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## ORIGINAL ARTICLE

# The Relationship between Essential Mineral Elements and Snatch Lift Performance in Weightlifters: An Analytical Study

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## KEYWORDS

*Sports Nutrition,  
Weightlifting Sports,  
Athletic Performance,  
Snatch Lift,  
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## ABSTRACT

**Background.** Weightlifting demands exceptional physical performance reliant on muscular strength and endurance, rendering nutrition and the presence of important mineral elements critical to attaining sports success. **Objectives.** The study of the relationship between certain biochemical indicators (iron, potassium, zinc, magnesium, sodium, and selenium) and the level of athletic performance in weightlifters. **Methods.** The research sample was selected in a deliberate way to suit the nature of the research and its procedures, and the study sample consisted of 7 weightlifters from Amanat Baghdad Sports Club for the 2024/2025 sports season; the age group was the applicants, and the weight category was 73 kg. **Results.** The results showed that weightlifters with sufficient levels of these minerals achieved achievements in the snatch lift test, with a positive correlation relationship between achievement and levels of mineral elements, as the values of the correlation coefficient were as follows, iron (0.7270), potassium (0.6930), zinc (0.7490), magnesium (0.8070), sodium (0.7430), selenium (0.7760). **Conclusion.** The study concluded that iron, zinc, and magnesium are crucial for weightlifters' snatch lift performance, and their absence can lead to a decline. Potassium increases endurance and reduces muscle spasms, while zinc boosts the immune system and healing processes. A balanced diet with adequate mineral elements is essential for optimal snatch lift results. A lack of these elements can result in a decline in performance.

## INTRODUCTION

Weightlifting requires high physical performance based on muscle strength and endurance, which makes nutrition and some of the essential mineral elements contain crucial factors in achieving athletic achievement, as well as some essential mineral elements such as (iron, potassium, zinc, magnesium, sodium, and selenium) represent key factors affecting athletic performance (1, 2).

As iron is essential for the transport of oxygen through the blood, which is necessary to improve muscle endurance and achievement (3, 4) as studies

indicate that iron deficiency may lead to reduced athletic achievement, as well as potassium and sodium are necessary for fluid balance and transmission of nerve signals, which contribute to enhancing muscle performance, which in turn leads to achievement, as well as zinc and magnesium, as zinc supports enzymatic processes (5), while magnesium promotes muscle contraction and relaxation. Selenium has antioxidant properties, which help reduce oxidative stress during intense exercise (6, 7).

A study (Smith et al., 2020) examined the impact of mineral elements such as iron, zinc, and magnesium on athletic performance, and the results of this study showed that the lack of these minerals can lead to a decrease in endurance and overall performance of athletes, which in turn reflects negatively on achievement. The study also stressed the importance of eating enough of these elements to improve performance and enhance physical ability (8).

A study examined the correlation between potassium levels and muscle performance, concluding that sufficient potassium is crucial for mitigating muscle spasms and enhancing performance during rigorous exercise. The study advised athletes to monitor their potassium levels to optimize performance (9). Additionally, another study explored the significance of zinc as an essential mineral for athletic performance, revealing that zinc deficiency can impair performance and elevate injury risk (10). This study emphasized zinc's role in bolstering the immune system and facilitating recovery, recommending that athletes consume zinc-rich sources to enhance their performance.

In the context of weightlifting, understanding the relationship between essential mineral elements and athletic achievement is significant, and essential mineral elements are vital components that play a pivotal role in enhancing athletic performance, especially in weightlifting sports. Mineral elements are essential to weightlifting, as they improve performance, enhance endurance, support recovery, and reduce the risk of injuries, due to the high effort exerted by weightlifters in training or competition (11).

The problem of research appeared in this study, as weightlifting is one of the sports that require high physical effort, which puts a great strain on the body, high performance in this sport requires a careful balance between nutrition, training, and recovery. Minerals are vital in this process, contributing to multiple functions such as energy production, supporting muscle health, and promoting recovery. However, studies show that many athletes, including weightlifters, may be deficient in these elements. The following question arose is there a relationship between the basic mineral elements (iron, potassium, zinc, magnesium, sodium, and selenium) and the performance of the snatch lift in weightlifting, and how does the lack of mineral elements, if any,

affect the achievement of the snatch lift in weightlifters?

A study on the role of essential mineral elements such as iron, calcium, magnesium, and zinc in improving athletic performance and recovery processes reviewed scientific evidence on how these elements affect various body functions associated with endurance and strength (12).

This study aims to identify the relationship between the basic mineral elements (iron, potassium, zinc, magnesium, sodium, selenium) and the performance of the snatch lift in weightlifting.

## MATERIALS AND METHODS

**Study Design.** The research sample was chosen by the intentional method because this method allows researchers to focus on a specific group of individuals who possess certain characteristics related to the study, in this case, these weightlifters have a high level of experience and professionalism, which makes them the most suitable for a specific study related to physical performance, this selection ensures the collection of accurate and reliable data that best reflect the experiences of these athletes.

**Participants.** It consisted of 7 weightlifters from Amanat Baghdad Sports Club for the 2024/2025 sports season, the age category of the athletes was the applicants and the weight category was (73 kg), the selection criteria for the sample were previous achievements and participation in international competitions, and the sample was heavily dependent on a nutritional program prepared by a nutritionist within the training camp prepared to participate in the upcoming local and international benefits. Despite the small sample size of 7 weightlifters, the goal may be to understand the phenomena in depth, and a small sample may allow for more detailed data analysis and interaction with participants, as well as a small sample, it may be easier to control external variables, allowing to study more accurately the influence of metal elements on the achievement of the snatch lift, moreover, it was difficult to reach a larger number of weightlifters due to time or logistical constraints, making the selected sample suitable for the study.

**Study Tools.** Blood samples were taken on Tuesday, 17/12/2024, at 3:00 pm. Some of the essential mineral elements (iron, potassium, zinc, magnesium, sodium, and selenium) are analyzed

by a spectrophotometer to determine mineral levels.

If blood samples were drawn from the study sample after a break from training, because intense exercise affects mineral levels, then blood samples were drawn 24 hours after the last training unit, and before the study sample ate any meal, as this can affect the results of the study, as the study sample was assured to be in a good state of hydration, as dehydration can affect mineral levels in the human body (13).

**Mineral Elements Assessment.** Blood ranging from 5 ml to 10 ml was withdrawn from weightlifters. The minerals were assessed via atomic absorption spectroscopy apparatus (AAS).

**Snatch Lift Test.** The snatch lift achievement test was performed for the research sample, after giving three attempts to each of the sample members, and the best lift was selected, after doing a sufficient warm-up before the test (14). Warm-up: The lifter must do appropriate warm-up exercises, including flexibility exercises and lifting light weights to stimulate the muscles and mental concentration. It is important that the lifter is in good mental condition and focused on technique and performance. The lifter is allowed three

attempts to lift the weight. Weightlifters should choose suitable weights that match their level and ability. After completing the three attempts, the top weight determines the best weight the weightlifter has successfully lifted.

**Data Collection.** The study data were gathered following the conclusion of the primary experiment, which involved conducting a blood analysis and an achievement test for weightlifters from the Amanat Baghdad club.

**Data Analysis.** The Shapiro-Wilk test was used to test the data distribution's normality. The researcher employed the mean and standard deviation tests to show the data distribution's central tendency and variance values. The Pearson coefficient test examined the correlation between Snatch performance and minerals. All analyses were performed using SPSS software (version 23.0) at the significant level of  $p < 0.05$ .

## RESULTS

The demographic characteristics of the weightlifters, including age, weight, height, body mass index, weightlifting experience, Snatch score, and minerals, are summarized in Table 1.

**Table 1. The demographic characteristics of the weightlifters.**

|                                 | Mean   | SD   |
|---------------------------------|--------|------|
| Age (year)                      | 24.71  | 2.14 |
| Weight (kg)                     | 73.71  | 0.76 |
| Height (m)                      | 1.77   | 0.03 |
| BMI (kg/m <sup>2</sup> )        | 20.81  | 0.25 |
| Weightlifting experience (year) | 6.00   | 1.29 |
| Snatch score (kg)               | 128.43 | 6.29 |
| Iron (mg/dL)                    | 143.29 | 4.07 |
| Potassium (mg/dL)               | 4.39   | 0.36 |
| Zinc (mg/dL)                    | 96.57  | 4.39 |
| Magnesium (mg/dL)               | 2.21   | 0.13 |
| Sodium (mg/dL)                  | 140.71 | 1.80 |
| Selenium (mg/dL)                | 85.57  | 1.51 |

BMI: Body mass index.

The normal level of iron, potassium, zinc, magnesium, sodium, and selenium is ranges between 135-155 mg/dL, 0.5-3.5 mg/dL, 70-120 mg/dL, 1.8-2.5 mg/dL, 135-145 mg/dL, and 80-100 mg/dL, respectively (15). It is shown that all weightlifters were in a normal range of minerals (iron = 120 mg/dL, potassium = 4.5 mg/dL, sodium = 140 mg/dL, zinc = 12 mg/dL, magnesium = 2.0 mg/dL, selenium = 0.1 mg/dL) (Table 1). The results also indicate that iron, potassium, zinc, magnesium, sodium, and selenium have a strong

positive relationship with the Snatch achievement level ( $r=0.727$ ,  $p=0.004$ ;  $r=0.693$ ,  $p=0.014$ ;  $r=0.749$ ,  $p=0.023$ ;  $r=0.807$ ,  $p=0.028$ ;  $r=0.743$ ,  $p=0.016$ ;  $r=0.776$ ,  $p=0.04$ , respectively) (Table 2).

## DISCUSSION

With the aim of "minerals play an important role in sports performance, especially in weightlifting," we conducted this study. It is shown that all weightlifters were in a normal range of minerals.

Moreover, the strong positive relationships of minerals with the snatch performance achievement of weightlifters show that the results support our central hypothesis. This

aligns with the findings of Johnson & Lee (2024), which underscored the significance of these factors in enhancing athletic performance (16).

**Table 2. Analysis of the relationship between minerals and achievement levels for the snatch lift.**

| Minerals  | Pearson Coefficient | p-values |
|-----------|---------------------|----------|
| Iron      | 0.727               | 0.004*   |
| Potassium | 0.693               | 0.014*   |
| Zinc      | 0.749               | 0.023*   |
| Magnesium | 0.807               | 0.028*   |
| Sodium    | 0.743               | 0.016*   |
| Selenium  | 0.776               | 0.04*    |

\*: significant at  $p < 0.05$ , with 6 degrees of freedom.

Iron is vital for transporting oxygen through hemoglobin in the blood, which is necessary to generate energy during physical activity (17). According to a study by Smith and Brown (2024), Iron deficiency can lead to anemia, negatively affecting endurance and performance aimed at athletic achievement (4). Besides, potassium regulates fluid balance and muscle functions (9), which are important in weightlifting. Moreover, sodium is important for muscle function, as evidence suggests that low sodium levels may decrease both achievement and performance, especially during intense exercise (18). Also, zinc is important for immune functions, wound healing, and hormone production, and it also plays a role in energy metabolism, as recent studies indicate that zinc can affect athletic performance by improving recovery ability and increasing muscle strength (16). Zinc deficiency can lead to poor performance, which leads to an increased risk of injury (10, 19). Our result was in line with McClung (2019), which emphasized the importance of zinc in improving athletic performance and achievement (10). Besides, magnesium plays an important role in energy production and muscle function, and studies show that magnesium deficiency can lead to muscle fatigue and reduced achievement (19, 20). Moreover, selenium is an antioxidant that boosts the immune system's health (21-23).

The findings of our study reflect the importance of balanced nutrition in improving performance achievement. Evidence indicates that focusing on adequate intake of mineral elements can significantly impact athletic performance and achievement in weightlifters (24). The intake of essential minerals within the recommended proportions is important to

maintain health; however, excessive intake of supplements should be avoided, as this may lead to serious side effects. It is better to consult a doctor or nutritionist before taking mineral supplements.

## CONCLUSION

We found strong positive relationships between minerals and the snatch performance achievement of weightlifters in a normal range of minerals. The results support that "minerals play an important role in sports performance, especially weightlifting." The limitations of this study were a small number of participants and the relationship-based study, which is a descriptive method. We suggest a cross-sectional study in mineral-deficient athletes who use supplementation medication during conditioning compared to normal-range mineral athletes.

## APPLICABLE REMARKS

- Professional weightlifters should adopt thoughtful dietary strategies that include mineral supplements, if necessary, especially in cases of mineral deficiencies, to ensure improved athletic performance and the ability to recover.

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### **AUTHORS' CONTRIBUTIONS**

Study concept and design: Omar Khalid Yasir. Acquisition of data: Zahad Fawzi Naji. Analysis and interpretation of data: Salih Mahdi Mukheef. Drafting the manuscript: Zahad Fawzi Naji. Critical revision of the manuscript for important intellectual content: Omar Khalid Yasir. Statistical analysis: Salih Mahdi Mukheef. Administrative, technical, and material support: Zahad Fawzi Naji. Study supervision: Omar Khalid Yasir.

### **CONFLICT OF INTEREST**

We guarantee that this manuscript has no relevant conflicts of interest or financial interests.

### **FINANCIAL DISCLOSURE**

No government agency or other group has provided funding for research. The tools and equipment used in this work are unrelated to our financial investments.

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### **ETHICAL CONSIDERATION**

The ethical norms of the University of Baghdad's Faculty of Physical Education and Sports Sciences were strictly adhered to in this study. Baghdad, Iraq. The ethics committee approved the research's conduct, and all study participants accepted these terms, including protecting the privacy of the sample's personal information.

### **ROLE OF THE SPONSOR**

The Amanat Baghdad weightlifting club gave technical help by using the sports club's research sample and its infrastructure to conduct tests, but it had no involvement in the study's design, data analysis, study procedures, or paper preparation.

### **ARTIFICIAL INTELLIGENCE (AI) USE**

We emphasize that no artificial intelligence tools were used in conducting the study and that all the ideas, data, and results contained in this study are the efforts of researchers only.



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