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# Effects of High-Intensity Training on Muscular Strength Development and Long Jump Performance

## (A field study conducted at the level of some Algerian professional clubs)

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**Abstract:**
The scientific value of this study lies in examining the impact of high-intensity training on enhancing muscular efficiency in the long jump event. The methodology focused on designing and implementing a targeted training program to improve this physical variable. Statistical analysis revealed statistically significant differences between the pre- and post-test measurements for the experimental group in favor of the post-test regarding the muscular strength variable. Furthermore, the results demonstrated a direct positive effect of the high-intensity training units included in the proposed program on developing both specific strength and performance outcomes for long jump athletes.
**Keywords:** Elite Sports Training; Athletics.

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## 1. INTRODUCTION

The objectives of training methods and styles have diversified to meet the needs and variables driven by the current reality, as an inevitable response to the significant progress achieved across various fields. Since athletic preparation represents the fundamental basis leading to the enhancement of training practices and the attainment of peak athletic form (peak performance), it has become imperative to explore possible mechanisms and strategies to advance the training process.( Pascal,2024)

Track and field events are among the most diverse sports, with strength and speed considered two of the most essential physical qualities relied upon to achieve top performances in this discipline. The primary characteristic of speed development lies in its strong correlation with muscular strength levels; strength training develops the muscular system and enables it to acquire acceleration, which positively reflects on speed levels—provided that these exercises are performed over short distances and with loads appropriate to the athletes' levels.

Sports training is considered the core component of the preparation process, functioning as the physical mechanism based on exercise usage to develop the physical, technical, and tactical aspects required for achieving the highest possible performance levels. In this regard, Robert Kennedy emphasizes the importance of diversifying training methods, training load structures(Alpignac,2023), and rest periods, while focusing on the specific physical, technical, and psychological demands of each sport. Furthermore, the approach used to develop physical qualities should align with the type of muscular work required, and the application of exercises using assistive equipment and devices positively impacts skill performance levels.

On his part, Abou El-Ela Abdel-Fattah notes that a challenge lies in selecting the appropriate training methods to achieve the desired goals, as these methods vary according to their intended outcomes. This diversity serves to increase motivation and excitement among athletes; hence, modern training methods have emerged to overcome the limitations of traditional physical preparation, most notably the high-intensity training approach.

High-intensity (intensive) training refers to intensifying training loads and significantly raising training intensity over a short timeframe, leading to accelerated physical and technical development compared to conventional

methods, with the recommendation to avoid relying on this approach for extended periods during the training season.( Sordello,2022)

In the same context, Ali El-Bek and Emad Abbas (2003) indicate that intensive training is utilized for several reasons, such as cases where an athlete experiences an abrupt interruption from training, or when the preparation period is insufficient due to various circumstances (e.g., examinations, injuries, or personal commitments).

Based on the researcher's experience as a former athlete and coach, a literature review of numerous previous studies in track and field (specifically the long jump event), and exploratory interviews with several coaches, it was observed that most coaches rely on traditional methods and styles with all athletes under varying circumstances. However, specific situations arise during the training path, such as an athlete returning from a brief absence due to personal reasons, academic exams, or a minor injury close to a competition date (where the available preparation period does not exceed eight weeks). From this perspective, the researcher developed the idea of utilizing intensive training to develop muscular strength and performance outcomes (digital level) in long jump competitors.( Fraley,1995)

All of the above led us to ask the following question: Does intensive training affect the development of muscular strength in long jumpers of Algerian professional clubs?

And also three secondary questions:

- Are there statistically significant differences between the pre- and post-test measurements of the experimental group in terms of muscular strength in long jumpers, favoring the post-test measurement?
- Are there statistically significant differences between the pre- and post-test measurements of the experimental group in terms of the long jumper's performance, favoring the post-test measurement?

**Study hypotheses:**

- **General hypothesis:**

Intensive training affects the development of muscular strength in long jumpers at professional Algerian clubs.

- **Partial hypotheses:**

- There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of muscular strength among the long jumpers, favoring the post-test measurement.

- There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of the long jumpers' performance, favoring the post-test measurement.

**2. Importance of the study*:***

- **Developing and Designing Modern Training Programs:** Providing a scientifically based training program that utilizes intensive training methods to develop specific muscular strength for jumping.
- **Shortening Physical Preparation Time:** Assisting coaches in achieving the required physical and technical response and adaptation for athletes within short timeframes (especially in cases of limited preparation time or when returning from a break).
- **Improving and Developing Performance:** Providing practical and proven solutions to enhance the performance of long jumpers in official competitions.
- **Guiding Athletics Coaches:** Providing coaches with practical evidence and statistical results demonstrating the effectiveness of intensive training methods, encouraging them to move away from traditional approaches.

**3. Study Objectives:**

The aim of the study is to design a training program using intensive training to develop muscular strength in long jumpers.

**4. Concepts and Terminology Definition:**

**4.1. Elite Sports Training:**

The Russian scientist Vladimir Platonov, one of the leading scientists in sports training theory for the upper levels, defines this training as:

"a long-term and highly specialized adaptation process, based on the exploitation of all the body's physiological systems to their fullest available biological limits, in order to improve performance in high-level competitive sports."( Platonov,1988)

**4.2. Athletics:**

Frank W. Dick's Definition:

International athletics expert Frank Dick defines this sport as:

"A primarily individual competitive activity based on utilizing the biomechanical and physiological potential of the human body to reach maximum speed (in running and sprinting races), or maximum distance/height (in jumping and throwing races), within precisely defined frameworks and rules."( Frank,2014)

**5. Previous studies:**

**Nizar Muhammad Khair Falih's study (2015):**

The study, titled "The Effect of a Weight Training Program on Developing Explosive Power and Performance Level in the Long Jump Among Athletics Students at Yarmouk University," aimed to identify the impact of a weight training program on developing explosive power and performance level in the long jump among athletics students at Yarmouk University. The experimental method was used with a single-group design, applied to a purposive sample of (20) students. The weight training program was implemented for (6) weeks, with three training sessions per week, totaling (18) sessions. To measure the program's effect, a set of tests was used to measure explosive power: (the standing long jump, the 2 kg medicine ball throw overhead for the longest distance), and the standard method for measuring performance level in the long jump. The results showed that there was a statistically significant positive effect ($a \leq 0.05$) of the weight training program on developing explosive power and numerical achievement level in the long jump event among students of the athletics course at Yarmouk University.( Nizar,2015)

**Study by Bakhoush Ibrahim (2024):**

The main objective of this study is to determine the effectiveness of plyometric exercises in developing explosive power and improving the performance of student long jumpers. To achieve this, the researchers adopted an experimental design, which was suitable for the study variables. The research population consisted of a sample of 60 students enrolled in athletics at the Institute of Physical Education and Sports at the University of Mostaganem (2015/2016 academic year), who were equally divided into two groups (experimental and control). The measurement tool used was a set of physical and technical tests (standing broad jump, standing vertical jump, and long jump performance test). The results of the statistical analysis showed a tangible positive effect of the plyometric exercises integrated into the practical sessions on the development of the explosive power of the lower limb and digital achievement, as the post-test measurements resulted in a statistically significant superiority in

favor of the experimental group compared to the pre-test measurements as well as compared to the control group, which proves the effectiveness of this training method in improving the digital performance of students.( Bakhoush,2024)

**Study by Samir Faghouli (2020):**

The study, titled "Using High-Intensity Interval and Repetitive Training Methods to Develop Specific Muscular Power Outputs of the Lower Limbs (Strength Endurance, Speed-Strength, Explosive Power) and Their Impact on High Jump Shooting Accuracy in U21 Handball Players," aimed to determine the effectiveness of applying high-intensity interval and repetitive training programs in developing specific strength indicators and jump shooting accuracy among players of the Wadi Sili team in Chlef Province. To achieve this, the researcher adopted an experimental approach with a two-group equivalent design on a purposive sample of 20 players. The homogeneity of the players was ensured in terms of anthropometric and physical variables such as age, height, weight, and strength tests. The players were then divided equally into two experimental groups of 10 players each. After conducting pre-tests and specific strength and accuracy tests, both groups underwent the two training programs for six weeks before administering the post-tests. Statistical analysis at a significance level of 0.05 resulted in a statistically significant advantage for the group using high-intensity interval training in developing all specific strength variables, with a clear advantage in improving strength endurance compared to repetitive training. Meanwhile, the repetitive training method showed a significant effect in developing speed-strength and explosive strength without recording significant differences in the strength endurance variable among the members of its group.( Faghouli,2020)

**6. Benefit from previous studies:**

- Researchers were able to discuss and interpret the results of the current study with the aid of the findings from these previous studies.
- This assisted researchers in understanding the nature and significance of the research problem.
- This facilitated the researchers' selection of the most suitable scientific statistical methods for data analysis(Dehamnia,2024).

**7. Methods and Materials:**

**1. Research Methodology :**

In accordance with the nature of the research and to achieve its objectives, the researcher used the experimental method due to its suitability to the nature of the problem.

**2. Study community:**

The research population consists of elite track and field athletes from some Algerian clubs during the 2025/2026 season.

**3. Research Sample:**

The researcher selected the research sample purposively from elite track and field athletes from some professional Algerian clubs. The sample size was (31) athletes, comprising (11) track and field athletes and (20) athletes from the same research population but outside the main sample. This exploratory sample was used to calculate the scientific coefficients of the tests used in the research.
Normal Distribution of Sample Members:
The researcher ensured the normal distribution of the main research sample members in light of the following variables: growth rates (height, weight, age), physical variables, and performance level in the long jump race under investigation. Table (1) illustrates this.

**Table 1.** The description of the sample represents the basic variables in the research.(n=31)

| Variables | | unit of measurement | arithmetic mean | The mediator | standard deviation | Torsion coefficient |
|---|---|---|---|---|---|---|
| **Growth rates** | Height | CM | 173.32 | 3.67 | 172 | 0.67 |
| | the Weight | KG | 73.81 | 3.02 | 75 | 0.29 |
| | Age | YEAR | 20.65 | 0.61 | 21 | 0.35 |
| **Physical variables** | Vertical jump | CM | 52.94 | 2.48 | 52 | 0.95 |
| | broad jump | M | 2.09 | 0.11 | 2.10 | -0.66 |
| | Constant muscle strength of the legs | KG | 116.29 | 3.41 | 115 | -0.37 |
| | Muscular strength of the arms | M | 5.27 | 0.21 | 5.30 | 0.15 |
| | Enemy 30m | S | 4.54 | 0.39 | 4.50 | 0.07 |
| **Digital level** | | M | 6 | 0.05 | 6 | 0.58 |

Table (1) shows that the skewness coefficient values for both the growth rates and the main variables under investigation for the entire research sample were between (3) and (3), indicating a normal distribution of players in these variables. This directly demonstrates that the data are free from the defects of non-normal distributions.

**Data Collection Tools and Methods:**

**A - Equipment and Tools Used:**

- Triple pit.
- Wrist, ankle, and foot weights of varying weights.
- Rasta meter for measuring height.
- Medical scale for measuring weight.
- Measuring tape.

- Stopwatches.
- Swedish benches.
- Degree rulers on both sides.
- Chalk.
- Video cameras for recording.

**B. Data Collection Tools:**

- Personal Data Registration Form for the Research Sample (Attached 1).
- Physical Test Results Recording Form (Attached 2).
- Proposed Training Program Using Weighted Skate Training (Attached 3).
- Exercises Used Within the Training Program (Attached 4).

**C.Tests Under Investigation:**

- Standing Vertical Jump to Measure Leg Muscle Strength.
- Standing Broad Jump to Measure Leg Muscle Strength.
- Leg Muscle Strength Test Using an Electronic Dynamometer.
- Arm Muscle Strength Test by Throwing a 5 kg Medicine Ball.
- 30-meter Sprint Test from Flying Start to Measure Speed.

**D.Digital Level Measurement:**

Digital level was measured according to the International Athletics Code (26, 2012:150-146).

**4. Research Sample and Selection Method:**

**Honesty:**

The validity of the physical tests under investigation was calculated by peripheral comparison on a pilot sample of (20) twenty players from the research population, and from outside the original sample, as shown in Table (2).

**Table 2.** This represents the significance of the statistical differences between the two groups, distinguished and non-distinguished, in the physical variables of the research.(n=10)

| | | | Control group | | Experimental group | | |
|---|---|---|---|---|---|---|---|
| Variables | | unit of measurement | arithmetic mean | standard deviation | arithmetic mean | standard deviation | Calculated value(T) |
| Physical variables | Vertical jump | CM | 53.10 | 3.81 | 62.5 | 2.64 | 2.45 |
| | broad jump | M | 2.09 | 0.11 | 2.62 | 0.09 | 5.85 |
| | Constant muscle strength of the legs | KG | 116 | 3.94 | 132 | 5.37 | 2.57 |
| | Muscular strength of the arms | M | 4.17 | 0.31 | 6.05 | 0.44 | 8.34 |
| | Enemy 30m | S | 5.18 | 0.20 | 4.08 | 0.08 | 2.48 |

The tabulated t-value at a significance level of 0.05 - 1.732

Table (2) shows statistically significant differences between the differentiated and non-differentiated groups in the muscular strength tests under investigation, favoring the differentiated group. This indicates the validity of these tests and their ability to differentiate between groups.

**Reliability:**

The researcher administered the physical tests under investigation, with a 11-day interval, to a pilot sample of (10) athletes from the research population and from outside the main research sample.

The tests were administered under the same conditions and circumstances, and correlation coefficients were calculated between the results of the first and second administrations to determine the reliability of these tests, as shown in Table (3).

**Table 3.** The correlation coefficient between the first and second applications represents.(n=10)

| | | | TEST ONE | | TEST TWO | | |
|---|---|---|---|---|---|---|---|
| Variables | | unit of measurement | M(م) | A(ع) | M(م) | A(ع) | Calculated value(R) |
| Physical variables | Vertical jump | CM | 62.5 | 2.64 | 62.2 | 2.78 | 0.99 |
| | broad jump | M | 2.62 | 0.09 | 2.59 | 0.13 | 0.96 |
| | Constant muscle strength of the legs | KG | 132 | 5.37 | 131 | 5.16 | 0.92 |
| | Muscular strength of the arms | M | 6.05 | 0.44 | 5.89 | 0.56 | 0.80 |
| | Enemy 30m | S | 4.08 | 0.08 | 4.09 | 0.09 | 0.93 |

The tabulated value of (r) at degrees of freedom (8) and a significance level of (0.05) = 0.57.

Table (3) shows that the correlation coefficients between the first and second applications of the physical tests under investigation were between (0.80: 0.99), which are statistically significant correlation coefficients, indicating the reliability of these tests.

**Research Implementation Steps:**

**First: Pre-tests:**

The researcher conducted pre-tests for the research sample from Sunday, October 26, 2025, to Thursday, October 30, 2025. These tests included muscular strength assessments and a long jump performance test.

**Second: Implementation of the Proposed Training Program for the Research Sample:**

**Training Program:**

After reviewing scientific references and studies applied in the field of training in general and track and field events in particular, the researcher utilized findings that demonstrated the importance of methods used to positively influence elements related to the long jump, such as those by Nudson and Morrison (2002). Some researchers indicated that muscular power production increases significantly through organized and comprehensive training, and that the use of modern training methods and tools has a profound impact on improving performance.

**Program Implementation Plan:**

The training program, "The Effect of Intensive Training on Developing Muscular Strength and Performance in the Long Jump," was implemented for the research sample over a period of eight (8) weeks, from October 26, 2025, to December 21, 2025. The program consisted of four training sessions per week for the research sample. Each training session was divided into four 75-minute sessions: a 25-minute warm-up, a 65-minute main session, and a 5-minute cool-down, resulting in a total of 32 training sessions.

The experimental group underwent the intensive training program designed to develop muscular strength and performance in the long jump.

**Third: Post-Test Measurements:**

The researcher conducted post-test measurements from December 22, 2025, to December 23, 2025. The researcher ensured that the measurements were

performed under the same conditions and procedures as the pre-test measurements.

- **Statistical Analysis Used in the Research:**

The researcher prepared, tabulated, and statistically analyzed the data, extracting and interpreting the results using the following statistical methods: arithmetic mean, median, standard deviation, skewness coefficient, correlation coefficient, Man-Whitney U test (non-parametric), t-test, and percentage of change, all at a significance level of 0.05.

## 5. Presentation and Discussion of Results:

**Presentation of the Results of the First Hypothesis:**

This hypothesis states:

There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of muscular strength among the long jumpers, favoring the post-test measurement.

**Table 4.** The significance of the difference between the pre- and post-test mean scores of the experimental group in muscle strength tests is represented.(n=10)

| | | | PRE- TEST | | POST TEST | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | | unit of measurement | M(م) | A(ع) | M(م) | A(ع) | **The difference between the two averages** | Calculated value(R) |
| **Physical variables** | Vertical jump | CM | 52.55 | 1.29 | 61.45 | 0.93 | 8.91 | 5.83 |
| | broad jump | M | 2.07 | 0.12 | 2.28 | 0.1 | 0.2 | 5.52 |
| | Constant muscle strength of the legs | KG | 116.82 | 2.52 | 132.73 | 2.61 | 15.91 | 7.88 |
| | Muscular strength of the arms | M | 4.69 | 0.30 | 5.29 | 0.2 | 0.6 | 5.12 |
| | Enemy 30m | S | 4.95 | 0.04 | 3.99 | 0.1 | -0.96 | 8.40 |

The tabulated t-value at 14 degrees of freedom and a significance level of 0.05 = 1.763.

Table (4) shows statistically significant differences between the pre- and post-tests of the experimental group in both the muscular strength under investigation and the performance level in the long jump, favoring the post-test, as the probability of error was significant at the (0.05) level.

**Results of the second hypothesis:**

This hypothesis states:

There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of the long jumpers' performance, favoring the post-test measurement.

**Table 5.** The significance of the differences between the pre- and post-measurement averages of the experimental group at the numerical level under investigation.(n=10)

| | | PRE- TEST | | POST TEST | | | |
|---|---|---|---|---|---|---|---|
| Variables | unit of measurement | M(م) | A(ع) | M(م) | A(ع) | **The difference between the two averages** | Calculated value(T) |
| **Digital level** | KG | 5.58 | 0.12 | 5.92 | 0.08 | 0.34 | 4.7 |

The tabulated t-value at 14 degrees of freedom and a significance level of 0.05 = 1.763.

Table (5) shows a statistically significant difference between the pre- and post-test scores of the experimental group in the long jump, favoring the post-test, as the probability of error is significant at a significance level of 0.05.

- **Discussion of Results:**
- **Discussion of the Results of the First Hypothesis:**

Table (5) indicates a statistically significant difference between the pre- and post-test scores of the experimental group in the long jump, favoring the post-test.

Table (4) shows the experimental group's improvement in the pre- and post-tests of specific fitness components in the long jump, vertical jump, broad jump, leg static strength, arm muscular power, and the 30-meter sprint.

The researcher attributes this improvement in muscle strength to the effect of intensive training on developing muscle strength and performance in the long jump. This significantly impacted the strength level of the experimental group, as well as their speed and leg movements. Table (5) shows that the improvement in muscle strength tests is due to the effect of the proposed training program, which utilizes intensive training to develop muscle strength and performance in the long jump. This positively affected the strength of the legs and back, indicating an overall improvement in strength among the experimental group. The researcher attributes this to the program's importance and its positive impact on muscle strength, as well as the overall improvement in physical variables for the experimental group.

The researcher attributes these results to the positive impact of the training process on the experimental group, specifically the development of muscular strength and performance levels in the long jump. This is due to the use of modern training methods, which helped the athletes gain muscle strength and overcome the monotony of traditional training. Furthermore, continuous training contributed to improved performance strength, leading to new performance levels. This aligns with the findings of Awais Al-Jabali (2000) and Kravitz (2004), who define intensive training as short-term training characterized by high intensity and volume to achieve peak athletic form. This is achieved by altering the dynamics of the training load (intensity and volume) without guaranteeing continuity throughout the competitive training season. (74:16) The researcher further explains that these results stem from the positive impact of the training process on the experimental group, resulting in improved specific fitness components and performance levels in the long jump. Intensive training exercises are comprehensive, enabling athletes to acquire all general fitness components. Consequently, they play a crucial role in developing specific components with high efficiency, thus contributing to improved performance levels. Therefore, Kazernik (azarmek) states that the load boost is an increase in the amount of the load equal to two or three times the weekly load, and this strong increase is called the load boost. It should be noted that the load boost is only given to players who have already trained for a long time and cannot be given to players coming from illness or a period of rest. This unusually high load continues for a maximum of two weeks. The load boost is an exceptional process used with high-level players who have had years of training, and the load boost is given for the following

reasons: raising the level of performance and physical fitness of the players in preparation for a competition that has special importance. The load boost must be followed by a positive rest period ranging from 3-6 days before the start of a competition or the start of training with the usual load, and thus the first hypothesis is fulfilled: "There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of muscular strength among the long jumpers, favoring the post-test measurement."

- **Discussion of the Results of the SECOND Hypothesis:**

Table (5) indicates that there are statistically significant differences between the pre- and post-tests for the experimental group in the long jump performance, favoring the post-test.

Table (5) shows that the post-test scores of the experimental group were higher than the pre-test scores in the long jump skill tests under investigation.

The researcher believes that the improvement in the long jump performance is a result of intensive training that develops muscular strength and performance levels in the long jump. This training is used during both general and specific preparation periods and is integrated with basic and skill-based training. This aligns with the findings of Risan Kharbit and Abu Alaa Abdel Fattah (2016), who indicated that training during specific preparation aims to prepare the athlete for peak physical condition. Consequently, specific exercises increase, closely resembling the nature of competitions. These exercises also include physical attributes such as speed and muscular strength, and the overall training volume tends towards specialization. The results of this current study are consistent with those of Hamdi Muhammad (2004) and Adel Ibrahim (2001), who stated that proponents of intensive training believe it is one of the best methods for developing physical attributes, especially in sports that rely on speed and power. Furthermore, it increases the opportunities to train at the same intensity required in competitions.

The researcher attributes these results to specialized training methods that utilize the effect of intensive training on developing muscular strength and performance in the long jump. These methods were implemented within the training units of the experimental group, leading to the observed differences in specific physical components. The intensive training program, which focused on the effect of intensive training on developing muscular strength and performance in the long jump, was comprehensive, contributing to the development of all specific physical components in addition to the general elements of the skill. This

overall improvement and comprehensive training resulted in achieving a new performance level. Furthermore, the long jump is a competition that demands a specific level of physical fitness, as these elements directly influence performance and, consequently, performance. A long jumper must possess considerable speed, a high level of jumping power, and a high degree of control over timing and skill execution.

The researcher The researcher believes that the improvement in the javelin throw's performance level is a result of intensive training in developing muscular strength and performance in the long jump. Combining these two elements achieves the equation sought by every coach: a method that combines strength and speed training, thus improving the long jump's performance level. This aligns with the study by Hamdi Mohamed Ali (2004), which found that improved performance levels are a result of improved physical variables and physiological capabilities.

Thus, the second hypothesis was confirmed: " There are statistically significant differences between the pre- and post-test measurements of the experimental group in terms of the long jumpers' performance, favoring the post-test measurement."

## Conclusions and Recommendations:

### Conclusions:

In light of the research objectives, hypotheses, and the statistical analyses used by the researcher, and based on the research results, the researcher reached the following conclusions:

1- The intensive training within the proposed program had a positive effect on the long jumpers in developing the specific strength under investigation.

2- The intensive training within the proposed program had a positive effect on the numerical level of the long jumpers in investigation.

**Recommendations:**

Within the limits of the research population and the selected sample, and in light of the research objectives, hypotheses, and results, the researcher recommends the following:

1- The proposed training program should rely on intensive training and modern methods to develop the specific physical attributes of long jumpers.

2- It is necessary to use different exercises to develop specific physical attributes that are similar to the technique used in performing the skills.

3- Similar research should be conducted on all other age groups of athletes. From the beginning of training until the championship stage.

4- Raising awareness among coaches and players about the importance of training planning for javelin throwers and providing all the necessary resources to implement the training program.

5- Attention must be given to speed, agility, and combined strength exercises for players within the training program, as these are crucial for developing athletes who can withstand daily training.

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