



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, Essential Minerals.

ABSTRACT

Background. Weightlifting demands exceptional physical performance, which relies on muscular strength and endurance, rendering nutrition and the presence of essential mineral elements critical to achieving 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 deliberately selected to suit the nature of the research and its procedures. The study sample consisted of 7 weightlifters from Amanat Baghdad Sports Club for the 2024/2025 sports season. The age group of the applicants 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 enhances endurance and reduces muscle spasms, while zinc supports the immune system and promotes 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, making nutrition and certain essential mineral elements crucial factors in achieving athletic success. These essential mineral elements, including 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 emphasized the importance of consuming sufficient amounts 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 highlighted the role of zinc in bolstering the immune system and facilitating recovery, recommending that athletes incorporate zinc-rich sources into their diet to enhance their performance.

In the context of weightlifting, understanding the relationship between essential mineral elements and athletic achievement is crucial, as these elements are vital components that play a pivotal role in enhancing athletic performance, particularly 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 research problem in this study arises from the fact that weightlifting is one of the sports that requires high physical effort, placing a significant strain on the body. High performance in this sport necessitates a careful balance between nutrition, training, and recovery. Minerals play a vital role in this process, contributing to multiple functions, including 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? 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 investigate the relationship between basic mineral elements (iron, potassium, zinc, magnesium, sodium, and 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, December 17, 2024, at 3:00 p.m. 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 the weightlifters. The minerals were assessed via an atomic absorption spectroscopy apparatus (AAS).

Snatch Lift Test. The snatch lift achievement test was administered to the research sample, with each member given three attempts. The best lift was then selected after a sufficient warm-up was completed (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 essential that the lifter is in a good mental state 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 assess the normality of the data distribution. The researcher employed the mean and standard deviation tests to illustrate the central tendency and variance values of the data distribution. 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/m²)	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 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 between minerals and the snatch performance achievement of weightlifters support our central hypothesis. This aligns with the findings of Johnson & Lee (2024), which underscore 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 in athletes aiming for athletic achievement (4). Besides, potassium regulates fluid balance and muscle function (9), both of 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). Additionally, zinc is crucial for immune function, wound healing, and hormone production, and it also plays a role in energy metabolism. Recent studies suggest that zinc can enhance athletic performance by improving recovery ability and increasing muscle strength (16). Zinc deficiency can lead to poor performance, which in turn increases the risk of injury (10, 19). Our result was in line with McClung (2019), who emphasized the importance of zinc in improving athletic performance and achievement (10). Additionally, magnesium plays a crucial role in energy production and muscle function, and studies have shown that magnesium deficiency can lead to muscle fatigue and reduced performance (19, 20). Moreover, selenium is an antioxidant that enhances 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 crucial for maintaining health; however, excessive intake of supplements should be avoided, as it 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 within a normal range of mineral levels. The results support that "minerals play an important role in sports performance, especially weightlifting." The limitations of this study included a small sample size and the use of a descriptive, relationship-based study design. We suggest a cross-sectional study comparing mineral-deficient athletes who use supplementation medication during conditioning with athletes who have normal mineral levels.

APPLICABLE REMARKS

- Professional weightlifters should adopt thoughtful dietary strategies that include mineral supplements, if necessary, especially in cases of mineral deficiencies, to enhance athletic performance and facilitate recovery.

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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.

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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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REFERENCES

1. Sawka MN, Cheuvront SN, Kenefick RW. Hypohydration and human performance: impact of environment and physiological mechanisms. *Sports Medicine*. 2015 Nov;45:51-60. [\[doi:10.1007/s40279-015-0395-7\]](https://doi.org/10.1007/s40279-015-0395-7) [PMid:26553489]
2. Ghazzawi HA, Hussain MA, Raziq KM, Alsendi KK, Alaamer RO, Jaradat M, AlObaidi S, Al Aqili R, Trabelsi K, Jahrami H. Exploring the relationship between micronutrients and athletic performance: A comprehensive scientific systematic review of the literature in sports medicine. *Sports*. 2023 May 24;11(6):109. 37368559. [\[doi:10.3390/sports11060109\]](https://doi.org/10.3390/sports11060109) [PMid:37368559]
3. Taylor H, Wilson P. Magnesium's role in muscle function and athletic performance. *Sports Med Res*. 2024;9(3):112–124.
4. Smith J, Brown L. The role of iron in athletic performance: implications for strength training. *J Sports Nutr*. 2024;15(1):45–58.
5. Nichols QZ, Ramadoss R, Stanzione JR, Volpe SL. Micronutrient supplement intakes among collegiate and masters athletes: A cross-sectional study. *Frontiers in Sports and Active Living*. 2023 April 06;5:854442. 37090821. [\[doi:10.3389/fspor.2023.854442\]](https://doi.org/10.3389/fspor.2023.854442) [PMid:37090821]
6. Salim AT, Kareem MA, Alwan SA. The effect of (HIT) training on immune globulins and white blood cells for amateur weightlifters after the return of activity from the mandatory quarantine for the Covid-19 epidemic. *Revista iberoamericana de psicología del ejercicio y el deporte*. 2022;17(5):328-31.
7. Johnson A, Smith R. Advances in chemical analysis techniques for trace element detection in biological samples. *Anal Chem J*. 2024;96(2):123-135.
8. Smith, J. et al. The Effects of Nicotine on Athletic Performance: A Review of Current Literature. *Journal of Sports Medicine*. 2020. 6(3):156-164.
9. Davis, M., & Lee, C. Potassium and muscle performance: A review. *Sport Sci Rev*. 2021;29(4):123–30.
10. McClung JP. Iron, zinc, and physical performance. *Biological trace element research*. 2019 March 15;188:135-9. [\[doi:10.1007/s12011-018-1479-7\]](https://doi.org/10.1007/s12011-018-1479-7) [PMid:30112658]
11. Saeed TA, Yasser OK, Fenjan FH. The effect of various aerobic exercises on the endurance and some physiological variables among fitness training practitioners of at (30-35) years old. *International Journal OfPsychosocial Rehabilitation*. 2020;24(03):6083-6086.

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 conduct of the research, and all study participants accepted these terms, including the protection of the sample's personal information.

ROLE OF THE SPONSOR

The Amanat Baghdad weightlifting club provided technical assistance by utilizing the sports club's research sample and infrastructure to conduct tests; however, 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 this study, and that all ideas, data, and results presented herein are the sole efforts of the researchers.

12. Smith J, Johnson L. The Role of Essential Minerals in Athletic Performance: A Review. *Nutrients*. 2023;15(2):345.
13. Smith J, colleagues. Timing of blood sampling for mineral analysis in athletes. *J Sports Sci*. 2023.
14. Yasser OK. Exercises With Different Ranges of Motion with Significance of Electrical Activity for Muscle in Strength With Speed Of Lower Limbs For Weight Lifters Of Physical Strength. *Journal of Physical Education*. 2014;26(4).
15. Taylor JR, Martinez PA. Essential minerals and their optimal levels in the human body: A comprehensive review. *J Nutr Sci*. 2023;12(2):123–35.
16. Johnson R, Lee T. Zinc supplementation and its impact on strength training performance. *Int J Sports Sci*. 2024;12(2):78–9.
17. Sadiq AJ, Obaid MA. The effect of rehabilitative exercises according to some kinematic variables in relieving lower back pain for women aged 25-35 old. *Wisdom Journal for Studies & Research*. 2024 Jul 15;4(04):1327-43. [\[doi:10.55165/wjfsar.v4i04.324\]](https://doi.org/10.55165/wjfsar.v4i04.324)
18. Rabeea MS, Khalifa AH, Obaid MA. The Effect of Suggested Exercises on Developing Some Mental Abilities for Children Aged 4-6 Years. *JSRSE* [Internet]. 2024 Nov. 14;34(4):473-8. [\[doi:10.55998/jsrse.v34i4.681\]](https://doi.org/10.55998/jsrse.v34i4.681)
19. Khalifa AH, Obaid MA. A Comparative Analytical Study of Some Biomechanical Variables and Their Relationship to The Accuracy of The Performance of The Shooting Skill of Jumping High in The Weak and Strong Foot the Players for Youth Handball. *Wasit Journal of Sports Sciences*. 2024 Jan 9;18(1):313-26. [\[doi:10.31185/wjoss.443\]](https://doi.org/10.31185/wjoss.443)
20. Khaled Jasem Z. Communicative Intelligence and Its Relationship to the Performance of the Kinetic Formation of the Hoop in Rhythmic Gymnastics. *Annals of Applied Sport Science*. 2024 Feb 10;12(1):0-. [\[doi:10.61186/aassjournal.1326\]](https://doi.org/10.61186/aassjournal.1326)
21. Ali H, Khalid O. Effect of Antioxidants On the achievement level Of National Weightlifting League. *jope* [Internet]. 2018 Jun. 28;30(2):395-407. [\[doi:10.37359/JOPE.V30\(2\)2018.372\]](https://doi.org/10.37359/JOPE.V30(2)2018.372)
22. Ahmed Obaid M, Hussein Khalifa A, Saad Rabeea M. The Effect of an Electronic Device Designed to Measure the Knee Bending Angle in Developing the Skill of Catch and Clearance the High Ball for Football Goalkeepers. *Annals of Applied Sport Science*. 2024 Jun 10;12(2):0-. [\[doi:10.61186/aassjournal.1286\]](https://doi.org/10.61186/aassjournal.1286)
23. Ghanbari-Niaki A, Afshar-Naderi A, Taibi M. Serum selenium, lipoproteins and testosterone responses to a single session of circuit resistance exercise in male college students. *Int J Human*. 2007;14(3):89-98.
24. Khalifab MA, Jabbar RH. The effect of an electronic device designed to measure the degree of bending of the knee angle in developing the skill of catch and Clearance the high ball for football goalkeepers under (15 years). *J Xi'an Shiyou Univ Nat Sci Ed*. 2023;19(11):751-64.