary among individuals. What works well for one person may not have the same effect for another.
3. **Quality Control:** Quality control issues can exist in the supplement industry. Choosing products from reputable manufacturers and checking for third-party testing can help ensure product safety.
4. **Overreliance:** Relying too heavily on supplements can lead to nutritional imbalances and may not provide the same health benefits as a varied and nutrient-dense diet.

In summary, while protein and creatine supplements can be beneficial for many individuals, it's important to approach their use with caution, considering individual health status, goals,



and overall dietary intake. Consulting with a healthcare professional or a registered dietitian is recommended to address any potential drawbacks or risks associated with supplementation.

## **Summary**

In conclusion, this article explores young athletes' nutrition as it delves into crucial facets essential for their growth, development, and athletic performance. The emphasis on a balanced diet, considering macronutrients, micronutrients, and hydration, serves as the foundational principle for their overall well-being.

Examining energy and macronutrient requirements sheds light on the importance of individualized dietary approaches tailored to varying activity levels. This becomes particularly pivotal during the dynamic phase of adolescence when nutritional needs fluctuate alongside rapid growth. Proactive monitoring of micronutrients, including calcium, iron, and antioxidants, is underscored as imperative for supporting long-term health during this critical growth period.

Turning our attention to the timing of nutrition, the discussion highlights its pivotal role in both performance optimization and post-exercise recovery. Specific focus is directed toward pre- and post-exercise nutrition strategies, recognizing the importance of fueling before exertion and replenishing nutrients afterward. The significance of hydration, with an emphasis on continuous monitoring, especially during strenuous physical activities, emerges as a fundamental factor in maintaining peak performance.

In navigating the diverse landscape of sports and positions within those sports, the customization of nutrition strategies becomes paramount for ensuring optimal performance. Special considerations, such as growth spurts, individual sport nuances, and the unique challenges posed by weight category sports, accentuate the need for a multidisciplinary approach. This collaborative effort involves coaches, nutritionists, and healthcare professionals working together to tailor strategies that address the varied needs of young athletes.

The exploration extends to the realm of dietary restrictions, encompassing allergies, vegetarianism, veganism, and specialized dietary practices. A key takeaway is the necessity for meticulous planning to ensure that athletes with specific dietary requirements receive the necessary nutrition. This involves detailed consideration of alternative food choices,

supplementation when needed, and effective communication between athletes, coaches, and nutrition professionals.

In summary, the comprehensive approach to young athletes' nutrition involves intricately tailored dietary strategies, accounting for special considerations and accommodating diverse dietary restrictions. This holistic approach aims to not only support optimal athletic performance but also foster healthy growth and contribute to the long-term well-being of young athletes.

### **Author's contribution**

Conceptualization, KW, AT, MG-B and MagJ; methodology, MaxJ, KW; software: PH, AW; check, JP, PH and AD, AŻ-Ł; formal analysis, KW, EB; investigation, EB; resources, KW; data curation: MG-B; writing - rough preparation, KW, PH, AŻ-Ł; writing - review and editing, MagJ, AT; visualization, AD, JP; supervision, MaxJ, AŻ-Ł; project administration, KW; receiving funding, (-).

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