

# The Effect of Unsteady Strength Training and EAA Supplementation on Performance Efficiency and Achievement in the Triple Jump Under 20 Years Old

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**Abstract:** The exercises contribute to increasing the range of motion of the working joints and increasing the elasticity of the muscles involved in the performance, taking into account each jumper's level in terms of distance and time. The second point relates to nutritional deficiencies, due to many coaches focusing on the physical aspect of the jumper in training sessions compared to the nutritional aspect, which is the foundation of the physical aspect. Furthermore, athletes do not understand the importance of nutritional supplements as much as they understand physical exercises. To improve performance efficiency and achievement in the triple jump competition, the researchers prepared unsteady strength exercises and EAS supplementation for triple jumpers randomly (by lottery) from clubs in the Middle Euphrates region, the study population. The jumpers were divided into three (experimental) groups of (5) jumpers each. The objective was to develop the efficiency of the jump and its execution. After conducting the pre-measurements, the unsteady strength exercises prepared by the researchers were performed, and the supplement (EAAs) was taken for a period of (6) weeks at a rate of (3) units per week. Then the post-measurements were conducted, and the results were positive, as it was shown that the unsteady strength exercises and the supplement (EAAs) together had a positive effect on developing the efficiency of performance, motor transfer, and achievement of the study sample.

**Keywords:** Strength, Supplementation, Performance.

## Introduction

The triple jump is an individual competition that requires a high level of technical and physical skill, relying on proper nutrition. It is well known that achieving success stems from the synergy and integration of appropriate nutrition and the level of instantaneous strength at each stage, and their impact on improving performance in the competition. Unsteady strength training leads to improved jumping ability and increases endurance under stretching loads. Therefore, it is considered one of the important training methods that plays an effective role in achieving success in the triple jump. The reason behind the success of unsteady strength exercises lies in the mechanism of muscle action during performance (Ferrando et al, 2023). It operates within a cycle of lengthening and shortening of the muscles involved in the action to increase the propulsive force resulting from eccentric contraction followed by concentric contraction at faster rates than in other exercises. Furthermore, it increases muscle elasticity and improves the flexibility of the ligaments and

joints involved in the action. The importance of the research lies in developing the most important scientific and practical solutions through building unstable strength exercises enhanced with the supplement (EAAs), to be a training system through which researchers seek to improve capabilities and achievement in the youth triple jump competition, and to prepare the best ways to overcome the difficulties that jumpers face in achieving achievement.

**Research Problem:**

The level of achievement is the primary determinant that all those working in the sports field strive for in all activities and competitions, including the triple jump competition. Through the researchers' experience and their observation of many jumpers, as one of the researchers is a former jumper and the other is a runner, as well as reviewing their training methods, it becomes clear that the current level of achievement requires finding new solutions that help develop the achievement. This is what prompted the researchers to prepare unstable strength exercises and take the supplement (EAAs) to be a solution that contributes to raising the level of achievement in the triple jump competition.

**Research Objectives:**

1. To develop unsteady strength and complementary exercises (EAAs) for triple jumpers from the clubs in the study sample.
2. To identify the effect of unsteady strength and complementary exercises (EAAs) on the performance efficiency and achievement of the study sample.
3. To determine the greater effect between the two experimental groups on the performance efficiency and achievement of the study sample.

**Research Hypothesis:**

- Unsteady strength and complementary exercises (EAAs) are superior to unsteady strength exercises in improving the performance efficiency and achievement of the study sample.

**Research Scope:**

- Human Scope: Youth triple jumpers from clubs in the Middle Euphrates region.
- Time Scope: From August 2, 2025, to October 2, 2025.
- Spatial Scope: The stadium of the College of Physical Education and Sports Sciences, University of Karbala, and the training center of the Central Athletics Federation in Karbala Governorate.

**Methodology****Research Methodology**

"The researchers used the experimental method with a two-group equivalent experimental design, as it was the most suitable approach for addressing the research problem".

## Research Population and Sample

The researchers identified the youth jumpers of the Middle Euphrates clubs (2025) as the study population, consisting of (5) clubs and a total of (13) jumpers. (10) jumpers were then selected from this population to represent the study sample. These 10 jumpers were divided into two experimental groups of five jumpers each.

## Research Methods and Equipment

### 1. Data Collection Methods

"The researchers used interviews, observation", questionnaires, tests, measurements, and references.

### 2. Equipment and Equipment

- (2) American iPhone 15 Pro Max devices.
- (1) Korean-made PH laptop.
- (1) Japanese-made Sony camera.
- (1) medical scale. - Kinovea Analysis Program
- 1-meter drawing scale (1 unit)
- 10 balance balls
- 15 hurdles
- 20 different colored resistance bands

## Research Procedures

### 1. Homogeneity of the Research Sample

The measurements that influence the studied variables, namely mass, height, training age, and time, were identified as having a relationship to the study variables. Homogeneity was established using Lewin's "test among the sample members for these measurements in order to control for the studied variables that influence the experiment and to attribute the differences to the independent variables".

Table 1. shows the homogeneity of the sample

Test of Homogeneity of Variances				
Factors	Levene Statistic	df1	df2	Sig.
Height	0.133	1	8	0.877
Mass	1.000	1	8	0.505
Training Age	1.333	1	8	0.384
Chronological Age	0.168	1	8	0.756

From the table above, "it can be observed that the p-value (sig) for all variables is greater than 0.05. Therefore, we accept the null hypothesis", which states that the variances are homogeneous for the sample, meaning the data are homogeneous.

### 2. Identifying Research Variables

By reviewing specialized scientific sources on athletics competitions, as well as drawing on the researchers' experience as practitioners of athletics competitions, and

considering the relationship of the independent variables to these abilities, the researchers determined the performance efficiency for the hop, step, and jump phases.

### 3. Selecting Tests for Research Variables

Tests are among the most important tools for objectively evaluating diverse abilities in the sports field. "A test is defined as a situation that is designed and standardized to demonstrate a specific behavior, whether skill-based or physical", requiring interaction between the test subject and the test material. A mini championship was conducted for the study sample, and each jumper was given three attempts. The variables were extracted from the best performance attempt (Sims et al, 2023).

### 4. Pre-Tests

"The researchers conducted the pre-tests for the research sample on Friday, August 8, 2025, at 4:00 PM at the Youth Stadium in Karbala Governorate".

### 5. Equivalence of the Research Groups

To ensure that both study groups started from the same point of departure, the researchers established equivalence in performance efficiency for the hop, step, jump, and achievement phases using the pre-test results. This was achieved by applying the independent samples t-test, as shown in Table (2).

**Table 2.** shows the equivalence of the two experimental groups for all research variables

variables	Units	Experimental Group 1		Experimental Group 2		Calculated value of t	Sig	Type of indication
		Mean	Std	Mean	Std			
Performance efficiency (hopping)	Watt	0.755	0.04066	.742	0.04326	2.994	.058	Non Sig.
Performance efficiency (stepping)	Watt	0.643	0.0362	.647	.0341	0.11	0.90	Non Sig.
Performance efficiency (leap)	Watt	0.7500	0.145	.720	.7283	0.421	0.68	Non Sig.
Achievement	meter	12.860	.17455	12.847	0.17557	2.418	.094	Non Sig.

"From Table (2), it can be observed that the p-value (sig) for all research variables is greater than (0.05). Therefore, we accept the null hypothesis, which states that there is no difference between the scores of Experimental Group 1 and Experimental Group 2, and that the differences are not significant, indicating the equivalence of the two study groups".

### 6. Application of the Research Exercises (Mangine & Stratton, 2019):

- Duration of the research exercises: (6) weeks.
- Number of units per week: (3) units.
- Total number of training units: (18) training units.
- Exercise duration per unit: (28-34) minutes.
- Number of exercises per unit: (2-4) exercises.

- The supplement (EAAs) was taken 30 minutes before the training unit.
- Dose ratio: (10-15) grams according to the mass of each jumper.
- The supplement (EAAs) was taken every day of the week except Friday, which is a holiday. "The researchers used repetitive training, with the intensity used in the exercises being the maximum effort the jumper could perform".
- "The exercises were implemented at the beginning of the main part of the training session, during the specific preparation period, and continued until the competition period".

### 7. Post-Tests

"After completing the exercises, the researchers conducted post-tests on the study sample on Friday, September 19, 2025, at 6:00 PM at the Youth Stadium. The same conditions and procedures used in the pre-tests were maintained as much as possible".

### Statistical Methods

The researcher used the SPSS statistical software:

- mean.
- Standard deviation.
- Pearson correlation coefficient.
- Levene's test.
- Independent samples t-test.
- Paired samples t-test.

## Results and Discussion

### Presentation and Analysis of Pre- and Post-Performance and Achievement Efficiency Results for Experimental Group 1.

**Table 3.** To identify the differences between the pre- and post-tests of performance and achievement efficiency, the researchers used a paired-samples t-test

variables	Units	Pretest		Posttest		Calculated value of t	Sig	Type of indication
		Mean	Std	Mean	Std			
Performance efficiency (hopping)	Watt	.7550	.04066	.8640	.0572	15.945	.001	Sig.
Performance efficiency (stepping)	Watt	.6430	.0362	.7530	56.05	9.739	.002	Sig.
Performance efficiency (leap)	Watt	.7500	.145	.8725	.2688	12.730	.001	Sig.
Achievement	meter	12.860	.17455	13.847	.5058	4.079	.027	Sig.

Table (3) shows "that the statistical indicators for the pre- and post-test results of performance efficiency in (hop, step, jump) and achievement for Experimental Group 1 indicate significant differences between the pre- and post-tests in favor of the post-test for Experimental Group 1. This is confirmed by the p-value (sig) shown in Table (3) for all

studied variables, which was less than the significance level of (0.05). Therefore, we accept the alternative hypothesis stating that there are significant differences between the pre- and post-test results in favor of the post-test".

**Presentation and Analysis of Performance Efficiency and Achievement Measurement Results (Pre--Post) for Experimental Group 2.**

**Table 4.** Show analyzed the pre- and post-test results using the paired samples t-test. Table (4) shows the significance of the differences between the pre- and post-tests for Experimental Group 1 in the study variables

variables	Units	Pretest		Posttest		Calculated value of t	Sig	Type of indication
		Mean	Std	Mean	Std			
Performance efficiency (hopping)	Watt	0.742	0.0432	0.7950	0.07416	2.058	0.132	Sig.
Performance efficiency (stepping)	Watt	.647	.0341	0.705	61.059	3.958	0.029	Sig.
Performance efficiency (leap)	Watt	.720	.0283	0.810	0.17263	5.253	0.013	Sig.
Achievement	meter	12.847	.17557	13.250	0.10847	2.418	0.094	Sig.

Table (4) shows "that the statistical indicators for the pre- and post-test results of performance efficiency in (hop, step, jump) and achievement for Experimental Group 2 indicate significant differences between the pre- and post-tests in favor of the post-test for Experimental Group 1. This is confirmed by the p-value (sig) shown in Table (4) for all studied variables, which was less than the significance level of (0.05). Therefore, we accept the alternative hypothesis stating that there are significant differences between the pre- and post-test results in favor of the post-test".

**Presentation and Analysis of Performance Efficiency and Achievement Measurement Results (Post-Test) between Experimental Groups 1 and 2**

**Table 5.** shows the means, standard deviations, calculated t-value, and significance level between the post-test measurements for Experimental Groups 1 and 2

variables	Units	Experimental Group 1		Experimental Group 2		Calculated value of t	Sig	Type of indication
		Mean	Std	Mean	Std			
Performance efficiency (hopping)	Watt	.8640	.0572	0.7950	0.07416	4.875	0.016	Sig.
Performance efficiency (stepping)	Watt	.7530	56.05	0.705	61.059	7.389	0.005	Sig.
Performance efficiency (leap)	Watt	.8725	.2688	0.810	0.17263	6.216	0.008	Sig.

Achievement	meter	13.847	0.5058	13.250	0.10847	3.303	0.046	Sig.
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Table (5) shows "that the statistical indicators for the post-test results of performance and achievement efficiency indicate significant differences in favor of Experimental Group 1. This is confirmed by the p-value (sig) shown in Table (5) for performance and achievement efficiency, which was less than the significance level of 0.05. Therefore, we accept the alternative hypothesis stating that there are significant differences in the post-test results in favor of Experimental Group 1". To determine the nature of these differences, we must refer to the means of Experimental Group 1 for performance and achievement efficiency, which were higher than the post-test means of Experimental Group 2.

## Discussion

Based on the data presented and analyzed in Tables (3 and 4), significant differences were found in the pre- and post-test measurements of performance and achievement efficiency, in favor of Experimental Group 1. This confirms the research hypothesis that there is an effect of unsteady strength exercises and the use of EAS supplements on the performance and achievement efficiency of the young triple jumpers in the study sample (Punte-Fernández et al, 2025). This effect was proven to be a positive one. The results of measuring the study sample also showed significant differences between the two study groups, with the differences favoring Experimental Group 1 in terms of performance and achievement efficiency (Hewlings & Kalman, 2020). Through the presentation and analysis of the post-test results, significant differences were found between the research groups (experimental 1 and experimental 2) in the post-test results, favoring experimental group 1, which performed unsteady strength exercises and took EAS supplementation. This was evident in the efficiency of performance in the hopping, stepping, and jumping movements, the execution of which depends on the degree of mobilization stimulated by the central nervous system in the motor units of the muscles performing the required task (Ferrando, 2022). This is confirmed by Abu Alaa Ahmed: "Even though the muscle reaches its maximum contraction, the nervous system does not recruit muscle fibers at 100% maximum contraction. It is possible to reach the motor units with the highest differential threshold through higher-intensity training. Therefore, high intensities should be used to mobilize the motor units through low repetitions to avoid fatigue and injury (Filippone, 2006)." Unsteady strength exercises and EAS supplementation contributed to increasing the mobilization of the muscle fibers involved in the action by increasing intensity while reducing repetitions, which led to improved efficiency of the nervous system. In contrast to unsteady strength training without supplementation, EAS (Electrolytic Acid Assistive Acids) sends more nerve signals to mobilize a larger number of motor units for muscular work. This explains the difference in results favoring unsteady strength training with EAS supplementation, reflecting the supplement's role. Researchers attribute this significant difference to the fact that unsteady strength training with EAS supplementation increases muscle tension by recruiting more motor units than those used during normal exertion. Consequently, the exercises involved the recruitment of motor units characterized by high contractile force and speed, contributing to achieving optimal muscular power for these groups (English et al,

2020). The goal of taking EAS supplementation is its significant impact on muscle groups and their participation in muscular work, thus enabling the performance of work that increases with increased muscle strength and efficiency in producing the necessary energy. Furthermore (Baranauskas, 2023), amino acids are important in protecting muscle tissue from tears resulting from the high physical exertion of strength training, as well as protecting ligaments and tendons (Moffatt et al, 2009). Regarding performance, researchers believe that the triple jump depends on the distance covered. The horizontal alignment achieved in the three phases (hop, step, and jump) reflects the superiority of Group 1, which performed unsteady strength exercises and took the EAS supplement in all three phases, thus achieving better performance (Awad & Al-Sayed, 2016; Negro et al, 2019; Salall & Jaber, 2023).

## Conclusion

Unsteady strength exercises contributed to improving the performance efficiency of the triple jump phases for the study sample. The EAS supplement contributed to the sample's acceptance of the exercises and increased their desire to train, leading to improved performance efficiency and better achievement.

Conduct another study that addresses strength exercises using different methods and applies them to other categories (juniors and advanced athletes).

Pay attention to nutritional supplements and healthy nutrition programs and include them in the training curricula for jumpers due to their importance in developing performance, as they are among the most important components.

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