EFFECT OF FLEXIBILITY TRAINING ON IMPROVING SOME MOTOR ABILITIES AND PERFORMANCE IN HIGH JUMP 12-14 YEARS OLD

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ABSTRACT

Background. The high jump requires a combination of motor abilities, including flexibility, coordination, and balance, to achieve optimal performance. However, in many young athletes, performance progress is hindered by insufficient attention to motor abilities compared to physical conditioning. This study addresses the problem of suboptimal high jump achievements among athletes aged 12–14 years by examining the role of flexibility training as a targeted intervention. Flexibility training, involving varied exercises designed to improve joint mobility and muscle elasticity, is hypothesized to enhance motor abilities and thereby improve high jump performance. **Objectives.** The purpose of this study was to investigate the effect of flexibility training on selected motor abilities and high jump achievement in young athletes. **Method.** An experimental method with a pre-test and post-test design was employed, involving participants aged 12–14 years who underwent an eight-week flexibility training program, three sessions per week, in addition to their regular practice. Measurements included flexibility, coordination, and high jump performance scores before and after the intervention. **Results.** The results showed a significant improvement in flexibility and coordination, accompanied by a measurable increase in high jump performance. Statistical analysis confirmed that flexibility training contributed positively to the enhancement of motor abilities, which translated into better competition results. **Conclusion.** In conclusion, flexibility training with varied exercises is an effective and practical approach for developing motor abilities and improving high jump performance in young athletes. This research contributes to training methodology by providing evidence-based support for incorporating structured flexibility programs into youth athletic development plans.

Keywords; flexible training, motor abilities, achievement, high jump.

A. INTRODUCTION

Planning based on logical and scientific thinking helps to improve and progress in all fields because it is a factor that helps to put the names in their proper and purposeful position, through which the planned goal can be achieved, and this includes the educational, social, sports, and other important aspects for humans. In the field of sports, proper planning plays an important and essential factor in building an athlete in terms of training, which helps in integrating the necessary qualities, whether physical or motor, in achieving sports achievement in various sports (Mariati et al., 2024; Yusroni, 2024).

Here, it becomes clear to us for each sports game that has physical and motor requirements that help to make sports achievement. One of these sports is the athletics games, including the high jump, which is one of the sports with suspense and excitement in the event of obtaining the advanced achievements (Hardinata et al., 2024). Which requires training planning for this event, and needs highly flexible training, that is, high training with flexibility for the necessary joints in the crossbar of all the joints of the body and the largest of the trunk, which needs exercises that elevate this physical ability and reflect it on the motor abilities (Harianto et al., 2023; Hussein, 2025).

Flexible training is "one of the exercises that focus on improving the range of motion and flexibility in muscles and joints, for examples of this training are yoga and ballistic exercises, which reduce the risk of injury and raise the level of athletic performance and increase physical fitness" (Internet, 2025: 2). Diana Ghassan Abdel-Muslim, (2023) believes that the term motor abilities is used to denote the performance competence of basic motor skills and skills associated with a specific sports activity ,it has many components (compatibility , agility , accuracy , balance).

Hosnia Koloufi, Muhammad Haddada, (2020) believed motor abilities as “playing an essential role in practicing various motor activities that considered the cornerstone from which the individual begins to start towards practice and then excellence and achievement. Motor abilities represent a known system that can be divided into physical abilities and consensual abilities, where physical abilities include endurance, strength, agility, speed and flexibility, while motor abilities also include speed, neuromuscular compatibility, under the pressure of throwing and motor accuracy “(Hosnia, Muhammad, 2020:43)

In light of this, we have shown the role and importance of motor abilities in the sports aspect and the extent of their relationship with each other, especially with flexibility in achieving the advanced level (Da'i et al., 2024; Dewantara et al., 2024; Mahesvi et al., 2024). Hence, the importance of research using appropriate training that enhances the motor aspect, especially flexibility exercises accompanying performance and other motor abilities for the purpose of upgrading the level of players in the high jump and making the required achievements. The high jump is one of the sports events that require a high level of flexibility, compatibility, balance and other motor abilities, so it must be trained with training that suits and fits the specificity of the event for achieving high achievements (Arsil et al., 2024; Nugraha et al., 2024; Setiawan et al., 2024).

Through the experience of the researcher in the arena games and the convict as a former player, coach and academic, I noticed the achievements made with the effectiveness of the high jump that do not achieve the ambition and the achievements that have begun to progress towards the top. The reason for the aspect is the interest in motor abilities is weak compared to the physical level (Faridah et al., 2024; Tantri et al., 2023; Yulianti et al., 2024). Therefore, choosing the appropriate training that concerns the motor aspect enhances the required level (Hartoyo et al., 2024; Samodra et al., 2023; Suryadi et al., 2024; Umar et al., 2023). Therefore, flexible training, by which we mean flexibility exercises with various exercises, has great importance in raising the required motor abilities in the effectiveness of the long jump and may help in addressing the research problem.

Study aims to identifying the impact of flexible training in raising the level of some motor abilities and achievement in the high jump at the age of (12-14) years. Researcher assumes there is a positive impact of flexible training in raising the level of some motor abilities and achievement in the high jump at the age of (12-14) years.

B. METHOD

Research Design

For the purpose of achieving the research objectives and addressing a problem, the researcher used the experimental approach with the design of the two equal control and experimental groups. The researcher identified the research community as high jump players aged (12-14) for the Basra Governorate Education Directorate in the intentional

manner, and their number was (10) players. After that, the sample, numbering (8) players, was selected and (2) players were excluded due to high achievement, which affects homogeneity and parity. The sample was divided randomly into two control and experimental groups, with (4) players for each group. The sample was homogenized using the coefficient of variation within each group as in Table (1), as well as the equivalence of the two groups using Test (T) for unrelated samples as in Table (2).

Table 1. shows homogeneity within each control and experimental group of the research sample in the research variables

Variables	Control group			Experimental group		
	M.	St.d	Coefficient of variation	M.	St.d	Coefficient of variation
Height (cm)	140	1.412	1.004	140.63	1.532	1.089
Mass (kg)	38.41	754	1.963	38.47	.845	2,196
Age (year)	3.142	0.241	7.67	3.214	0.241	498

Table 2. shows equivalence between the control and experimental groups in the tests used for the research sample

Kinetic Variables and Achievement	Control group		Experimental group		Calculated T Values	significance level
	M.	St.d	M.	St.d		
Motor Balance/sec	15.232	0.51	15.345	0.63	0.245	Insig.
Motor Compatibility/Number	40.142	0.78	40.232	0.234	0.191	Insig.
Flexibility	35.242	0.62	35.341	0.471	0.22	Insig.
Achievement / meter	1.27	0.24	1.28	0.14	0.062	Insig.

* Table value (C) at a degree of freedom (6) and the probability of error (0.05) =2.447

Variables determination

As the researcher reviewed the sources, references, and previous research, She concluded that movement abilities (motor balance, motor coordination, flexibility), and long jump achievement were important variables to address the research problem.

Balance Test: (Internet, 2025: 3) Test Name: Beam Walking Test Purpose of the test: Measuring equilibrium through movement. Tools: Balance beam with width (10) cm, length

(4) m, thickness (3-5) cm, flat ground, stopwatch. Test Specifications: In response to the start signal, the tester walks on the bar until the end, turns, and returns to the start point at maximum speed without touching any part outside the bar. Recording: The time taken to walk on the beam is calculated to be less than 1/10 of a second**.** When any part of the body comes into contact with the ground outside the beam, a second is added for the time taken.

Compliance Test: (Internet, 2025: 4) Test Name: Jump Rope Test, Purpose of the test: Measuring compatibility. Tools: A rope of 24 inches length, so that it is held from the terminal, provided that the distance between the two nodes is 16 inches (which is the distance from which it will be jumped), leaving a distance of 4 inches outside each node to be used to hold the rope . Performance specifications: The player holds the rope from the specified places, he jumps over the rope so that the rope passes in front and under the feet, (repeated five times). Recording: Record the number of correct jumps from the five attempts made by the tester.

Flexibility Test: (Hassan, 2025: 51), Test Name: Touch the four rectangles. Test Aim: This test measures flexibility for the dynamics and speed of flexion, extension of the legs, and rotation of the spine. Test specification: A test that measures the dynamics and speed of flexing and extending the legs. Testing instruments: Two wooden posts with two rectangles fastened with a leather strap and stopwatch. Method of performing the test: The tester stands with the two stands on either side of him, with the arms secured by the belt. Upon hearing the start signal, the tester turns to the right and left, touches the upper rectangles, then bends his knees and touches the lower rectangles until the end of the signal within (30) seconds. As in Figure (4) Directions: Do not calculate counts after or before the end of the signal for (30) seconds.

High jump achievement test: The researcher selects according to the International Association of Athletics Federations (IAAF). The examiner is given three attempts.

Procedure

An exploratory experiment was conducted by the researcher on 5 October 2025 with the original research sample to test and codify selected exercises, as well as to determine their suitability for the participants. Pre-tests were administered on 12 October 2025 to establish baseline measurements. The flexibility training program used in this study consisted of a

series of exercises targeting joint mobility and muscle stretching, supported by various tools, with the aim of improving flexibility and motor abilities essential for high jump performance. The program was implemented over a duration of two months, comprising eight weeks and a total of 24 training sessions. Training was scheduled three times per week—on Sundays, Tuesdays, and Thursdays—with an intensity of 80–90%, determined according to maximum capacity, and performance frequency calculated accordingly. Rest periods were regulated by pulse rate, with 120–130 beats per minute between repetitions and 110–120 beats per minute between sets. Upon completion of the exploratory experiment, the training load was standardized and incorporated into the main section of the coach's training modules, applied during the special preparation period. The training program commenced on 13 October 2025 and concluded on 8 December 2025. Post-tests were conducted on 9 December 2025 to assess the effects of the training intervention.

Statistical means

The research data were processed and analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were applied to summarize the data, while appropriate inferential statistical tests were conducted to determine the significance of differences and relationships between variables in accordance with the research objectives.

C. RESULTS AND DISCUSSION

Results

Table 3 presents the pre- and post-test results of the control group. The data show improvements across all measured variables—motor balance, motor compatibility, flexibility, and high jump achievement. Specifically, motor balance decreased from 15.232 seconds to 13.02 seconds, motor compatibility increased from 40.142 to 42.24, flexibility improved from 35.242 to 37.24, and high jump performance rose from 1.27 m to 1.32 m. The calculated *t*-values for all variables (3.853, 3.655, 3.548, and 4.66) exceeded the tabular *t*-value of 3.182 at $p < 0.05$, indicating statistically significant improvements.

Table 3. shows the pre and post arithmetic media, the standard error, and the calculated T tabular values of the control group in the tests used

Variables and Achievement	M. Pre-test	M. Post-test	Standard Error	Calculated T	Sig. level
Motor Balance/sec	15.232	13.02	0.574	3.853	Sig.
Motor Compatibility /Number	40.142	42.24	0.574	3.655	Sig.
Flexibility	35.242	37.24	0.563	3.548	Sig.
Achievement / meter	1.27	1.32	0.012	4.66	Sig.

Table (T) value at a degree of freedom (3) and under the probability of error (0.05) = 3.182

Table 4*. shows the pre and post arithmetic media, the standard error, and the calculated T tabular values of the experimental group in the tests used*

Variables and Achievement	M. Pre-test	M. Post-test	Standard Error	Calculated T	Sig. level
Motor Balance/sec	15.345	11.42	0.861	4.558	Sig.
Motor Compatibility /Number	40.232	44.74	1.23	3.665	Sig.
Flexibility/ Number	35.341	39.45	1.22	3.368	Sig.
Achievement / meter	1.28	1.38	0.024	4.166	Sig.

Table (T) value at a degree of freedom (3) and under the probability of error (0.05) = 3.182

Table 4 shows the pre- and post-test results of the experimental group, which underwent flexibility training. All variables recorded greater improvements compared to the control group. Motor balance improved substantially from 15.345 seconds to 11.42 seconds, motor compatibility increased from 40.232 to 44.74, flexibility rose from 35.341 to 39.45, and high jump performance improved from 1.28 m to 1.38 m. The calculated *t*-values (4.558, 3.665, 3.368, and 4.166) also exceeded the critical value of 3.182, confirming statistical significance at $p < 0.05$.

Table 5. shows the arithmetic media, post standard deviations, and calculated and tabular T values between the control and experimental groups in the tests used

Variables and Achievement	Control group		Experimental group		Calculated T	Sig. level
	M.	St.d	M.	St.d		
Motor Balance/sec	13.02	0.647	11.42	0.745	2.811	Sig.
Motor Compatibility /Number	42.24	0.76	44.74	812	3.894	Sig.
Flexibility/Number	37.24	0.95	39.45	0.762	3.143	Sig.
Achievement / meter	1.32	0.022	1.38	0.012	4.285	Sig.

Table (T) value at a degree of freedom (6) and under the probability of error (0.05) = 2.447

Table 5 compares the post-test results between the control and experimental groups. The experimental group outperformed the control group in all variables, with calculated *t*-values (2.811, 3.894, 3.143, and 4.285) surpassing the tabular *t*-value of 2.447 at $p < 0.05$. These findings indicate that flexibility training had a greater positive effect on motor abilities and high jump performance than the conventional training applied to the control group.

Discussion

By observing tables (3) and (4), we found that there is a development of the control and experimental groups in the research variables, especially motor abilities (motor balance, motor compatibility, flexibility) and high jump achievement. This is evidence of the success of the exercises used for the two groups, which achieved the objectives of the training used. As show by (Ahmed Shihab Ahmed, 2024) quoting (Kamal Jamal Al-Rabadi) "Training methods and techniques are used to develop and improve the physical level of the player to achieve advanced sporting achievements. We do not believe that a coach can dispense with the use of these methods and techniques, which have become the basis for construction and development. The important thing about these methods is that they are used for all forms of sports of different types. The coach only has to be an artist in choosing the appropriate method for the event in which a method can be used more than the rest of the other methods." (Ahmed, 2024: 22)

While (Sidqi Ahmed Salam, 2014) believes that, "improving the level of sports performance is one of the indicators of the success of the training process, in order to reach the highest sports levels. The great development that has occurred in training methods is the result of the increasing interest in searching for new methods in training players and relying on scientific foundations in planning and developing training programs that make them able to improve digital levels" (Sidqi, 2021: 83). By observing Table (5), we found that the experimental group was superior to the control group due to the use of flexible training that includes stretching exercises using ballistic exercises and joint flexibility exercises using tools such as the bar, dumbbells, stick and other tools that help to stretch and raise the level of flexibility, which affects motor abilities.

Flexible training using ballistic exercises enhances stretching and increases the motor aspect, as (Ahmed Araibi Sabaa , 2024) shows that "Ballistic training is of great importance in all sports events, as it is one of the factors of good performance and high achievement and

is one of the important indicators of the state of physical fitness and skill " (Ahmed , 2024:331). In terms of flexibility and its role, (Mowaffaq Asaad Mahmoud, 2020) believes that flexibility is "the motor capacity of the joints. Muscle flexibility depends mainly on the degree of elasticity of the tissues around the joint, as there are adipose muscle tissues as well as tendons and bonds between the heads of bones. This trait depends on exercises that stretch the tissues around the joint in order to increase the motor capacity of the joint "(Mowaffaq, 2020: 193).

Hence, the role of flexibility in motor abilities becomes clear, which helped in raising motor coordination as well as motor balance, which are two important requirements in achieving the achievement in the high jump. as (Haitham Sadiq, Ahmed Sabaa, 2023) sees the role of motor balance as "working directly in improving the player's resulting strength by reducing the proportions of muscles allocated to achieve stability and allowing them to contribute more driving force. It was found that it caused an increase in muscle activation by increasing the strength of muscles and joints, which reduces the consumption phase in the shortening and extension cycle of the muscle and thus improves performance" (Haitham, Ahmed, 2023: 542).

Regarding the motor coordination is defined by (Faiza Abdul Jabbar Ahmed, Lisa Rustum Yaqoub, 2016) "from a physiological perspective, coordination is the ability of the central nervous system to coordinate, and if an athlete is able to move multiple parts of his body simultaneously, he is said to have coordination. (Faiza, Lisa, 2022: 98). In terms of high jump achievement, "doing exercises, developing the necessary requirements for effectiveness, using flexibility, and special exercises derived from the effectiveness of specialization, along with selected exercises, increases the improvement of neuromuscular coordination when performing effectiveness with high strength, which leads to achieving high achievement" (Kazem, 2023: 80).

D. CONCLUSION

The findings of this study demonstrate that flexibility training is an effective method for improving selected motor abilities and enhancing high jump performance among athletes aged 12–14 years. Flexibility itself is a fundamental physical attribute that supports the

development of motor abilities and plays a critical role in preparing the joints for work and movement under challenging conditions, thereby contributing to higher athletic achievement. Based on these results, it is recommended that coaches and trainers integrate flexibility training as a key component of youth high jump programs to maximize motor ability development and performance outcomes. Furthermore, greater emphasis should be placed on fostering flexibility as a core physical quality, given its capacity to optimize joint function and mobility in even the most demanding competitive situations.

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F. AUTHOR CONTRIBUTION STATEMENT

AKJ authors contributed to and are responsible for the entire manuscript.

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