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The Effect of a Mental Training Method Combined with Technical Skill Acquisition on Improving Performance Level in the Long Jump Event for Under-16 Male Athletes Constantine Athletics League, Algeria

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Abstract
This study aimed to examine the effect of mental training combined with technical skill acquisition on improving performance levels in the long jump event. The sample consisted of 42 male athletes from the under-16 category, enrolled in the Constantine Provincial Athletics League. Participants were divided into two equal groups: a control group, which followed the traditional training method, and an experimental group, which supplemented traditional training with a mental training program accompanying technical skill instruction. The experimental method was adopted using a control-group/experimental-group design, as it was best suited to the study's objectives.
Upon completion of equivalence and pre-tests, the training program was implemented and post-tests were administered. Data were collected and statistically analyzed using the arithmetic mean, standard deviation, and the t-test for paired and independent equal samples. The researchers concluded that mental training combined with technical skill acquisition exerts a positive effect on improving performance levels in the long jump event.
Keywords: *Mental Training; Skill Performance; Direct Mental Training; Cognitive Training; Long Jump*

1. Introduction

The rapid progress achieved in reaching high-performance records at the global level in recent years is attributable to worldwide advances in training methods and approaches that elevate the physical, technical, psychological, and functional preparation of athletes. Among these developments, coaches and researchers have devoted increasing attention to mental training methods, as they constitute a vital and foundational component of sports training across all its forms—serving to prepare athletes to attain elite performance levels. Mental training helps athletes achieve correct execution by enabling them to visualize their strengths and weaknesses, thereby developing and acquiring motor skills, sharpening attentional focus on those skills, and fostering the sensation of optimal performance.

It is from this perspective that the significance of the present study emerges: the need to investigate the effect of a mental training method combined with technical skill acquisition on improving performance levels in the long jump event among under-16 male athletes of the Constantine Athletics League, with the aim of producing superior performance and better competitive results in this discipline.

The long jump is among the most important events in track and field athletics, distinguished by its aesthetic dimension and the creative, technically demanding nature of its execution. This event now imposes on athletes a set of complex movement tasks requiring substantial physical and cognitive effort. Despite the recognized importance of physical conditioning, the role of tactical and mental attributes in developing athlete performance cannot be overlooked.

A review of the scientific literature and training resources revealed that the majority of training programs designed by coaches for long jump athletes lack a mental training component. This gap has prompted coaches and athletes to seek supplementary alternatives—chief among them being mental training. The study's central research question thus becomes:

To what extent does direct mental training combined with technical skill instruction contribute to improving selected motor skills and developing the performance level in the long jump event among under-16 male athletes?

The study aims to:

- Examine the effect of a proposed mental training program combined with technical skill acquisition on developing the performance level in the long jump.
- Examine the effect of technical skill training alone (without mental training) on developing the performance level in the long jump.
- Identify the differences in performance level development between the experimental and control groups across pre- and post-test measurements.

Research Hypotheses

- Direct mental training combined with technical skill instruction exerts a positive and effective influence on developing performance levels in the long jump (experimental group).
- Technical skill training alone exerts a positive influence on developing performance levels in the long jump (control group).
- Statistically significant differences exist between the experimental and control groups in pre- and post-test performance, in favor of the experimental group.

Research Scope

- Human domain: Under-16 male athletes from the Constantine Provincial Athletics League.
- Temporal domain: 24 January 2023 to 20 May 2023.
- Spatial domain: Hamlawy Martyr Stadium (annexe pitch).

Key Definitions

Learning: Modification of behavior through experience and practice (Al-Kenani & Al-Kandari, 2004, p. 15).

Motor Learning: A set of processes associated with practice and experience that lead to stable changes in motor behavior.

Mental Training: Defined by Lars-Eric Uneståhl as a systematic, long-term training process used to develop mental skills, attitudes, and performance in pursuit of elite-level achievement. Mohammed Al-Arabi Mashaoun (2001, p. 77) defines it as the repeated visualization of a previously learned motor skill with the aim of enhancing the performance of that skill.

Skill Performance: The optimal way of executing a skill with minimum effort (Matveyev, 1976, p. 42).

Direct Mental Training: The athlete mentally performs and visualizes a skill after it has been explained and modeled by the coach or a distinguished fellow athlete.

Mental Imagery: The recall or retrieval from memory of stored objects or experiences. It is not limited to simple recall; it also generates and creates new ideas and experiences by transforming and producing new images based on prior ones (Harris et al., 1984), as cited in (Alawi, 2002, p. 424).

Relaxation: A temporary, deliberate withdrawal from activity that allows for recharging and the full recuperation of physical, mental, and emotional energies (Mashaoun, 1996, p. 164).

Motor Skills: The ability to perform a movement with accuracy, ease, control, and economy of effort (Fawzi, 1980, p. 433).

2. Research Methodology

2.1 Research Design

The experimental method is defined as the approach through which diverse conditions and variables emerging during the investigation of a given phenomenon are identified, controlled, and managed (Qandelji, 1999, p. 116). Accordingly, the experimental method was employed using a control-group and experimental-group design, as this was most appropriate to the nature of the study.

2.2 Sample

The research sample was purposively selected from under-16 male athletes affiliated with the Constantine Athletics League. The total sample comprised 42 athletes, divided into two equal groups of 21 athletes each:

- Experimental Group: Received the mental training program in conjunction with technical skill instruction.
- Control Group: Received standard technical skill training only.

Table 1: Sample Composition and Training Methods

Group	Training Method	N
Control	Technical skill training only	21
Experimental	Technical skill training + Mental training	21
Total		42

2.3 Research Instruments

The following instruments were used in the study:

- Measuring tape.
- Stopwatch and cones.
- Take-off board (tremplin).
- Long jump landing area (sautoire de saut).
- Athletics track.

2.4 Data Collection Methods

- Review of related literature, research sources, and comparable studies.
- An expert questionnaire directed to athletics and sports training specialists, used to identify the physical and technical attributes needed to establish group equivalence.
- Preparation of the experimental training program.
- Personal interviews with field coaches to assess the current use of mental training within training sessions.

2.5 Research Variables and Equivalence Tests

Following a review of scientific sources and studies, a set of variables was identified for establishing homogeneity and equivalence between the two groups. The variables controlled were: chronological age, height, body mass, and physical fitness components.

Content analysis of the sports training literature identified the following physical fitness components most influential on long jump performance, verified by expert review:

- Explosive strength of the lower limbs: measured by the standing long jump test (Hassanein & Hamdi, 1997, p. 117; Al-Hakim, 2004, p. 91).
- Transitional speed: measured by the 30-metre sprint from a standing start.
- General endurance: measured by the 1000-metre run.

2.6 Reliability and Validity of Physical Tests

Test-retest reliability was established by administering the physical and skill tests to a pilot sample of 10 athletes, then re-administering the same tests one week later. Pearson's simple correlation coefficient was used to compute reliability coefficients.

Self-validity (concurrent validity) was computed as the square root of the reliability coefficient. All results are presented in Table 2.

Table 2: Reliability and Self-Validity Coefficients of the Physical and Skill Tests

Test	n	M_1	SD_1	M_2	SD_2	Reliability (r)	Self-Validity
Standing Long Jump	10	1.645	0.146	1.643	0.154	0.882*	0.939
30m Sprint	10	5.622	0.164	5.604	0.171	0.825*	0.908
1000m Run	10	3.152	0.455	3.162	0.436	0.974*	0.987
Long Jump (performance)	10	2.503	0.151	2.644	0.143	0.964*	0.982

- *Significant at the 0.05 error level, df = 8.*

Table 2 shows that all correlation coefficients (0.882, 0.825, 0.974, 0.964) are statistically significant at the 0.05 level with df = 8, confirming the high reliability of all tests used.

2.7 Group Equivalence

Equivalence between the two groups was established on the variables of age, height, weight, and selected physical fitness attributes, as well as the long jump performance test, using the independent-samples t-test for equal groups. Results are presented in Table 3.

Table 3: Equivalence of the Experimental and Control Groups

Variable	M_1 (Ctrl)	SD_1	n	M_2 (Exp)	SD_2	n	t	p
Age (yrs)	13.333	0.464	21	13.217	0.441	21	0.423	.671
Height (m)	1.535	0.240	21	1.544	0.222	21	0.264	.620
Weight (kg)	50.522	4.476	21	51.333	3.676	21	1.361	.147
Standing Long Jump (m)	1.042	0.152	21	1.702	0.442	21	1.634	.116
30m Sprint (s)	5.624	0.167	21	5.571	0.444	21	0.021	.357
1000m Run (min)	3.414	0.354	21	3.173	0.454	21	0.325	.762
Long Jump – Pre-test (m)	2.741	0.472	21	2.705	0.404	21	0.144	.022

- *Significant at 0.05 level, df = 40; tabulated t-value = 2.270.*

All computed t-values (−0.423, 0.264, −1.361, 1.634, 0.021, 0.325, −0.144) are non-significant at the 0.05 level (df = 40), indicating the absence of significant differences between the two groups and confirming their equivalence across all selected variables.

2.8 Experimental Design

The researchers employed the randomized pre-test/post-test control-group design (Al-Zubaie & Al-Ghanam, 1981, p. 114).

3. The Mental Training Program

3.1 Program Objectives and Structure

The mental training program aimed to elevate the level of execution of the fundamental motor skills of the long jump. This was achieved by decomposing the skill into its component parts, visualizing each part separately, and finally visualizing the skill in its entirety.
Drawing on a thorough review of the relevant scientific literature (Mahjoub, 1989, pp. 117–155; Othman, 1990, pp. 202–242) and consultation with specialists in track and field and motor learning, a proposed mental training program was developed to accompany technical skill instruction in the long jump. The program was implemented over 13 weeks during the second semester of the 2022/2023 academic year (24 February to 20 May), comprising 39 instructional units per group at a rate of 3 units per week. Each unit lasted 90 minutes.

3.2 Session Structure

Session Structure for the Mental Training Program

Phase	Activity	Content	Duration
Preparatory (Warm-Up)	Administrative introduction; General warm-up; Specific warm-up	Attendance recording; Warm-up, flexibility, and stretching exercises; Sport-specific physical exercises	1' / 10' / 5'
Main Phase	Instructional activity	Skill explanation and coach-led demonstration	5'
	Mental training activity	Athlete sits then lies on the floor, arms at the sides, closes eyes, begins breathing cycle (inhale/exhale) twice; Progressive relaxation (differential relaxation); Visualization of the training venue; Visualization of the venue empty and self alone; Segmented skill visualization; Full-skill visualization repeated 5 times with 30-second rest intervals; Controlled arousal from relaxation (deep breath, foot movement, arm flexion/extension, gentle head movement, full awakening, eyes open)	2' / 10s / 10s / 10s / 7' / 30s
	Applied activity	Practical training exercises	55'
Cool-Down	Return to calm	Cool-down exercises	5'
Total			90 minutes

3.3 Program Content and Mental Training Procedure

The athlete begins mental training in a relaxed sitting position, eyes closed, free of tension. Visualization of the target performance commences by calling up a realistic image of the skill in its ideal form—uninterrupted from start to finish—while perceiving the general referential context (the nature of the venue), activating all relevant senses, and focusing on the breathing that accompanies the performance. This process culminates in complete perceptual awareness. The athlete then reviews the visualization with heightened concentration, attending to the finer details of performance, pauses briefly, then inhales and exhales slowly. The key phases of the motor skill are then isolated and rehearsed mentally, with deliberate focus on muscle contractions as though the movement were actually being executed. This process is followed by integrated mental retrieval—linking all elements in sequence and maintaining the actual temporal rhythm of execution.

Prior to commencing mental imagery training, the experimental group received two preparatory weeks (three sessions per week) using three relaxation techniques:

- Progressive (differential) relaxation: alternating contraction and relaxation (Ratib, 1995, pp. 124–125).
- Autogenic relaxation (Orlick, 1990, pp. 45–50).
- Mental relaxation (Mashaoun, 1996, pp. 95–44).

Progressive relaxation was introduced first to clarify the distinction between tension and relaxation for the experimental group members. Relaxation exercises included training in breathing, calmness, and the sensation of warmth in multiple body regions, with athletes asked to repeat the sequence five times in complete calm.

Following 10 minutes of relaxation, athletes were guided to mentally prepare for imagery and to capitalize on the visualization process. The athlete begins feeling and perceiving relaxation; he affirms to himself: 'I am well rested, my mind is clear and ready to visualize, I am full of energy and vitality.' This mental preparation process typically lasts one minute or more.

During the final five minutes of each visualization session, athletes were asked to focus on one of the fundamental technical phases of the long jump and to concentrate on the verbal/oral scripts read to them, detailing how the skill should be performed. These scripts covered:

- The coach's demonstration of the skill in technically correct form.
- Detailed descriptions of the long jump phases, fellow athletes, ambient sounds, and equipment.
- Suggestions regarding the complete performance of motor skills.

3.4 Key Implementation Guidelines

- Training environment: The setting must replicate the actual training conditions—equipment, apparatus, and surroundings—so that all dimensions of motor performance imagery can be fully activated.
- Target skill: The skill must be performed in its complete form to achieve comprehensive perceptual understanding.
- Correct performance: Focus exclusively on correct execution, to prevent the consolidation of technical errors through repeated incorrect visualization.

- Performance style: During mental practice, concentrate on the execution style and the technical aspects of the skill.
- Speed and movement rhythm: Mental training must be conducted at the same speed and rhythm as the target skill.
- Kinesthetic sensation: Mental training must engage the kinesthetic sense, as this contributes to the generation of stimuli that govern movement control.

3.5 Program Implementation Protocol

1. Both groups received the same instructional content included in the study, with the principle of equal repetitions upheld during technical skill instruction.
2. The control group received technical instruction in the long jump using the traditional method only, without mental training.
3. The experimental group received technical instruction using the traditional method supplemented by mental training. The coach explained the movement task for each unit (3–5 minutes), then provided mental training. The duration of mental training was set in accordance with studies by Morgan (1972, p. 25), which indicated that sessions should not exceed this time limit to avoid adverse effects during the control group's skill training.

The mental training methodology was based on Spilker's (1978, pp. 28–34) approach, which rests on three principal components:

- Verbal description of the full movement in conjunction with the coach.
- Observation of the movement path following the coach's demonstration, enabling complete visualization of the skill.
- Complete visualization of the movement as performed by the athlete, with focus on the sensation of movement and the kinesthetic experience of its most demanding phases (Mashaoun, 2001, p. 102).

4. Results and Discussion

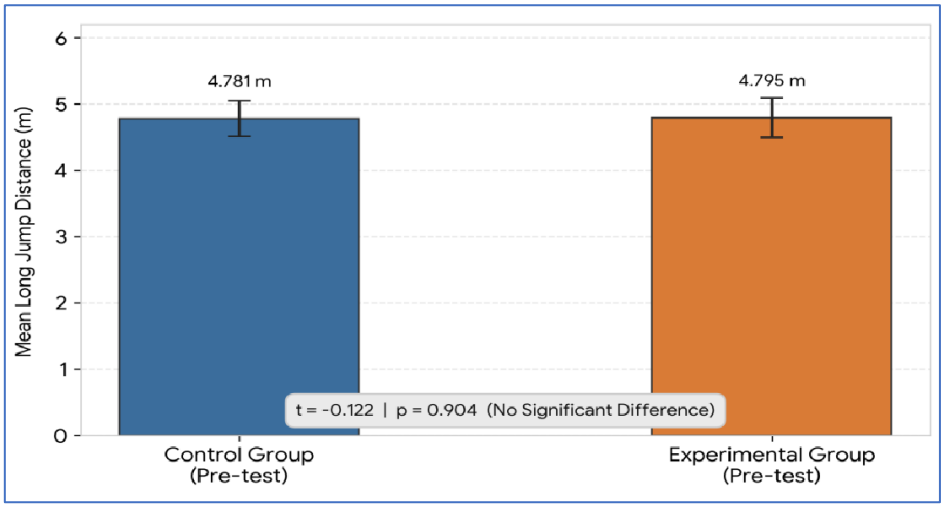
4.1 Pre-Test Comparison: Control vs. Experimental Groups

To identify differences between the two groups prior to the intervention, an independent-samples t-test was conducted for the long jump performance test. Results are presented in Table4.

Table 4: Pre-Test t-Test Results — Control vs. Experimental Group (Long Jump)

Test	M (Ctrl)	SD (Ctrl)	n	M (Exp)	SD (Exp)	n	t	p	Result
Long Jump (m)	4.781	0.270	21	4.795	0.298	21	0.122	.904	No significant difference

Table 4 shows that the probability value (p = .904) exceeds the 0.05 threshold, confirming the absence of any significant difference between the experimental and control groups on the pre-test long jump measure. Both groups were therefore equivalent at baseline.



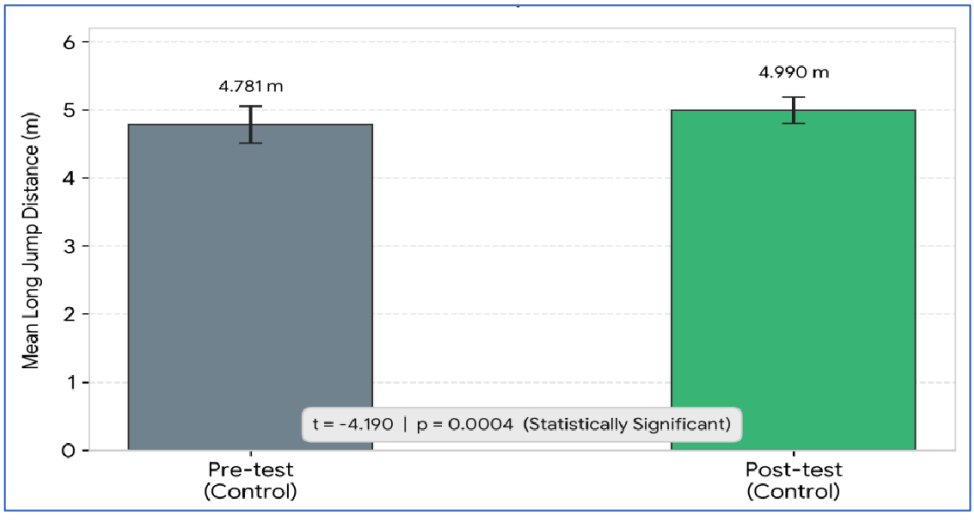
4.2 Pre-Test vs. Post-Test: Control Group

A paired-samples t-test was conducted to determine within-group change from pre- to post-test in the control group. Results are presented in Table 5.

Table 5: Pre- vs. Post-Test t-Test Results — Control Group (Long Jump)

Test	M (Pre)	SD (Pre)	n	M (Post)	SD (Post)	n	t	p	Result
Long Jump (m)	4.781	0.270	21	4.990	0.192	21	4.190	.0004	Significant difference

Table 5 shows that the probability value (p = .0004) is less than 0.05, indicating a statistically significant difference between the pre- and post-test scores in the control group's long jump performance, in favor of the post-test. Traditional skill training alone produced a meaningful—albeit more modest—improvement.



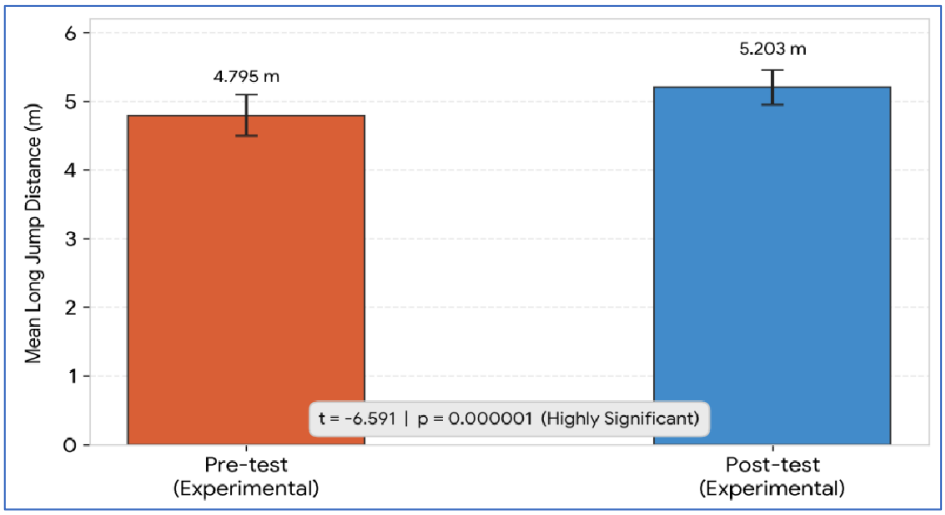
4.3 Pre-Test vs. Post-Test: Experimental Group

A paired-samples t-test was conducted to assess within-group change from pre- to post-test in the experimental group. Results are presented in Table 6.

Table 6: Pre- vs. Post-Test t-Test Results — Experimental Group (Long Jump)

Test	M (Pre)	SD (Pre)	n	M (Post)	SD (Post)	n	t	p	Result
Long Jump (m)	4.795	0.298	21	5.203	0.252	21	6.591	.000001	Significant difference

Table 6 shows that the probability value (p = .000001) is substantially less than 0.05, indicating a highly significant difference between the pre- and post-test scores of the experimental group in long jump performance, in favor of the post-test. The experimental group demonstrated a far more pronounced improvement compared to the control group.



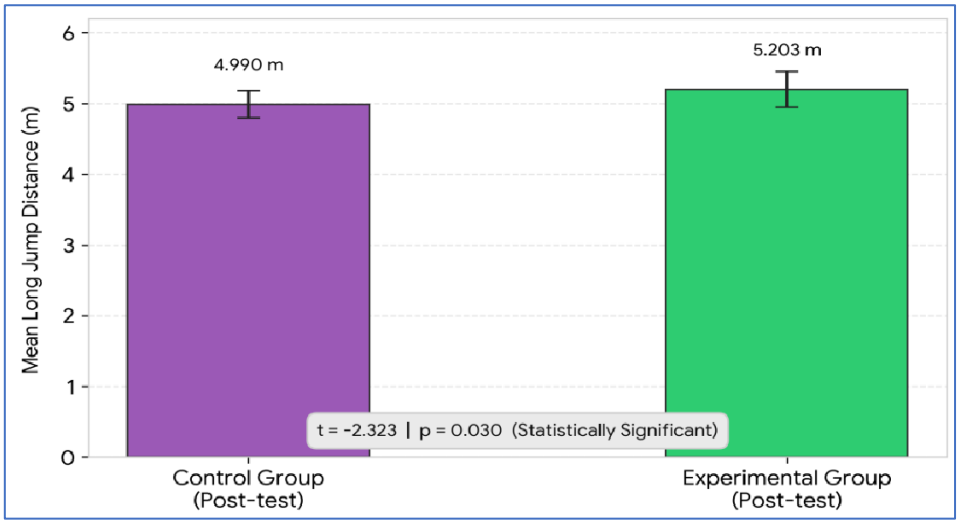
4.4 Post-Test Comparison: Control vs. Experimental Groups

An independent-samples t-test was conducted to compare the two groups' performance at post-test. Results are presented in Table 7.

Table 7: Post-Test t-Test Results — Control vs. Experimental Group (Long Jump)

Test	M (Ctrl)	SD (Ctrl)	n	M (Exp)	SD (Exp)	n	t	p	Result
Long Jump (m)	4.990	0.192	21	5.203	0.252	21	2.323	.030	Significant difference (Exp favor)

Table 7 shows that the probability value (p = .030) is less than 0.05, confirming a statistically significant difference between the two groups at post-test in favor of the experimental group (M = 5.203 m vs. M = 4.990 m for the control group).



4.5 Discussion of Results

The results presented across Tables 4 through 7 clearly demonstrate statistically significant differences between the mean scores of the control and experimental groups, consistently favoring the experimental group. These findings confirm the study's hypotheses and support the conclusion that mental training combined with technical skill instruction in the long jump develops technical movement quality, improves practical performance, reduces learning time, consolidates motor capacities, and fosters positive engagement with all demands of the educational process.

Engaging the mental dimension—specifically, thinking through the detailed components of the skill to be executed within each instructional unit—produced a notable advancement in the athletes' quantitative performance levels. This finding is consistent with Schmidt (1991, p. 5), who argued that mental practice can organize aspects related to technical performance as a cognitive dimension, and that it assists athletes in effective training and in applying diverse strategies that contribute to evaluating probable outcomes in real-time training conditions.

Morgan (1972, p. 2) similarly defines mental training as the repeated visualization of a previously learned motor skill with the aim of enhancing the learning of that skill.

The experimental group, which implemented the instructional program including all scheduled sessions alongside mental training—encompassing relaxation exercises, internal mental imagery, and focused attention to the technical steps and their demonstration—granted the athlete a visualization of the performance as though a camera mounted above their head were recording the technical steps in precise detail as they unfolded during execution. This process also enabled full recognition of all accompanying sensations, feelings, and emotional states during performance, facilitating an evaluative process that informed appropriate future responses.

The control group, which followed the traditional approach without mental training, exhibited a non-significant improvement between pre- and post-tests—a marginal gain substantially smaller than that observed in the experimental group. The researchers attribute this to the absence of mental training accompanying the technical performance, as well as the absence of deliberate cognitive engagement with the mental requirements of analyzing the active muscle groups during motor execution and identifying the critical and demanding segments of the

technical steps—factors that collectively lead to achieving the best possible performance level in the long jump.

5. Conclusions

- The proposed mental training program combined with technical skill instruction exerts a positive effect on developing performance levels in the long jump, confirming the first research hypothesis.
- The experimental group achieved a significant difference in performance level development in the long jump—between pre- and post-tests—compared to the control group, in favor of the post-test, confirming the second research hypothesis.
- The control group did not achieve significant differences between pre- and post-test performance in long jump performance level development.

Recommendations

- The researchers emphasize the importance of adopting the proposed mental training program combined with technical skill instruction as a method for developing performance levels in the long jump.
- Physical education teachers and coaches at club and national team levels are urged to incorporate direct mental training alongside technical skill instruction as a standard practice.
- Future research should conduct comparable studies across other athletic events and sports disciplines, with particular focus on track and field athletics.

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