DOI: https://doi.org/10.61841/4r61wa44 **Publication URL :** https://jarel.org/index.php/EL/article/view/38

THE EFFECT OF SPECIAL STRENGTH EXERCISES BASED ON THE FRENCH CONTRAST METHOD ON SELECTED BIOMOTOR CAPACITIES AND ON THE SPEED AND ACCURACY OF THE LUNGE WITH THE FOIL WEAPON AMONG FENCERS UNDER 18 YEARS

Assistant Lecturer Ali Hussein Owaid[1], Lecturer Dr. Dunya Abdulsalam Fadhil Al-Khaqani[2], Assistant Lecturer Saif Fadel Khalil Abd[3]

[1]*University of Kufa — College of Dentistry, alih.alabbodi@uokufa.edu.iq*

[2]*Al-Najaf Vocational Preparatory School for Sports Sciences, dinaabdulsallam@gmail.com*

[3]*University of Kufa — Faculty of Physical Education and Sports Sciences, Al-Najaf, Iraq, saiffadelkhalil@gmail.com*

Corresponding Author :
alih.alabbodi@uokufa.edu.iq

To Cite This Article : THE EFFECT OF SPECIAL STRENGTH EXERCISES BASED ON THE FRENCH CONTRAST METHOD ON SELECTED BIOMOTOR CAPACITIES AND ON THE SPEED AND ACCURACY OF THE LUNGE WITH THE FOIL WEAPON AMONG FENCERS UNDER 18 YEARS (A. H. Owaid, D. A. F. A.-. Khaqani, & S. F. K. Abd, Trans.). (2026). *International Journal of Advance Research in Education & Literature (ISSN 2208-2441)*, *12*(3). https://doi.org/10.61841/4r61wa44

ABSTRACT

The present study aimed to design special strength exercises using the French Contrast Method and to determine their effect on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon among fencers under 18 years, as well as to identify the more effective approach between the proposed method and the coach's customary programme. The researcher adopted the experimental method using a design of two equivalent groups (experimental and control) with pre- and post-tests, in alignment with the nature of the research problem. The sample was selected purposively from foil fencers under 18 years, comprising fourteen (14) fencers who were randomly divided into two groups of seven (7) fencers each. The experimental group performed the special strength exercises based on the French Contrast Method, while the control group continued training in accordance with the coach's customary programme. The training programme extended over eight (8) weeks at a rate of three (3) sessions per week (Saturday, Tuesday, and Thursday), for a total of twenty-four (24) training sessions. The research tests covered selected biomotor capacities — namely power-speed strength, explosive power, agility, and balance — as well as the speed and accuracy of the lunge together with spatial and temporal perception. The data were treated statistically using the Statistical Package for the Social Sciences (SPSS). The results revealed statistically significant differences between the pre- and post-tests in favour of the post-tests for both groups, together with the superiority of the experimental group over the control group across all study variables. The researcher attributes this finding to the effect of the special strength exercises based on the French Contrast Method and to the neuromuscular adaptations they produced, which contributed to developing the fencers' biomotor capacities together with the speed and accuracy of the lunge. In light of these results, the researcher concluded that special strength exercises grounded in the French Contrast Method are effective in developing biomotor capacities and the speed and accuracy of the lunge with the foil weapon, and recommended that this method be adopted in the training of fencers under 18 years and that similar studies be conducted on different age categories and weapons.

KEYWORDS: *Special Exercises; French Contrast Method; Biomotor Capacities; Foil Fencing; Explosive Power; Lunge Accuracy; Youth Athletes.*

INTRODUCTION TO THE RESEARCH
INTRODUCTION AND IMPORTANCE OF THE STUDY

Recent years have witnessed considerable progress in the field of sport as a result of the scientific advances achieved in sports training, physiology, biomechanics, and kinesiology. Progress in sporting achievement has come to depend chiefly on the use of modern training approaches and methods grounded in precise scientific foundations that aim to develop athletes' physical, technical, and functional capacities. Reaching elite levels is no longer attainable through traditional training alone; it now requires modern training approaches commensurate with the nature and demands of each sporting activity, together with the implementation of structured programmes that improve the efficiency of the players' functional, neural, and muscular systems.

Fencing is among the individual sports characterised by rapidity of performance and the continuous changes of playing situations, demanding that the athlete possess a high level of physical, technical, and neural capacities in order to execute offensive and defensive actions with both speed and accuracy. Modern fencing relies to a large extent on speed of motor response, special strength, and the capacity for motor control during performance, given the rapid changes that occur in competition and the need to make appropriate decisions within the shortest possible time. Mohammed Hassan Allawi notes that progress in sporting performance is linked to the athlete's ability to deploy his or her physical and motor capacities in a manner consistent with the technical demands of the activity.

Among the fencing weapons, the foil relies most heavily on speed and accuracy of execution, since the effectiveness of the lunge depends on the player's ability to perform the action in the shortest possible time while striking the target precisely. This requires the player to possess advanced special strength, explosive power, and neuromuscular coordination. Success in fencing is further linked to the ability to integrate the work of the arms and legs while executing the lunge, advance, and retreat, in addition to motor control during technical performance. Bassam Abbas Mohammed indicates that the speed and accuracy of the lunge are decisive factors for achieving victory in fencing, since a fencer able to execute the lunge with speed and precision has a clear advantage during competition.

To develop these physical and technical demands, a number of modern training methods have emerged that aim to improve the efficiency of the neuromuscular system and to enhance the capacity for producing force and motor speed. Among these is the French Contrast Method, a contemporary approach used to develop special strength and explosive power. The method is based on combining maximal strength, plyometric, and high-speed exercises within a single, sequenced training set designed to stimulate the neuromuscular system and to maximise force production within the shortest possible time, drawing on the principle of post-activation potentiation. Many specialists in sports training affirm that the French Contrast Method contributes to the development of power-speed, explosive power, and motor response speed, and exerts a positive effect on technical performance in sports that depend on speed and muscular explosiveness. The method also enhances neuromuscular coordination and the efficiency of motor performance through the alternation between high loads and rapid, explosive movements — properties that make it well suited to sports demanding fast and precise execution, such as fencing.

Furthermore, the use of special strength exercises that mirror the nature of technical performance helps to improve sporting achievement. Reisan Khuraibet Majeed affirms that the closer specific training is to the actual motor performance of the sporting activity, the more effective it is in developing physical and technical capacities. Accordingly, the use of special strength exercises based on the French Contrast Method in fencing may contribute to improving the speed and accuracy of performance through enhancements in muscular capacity and neuromuscular response speed associated with the lunge action.

The importance of the present study therefore lies in designing special strength exercises based on the French Contrast Method and identifying their effect on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon among fencers under 18 years, as well as in providing coaches with a modern training approach that may contribute to elevating players' physical and technical performance and to advancing their sporting achievement.

STATEMENT OF THE PROBLEM

Fencing is a sport that demands a high level of physical and technical capacities, owing to its rapidity of performance and the precision required in executing lunges during competition. The fencer's success rests on possessing appropriate special strength, speed, and accuracy of technical performance. Through the researcher's observation of training sessions for fencers under 18 years, a relative weakness was noted in some biomotor capacities and in the speed and accuracy of the lunge, alongside the prevailing reliance of most coaches on traditional training approaches and the limited use of modern methods — particularly the French Contrast Method, which is one of the contemporary approaches for developing special strength and explosive power. The researcher also found a paucity of studies addressing the use of this method in fencing, which prompted the design of special strength exercises based on the French Contrast Method to identify their effect — relative to the coach's customary approach — on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon among fencers under 18 years.

RESEARCH OBJECTIVES

- To design special strength exercises based on the French Contrast Method for foil fencers under 18 years.
- To identify the effect of special strength exercises based on the French Contrast Method, and of the coach's customary approach, on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon among fencers under 18 years.
- To identify the more effective of the two approaches — the French Contrast Method exercises and the coach's customary approach — for developing selected biomotor capacities and the speed and accuracy of the lunge with the foil weapon among fencers under 18 years.

RESEARCH HYPOTHESES

- There are statistically significant differences between the pre- and post-tests of the experimental and control groups, in favour of the post-tests, on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon among fencers under 18 years.
- There are statistically significant differences in the post-tests between the experimental and control groups, in favour of the experimental group, which used the special strength exercises based on the French Contrast Method, on selected biomotor capacities and on the speed and accuracy of the lunge with the foil weapon.

SCOPE OF THE STUDY

- **Human scope:** Foil fencers under 18 years.
- **Temporal scope:** From 5 January 2026 to 15 April 2026.
- **Spatial scope:** The hall of the Iraqi Central Fencing Federation.

DEFINITION OF TERMS

French Contrast Method: A training approach based on alternating between high-load strength exercises, plyometric exercises, and high-speed exercises within a single training sequence, with the aim of developing muscular power and power-speed by enhancing the efficiency of the neuromuscular system. It is widely used in sports that demand speed and muscular explosiveness (NSCA Coach, 2023).

METHODOLOGY AND FIELD PROCEDURES

RESEARCH METHOD

The researcher adopted the experimental method using a two-group design (experimental and control) with pre- and post-tests, given its suitability to the nature of the research problem and its appropriateness for achieving the study's objectives. The experimental method is one of the most scientifically rigorous approaches for uncovering causal relationships between variables through the controlled manipulation of the factors influencing the phenomenon under investigation (Wajih Mahjoob, 2002).

POPULATION AND SAMPLE OF THE STUDY

The research sample was selected by the purposive method from among the foil fencers under 18 years who train within the training centre of the Iraqi Central Fencing Federation for the 2025–2026 sporting season. The sample comprised (14) fencers, representing (100%) of the research population, who were assigned randomly by lot to two equivalent groups: the experimental group, which performed the special strength exercises based on the French Contrast Method (n = 7), and the control group, which continued training in accordance with the coach's customary approach (n = 7).

The researcher established the homogeneity of the participants in the variables of height, body mass, age, and training age. The coefficient of variation for each variable was below (30%), indicating an acceptable degree of homogeneity within the sample. Equivalence between the experimental and control groups was also verified for the research variables on the pre-tests for selected biomotor capacities and for the speed and accuracy of the lunge, using the independent-samples t-test. The results showed no significant differences between the groups, demonstrating their equivalence prior to the implementation of the experimental treatment.

Table 1: Distribution of the research population and sample

Sample group	Number	Percentage (%)
Total population	14	100%
Control group	7	50%
Experimental group	7	50%

In order to achieve sample homogeneity and control for variables that might influence the results of the experiment, the researcher established homogeneity across a number of basic variables: age, height, body mass, and training age.

Table 2: Means, standard deviations, and coefficients of variation for the research sample

#	Variable	Unit	Mean	SD	CV (%)	Result
1	Height	cm	168.000	2.511	1.494	Homogeneous
2	Body mass	kg	67.642	3.894	5.756	Homogeneous
3	Age	years	15.500	0.518	3.341	Homogeneous
4	Training age	years	3.285	0.468	14.246	Homogeneous

As shown in Table 2, the coefficients of variation were all below (30%), confirming the homogeneity of the sample with respect to the above variables.

An independent-samples t-test was then used to verify whether statistically significant differences existed between the two groups. The results indicated no significant differences at the (0.05) level of significance, demonstrating equivalence between the experimental and control groups and thereby permitting the experimental treatment to be applied with scientific confidence. This procedure ensures that any differences emerging in the post-tests can be attributed to the effect of the independent variable of the study (Hassanin, 2004; Allawi, 2001).

Table 3: Equivalence between the experimental and control groups on pre-test variables

Category	Variable	Unit	Experimental (pre)		Control (pre)		t-value	Sig.	Result
			Mean	SD	Mean	SD			
Biomotor capacities	Power-speed strength	cm	114.8	2.31	113.8	1.47	0.892	0.393	n.s.
	Explosive power	cm	55.1	1.47	55.3	1.75	0.178	0.862	n.s.
	Agility	s	19.00	1.41	19.50	1.04	0.696	0.503	n.s.
	Balance	s	35.83	0.75	35.30	1.04	0.632	0.541	n.s.
Lunge speed & accuracy	Lunge accuracy	hits	4.42	0.97	4.85	1.15	1.420	0.067	n.s.
	Spatial perception	hits	2.71	0.68	2.42	1.13	0.575	0.600	n.s.
	Temporal perception	hits	2.42	0.799	2.000	0.750	1.030	0.320	n.s.

Note. df = 12; significance level = 0.05; n.s. = non-significant ($p > .05$).

MEANS, TOOLS, AND EQUIPMENT USED IN THE STUDY

MEANS OF DATA COLLECTION

- Arabic and foreign sources and references.
- The Internet.
- Observation and experimentation.
- Personal interviews.

EQUIPMENT AND TOOLS USED IN THE STUDY

- A fencing piste.
- A metric measuring tape.
- A wall-mounted training target.
- Coloured adhesive tapes.
- An agility ladder.
- Chalk.
- Fourteen (14) black eye-blindfolds.
- Four (4) coloured cloth squares, 10 × 10 cm each.
- An American-made electronic audio device.
- An American-made electronic optical device.
- A graphic scale (1 m).
- Notebook and pens for recording data and observations.

FIELD PROCEDURES

IDENTIFICATION OF THE RESEARCH TESTS

The research tests were identified by reviewing the scientific sources and references specialised in sports training and in the sport of fencing. Selected biomotor capacities and measures of the speed and accuracy of the lunge with the foil weapon were chosen as variables appropriate to the nature of the research problem and to its objectives. The selection was further informed by experts and specialists in sports training, testing, and measurement, each within their respective field of specialisation.

DESCRIPTION OF THE BIOMOTOR-CAPACITY TESTS

FIRST: EXPLOSIVE POWER OF THE LEGS TEST

Source: Hatem (1997, p. 194).

Objective. To measure the explosive power of the legs from the on-guard (en-garde) position.

Procedure. The participant stands in the en-garde position behind the starting line and, on the start signal, performs a single forward jump.

Recording. The distance is measured in centimetres from the inner edge of the starting line to the last mark left by the participant when the rear foot touches the ground. Two attempts are given and the better performance is recorded.

SECOND: POWER-SPEED STRENGTH OF THE LEGS TEST

Source: Bayan Ali Abd Ali (1997, p. 194).

Test. Three consecutive forward jumps from the en-garde position.

Objective. To measure the power-speed strength of the legs from the en-garde position.

Equipment. A level, non-slip surface; a measuring tape fixed to the floor with transparent tape with the starting line drawn on one edge; and a junior foil with a Belgian grip (non-electric).

Procedure. From the en-garde position with the rear foot behind the starting line, the participant extends the legs forcefully and pushes off the ground with both feet, performing three successive forward jumps to the farthest possible distance while remaining in the en-garde position.

Recording. Distance is measured from the inner edge of the starting line to the last mark left by the participant (when the rear foot touches the ground). One attempt is given and the distance is recorded.

THIRD: AGILITY TEST

Source: Abdul-Hadi Hameed Mahdi (2007, pp. 121–122).

Objective. To measure agility in the sport of fencing.

Requirements. The test requires three administrators: a test director, a timekeeper, and a recorder.

Equipment. A regulation fencing piste; a regulation foil weapon; and an electronic stopwatch.

Procedure. The participant stands at point (A) with the front foot behind the starting line. On the test director's whistle, the participant performs a normal advance toward point (C); upon contact with the line, performs a normal retreat toward point (B); upon contact with that point, performs a normal advance toward point (H); then a normal retreat to point (C); then a normal advance toward point (Z); and finally a normal retreat back to the starting point (A), as illustrated in Figure 1.

Recording. The time taken (in seconds) is recorded from the moment the whistle is heard until the participant's front foot crosses the starting line.

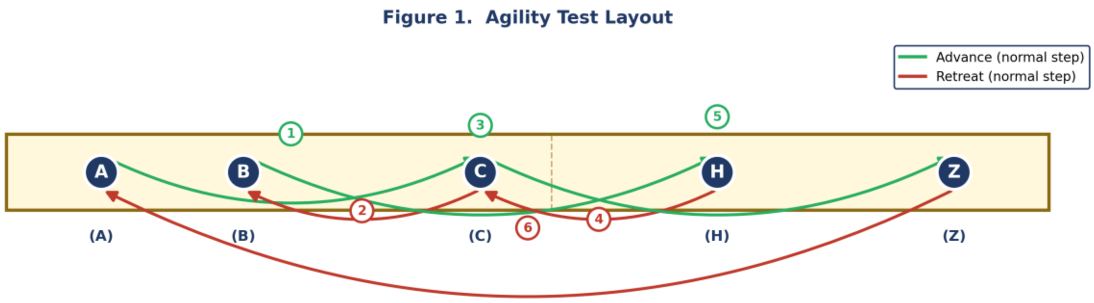

Figure 1: Schematic of the agility test on the fencing piste

FOURTH: DYNAMIC BALANCE TEST

Source: Davis et al. (2000, p. 129).

Objective. To measure dynamic balance.

Equipment. A stopwatch; a measuring tape; and eleven (11) marks fixed on the ground, with a distance of 75 cm between successive marks.

Procedure. The participant stands on the right foot at the starting point and then hops onto the first mark with the left foot, attempting to maintain balance on the ball of the left foot for up to (5) seconds. The participant then hops onto the second mark with the right foot, and so on — alternating the landing foot from mark to mark and always landing on the ball of the foot, while ensuring that the foot is directly over the mark. The expected total duration of the test is (50 s); any failure to maintain balance or any landing off the mark results in a deduction of five seconds from the recorded time. The longer the time recorded, the better the balance.

Recording. The time taken by the participant from the start of the test to the finish line is recorded.

DESCRIPTION OF THE LUNGE SPEED AND ACCURACY TESTS

TEST 1. LUNGE ACCURACY

Objective. To measure lunge accuracy.

Equipment. An electronic optical device with stand and remote control; a wall-mounted target containing (4) coloured zones (red, blue, green, yellow) — the same colours as on the device — each measuring 10 × 10 cm²; and a foil weapon.

Procedure. The participant stands in front of the target at his appropriate lunge distance. The optical device is positioned to one side, facing the participant. The device is activated by pressing the button for the chosen colour on the remote, which causes that colour to be emitted from the device's screen; the participant then lunges to strike the corresponding colour on the wall target.

Recording. Ten (10) attempts are given, and the number of successful attempts is recorded.

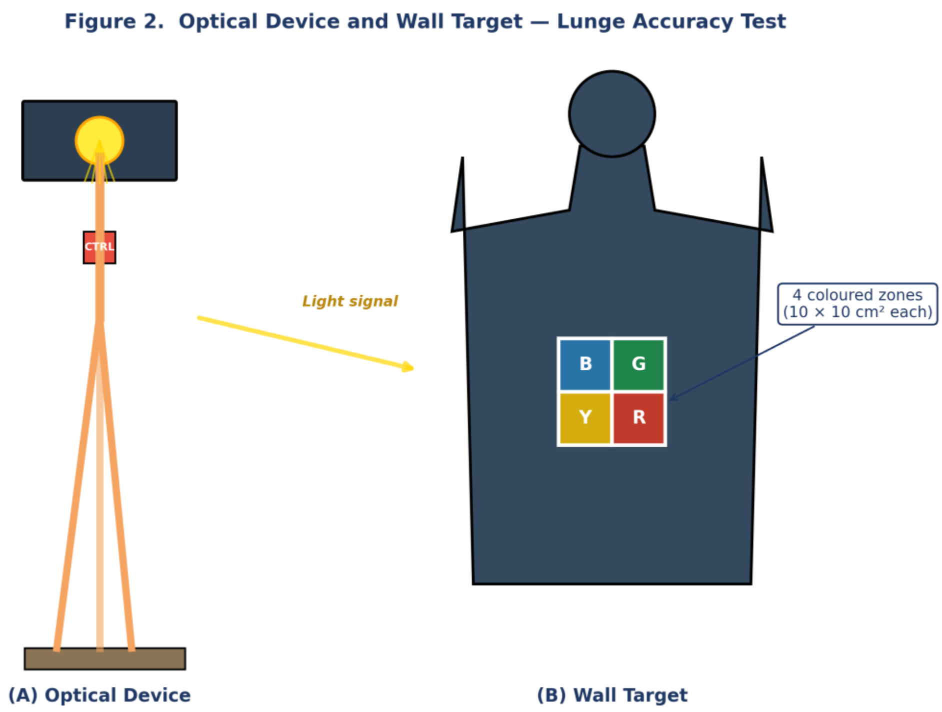

Figure 2: Optical device and wall target used for the lunge accuracy test

TEST 2. SPATIAL PERCEPTION FOR LUNGE ACCURACY

Objective. To measure spatial perception in lunge accuracy.

Equipment. An electronic audio device; a target divided into (4) numbered squares (1, 2, 3, 4), each measuring 10 × 10 cm²; a foil weapon; and an eye-blindfold.

Procedure. (1) The participant stands in front of the target at his appropriate lunge distance. (2) The audio device is placed to one side in front of the participant. (3) The participant is given one open-eyed lunge attempt to learn the locations of the target zones. (4) The eyes are then blindfolded. (5) On the start signal, the participant performs the lunge step, thereby crossing the device's electronic sensor line, which triggers a random number to be sounded by the device; the participant then lunges to strike the number on the target whose location has been learned beforehand.

Recording. Ten (10) attempts are given, and the number of successful attempts is recorded.

Figure 3. Audio Device and Numbered Target — Spatial Perception Test

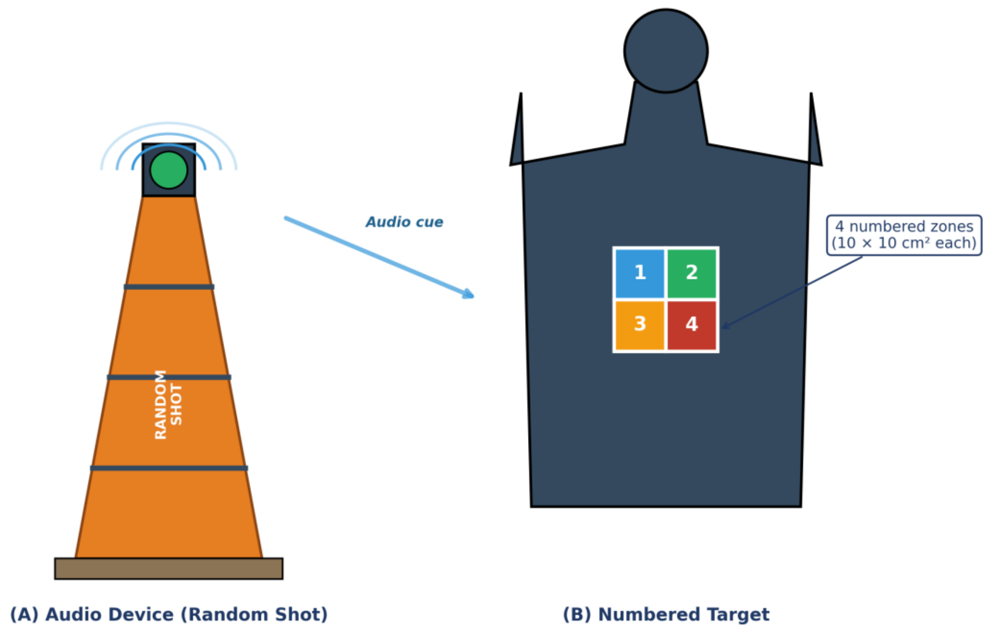

Figure 3: Audio device (Random Shot) and numbered target used for the spatial perception test

TEST 3. TEMPORAL PERCEPTION OF THE LUNGE MOVEMENT

Objective. To measure temporal perception of the lunge movement.

Equipment. A fencing target; a stopwatch; and a foil weapon.

Procedure. The participant stands in front of the target at his appropriate lunge distance. On the start signal, the participant must execute ten (10) lunges within (10 s) — striking the target and returning to the lunge position for each — perceiving the timing of each lunge.

Recording. The temporal-perception error is computed as the number of repetitions completed below or above the intended ten within the (10 s) window.

PILOT STUDY

A pilot study was conducted on a sample of (5) fencers drawn from outside the principal sample, in order to verify the suitability of the tools and equipment, to determine the appropriate timing for the tests, to detect difficulties that might arise during application, and to train the assisting team in the procedures of execution and recording (Al-Shawk, 2015; Al-Badri, 2018). The pilot study was carried out at the Sports Talent Centre of the Ministry of Youth and Sport in Baghdad on Monday, 8 December 2025, under the same conditions and procedures that would be adopted in the main experiment, so as to ensure accuracy of measurement and faithful application.

The aims of the pilot study were:

- To verify the suitability of the tools and equipment used to administer the tests.
- To identify the appropriate time required to perform each test.
- To detect potential difficulties and problems that might confront the researcher during field application.
- To train the assisting team in administering the tests and accurately recording the results.
- To ensure that the test instructions were clear for the participants and that the tests could be applied straightforwardly (Al-Shawk, 2015; Al-Badri, 2018).

SCIENTIFIC FOUNDATIONS OF THE TESTS

1. Validity of the tests. The researcher adopted face validity by presenting the tests to a panel of experts and specialists in sports training and fencing in order to verify that the tests measured what they were designed to measure. The tests obtained an appropriate level of agreement among the experts. Muhammad Subhi Hassanin notes that validity refers to "the capacity of a test to measure what it was designed to measure" (Hassanin, 2004, p. 145). The researcher also computed self-validity — one of the most common forms of validity in sports research — by taking the square root of the reliability coefficient, thereby confirming the suitability of the tests employed in the study.

Self-validity coefficient = √(reliability coefficient).

The research tests are therefore valid for measuring the study variables.

2. Reliability of the tests. The researcher used the test–retest method to compute the reliability coefficient. The tests were administered to the pilot sample on 8 December 2025 and then re-administered on 15 December 2025 to the same sample under the same conditions. Bahi Hussain notes that reliability means “the test yields the same — or closely similar — results when re-administered under the same conditions” (Bahi Hussain, 1999, p. 23). After the data were treated statistically using Pearson's correlation coefficient, the results showed that the tests possessed a high degree of reliability, with all correlation coefficients exceeding the tabulated value at the (0.05) level of significance, indicating that the tests are reliable and suitable for application.

3. Objectivity of the tests. Objectivity was established by enlisting two raters to record the results of selected tests and then computing the correlation between their scores using Pearson's correlation coefficient. Mohammed Hassan Allawi notes that objectivity refers to “agreement in evaluation results irrespective of those carrying out the rating or measurement” (Allawi & Rateb, 1999, p. 35). The high inter-rater correlations obtained demonstrate that the tests possess a high degree of objectivity and are suitable for application. The corresponding coefficients are presented in Table 4.

Table 4: Validity, reliability, and objectivity coefficients for the study variables

#	Test	Unit	Validity	Reliability	Objectivity
1	Power-speed strength	cm	0.95	0.92	0.91
2	Explosive power	cm	0.94	0.90	0.89
3	Agility	s	0.93	0.88	0.90
4	Balance	s	0.91	0.87	0.88
5	Lunge accuracy	hits	0.96	0.92	0.94
6	Spatial perception	hits	0.94	0.88	0.90
7	Temporal perception	hits	0.95	0.91	0.93

THE OPTICAL DEVICE

The optical device is a multi-purpose American-made electronic apparatus consisting of a metal stand topped by an electronic screen containing several colours that can be activated electrically through a remote control. The device is positioned in front of the participant and is operated through the remote: pressing the button corresponding to the desired colour causes the device's screen to emit that colour, to which the participant responds. The device thereby enables the assessment of accuracy, response speed, or spatial perception, as required.

THE AUDIO DEVICE (RANDOM SHOT)

The audio device (Random Shot) is a multi-purpose American-made electronic apparatus designed for instructional and training use. It consists of a height-adjustable cone-shaped stand topped by an electronic optical head; the device may be placed on the floor or in any suitable location. It operates via sensory detection: whenever an object crosses its longitudinal sensing line, the device emits a random number drawn — without order — from four (1, 2, 3, 4). The device can be used to assess accuracy, response speed, and spatial perception.

DESIGNING THE SPECIAL EXERCISES USING THE FRENCH CONTRAST METHOD

The researcher designed the special strength exercises using the French Contrast Method in a manner consistent with the nature of the technical and motor performance of foil fencing. The exercises were developed after reviewing recent scientific sources and prior studies on strength and muscular power training, together with input from experts and specialists in sports training and fencing. The exercises were tailored to the demands of the specific preparation phase for fencers under 18 years and to the development of selected biomotor capacities and of the speed and accuracy of the lunge. They combined maximal-strength, plyometric, and high-speed exercises within a single training session in order to enhance neuromuscular efficiency and to improve the capacity for producing force within the shortest possible time.

Exercise design was guided by the principle of progression of the training load in terms of intensity, volume, and rest intervals, together with attention to the motor similarity between the exercises and the technical performance of fencing. Accordingly, the exercises included lunging, advancing, retreating, jumping, and rapid changes of direction, so as to develop the biomotor capacities most closely tied to technical performance in fencing. The training sessions were implemented during the specific preparation phase: exercises were applied for (8) weeks at a rate of (3) sessions per week, embedded within the main part of each training unit, with loads scaled to the level and capacities of the participants.

The designed exercises aimed to develop the following:

- Improving the explosive power of the legs.
- Improving power-speed strength.
- Developing agility and motor balance.
- Improving motor response speed.
- Developing the speed and accuracy of the lunge with the foil weapon.
- Elevating the efficiency of technical performance during competition.

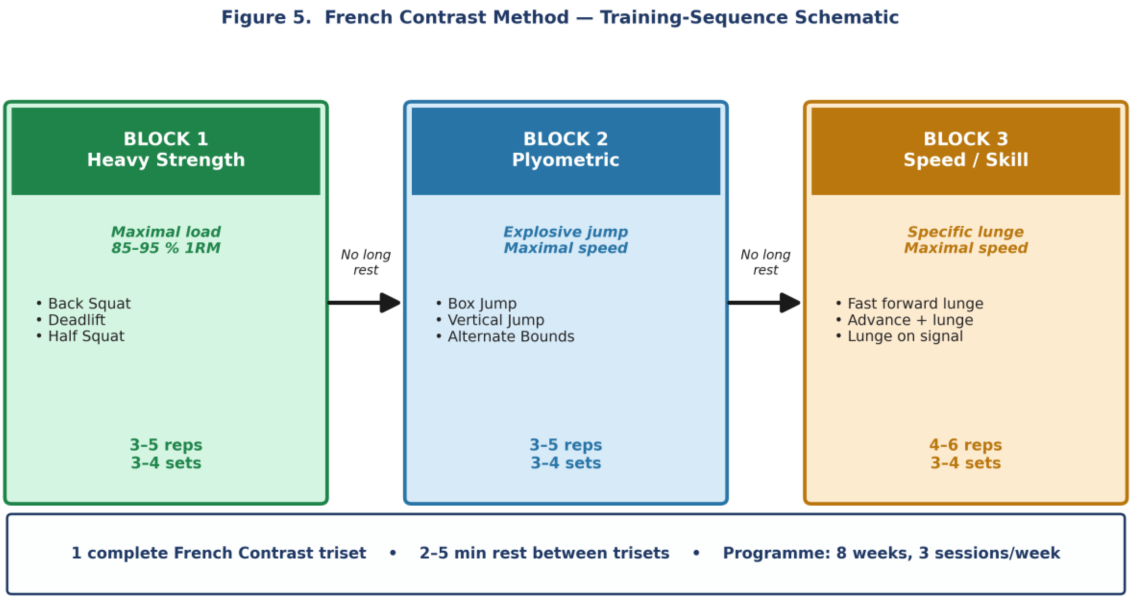

Figure 5: Schematic of the French Contrast Method training sequence

SAMPLE EXERCISES — FRENCH CONTRAST METHOD (UNDER-18 FOIL FENCERS)

The French Contrast Method relies on executing four (4) consecutive exercises within a single set: a maximal-strength exercise; a plyometric exercise; a high-speed or explosive-power exercise; and a specific technical exercise that mirrors the actual performance.

Set 1: Developing Explosive Power and Lunge Speed

#	Exercise	Intensity	Reps / Distance
1	Half Squat with weights	80 %	3 reps
2	Box Jump	70 %	5 reps
3	Fast forward bounds	75 %	10 m
4	Direct fast lunge with the foil	90 %	6 lunges

Set 2: Developing Power-Speed Strength

#	Exercise	Intensity	Reps / Distance
1	Lunges with weights	80 %	4 reps
2	Jump Lunges	75 %	6 reps
3	5-m fast start	85 %	4 attempts
4	Lunge with rapid advance	90 %	5 lunges

Set 3: Developing Agility and Balance

#	Exercise	Intensity	Reps / Distance
1	Single-leg squat	75 %	4 reps
2	Lateral hurdle hops	70 %	8 reps
3	Rapid change of direction between cones	80 %	15 s
4	Lunge with change of direction	90 %	6 lunges

Set 4: Developing Response Speed

#	Exercise	Intensity	Reps / Distance
1	Push Press with weights	80 %	3 reps
2	Forward medicine-ball throw	75 %	5 reps
3	Rapid optical or audio response	85 %	6 attempts
4	Immediate lunge after signal	90 %	6 lunges

Set 5: Developing Lunge Speed and Accuracy

#	Exercise	Intensity	Reps / Distance
1	Front Squat	85 %	3 reps
2	Depth Jump	75 %	5 reps
3	Short Sprint, 10 m	85 %	3 attempts
4	Lunge to defined targets	90 %	8 lunges

PROCEDURES OF THE MAIN EXPERIMENT

PRE-TESTS

After the research sample had been identified and partitioned into experimental and control groups, the pre-tests were administered to both groups on Thursday, 18 December 2025 at 4:00 p.m. in the training hall at the Sports Talent Centre, Ministry of Youth and Sport, Baghdad. The researcher took care to fix the spatial and temporal conditions and the testing procedures for both groups so that the post-tests could be carried out under the same conditions to the greatest extent possible. The tests were administered by the assisting team under the direct supervision of the researcher.

The researcher followed the steps below:

- Fixing the testing locations and sequence by the researcher and the assisting team.
- Explaining the tests to the participants before commencing administration.
- Adhering to the scientific sequence in administering the tests so as to ensure accurate results and to control for fatigue or interference effects.

THE MAIN EXPERIMENT

The researcher commenced the main experiment on Saturday, 20 December 2025 at the Sports Talent Centre, Ministry of Youth and Sport, Baghdad. The experiment continued for eight weeks, ending on Thursday, 12 February 2026, and was implemented on the participants from both the experimental and control groups. Before applying the special exercises, the researcher administered the pre-tests to measure the variables under investigation. He then applied the special exercises based on the French Contrast Method to the members of the experimental group throughout the training period, while the control group continued to follow the customary training programme administered by the coach.

During the implementation of the experiment the researcher ensured the following:

- Fixing the measurement conditions in terms of place and time.
- Using the same tools and equipment.
- Standardising the assisting team.
- Adhering to the testing sequence.

These measures were taken to ensure the accuracy and objectivity of the results. After the end of the training programme on 12 February 2026, the researcher administered the post-tests on the same variables under conditions identical to those of the pre-tests, in order to identify the effect of the special exercises on the research variables.

The researcher distributed the training load across the 8-week programme according to the principle of ascending and descending wave-loading, in line with the nature of the specific preparation phase and with the requirements of the special strength exercises based on the French Contrast Method. The loads were distributed scientifically to bring about appropriate physiological and physical adaptation, while preserving recovery and progression. Intensity began at a moderate level in Week 1, rose progressively to a high level in Week 2, and reached a maximal level in Week 3 in order to develop strength and explosive power. Week 4 was a relative load reduction allowing neuromuscular recovery and restoration of functional efficiency. The load was then escalated again across Weeks 5 and 6, reaching its maximum once more so as to achieve further adaptations in strength and muscular power. Across Weeks 7 and 8, the load was gradually reduced so as to maintain the physical and technical level achieved and to prepare the players for the post-tests.
The intensities used ranged from (60 % – 100 %), partitioned as follows:

- Moderate load: 60 % – 75 %.
- High load: 75 % – 90 %.
- Maximum load: 90 % – 100 %.

The researcher also took into account individual differences between players and the nature of their response to the training loads, and arranged rest intervals so as to ensure the best possible training response from the sample.

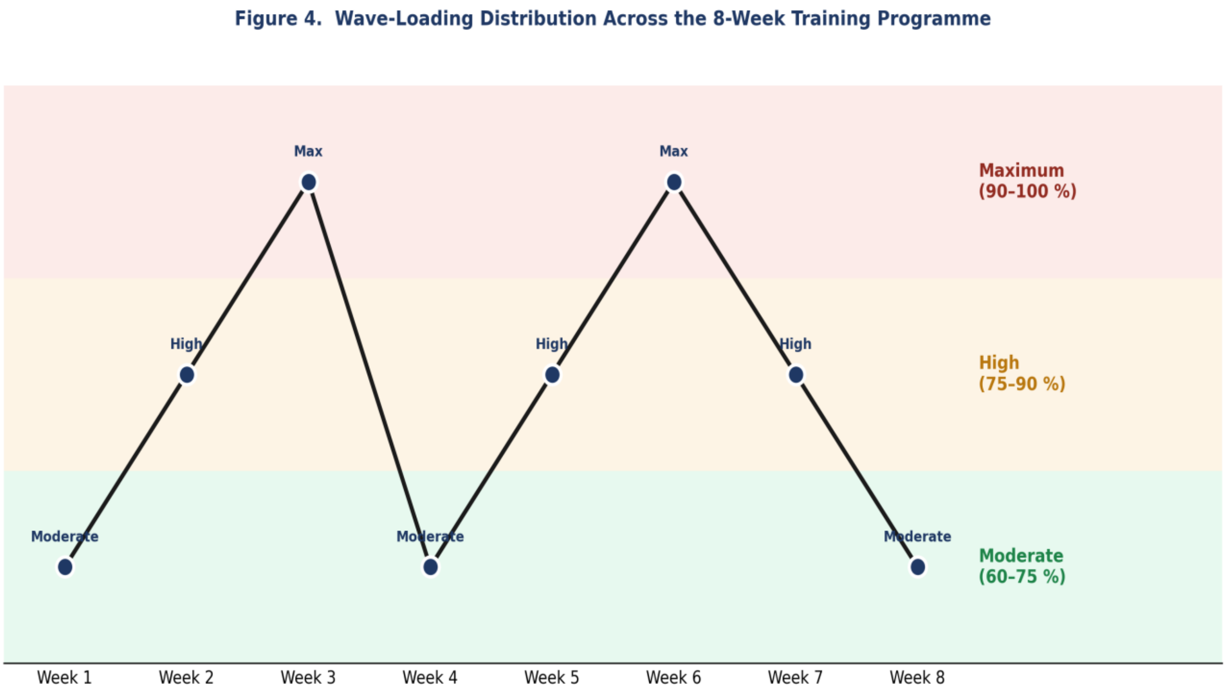

Figure 4: Wave-loading distribution of the training programme

POST-TEST

After completing the application of the proposed training programme over eight weeks, the researcher administered the post-tests on the experimental and control groups on Sunday, 15 February 2026 at 4:00 p.m., in the training hall at the Sports Talent Centre, Ministry of Youth and Sport, Baghdad. The same conditions and procedures used in the pre-tests were maintained — venue, time, tests administered, sequence, equipment, and assisting team — in order to preserve constant conditions and to prevent any factor that might confound the results of the research.

STATISTICAL METHODS

The researcher used the Statistical Package for the Social Sciences (SPSS) to analyse the data.

RESULTS: PRESENTATION, ANALYSIS, AND DISCUSSION

PRE- AND POST-TEST RESULTS FOR THE CONTROL GROUP

Table 5 presents the means, standard deviations, and t-values for the differences between the pre- and post-tests of the control group across the research variables, together with significance values and the type of significance.

Table 5: Pre- and post-test results for the control group on the research variables

Category	Variable	Unit	Control (pre)		Control (post)		t-value	Sig.	Result
			Mean	SD	Mean	SD			
Biomotor capacities	Power-speed strength	cm	113.80	1.47	155.50	1.64	2.51	0.045	Significant
	Explosive power	cm	55.30	1.75	63.83	1.72	2.43	0.048	Significant
	Agility	s	19.50	1.04	16.83	0.75	2.66	0.036	Significant
	Balance	s	35.30	1.04	39.50	1.04	2.40	0.049	Significant
Lunge speed & accuracy	Lunge accuracy	hits	4.85	1.15	6.12	1.25	2.58	0.041	Significant
	Spatial perception	hits	2.42	1.13	3.35	1.20	2.74	0.047	Significant
	Temporal perception	hits	2.00	0.75	1.85	0.97	2.38	0.050	Significant

Note. df = 6; α = 0.05.

PRE- AND POST-TEST RESULTS FOR THE EXPERIMENTAL GROUP

Table 6 presents the means, standard deviations, and t-values for the differences between the pre- and post-tests of the experimental group across the research variables.

Table 6: re- and post-test results for the experimental group on the research variables

Category	Variable	Unit	Experimental (pre)		Experimental (post)		t-value	Sig.	Result
			Mean	SD	Mean	SD			
Biomotor capacities	Power-speed strength	cm	114.80	2.31	183.60	2.06	6.84	0.001	Significant
	Explosive power	cm	55.10	1.47	88.00	0.89	5.91	0.002	Significant
	Agility	s	19.00	1.41	12.83	0.75	4.86	0.004	Significant
	Balance	s	35.83	0.75	44.50	1.04	4.55	0.003	Significant
Lunge speed & accuracy	Lunge accuracy	hits	4.42	0.97	9.00	4.60	7.11	0.000	Significant
	Spatial perception	hits	2.71	0.68	6.10	0.72	5.26	0.003	Significant
	Temporal perception	hits	2.42	0.799	4.71	0.90	4.97	0.004	Significant

Note. df = 6; α = 0.05.

DISCUSSION — PRE/POST DIFFERENCES FOR THE CONTROL AND EXPERIMENTAL GROUPS

The pre- and post-test results for the control group revealed significant differences on most of the research variables. The researcher attributes this to the regularity of the players in completing the training sessions and their adherence to the coach's customary programme; sustained, regular training elicits physical and technical adaptations that progressively improve motor and technical performance. The continued repetition of lunging, advancing, and retreating during training also contributed to a gradual improvement in the biomotor capacities and in the speed and accuracy of the lunge. As Allawi notes, sustained and well-organised training contributes to developing physical and technical capacities through the functional and neural adaptations produced by repeated practice (Allawi, 1994).

The experimental group, by contrast, showed clear significant differences in favour of the post-tests across all the research variables. The researcher attributes this to the effect of the special strength exercises based on the French Contrast Method, which integrates maximal-strength, plyometric, high-speed, and technical exercises within a single training sequence. This integration raised the efficiency of the neuromuscular system and improved the capacity to produce force within the shortest possible time. Chu has argued that plyometric and combined exercises contribute effectively to developing explosive power and power-speed and to enhancing specific sporting performance (Chu, 1996).

The researcher further considers that the exercises were similar in nature to the actual performance demands of fencing, encompassing lunges, rapid changes of direction, and quick motor responses, which facilitated the direct transfer of training effects to technical performance. This finding aligns with Cometti's observation that the French Contrast Method improves muscular power and neuromuscular coordination through the variety of training stimuli and the gradation in training intensity (Cometti, 2001).

The researcher attributes the superiority of the experimental group over the control group to the specificity of the French Contrast Method: it provided variety in motor performance and increased neuromuscular work efficiency, in addition to depending on wave-loading and progressive intensity. This combination produced superior physical and technical adaptations in the experimental group compared with the control group.

BETWEEN-GROUP DIFFERENCES ON THE POST-TESTS

Table 7 presents the post-test means, standard deviations, computed t-values, and significance values for the comparison between the experimental and control groups on the research variables.

Table 7: Between-group differences on the post-tests (experimental vs. control) for the research variables

Category	Variable	Unit	Control (post)		Experimental (post)		t-value	Sig.	Result
			Mean	SD	Mean	SD			
Biomotor capacities	Power-speed strength	cm	155.50	1.64	183.60	2.06	7.214	0.001	Significant
	Explosive power	cm	63.83	1.72	88.00	0.89	6.10	0.002	Significant
	Agility	s	16.83	0.75	12.83	0.75	5.44	0.003	Significant
	Balance	s	39.50	1.04	44.50	1.04	4.86	0.004	Significant
Lunge speed & accuracy	Lunge accuracy	hits	6.12	1.25	9.00	4.60	7.95	0.000	Significant
	Spatial perception	hits	3.35	1.20	6.10	0.72	6.337	0.002	Significant
	Temporal perception	hits	1.85	0.97	4.71	0.90	5.884	0.003	Significant

Note. df = 12; α = 0.05.

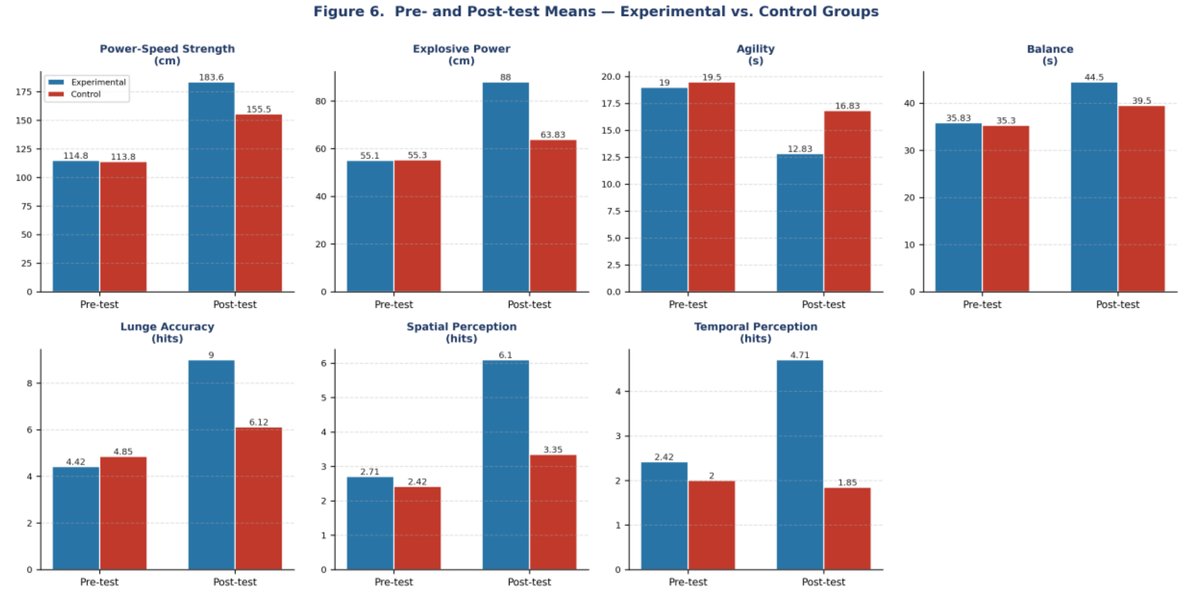

Figure 6: Pre- and post-test means for the experimental and control groups across the research variables

DISCUSSION — BETWEEN-GROUP DIFFERENCES ON THE POST-TESTS

The results for the experimental group revealed significant differences in favour of the post-tests across all the research variables. The researcher attributes this to the effectiveness of the special strength exercises based on the French Contrast Method, which contributed to developing biomotor capacities and the speed and accuracy of the lunge by combining maximal-strength, plyometric, and high-speed exercises within a single training session.

In the researcher's view, the progression of training load and the wave-loading of intensity across the training period contributed to clear neuromuscular adaptations, which were reflected positively in improvements to power-speed, explosive power, agility, and balance. As Chu notes, plyometric and combined exercises help to improve muscular power and to increase the rate of force production by enhancing neuromuscular system efficiency (Chu, 1996).

The researcher also attributes the gains in the speed and accuracy of the lunge to the nature of the exercises used, which mirrored the actual technical performance of fencing — encompassing the lunge, the advance, the retreat, and rapid changes of direction. This facilitated the direct transfer of training effects to technical performance during competition. The finding is consistent with Allawi (1994), who notes that special exercises are more effective in developing technical and physical performance the closer they are to the natural motor demands of the sporting activity.

The researcher further considers that the use of the French Contrast Method activated neuromuscular work through variety in training stimuli and through transitions between high-load strength exercises and rapid, explosive movements, which improved response speed and motor control in the fencers. Cometti has affirmed that the French Contrast Method contributes to developing explosive power, neuromuscular coordination, and motor performance in sporting activities that depend on speed and muscular explosiveness (Cometti, 2001).

The clear development in spatial and temporal perception is attributed to the nature of the technical exercises employed within the training programme, which forced the players to respond rapidly to varied motor stimuli and to determine appropriate distances and timing while executing the lunge — contributing to improvements in the motor perception associated with technical performance in fencing.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

- Special strength exercises based on the French Contrast Method contributed to developing selected biomotor capacities among under-18 foil fencers.
- The experimental group achieved superior development to the control group on power-speed, explosive power, agility, and balance.
- Exercises based on the French Contrast Method improved the speed and accuracy of the lunge among members of the experimental group.
- The special exercises — similar in nature to actual technical performance — helped to improve the spatial and temporal perception of the fencers.
- Progression of training load and wave-loading of intensity contributed to neuromuscular adaptations that were reflected positively in physical and technical performance.

RECOMMENDATIONS

- Adopt special strength exercises based on the French Contrast Method in the training of foil fencers under 18 years.
- Emphasise the use of exercises similar in nature to the technical performance of fencing when designing training programmes.
- Pay attention to developing biomotor capacities, given their importance in improving the speed and accuracy of the lunge.
- Use the French Contrast Method during specific preparation phases, given its positive effect on physical and technical performance.
- Conduct similar studies on the other fencing weapons and on different age categories.

REFERENCES

ARABIC REFERENCES (TRANSLITERATED)

1. Allawi, M. H. (1994). Sports training science. Cairo: Dar Al-Fikr Al-Arabi. [in Arabic]
2. Allawi, M. H. (2001). Sports training science. Cairo: Dar Al-Ma'arif. [in Arabic]
3. Allawi, M. H., & Rateb, O. K. (1999). Scientific research in physical education and sports psychology. Cairo: Dar Al-Fikr Al-Arabi. [in Arabic]
4. Abd Ali, B. A. (1997). Fundamental determinants in the testing of youth fencers (Doctoral dissertation, p. 194). University of Baghdad, College of Physical Education. [in Arabic]
5. Abdul-Hadi, H. M. (2007). Designing a test to measure agility in the sport of fencing. Journal of Sports Sciences, College of Physical Education, University of Diyala, 1, 121–122. [in Arabic]
6. Al-Badri, A. (2018). Modern teaching methods in physical education. Amman: Dar Al-Maseera. [in Arabic]
7. Al-Shawk, N. I. (2015). Motor learning and its applications in physical education. Baghdad: Dar Al-Kutub for Printing and Publishing. [in Arabic]
8. Bahi, H. (1999). Scientific coefficients between theory and practice (p. 23). Cairo: Book Centre for Publishing. [in Arabic]
9. Hassanin, M. S. (2004). Measurement and evaluation in physical education and sports sciences (Vol. 1, 6th ed., p. 145). Cairo: Dar Al-Fikr Al-Arabi. [in Arabic]
10. Hatem, N. (1997). A proposed training programme using variable resistances on the basis of selected biokinematic indicators and its effect on selected special physical capacities for the accuracy and speed of the lunge in fencing (Master's thesis, p. 194). University of Baghdad, College of Physical Education for Women. [in Arabic]
11. Majeed, R. K. (1995). Applications in exercise physiology and sports training. Baghdad. [in Arabic]
12. Mahjoob, W. (2002). Scientific research and its methods in physical and sport education. Baghdad: Dar Al-Kutub. [in Arabic]
13. Mohammed, B. A. (1983). A proposed programme for developing the speed and accuracy of the lunge among foil fencers (Master's thesis). University of Baghdad. [in Arabic]

ENGLISH REFERENCES

1. Behm, D. G., & Sale, D. G. (1993). Velocity specificity of resistance training. Sports Medicine, 15(6), 374–388.
2. Chu, D. (1996). Explosive power and strength. Champaign, IL: Human Kinetics.
3. Cometti, G. (2001). French Contrast Training Method. French Institute of Sport Training.
4. Davis, B., Bull, R., Roscoe, J., & Roscoe, D. (2000). Physical education and the study of sport (p. 129). UK: Harcourt Publishers Ltd.
5. NSCA Coach. (2023). The French Contrast Method: Theory and application. National Strength and Conditioning Association.