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### **RESEARCH ARTICLE**

# The Effect of Compression Training with Distance Variation on the Development of Certain Types of Speed and Offensive Skills in Young Handball Players

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#### Abstract

The significance of this research lies in the use of pressure training exercises with varying distances to enhance certain types of speed and offensive skills in handball. Regarding the research problem: Based on the researcher's modest experience, his follow-up of the club's handball team, and his attendance at the team's matches, he observed that the players' speed does not meet the required level. This allows opposing players to quickly return and thwart attacks, which leads to a decline in progress and success, and subsequently, a lower goal-scoring rate. This observation prompted the researcher to investigate this issue in depth in order to address it. The solution involved employing pressure training through the manipulation of exercise intensity, controlling and varying distances, and changing directions during exercises to mimic real gameplay. The aim was to elevate the level of speed and offensive skills in handball as a significant step toward advancing the game by providing practical and effective solutions. If any part of the translation appears unclear or inaccurate compared to the original text, feel free to share which part needs refinement for further improvement. The objectives of the research were to prepare compression training exercises by changing the distance to develop certain types of speed and offensive skills in handball, as well as to assess the effect of these exercises and identify the differences between the pre- and post-tests of the experimental and control groups. The final goal was to identify the differences between the post-tests of the experimental group. The experimental method with both experimental and control groups was used due to its suitability for the nature of the problem and to find appropriate solutions. The research sample consisted of youth players from Diyala Sports Club in handball. The main conclusions were that the exercises used in compression training had a positive effect on developing certain types of speed and offensive skills in handball. Additionally, the compression training method, which involved changing the distance, helped to increase motivation among the players. The most important recommendations were to adopt compression training exercises by changing the distance within training units for coaches, as these exercises successfully achieved their training goals by developing certain types of speed and offensive skills among young handball players. Additionally, the study recommended applying these exercises to other variables and samples and further developing them. and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education)

Keywords: Compression training, Speed, Offensive skills, Handball

#### 1. Introduction

S tudies and proper planning in the field of sports have become crucial for building athletes and enabling them to perform their sports tasks during training and competition, as well as achieving sporting accomplishments. Based on this foundation, exercises, methods, and training techniques are developed and selected in a scientifically researched and planned manner, tailored to the specifics and requirements of the sport, with the aim of achieving desired results and attaining peak performance. Handball is

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a team sport with unique training requirements, as it demands various physical attributes, particularly speed, which is a critical element due to the small size of the playing field and the rapid movements required by players. These movements include advancing to the opponent's area to score or retreating to defend the goal. Such physical demands, including speed, serve as decisive factors in achieving success. In a study conducted by Sarayia Jamal (2015) he states, "We will focus our attention on developing speed in the sport of handball, particularly the speed required for executing tactical and technical movements, as it is the primary objective in preparing athletes for competition" [7, p. 137].

On this basis, and after studying the problem, the researcher decided to use stress training in a high-intensity interval training method that controls directions and distance. This method is characterized by focusing on intense exercises over a short period and reducing rest periods between exercises, while taking into account the gradual increase in the difficulty of exercises. This approach aims to avoid injuries, enhance muscle stimulation, diversify exercises, and economize time. One of the benefits of stress training is improving muscular strength and endurance, increasing metabolism, and enhancing cardiac and respiratory efficiency to develop speed and offensive skills in handball.

According to Al-Fatih and Al-Sayed (2002), "This type of training is of great importance in improving physical variables such as endurance and speed, particularly performance speed. The player performs the skill at maximum speed within a specific time, and this process is controlled either through changes in direction or distance" [13, p. 86].

Additionally, Al-Bahadli (2024) notes, "The pressure training method is of great importance in training basic skills and game strategies, resembling situations in matches where direct pressure is applied to the opponent in tight spaces. In this type of training, the player performs skills with high precision, maximum strength, and speed within a specified time" [4, p. 25].

According to the above, the importance of selecting an appropriate training method and its role in the success of the training process becomes evident. As Abdullah (2003) explains, "It is the organized, applied procedure for the selected exercises within the training unit, executed in light of specific values for the training load used" [12, p. 58].

Hence, the importance of this research lies in improving the speed of handball players and developing offensive skills using the stress training method in a high-intensity interval training style tailored to the demands of this sport and its physical requirements. As for the research problem: Speed is considered one of the essential physical abilities for handball players, enabling them to perform the required skills and meet the game's demands. Each sport has its specific physical requirements and training methods, and employing the correct techniques and approaches will help enhance physical and skill levels to their maximum potential. Through the researcher's modest experience, observations of the club's handball team, and attendance at their matches, he noticed that the players' speed was not at the desired level. This deficiency allowed opposing team players to return quickly and thwart offensive plays, leading to a decline in progress, success, and goal-scoring rates.

After reviewing relevant literature and previous research to explore new training methods that could improve players' speed and offensive skills, and after consulting with the team coach to identify the problem, the researcher initiated an in-depth investigation of this issue. The proposed solution involved implementing pressure training exercises that incorporate variations in distance and direction, with controlled adjustments, to enhance players' speed and offensive skills in handball. This represents an important step in addressing the problem and providing valuable contributions to the sport.

#### The objectives of the research were as follows

- Designing compression training exercises with variations in distance to develop specific types of speed and offensive skills among young handball players.
- Investigating the impact of compression training exercises, incorporating distance variations, on the development of speed and offensive skills among young handball players.
- 3. Examining the differences between the pre- and post-test results for the control and experimental groups in developing speed and offensive skills among young handball players.
- Assessing the differences in post-test results between the control and experimental groups in the development of speed and offensive skills among young handball players.

#### The research hypotheses were as follows

- There are significant differences between the results of the pre- and post-tests for the control and experimental groups, in favour of the post-tests, in developing certain types of speed and offensive skills among young handball players.
- 2. There are significant differences between the control and experimental groups in the post-test results, in favour of the experimental group, in

No.	Variables	Arithmetic mean	Standard deviation	Coefficient of variation
1	Weight/kg	72.41	1.045	1.443
2	Height/cm	171.56	2.547	1.484
3	Training age/year	5.474	0.356	6.503
4	Biological age/year	16.54	0.535	3.234

Table 1. Illustrates the homogeneity of the sample in the morphological variables of the research.

developing certain types of speed and offensive skills among young handball players.

#### **Research domains**

- Human Domain: Youth handball players of the Diyala Sports Club.
- **Spatial Domain**: The indoor hall of the Diyala Sports Club.
- **Temporal Domain**: From July 4, 2024, to September 3, 2024.

#### 2. Methodology and procedures

The researcher used the experimental method with a design of equivalent groups (control and experimental) to address the research problem and achieve its objectives.

#### 2.1. Research community and sample

To define the research problem, the research community consisted of 22 handball players from the youth category of the Diyala Sports Club, selected intentionally. After excluding the two goalkeepers, a sample of 20 players was selected, representing 90.90% of the original community. The sample was divided into two groups randomly (control and experimental), with each group comprising 10 players. The two samples were made homogeneous within each group. Subsequently, the researcher homogenized the sample within each group using the coefficient of variation, which showed that all research variables were less than (25%), indicating the equivalence of the two groups, as shown in Tables 1 and 2.

From Table 1, it is evident that the coefficient of variation values were less than 30% and approached

1%, indicating that the sample is homogeneous within each group.

Table 2 illustrates the equivalence of the control and experimental groups in the research variables, as well as the values of arithmetic means, standard deviations, T-value, and significance level. This enables the researcher to confirm a shared starting point for both groups and to attribute any observed results to the experimental factor.

#### 2.2. Data collection methods

- Sources and references.
- Tests.
- 2.3. Tools and equipment used in the research
  - Standard handball court.
  - Ten handballs.
  - Medical scale.
  - 10-meter measuring tape.
  - Elastic rope.
  - Divided handball goal.
  - Whistle.

#### 2.4. Field research procedures

#### 2.4.1. Defining research variables

The researcher identified the research variables relevant to the problem, as approved in the sources and references. These variables consisted of:

- 1. Transitional speed.
- 2. Reaction speed.
- 3. Speed endurance.
- 4. Offensive handball skills (shooting accuracy, passing, and dribbling).
- 2.5. Used tests

Running Test (30m) with a Flying Start (Al-Hakim, 2004) [9, p. 113]

 Test Name: Measurement of Maximum Translational Speed

Table 2. Illustrates the equivalence between the control and experimental groups in the tests used.

	Control group		Experimental group		Calculated	Significance	
Tests and measurements		SD	AM	SD	t-value	level	
Transitional speed/sec	8.475	0.452	8.542	0.568	0.278	Not significant	
Response speed/sec	7.124	0.532	7.367	0.617	0.896	Not Significant	
Speed endurance/sec	45.54	0.925	45.63	0.898	0.209	Not significant	
Shooting accuracy/count	20.45	0.561	20.74	0.755	0.926	Not significant	
Passing and receiving from a distance of (3) meters/count	18.452	0.745	18.611	0.967	0.391	Not significant	
Dribbling around a rectangular court/sec	11.457	0.637	11.574	0.745	0.326	Not significant	

The tabulated T-value at a degree of freedom (18) and a significance level of (0.05) is 1.734.

- Equipment Used for the Test: Handball court, a designated distance of 50m with a width of 5m, a timekeeper, a stopwatch, and a whistle.
- Test Procedure:

The tester begins in a ready position at the first line. Upon hearing the whistle signal, the tester starts running, progressively increasing their speed until reaching maximum velocity at the second start line, located 20 meters from the first line. A line observer is stationed at each starting line. The second line observer raises their hand, and once the tester crosses the second start line, the observer quickly lowers their hand, signalling the timekeeper to start the stopwatch. When the tester crosses the finish line, the timekeeper stops the stopwatch and records the elapsed time.

• **Scoring:** The best time taken to cover the distance is recorded to the nearest 1/100th of a second.

# Nelson Motor Response Test (Majeed R. K. [6, p. 103])

**Purpose of the Test:** To measure the ability to respond and react at the moment of initiation.

**Tools Used:** An open area 20 meters long and 2 meters wide, a measuring tape, and a stopwatch.

#### 2.6. Performance method

The tester stands at one end of the centre line, facing the referee, who is positioned at the other end of the line. The referee holds a stopwatch in one hand and raises it. The referee then quickly moves their arm either to the left or right while simultaneously starting the stopwatch. At that moment, the tester runs at maximum speed toward the sideline indicated by the referee. Upon reaching the line, the tester stops the stopwatch, as illustrated in Figure (1).

**Scoring:** The player's best attempt out of three trials for each side (right and left) is recorded.

#### Speed Endurance Test (Faris Sami Yousef & Laith Mohammed Abdul Razzaq, 2016) [10, p. 413]

- Test Name: Speed Endurance with Three Markers.
- **Purpose of the Test:** To measure speed endurance time (in seconds and fractions).
- **Tools Used:** Three markers, a handball court, a whistle, and an electronic stopwatch.
- **Performance Description:** The player starts at the designated starting point, located at the middle of the baseline in the shooting area on the right side. Upon hearing the whistle, the player runs to marker (1), positioned at the centre of the three-point line, circles around it, and returns to the starting point. This sequence is repeated four times.

Next, the player proceeds to marker (2), positioned at the centre of the court, circles around it three times, and then returns to the starting point.

Finally, the player runs to marker (3), located at the centre of the three-point line on the opposite side of the court, circles around it, and returns to the starting point. This sequence is repeated two times before returning to the starting point.

#### • Test Conditions:

- The test must be performed quickly.
- Each player is allowed two attempts.
- Test Management:
  - **Timer:** Signals the start and end of the test using a whistle to calculate the time.
  - **Recorder:** Calls out the players' names, observes, and records the test times.
  - Score Calculation: The best time recorded from the two attempts is considered the player's score, based on the starting and ending whistle signals.

# 3. Offensive skills tests (Diyaa Qasim Al-Khayyat, 1995) [8, p. 63]

#### 3.1. Shooting accuracy test

**Purpose of the test:** To measure shooting accuracy in handball.

**Performance method:** A handball goal is drawn on a front wall, consisting of two posts and a crossbar measuring  $(2 \times 3)$  meters, such that the posts are in contact with the line where the wall and the playing field meet. The goal is divided into nine rectangles, and a line is drawn on the ground 9 meters away from the goal to measure shooting accuracy.

The player shoots from behind the line using a pivot step. Scoring depends on the specific rectangle hit by the ball. If the ball hits rectangles 1, 3, 7, or 9, which represent the four corners of the goal and measure  $60 \times 100$  cm, the player receives the maximum score of four points. If the ball hits rectangles 2 or 8, representing the area above the goalkeeper's head and between their feet, also measuring  $60 \times 100$  cm, the player receives three points. If the ball hits rectangles 4 or 6, which correspond to the area covered by the goalkeeper's arms and measure  $80 \times 100$  cm, the player earns two points. If the ball hits the central rectangle, representing the goalkeeper's chest and torso area with dimensions of  $80 \times 100$  cm, the player receives one point. If the ball misses the goal entirely, the player scores zero points. Each player is given ten attempts to perform the test.

Handling and Receiving from a Distance of (3) Meters: (Kamal Abdul Hamid & Mohammed Subhi Hassanein, 1980) [15, p. 214] **Objective of the Test:** To measure coordination and handling speed against a wall.

**Tools Used:** A handball, stopwatch, recording sheet for tallying the number of ball receptions, and a flat wall.

**Performance:** The tester stands 3 meters away from the wall and passes the ball to the wall, continuing to do so as many times as possible within a specified time of 30 seconds.

**Scoring:** The number of successful passes is counted within the specified time, with only the passes where the ball is received without falling to the ground being included.

Motor Speed Test for Dribbling the Ball with the Dominant Hand: (Louay Ghanem Al-Sumaidaie, 2010) [14, p. 419]

**Objective of the Test:** To measure the speed of dribbling the ball with the dominant hand.

**Tools Used:** A 30-meter track for the test's start and end points, a stopwatch, and a handball.

**Performance Description:** The player stands behind the start line holding the ball. Upon hearing the start signal, the player runs in a straight line while dribbling the ball with the dominant hand until reaching the endpoint.

**Guidance and Recording:** The time taken by the player is recorded, with the best time from two attempts being considered. A rest interval of 10 minutes must be provided between the two attempts.

#### 3.2. Pilot study

The researcher conducted a pilot study on 4/7/2024 with some members of the experimental sample to determine the suitability of applying compression training and how to control it, in addition to identifying the difficulties faced by the researcher during the tests and exercises applied.

#### 3.3. Main experiment

**Pre-tests:** Pre-tests were conducted on the experimental and control research samples for some types of speed under investigation and offensive skills, with the help of the research team, on Tuesday, 7/9/2024, at exactly five o'clock in the afternoon. An appropriate warm-up was performed before starting the tests to prevent injuries, as well as to familiarize the players with the nature of the tests used.

#### 3.4. Applicable training

After preparing the required exercises and the necessary tools, compression training exercises were implemented based on distance variation. These exercises were applied over two months, with a frequency of three weekly units, totalling 24 training sessions. During the special preparation period, the intensity ranged between 85–100%, while the volume depended on the distance, time, and repetitions used during the exercises. For rest, the pulse rate was adopted as an indicator of recovery (120–130 bpm between repetitions and 110-120 bpm between sets). The exercises were conducted in the main part of the training units under the supervision of the coach. The implementation of compression training exercises began on Wednesday, 7/10/2024, and concluded on Wednesday, 9/11/2024.

#### 3.5. Post-tests

After completing the exercises on the research sample, the researcher, with the help of the same assistant work team, conducted the post-tests on Thursday, September 12, 2024, at exactly 4:30 PM. The researcher ensured the same conditions were provided and maintained to prevent the occurrence of extraneous variables. The tests were conducted in the same sequence as followed in the pre-tests.

#### 3.6. Statistical methods

The SPSS software was used to process the data:

- Arithmetic means
- Standard deviations
- Coefficient of variation
- T-test for paired samples
- T-test for independent samples

#### 4. Results

After presenting Tables 3 and 4 above, which pertain to the tests measuring various types of speed and offensive skills, it became evident that there were significant differences between the pre- and post-tests of the experimental group, with the posttest results showing improvement. The researcher attributes this to the characteristics of compression training, including the variety of exercises, high intensity, acceleration of performance, and repetition. This aligns with fundamental principles in sports training science, which suggest that consistent training enhances both physical and skill levels. This notion is supported by Ibrahim and Al-Yasiri (2010), who stated: "The objective of the sports training process is to enable an athlete to reach the highest level of sports achievement in the specific event or activity in which they specialize" [11, p. 22].

Furthermore, employing any specific training method and effectively implementing its objectives will contribute to achieving the desired performance

	Pre-test		Post-test		Standard	Calculated	Significance
Tests		SD	AM	SD	error	t-value	level
Transitional speed/sec	8.475	0.452	7.012	0.896	0.567	2.58	Significant
Reaction speed/sec	7.124	0.532	6.078	0.864	0.452	2.314	Significant
Speed endurance/sec	45.54	0.925	43.87	1.023	0.631	2.646	Significant
Shooting accuracy/count	20.45	0.561	22.57	0.768	0.554	3.826	Significant
Passing and receiving from a distance of 3m/count	18.452	0.745	20.45	0.669	0.761	2.625	Significant
Dribbling around a rectangular court/sec		0.637	9.769	0.743	0.861	1.96	Significant

Table 3. Presents the values of arithmetic means, standard deviations, error percentage, and the calculated T-value for the control group in the pre- and post-tests used for the specified variables.

The tabulated t-value at a degree of freedom (9) and a significance level of (0.05) = 1.833.

Table 4. Shows the pre-test and post-test t-values for the experimental group in the tests used.

	Pre-test		Post-test		Standard	Calculated	Significance
Tests		SD	AM	SD	error	t-value	level
Transitional speed/sec	8.542	0.568	5.745	0.784	0.966	2.895	Significant
Reaction speed/sec		0.617	4.452	0.634	0.889	3.278	Significant
Speed endurance/sec		0.898	42.515	0.996	1.042	2.989	Significant
Shooting accuracy/Count	20.74	0.755	24.784	0.879	1.221	3.312	Significant
Passing and receiving from a distance of 3m/Count	18.611	0.967	22.654	0.695	1.114	3.629	Significant
Dribbling around a rectangular court/sec		0.745	7.563	0.764	1.113	3.603	Significant

The tabulated t-value at a degree of freedom (9) and a significance level (0.05) = 1.833.

level. Al-Ali and Shaghati (2010) define a training method as "a structured plan that outlines the selection and organization of training content, in addition to designing and structuring the training format according to the predetermined goal or intended outcome" [5, p. 19].

Similarly, Al-Basati (1998) states that "sports training, in all its forms, aims to enhance an individual's physical, psychological, and cognitive abilities through structured engagement in the activity" [3, p. 50].

To compare the training method used (compression training) with the coach's conventional method in developing certain types of speed and offensive skills in handball, Table 5 indicates that the arithmetic mean values of the post-test for the experimental group in the studied variables were superior to those of the control group. This superiority is attributed by the researcher to the scientific application of compression training, which adhered to proper principles while eliminating extraneous variables that could influence the research results.

In this context, Abdul-Aleem (2004) states that "compression training relies on intensifying training loads and significantly increasing training intensity over a short period, which enables athletes to reach peak performance in the shortest possible time" [2, p. 37].

As for the variables developed in this training, they include certain types of speed and offensive skills in handball, given their significance in the game. This is confirmed by Singer (1990), who stated that "skill is not achieved except in the presence of special physical abilities" [16, p. 221].

Fattah and El-Din (1993) assert that "during speed training, the player must perform the exercises with maximum effort, and decision-making speed must be developed, as it transforms into a motor response. Therefore, speed exercises and training must be performed using balls. A scientifically sound methodology must be followed in speed training, aimed at enhancing the player's ability to perceive, focus, and anticipate various game stimuli and situations, as well as improving the

Table 5. Presents the post-test (t) values for the control and experimental groups in the applied tests.

Tests		Control group		nental group	Calculated	Significance
		SD	AM	SD	t-value	level
Translational speed/seconds	7.012	0.896	5.745	0.784	3.199	Significant
Reaction speed/seconds	6.078	0.864	4.452	0.634	4.541	Significant
Speed endurance/seconds	43.87	1.023	42.515	0.996	2.852	Significant
Shooting accuracy/count	22.57	0.768	24.784	0.879	5.691	Significant
Passing and receiving from a distance of (3) meters/count	20.45	0.669	22.654	0.695	6.866	Significant
Dribbling around a rectangular court/seconds	9.769	0.743	7.563	0.764	6.214	Significant

The Tabulated T-value at a degree of freedom (18) and a significance level of (0.05) = 1.734.

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speed of decision-making based on the opponent's movements, reactions, and responses" [1, p. 330].

Speed training in handball through compression training and adjusting distance variations helps players adapt to the competitive environment and achieve the primary goal of training—engaging in competition and attaining the highest level of skill performance. Tony Reynolds (2006) states that "targeted speed training represents a functional approach to developing physical capabilities and motor skills. It operates by compelling the nervous system to transmit information for execution at high velocity, thereby recruiting and activating a greater number of motor units" [17, p. 19].

#### 5. Conclusions

- 1. Compression training exercises demonstrated a positive impact on the development of certain types of speed and offensive skills in handball.
- 2. The compression training method, based on distance variation, contributed to enhancing player motivation.
- 3. The results indicated significant improvement in the post-tests of the experimental group, which the researcher attributes to the effectiveness of the applied exercises.

#### 6. Recommendations

- 1. Incorporating compression training exercises with distance variation into training programs for coaches, as they have proven effective in developing various types of speed and offensive skills among young handball players.
- 2. Applying these exercises to other performance variables and further refining them.
- 3. Expanding the use of compression training across different samples and sports disciplines to maximize its benefits.

#### **Conflicts of interest**

None.

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

#### **Ethics statement**

This manuscript approved by local ethical committee of physical education and sport sciences college for women on (July/2024).

#### Author's contributions

All contributions of this study were done by the researchers (A.T.) who get the main idea and work on writing and concluding also with number of experts,

Mohammed Shaheed Abdul in Statistics, Dr. Manal M. Bayyat in revision, Noor Riyadh Rahim in translating, Dr. Batoul Ahmed Salim in proofreading.

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#### Data availability

The data that support the findings of this study are available on request from the corresponding author.

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#### **Appendix 1: Used Exercises**

- 1. Divide half of the court into four longitudinal sections, each measuring 20 meters. Sprint to each line and return to the starting point.
- 2. Jog from the starting line to the midpoint of the court, then sprint from the midpoint to the end of the court.
- 3. Perform a rapid dribble to the mid-court line and back.
- 4. Plank exercises.
- 5. Lie on the floor, raise and hold your legs in a fixed position.
- 6. Wall-sit exercise: Assume a seated position with your back against the wall and your knees bent at a 90-degree angle.
- 7. Perform passing with a teammate from mid-court, then dribble and shoot with speed, returning in the opposite direction.
- 8. Shoot with ten balls placed around the six-meter line.
- 9. Dribble between markers back and forth along the length of the court.
- 10. Dribble from mid-court and perform a jump shot.
- 11. Pass with a teammate back and forth.

### **Appendix 2: Sample of training units**

Week: First

#### **Intensity: 85%**

**Training unit: First** 

### **Training Duration: 50 minutes**

#### Date: 10/7/2024

Objective of the Unit: Developing transitional speed, dribbling, and passing skills.

Section	Time (Minutes)	Exercises	Repetitions	Total Work Time	Rest between exercises	Rest between sets	Total Time for Rest and Work
Main	60 sec.	<ol> <li>Divide half of the field into four longitudinal sections, each measuring 20 meters. Perform sprints to each line and return to the starting point.</li> </ol>	5	300 sec.	240 sec.	60 sec.	10 min
	60 sec.	2. Jog from the starting line to the middle of the field, then accelerate into a sprint from the midpoint to the end of the field upon reaching it.	5	300 sec.	240 sec.	60 sec.	10 min
	60 sec.	<ol> <li>Perform fast dribbling to the middle line and back.</li> </ol>	5	300 sec.	240 sec.	60 sec.	10 min
	60 sec.	<ol> <li>Execute passing with a teammate from the middle, followed by dribbling and shooting, ensuring speed and returning in the opposite direction.</li> </ol>	5	300 sec.	240 sec.	60 sec.	10 min
	60 sec.	5. Perform shooting using ten balls distributed around the six-meter line.	5	300 sec.	240 sec.	60 sec.	10 min