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ORIGINAL STUDY

The Impact of the Dual-Task Strategy on Improving Specific Sensory Abilities and Long Jump Performance among Specialized School Athletes

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Abstract

This research contains four chapters, including an introduction and its significance. The research problem arises from the researchers' extensive professional and practical experience as former athletes and instructors, their experience in field athletics, their observations of jumpers' performance and their own review of scientific sources and studies concerning the long jumps. The study aimed to examine the effect of the dual-task strategy on developing certain sensory abilities and improving long jump performance among specialized school athletes. The researchers used an experimental method based on a one-group pretest–post-test design. The research sample consisted of six long jump athletes from specialized schools. Tests of time perception, force perception, and distance perception were used, along with a long jump performance test. The data were then analyzed statistically using the SPSS software. The results showed statistically significant differences between the pre- and post-tests, in favor of the post-test. The mean score for time perception was 1.458 in the pre-test and 1.214 in the post-test, with a t-value of 7.071. For force perception, the mean was 1.571 in the pre-test and 0.857 in the post-test, with a t-value of 3.528. For distance perception, the mean was 2.614 in the pre-test and 1.571 in the post-test, with a t-value of 8.896. Long jump performance also improved, increasing from 5.774 to 5.864, with a t-value of 5.612. The researchers concluded that the dual-task strategy had a positive effect on developing sensory abilities and improving long jump performance among the participants.

Keywords: Dual-task strategy, Sensory abilities, Long jump, Specialized schools

1. Introduction

The long jump is considered one of the oldest and most common track and field events, combining physical strength with technical precision. It requires athletes to possess multiple skills, including speed, strength, flexibility, and balance, to achieve maximum distance in a single jump. It is considered a comprehensive sport that integrates physical power, technical ability, and mental agility. It is not specifically a test of physical strength, but also an examination of coordination and accurate control of movements. Success here is achieved by the athlete's ability to run at maximum speed while maintaining balance and controlling body positioning during take-off, whether the goal is to compete in championships or to develop physical fitness. The method must be flawless and smooth to ensure the transformation of maximum speed to the jump by pushing off the foot on the take-off board and unleashing into the air.

A successful flight requires the ability to convert horizontal speed into vertical thrust (Saemi et al., 2024) which assists in achieving maximum height and distance in the jump. This sport is not just an ordinary physical strength test, but also an examination of movement coordination and accurate technique

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to achieve a high standard performance (Abbas & Hameed, 2022).

A high level of mental focus and close attention to details are required to reach success in long jumps. From approach to landing, the athlete must be able to make quick decisions and to have the skill to make accurate decisions in fractions of a second (González-Millán et al., 2024). Long jump training boosts the ability of concentration and quick thinking under pressure (Chaitidou & Panoutsakopoulos, 2023). The long jump demands tremendous muscular strength, especially in the legs and thighs (Darawsha, 2023), in addition to high running speed.

Long jump training enhances physical strength and helps improve the main muscles used in the jump. The athlete needs to improve balance and coordination (Wu et al., 2024). The athlete learns how to properly distribute their body weight and control their movements during flight and landing (Abdul-Hassan, 2020), which positively impacts overall athletic performance.

It is one of the skills that requires a balance between physical and mental abilities. The application of dual-task learning strategies which are highly effective tools can achieve the required balance and develop the sensory abilities related to the long jump.

These are complementary tasks which combine physical and mental elements, performed simultaneously in the context of the long jump. These dual tasks (Brinkbäumer et al., 2024) can be beneficial for attention and sensory focus enhancement leading to improved accuracy and balance during the jump. This emphasizes the importance of research based on the hypothesis that performing multiple tasks simultaneously can help athletes to improve their ability to control and divide the attention to the whole body during the jump. An example of such a task is requiring the athlete to memorize a certain path or repeating a specific pattern of movements during the jump, prompting them to focus more on different senses, which results in impacting their performance.

The two researchers, one of whom is a former athlete and teacher with experience in athletics, observed jumpers' performances and reviewed scientific sources and research on the long jump based on their work and practice. They noted a discrepancy in the long jump performance of Iraqi jumpers in their school teams as opposed to their counterparts from other countries.

Performance depends on several variables, primarily all aspects of body movements prior to and during the jump, from the moment of preparation and all the way to the moment of impact with the take-off board and the flight phase can result in this contradiction in achievements. Jumpers may face hardships when pacing their steps to the take-off board (Hussein & Saddam, 2025), which leads to a poor impact and a lack of focus during preparation, resulting in incompatible steps that negatively affect the power of the take-off and flight. Furthermore, the occurrence of an imbalance in the body's equilibrium during the take-off takes place when the force is not distributed correctly between the feet. This imbalance may reduce the propulsive force and result in a shorter jump.

The researchers aim at solving the problems that resulted from all of the presented details through a dual-task strategy to enhance a specific sensory ability that would enable the jumper to maintain their body position in the air and achieve the maximum possible distance. A high degree of body control and direction to facilitate optimal landing are required to achieve the ideal distance (González-Millán et al., 2024). The research attempts to identify the dual-task strategy and specific sensory abilities of jumpers, and determine the effect of the dual-task strategy on certain sensory abilities and long jump performance among athletes from specialized schools. The research hypotheses indicate statistically significant differences between the pre-test and post-test results, in favor of the post-test. The study area included seven long jumpers representing specialized schools, the location was Baghdad - Ministry of Youth Stadium, and the time frame was from June 6, 2024, to August 3, 2024.

2. Research approach, sample, and field procedures

By designing pre- and post-tests, the two researchers utilized the experimental method. The research sample is composed of players from Al-Sina'a Club, and (6) jumpers who were enlisted using the method. The correspondence of the research sample was secured and based upon terms of (age, weight, height, training experience), which was controlled using the Skewness Coefficient.

The results in Table 1 showed that the research sample was homogeneous. The skewness values for all variables were within the normal range (±3). This indicates that the data were normally distributed. It also confirms the homogeneity of the sample. Therefore, the data are suitable for testing the research hypotheses.

Table 2 shows a clear distribution of Skewness Coefficient values for the measurements mentioned above, falling between (±3). This shows a normal distribution of samples according to these indicators. it also shows homogeneity through low skewness coefficient (under (±1) which is a totally good indicator given the fact that the closer these values are to zero

Table 1. Homogeneity of the research sample.

Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness	Distribution
Age	Year	15.857	16	0.690	0.174	Normal
Weight	Kg	61.57	61	1.511	0.620	Normal
Height	Cm	175.14	176	3.532	0.927	Normal
Training age	Year	2.428	2.00	0.534	0.374	Normal

Table 2. Normal distribution in some particular measurements under study.

Variables	Unit of Measurement	Mean	Median	Standard Deviation	Skewness	Distribution
Time perception	sec.	1.571	1.5	0.449	-0.353	Normal
Force perception	kg	1.458	1.440	0.078	0.433	Normal
Distance perception	cm	2.614	2.80	0.456	-0.704	Normal
Performance	m/sec.	5.774	5.80	0.122	0.004	Normal

the more it signifies a normal distribution. hence, the sample is labeled as homogeneous according to the skewness coefficient results.

The researchers utilized the following methods for data collection, information gathering, and equipment:

- Arabic and Foreign Sources: (Literature review/References)
- Global Network Sources (The Internet): (Online databases/research)
- Personal Interviews and Observation: (Direct data collection methods)
- Dell laptop (Chinese-made), Model n5110 (The hardware used for data processing)
- Measuring Tape: (General tool for distance)
- Medical Scale (Japanese-made): (Used for measuring body weight).
- Dynamometer: (A device used to measure force/strength-this corresponds to the "sense of Force" in your previous table)
- Medicine Balls of Various Weights: (Used for physical testing)
- Benches of Various Heights: (Used for jumping or step testing).
- 20-meter Metal Measuring Tape: (Specific tool for long-distance accuracy)

2.1. The researchers conducted a series of tests, which are

2.1.1. Test and measurement

1- Distance Perception Test (Al-Mutawalli et al., 2025)

Description: This test measures the individual's ability to estimate the distance between two points. It is applied by having the participant and at a specific distance from a target. They are then asked to close their eyes, walk toward the target, and stop at the point they believe represents the exact same distance.

Procedures: The participant stands at a distance of 10 meters from a specific target and then they are asked to look at the target for 10 seconds. After closing their eyes, the participant begins walking toward the target and attempts to stop at the point they believe is correct. The difference between the point where they stopped and the actual target distance is then measured.

2- Time Perception Test (Al-Mutawalli et al., 2025)

Objective: To measure the accuracy of time estimation

Tools used: Stopwatch/A piece of cloth.

Performance specifications: The examiner starts the stop watch for specific intervals: 5, 7, and 15 seconds, repeating each three times. The participant stands with their arm extended, eyes blindfolded with a piece of cloth so they cannot see the watch. They are then tasked with starting and stopping the watch when they believe exactly 7 seconds have passed.

Scoring: Each participant is given three trials. The amount of deviation (deficit or excess) from the 7-second target is calculated.

3- Force Perception Test: (Proske & Gandevia, 2012)

Description: This test measures the ability of a person to estimate the required force to lift a certain object. This test is applied using a dynamometer or different weights.

Procedure: A set of weights is presented to the participant, with the actual weight of each weight concealed. The participant is required to lift the weight and estimate the force they believe is necessary to lift it.

The estimates are compared to the actual weight (in kilograms).

4- Long Jump Test (Castro-Piñero et al., 2010)

- **Test Name:** Long Jump

- **Test Purpose:** To measure distance and technical performance.
- **Test Equipment:** Measuring tape, take-off board

Test Description: The subject runs approximately 45 meters (approach distance) and then takes off, remaining within the take-off board for as long as possible.

Test Instructions:

- The subject must not exceed the take-off board.
- Land with both feet.
- The jump distance is measured from the take-off board to the nearest mark left by the subject with any part of their body in the pit.
- Each laboratory has three attempts, and the best one is recorded.

The researchers conducted a pilot study at 6:00 PM on Thursday, June 6, 2024, with the help of three long jumpers which were randomly picked from the research population. The main aim of this pilot study was to determine the number and competence of the support team members.

The researchers then conducted a pre-test on the research sample at 5:00 PM on Saturday, June 8, 2024, at the Ministry of Youth's track and field stadium. Forms containing the names of the athletes were prepared to facilitate the process and record each athlete's results. The essential testing equipment was also prepared. There was a measurement of each athlete's performance in the long jump, and each athlete was given three attempts. The next step was to select their best performance. Following this, sensorimotor ability tests were administered, including distance estimation, time estimation, and power estimation. The main trial of the prepared training program began on Monday, June 10, 2024, and continued until Wednesday, July 31, 2024.

1. The implementation of the training program, using performance-based aids, lasted eight (8) weeks, with two (2) training sessions per week (Saturday and Wednesday.
2. The total number of training sessions was sixteen (16)
3. The researchers followed a strategy for dual tasks, bearing in mind the training stage, the tools used, the method of implementation, and the economic conditions when they design the exercises for the research sample. This strategy included:
4. Clearly defining objectives: each exercise should have a clear objective. For example, the objective could aim at improving balance during jumping and increase coordination between running and standing.
5. Focusing on priorities: There is no place for equal importance when it comes to all tasks. The mission is to Identify the most important tasks and develop strategies to achieve them perfectly.
6. Designing integrated exercises: A design of integrating multiple tasks should be followed. For example, exercises could include running and jumping together to enhance the ability to quickly switch between tasks.
7. Multitasking: Exercises should be designed to combine several tasks simultaneously. For example, exercises could include running and jumping together to develop the ability to quickly switch between tasks.
8. The exercises were specified for youth athletes
9. Variety: Using a variety of exercises to boost the development of all horizons required for athletic performance, with certain exercises tailored to each phase of the jump.
10. Mental Focus: Elevate the ability of an athlete to concentrate while performing multiple tasks through mental exercises such as visual meditation or guided concentration.
11. Stress Management: It enables athletes to learn how to manage stress while performing dual tasks, especially under a stressful competitive condition.
12. Simulating Real-Life Conditions: Utilizing exercises that simulate the actual conditions in which athletes might confront in competitions, such as timing the run and hitting the board within a specific time frame.
13. Repetition under Pressure: Develop the ability to multitask under pressure by repeating exercises in challenging conditions or with doubled hardships.
14. Adapting to Individual Abilities: To cope with different skill levels, a flexible strategy is required. The difficulty and frequency of exercises can be aligned according to the progress of the player.
15. Gradual Progression: Begin with simple tasks and gradually move to more complex and challenging ones.
16. Adjusting the Strategy: If difficulties or challenges occur, A modification of strategy should be applied to meet the player's needs and enhancement.
17. The duration of exercises in a training session ranges from 20 to 30 minutes, while the total training session duration ranges from 90 to 100 minutes.
18. Work with the experimental group is limited to the allotted time in the main session.

19. The remaining time in the training session is spent with the experimental group and the team coach.
20. Appendix (1) shows a set of suggested exercises.

The post-test was conducted on the research sample at 5:00 PM on Saturday, August 3, 2024, at the same stadium. The researchers maintained the same conditions and requirements as those used in the pre-tests to achieve accuracy. The researchers used the SPSS statistical software to process and extract the research data.

3. Presentation of results

3.1. Presentation of the results of the pre-measurements of sensory abilities for the experimental group members

The results in the table showed statistically significant differences between the pre- and post-tests. The differences were in favor of the post-test in the variables of time perception, force perception, and distance perception. The significance level was less than 0.05. This indicates a meaningful improvement in these sensory abilities among the participants in the experimental group.

3.2. Display of the pre-test achievement results for the experimental group

4. Discussion of the pre-test results of sensory abilities and achievement for the experimental group

As shown in Tables 3 and 4, a clear improvement was observed in some sensory abilities. A clear improvement is presented by the two tables in some sensory abilities and performance for the experimental group in the post-tests compared to the pre-tests. The researchers assign this improvement to the dual-task strategy they employed, using a performance-based learning strategy. This strategy proved highly effective, as the dual-task strategy is an effective tool for developing sensory abilities and physical skills among specialized school athletes, particularly in long jump. By integrating sensory and mental tasks with physical training, athletes' performance can be significantly improved, helping them achieve greater athletic accomplishments and develop their abilities in the long term.

This strategy remains one of the tools that can be used to develop athletic excellence and success in specialized sports. The long jump requires a high degree of kinesthetic awareness, both in terms of movement in space and in estimating the force needed during the take-off phase, as well as in the perception of time from the moment the take-off occurs. Although the basic estimations of time, distance, and force are individual elements that vary from person to person, they constitute effective components of the long jump as a motor performance linked to precision. The development of these sensory processes contributes to the refinement of performance. This aligns with recent studies indicating that motor experience developed through 'musculoskeletal' and proprioceptive awareness plays a crucial role in enhancing performance, as improvements in sensory feedback contribute to higher levels of motor efficiency (Proske & Gandevia, 2012; Goepp et al., 2025).

Dual tasks are integrated by directing attention to specific elements in the surrounding environment (Goepp et al., 2025), such as focusing on a particular point on the track or maintaining a specific rhythm while running. This helps the athlete improve their balance and motor coordination. It is an integration of a physical task and a mental task performed simultaneously, enhancing the ability to process sensory and visual information during physical performance.

With regard to the long jump, dual tasks are beneficial for developing attention and sensory focus, which can lead to improved accuracy and balance during

Table 3. Values of the Mean, Standard Deviation, and the calculated t-value between post-test and pre-test for the experimental group.

Variable name	Unit of Measurement	Pre-test		Post-test						
		M	SD	M	SD	*D*	SDD	t-value	Sig.	*Result*
Time perception	Second	1.458	0.078	1.214	0.121	0.714	0.267	7.071	0.000	Significant
Force perception	Kg.	1.571	0.449	0.857	0.243	0.244	0.183	3.528	0.012	Significant
Distance perception	Meter	2.614	0.456	1.571	0.449	1.042	0.310	8.896	0.000	Significant

Table 4. It highlights the values of the arithmetic mean, standard deviation, and calculated t-value between the pre-test and post-test measurements for the experimental group.

Variable	Pre-test		Post-test						
	M	SD	M	SD	*D*	SDD	t-value	Sig.	*Result*
Performance	5.774	0.122	5.864	0.089	0.09	0.042	5.612	0.001	Significant

the jump. It has been emphasized that skill is a key indicator of effective performance, and that the development of motor responses involves organizing and coordinating the action of muscle groups in the direction of movement (Schmidt & Lee, 2019; Magill & Anderson, 2017).

The dual-task strategy significantly develops athletes' sensory abilities (Moreira et al., 2021). It improves concentration and attention, enhancing the ability to make quick and accurate decisions during athletic performance. This type of training also helps improve eye-hand and foot-eye coordination (Brinkbäumer et al., 2024), which directly contributes to improved long jump performance.

5. Conclusions

Through presenting, analyzing, and discussing the results, the researchers reached the following conclusions:

1. The research results displayed the effectiveness of the dual-task strategy in developing certain sensory abilities in relation to long jump performance among specialized school athletes.
2. The training exercises based on the dual-task strategy contributed to enhancing the sense of distance among the research participants.
3. The dual-task strategy led to the development of the sense of time associated with skill performance in the long jump
4. Dual-task training helped develop a sense of power in athletes during the technical phases of the long jump.
5. The dual-task strategy had a distinct positive effect on developing the long jump performance of specialized school athletes.
6. Integrating motor and cognitive requirements within dual-task training contributed to enhancing the skill and technical performance of the long jump.

6. Recommendations

In light of the findings of the current research, the researchers recommend the following:

1. Coaches should adopt the strategy of
2. Dual tasks for the long jump and utilize them in training young athletes in the long jump.
3. Diversifying the use of modern strategies and various appropriate training methods contributes to developing athletic performance in the long jump.
4. The study should be adopted by specialized schools.
5. Similar studies and research should be conducted on the triple jump or on different samples and levels.

Conflicts of interest

None.

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical clearance

This manuscript approved by the Scientific Committee of the College of Physical Education and Sports Sciences for Women, University of Baghdad, Iraq, on (2025/06/03).

Author's contributions

All contributions to this study were carried out by the researchers. Lina Ali Sheerkhan conducted the study procedures, collected and organized the data, participated in the implementation of the experimental program, and contributed to drafting the manuscript. Suhad Haseeb Abd El Hamid developed the research idea, designed the study, supervised the research procedures, interpreted the results, and reviewed and finalized the manuscript. Khitam Mousa Ay contributed to the study design, participated in data interpretation, provided critical revisions to the manuscript, and assisted in finalizing the manuscript for publication.

The study also benefited from the assistance of a number of experts: **Asst. Prof. Dr. Haider Nawar Hussein** (Statistics), **Prof. Dr. Najlaa Abbas Al-Zuhairi and Prof. Dr. Aseel Jaleel Gatia** (Revision), and **Ameer Maytham Ismail** (Translation), Bilad Al-Nahrain High School, Iraqi Ministry of Education

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Roles of each researcher in the research

- **First researcher: Lina Ali Sheerkhan** was responsible for participating in the implementation of the study procedures, collecting and organizing the data, assisting in conducting the experimental program, contributing to the interpretation of the results, and assisting in drafting the manuscript.
- **Second researcher: Suhad Haseeb Abd El Hamid** was responsible for the conceptualization

of the research idea, study design, literature review, supervision of data collection and experimental procedures, interpretation of the results, reviewing the manuscript, and final revision.

- **Third researcher: Khitam Mousa Ay** contributed to the study design, participated in data interpretation, provided critical revisions to the manuscript, and assisted in the final review and preparation of the manuscript for publication.

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Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Appendix (1)

Examples of Dual Task Exercises

1. Running and Jumping Coordination Exercise (Rhythm and Timing Steps)

Objective: To improve coordination between running speed and preparation for hitting the take-off board.

Description: Have the athlete run 10-15 meters at a moderate pace, then perform a small jump over a low hurdle (20-30 cm) in a three-step rhythm. This exercise enhances rhythm and coordination between steps and hitting the board.

Repetitions: 4-6 times with a 1–2-minute rest between attempts

2. Single-Leg Jumping Exercise Focusing on Balance

Objective: To improve balance and foot strength for better board striking and flight control.

Description: Have the player jump on one leg consecutively for five consecutive jumps, then perform a final jump transitioning into a long jump. The goal is to maintain balance during the consecutive jumps.

Repetitions: 3–5 sets with a 1–2-minute rest between sets

3. Short Hurdles Exercise Focusing on Rhythm

Objective: To improve the player's ability to control rhythm and their neuromuscular coordination.

Description: Place 5–7 low hurdles (20–30 cm) at equal intervals. Have the player run quickly between the hurdles, focusing on the number of steps between each hurdle. At the end of the hurdles, the player performs a long jump.

Repetitions: 4–6 times with a 1–2-minute rest between attempts

4. Multitasking Exercise

Objective: To improve the player's ability to quickly switch between different tasks such as running, jumping, and balancing.

Description: Have the player run quickly for five meters, then stop suddenly to perform a vertical jump on one foot, then run another five meters and perform a long jump. The focus here is on the speed of switching between different tasks.

Repetitions: 3–5 sets with a 2–3-minute rest between sets

5. Ball Passing and Balancing on One Leg

Goal: To improve balance and the ability to focus on multiple tasks

Description: The player stands on one leg holding a ball in both hands. The player passes the ball from one hand to the other while maintaining balance. The challenge can be increased by adding a light jump on one leg.

Repetitions: 2–3 minutes per set, 3–4 sets

6. Vertical Jump with Body Rotation

Goal: To improve the player's ability to control body rotation during flight

Description: The player stands in place and then performs a vertical jump, attempting a 180-degree body rotation in the air. This exercise enhances body control during flight, which can be applied to the flight phase of the long jump.

Repetitions: 3–5 sets with a 1–2-minute rest between sets

7. Interval Running with Repeated Jumps

Goal: To improve the ability to quickly transition between running and jumping. Description: Have the player sprint 20 meters at maximum speed, then perform three consecutive jumps on one foot, followed by another 20-meter sprint before finishing with a long jump.

Repetitions: 4–6 times with a 2–3-minute rest between sets.

أثر استراتيجية المهام المزدوجة في تطوير بعض القدرات الحسية وانجاز الوثب الطويل لدى لاعبي المدارس التخصصية

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المستخلص

يتكوّن هذا البحث من أربعة فصول، يتضمن الفصل الأول المقدمة وأهميته. تتبع مشكلة البحث من الخبرة المهنية والعملية الواسعة للباحثين بوصفهم لاعبين ومدربين سابقين، فضلًا عن خبرتهم في ألعاب القوى وملاحظاتهم لأداء لاعبي الوثب، إضافةً إلى مراجعتهم للمصادر والدراسات العلمية المتعلقة بالوثب الطويل. هدفت الدراسة إلى التعرف على أثر استراتيجية المهام المزدوجة في تطوير بعض القدرات الحسية وتحسين إنجاز الوثب الطويل لدى لاعبي المدارس التخصصية. اعتمد الباحثان المنهج التجريبي بتصميم المجموعة الواحدة ذات الاختبارين القبلي والبعدي. وتكوّنت عينة البحث من ستة لاعبين في فعالية الوثب الطويل من المدارس التخصصية. تم استخدام اختبارات إدراك الزمن، وإدراك القوة، وإدراك المسافة، بالإضافة إلى اختبار إنجاز الوثب الطويل. كما عولجت البيانات إحصائيًا باستخدام الحقيبة الإحصائية (SPSS). أظهرت النتائج وجود فروق ذات دلالة إحصائية بين الاختبارين القبلي والبعدي ولصالح الاختبار البعدي. إذ بلغ متوسط إدراك الزمن في الاختبار القبلي (1.458) وفي الاختبار البعدي (1.214) بقيمة (T) بلغت (7.071). أما في إدراك القوة، فقد بلغ المتوسط القبلي (1.571) والبعدي (0.857) بقيمة (T) بلغت (3.528). وفي إدراك المسافة، بلغ المتوسط القبلي (2.614) والبعدي (1.571) بقيمة (T) بلغت (8.896). كما تحسن إنجاز الوثب الطويل من (5.774) إلى (5.864) بقيمة (T) بلغت (5.612). واستنتج الباحثان أن استراتيجية المهام المزدوجة كان لها تأثير إيجابي في تطوير القدرات الحسية وتحسين إنجاز الوثب الطويل لدى أفراد عينة البحث.

الكلمات المفتاحية: استراتيجية المهام المزدوجة، القدرات الحسية، الوثب الطويل، المدارس التخصصية