

## The Effect of Training Exercises in Developing Explosive Strength and Some Basic Skills for Young Football Goalkeepers

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### Abstract

Scientific research in sports sciences, particularly in sports training, significantly advances athletic performance by adopting scientific methods that enhance team performance and optimize physical effort. As a game aiming to score against the opponent, football necessitates special attention to the goalkeeper. Proper training equips goalkeepers to defend the goal effectively, especially in critical scenarios like one-on-one situations, requiring mastery in narrowing the scoring angle through appropriate positioning. The goalkeeper is pivotal in the team as the last line of defense. In light of global advancements, especially in sports, various methods and approaches have emerged to develop the goalkeeper's skill-specific and physical abilities. Among these are plyometric training and weight training, which are particularly effective in enhancing explosive strength—a key requirement for goalkeepers to perform crucial movements. This research investigates the effect of plyometric training on explosive strength and the skill of catching for goalkeepers in Diyala Sports Club. The researchers identified a gap in explosive strength training for football goalkeepers due to limited knowledge of appropriate methods. Employing the experimental method, they conducted pre- and post-tests under controlled conditions, utilizing SPSS for statistical analysis. The results indicated that the training methods, especially plyometric exercises, effectively developed the explosive strength of the hands and legs and improved the catching skills of the goalkeepers.

**Keywords:** Training exercises, explosive strength, basic skills, football goalkeepers.

### 1- Introduction

This research emphasizes the significant role of scientific studies in sports sciences, particularly in the field of sports training, in advancing athletic performance. By adopting scientific methods, coaches can develop team performance and optimize physical effort. Since football aims at scoring against the opponent to achieve victory, it is essential for coaches to give special attention to

training goalkeepers effectively. This is especially crucial in critical situations like one-on-one encounters, where the goalkeeper must master narrowing the shooting angle by taking the appropriate position and distance. Being the only player allowed to use hands in addition to other body parts to avert danger from the goal, the goalkeeper is considered the most important player on the team as he protects the primary target of the opponents.

In light of global developments, especially in sports, various methods and approaches have emerged to develop goalkeepers' abilities—both skill-specific to the sport practiced and physical attributes like strength, speed, power characterized by speed, and endurance. Football requires specific skills and physical attributes, with explosive strength being one of the most important requirements upon which the goalkeeper directly relies in performing most of his movements. Muscle strength, particularly in the legs, arms, shoulders, and torso, is crucial for goalkeepers not just to perform skills but to execute them effectively.<sup>1</sup>

There are numerous training methods and theories that coaches can utilize to create effective training programs aimed at improving performance. Weight training and plyometric exercises are among the most commonly used methods for developing explosive power. Catching is a fundamental skill in football that requires special strength for successful execution and is vital in achieving key plays and victories. While many studies have been conducted on football goalkeepers across various fields of sports sciences, this research takes a new direction by focusing on determining the appropriate distances for the goalkeeper's positioning to narrow the shooting angle from different areas. According to the researchers' knowledge, this is the first study of its kind in the country.<sup>2</sup>

The researchers hope this study serves as a practical guide for coaches, academics, and goalkeepers by adopting scientific principles and appropriate distances for the goalkeeper's advancement toward the ball, thereby avoiding improvisation and unproductive training time. The importance of this research lies in using exercises with different training methods to develop the performance level of goalkeepers at Diyala Sports Club in football. The research problem arises from the researchers' observation, as specialists in the game, of a weakness in the training of explosive strength aspects for goalkeepers. This weakness is due to a lack of familiarity with appropriate training methods to develop the goalkeepers' level, especially concerning the strength aspects of

the muscles of the hands and legs. Even when exercises are included in training curricula, the optimal training method or approach to develop this attribute may not be known. Therefore, the researchers decided to address this problem by examining the impact of the training methods used in this study and their effect on developing the catching skills of young football goalkeepers.<sup>3</sup>

The research aims to identify the effect of methods for developing aspects of explosive strength on the catching skill of goalkeepers. The research hypotheses include:

- There are significant differences between the pre-and post-tests in favor of the post-tests for both the control and experimental groups in developing aspects of explosive strength of the muscles involved in the catching skill.
- There are significant differences in the post-tests between the control and experimental groups in favor of the experimental group concerning the tests under study.

## **2- Research Methodology and Field Procedures:**

### **2.1 Research Methodology:**

The experimental method is one of the most widely used methodologies in sports research. It is based on direct and practical interaction with various phenomena and relies on two fundamental pillars: observation and experimentation in its various forms. As stated by Abdel-Moti Mohamed Assaf (2002), the choice of methodology depends on the nature of the problem being addressed. For this study, the researchers employed the experimental method, using a design that included both an experimental group and a control group.

### **2.2 Research Population**

The research population consisted of goalkeepers from Diyala Sports Club. The researchers deliberately selected 10 goalkeepers and divided them randomly into two groups: an experimental group and a control group, each comprising five goalkeepers. The researchers established homogeneity and equivalence between the two groups.

**Table (1): Homogeneity and Equivalence of the Groups in Research Variables**

Test	Control Group (Mean ± SD)	Experimental Group (Mean ± SD)	T-Test Value
Age (years)	14.3 ± 0.65	20.3 ± 0.34	0.40
Weight (kg)	64.32 ± 2.17	72.32 ± 2.85	0.63
Height (cm)	187.5 ± 3.55	186.6 ± 3.54	0.36
Arm explosive strength	61 ± 2.22	62 ± 2.26	0.70
Leg explosive strength	262.2 ± 1.23	270.1 ± 1.24	0.13
Catching skill	2.14 ± 0.36	2.4 ± 0.44	0.49

The tabular T-value at a degree of freedom (10) and a significance level of (0.05) is 2.23.

### 2.3 Tools and Instruments:

The tools and instruments used in the research to gather data included:

- **Sources:** Arabic and foreign books, studies, research, journals, and the internet.
- **Tests and measurements:** Observation, experimentation, and personal interviews.
- **Materials and devices used:**<sup>4</sup>
  - Stopwatches (2 units).
  - Metal measuring tape.
  - Adhesive tape and chalk for marking.
  - Medicine balls (6 units of various weights: 1 kg, 2 kg, 3 kg, 4 kg).
  - Special fencing tools for testing.
  - Wooden jump boxes of different heights:
    - Three boxes of 35 cm.
    - Three boxes of 45 cm.
    - Two boxes of 50 cm.
  - A special chair for throwing the medicine ball.

### 2.4 Pilot Study:

The pilot study was conducted on Monday, August 5, 2023, using a sample of three goalkeepers from Shahrban Sports Club, outside the main research sample. The objectives of the pilot study were to:

- Assess the appropriateness of the tests for the sample's level and their understanding of the tests.
- Ensure the suitability of the time and location for conducting the tests.
- Identify and rectify any errors that might occur during the tests.
- Determine the time required to perform the tests.
- Identify potential challenges and difficulties faced during the testing process.
- Evaluate the adequacy and understanding of the assisting team.
- Organize and sequence the performance of tests and measurements.

### **2.5 Pre-tests:**

The pre-tests for the research variables were conducted on Monday, August 12, 2023, with the main research sample under standardized conditions.

### **2.6 Main Experiment:**

The researchers designed the training exercises based on scientific principles and incorporated them into the training regimen of the team coach. Plyometric and interval training methods were applied, with intensity ranging between 65-75%, repetitions of 8-10, and sets ranging from 3-4. Rest periods were determined using heart rate monitoring, with rest between exercises lasting 1-1.5 minutes and 2 minutes between sets. Two training sessions were conducted weekly, on Sundays and Wednesdays, to allow adequate recovery time, as high-intensity anaerobic training requires 48-72 hours for functional recovery and to reach super-compensation.<sup>5</sup>

The training program lasted three months (12 weeks) and included 24 training sessions, each lasting 120 minutes. It began on Wednesday, August 14, 2023, and concluded on Wednesday, November 6, 2023.

### **2.7 Post-tests:**

The post-tests were conducted on Monday, November 11, 2023, under the same conditions as the pre-tests.

### **2.8 Statistical Analysis:**

The researchers used the SPSS statistical package to process the data and extract the results.

### 3-Results

- **Presentation and Discussion of Results:**

#### 3.1 Presentation and Discussion of Pre- and Post-Test Results for the Control and Experimental Groups in Research Variables:

**Table (2): Results of Pre- and Post-Tests for the Control and Experimental Groups in Research Variables**

Test	Control Group Pre-Test (Mean)	Control Group Post-Test (Mean)	Standard Error	T-Test Value	Experimental Group Pre-Test (Mean)	Experimental Group Post-Test (Mean)	Standard Error	T-Test Value
Arm explosive strength	61	71	2.4	4.33	62	76	3.5	4.12
Leg explosive strength	261.2	269.5	3.02	3.09	261.1	272.2	3.6	3.18
Catching skill	2.14	3.47	0.19	7	2.3	7	0.23	17.28

The data in Table (2) show that both the control and experimental groups exhibited improvements across all research variables, as indicated by significant differences between the calculated T-values and the tabular T-value at a degree of freedom (5) and a significance level of (0.05). This indicates the presence of significant differences in favor of the post-tests, suggesting that the exercises used helped develop arm and leg explosive strength as well as catching skills for football goalkeepers.<sup>6</sup>

The researchers attribute the improvements in both groups to regular and continuous training, which is essential for enhancing both physical and technical attributes, as supported by the principles of sports training science. Moreover, the significant improvements in the experimental group are attributed to the specific training methods used, including plyometric exercises, which were scientifically designed to achieve training objectives.<sup>7</sup> Unlike traditional methods, plyometric training systematically develops the explosive strength of the arms and legs, as confirmed by sports scientists like Mohamed Hassan Allawi (1998). Additionally, Mohamed Osman (1990)

emphasized that developing strength requires consistent training with weights and bodyweight exercises.

The improvements in catching skills in the experimental group were directly linked to the development of explosive strength in the arms and legs, as goalkeepers cannot master essential skills without possessing the necessary physical attributes. This relationship highlights the interconnectedness between technical skill levels and specific physical requirements in each sport.<sup>8</sup>

### 3.2 Presentation and Discussion of Post-Test Results Between the Control and Experimental Groups in Research Variables:

**Table (3): Post-Test Results Between the Control and Experimental Groups in Research Variables**

<b>Test</b>	<b>Control Group (Mean ± SD)</b>	<b>Experimental Group (Mean ± SD)</b>	<b>T-Test Value</b>
<b>Arm explosive strength</b>	71 ± 1.5	76 ± 1.4	5.86
<b>Leg explosive strength</b>	269.6 ± 0.5	272.3 ± 0.33	8.68
<b>Catching skill</b>	3.47 ± 0.65	7 ± 0.67	10.59

The data in Table (3) revealed that the experimental group outperformed the control group in all research variables. This is evident from the significant differences in the post-test results, favoring the experimental group. The researchers attribute this to the plyometric training program, which included exercises using body weight and varied loads.<sup>9</sup> These exercises targeted the key muscle groups required for football goalkeeping, resulting in improved catching skills.<sup>10</sup> It is well-established that each sport relies on specific muscle groups, and football goalkeepers, in particular, require strong arm and leg muscles. Systematic repetition of exercises and gradual increases in intensity have proven effective in developing these attributes.<sup>11</sup> As noted by Qasim Hassan and Mansour Jamil (1988), plyometric training has shown success in enhancing explosive strength through repeated physical exercises during training sessions. The researchers also highlight the positive effect of the experimental training program on the development of catching skills, emphasizing that the exercises were carefully designed based on scientific principles. Time was specifically allocated to focus on catching as a standalone skill, which, combined with consistent

training, led to significant improvements in this critical ability. Additionally, feedback from experts and a well-organized training environment contributed to achieving these results.<sup>12</sup>

The findings align with the principles of football training, which emphasize planning, organization, and continuity to ensure positive impacts on player performance.<sup>13</sup> This includes the gradual increase in training intensity and proper timing of exercise repetition.<sup>14,15</sup>

### **Conclusion:**

The results indicate that the training exercises, particularly those using the plyometric method, significantly contributed to developing the explosive strength of the arm and leg muscles, which directly impacted the improvement of catching skills for football goalkeepers. Additionally, the use of weighted exercises proved more effective than traditional methods used with the control group in enhancing explosive strength and catching skills.

### **5- Recommendations:**

1. Adopting plyometric training with carefully calibrated weights to develop the explosive strength of the arm and leg muscles, as well as improving catching skills for goalkeepers.
2. Focusing on the development of arm and leg explosive strength, given its substantial effect on enhancing catching skills.
3. Emphasizing scientifically designed and structured training programs tailored to the specific requirements of football goalkeepers for optimal performance improvement.

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