

**THE EFFECT OF A DRY TRAINING PROGRAM USING AIDS ON THE RESULTS  
OF ERROR MEASURES AND THE EFFECT SIZE ON THE AIR PISTOL  
ACCURACY OF CORRECTION**

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***The research definition***

- Introduction and the research importance:

The world is keeping pace with evolution in all its fields as a result of scientists' pursuit of continuous scientific and technological development. This evolution included the sports field, which had a large space in the aspect of development and for all disciplines, Therefore, it's reflected today in what we see of records and advanced achievements in sporting events and activities. The development in the field of sports was the result of scientific research (Hussein and Jawad., 2022), where the interest in the training process has become one of the most important pillars of the development of achievement (Neamah and Altay., 2020). The shooting sport has also witnessed a remarkable development due to the diversity and development of its teaching and training methods, in which the means of learning and training had to develop also in the stages of the shooting process. Thus, it became necessary to find new educational means to ensure the acceleration of shooter learning on the one hand. In addition to helping the trainee to reach the planned level, to facilitate the process of teaching the performance of the stages of the shooting process on the other hand. The development at the level requires the trainers to use applied sciences (Drwysh and Farida, 2017). Dry training for shooters is one of the appropriate educational methods for mastering all the technical, sensory, and motor elements of the shooters performance as it is an essential part of the learning and training process in shooting with air weapons without the use of ammunition. Dry training is one of the educational and training methods at the same time to master all the technical and sensory elements of the shooters' performance. This technique is not a substitute for direct training or direct throwing, it is an essential part of the air weapons training process in general and the air gun weapon in particular. That is, developing an ideal image of different positions of pistol or gun throwing and developing a mental image of the performance attitudes of the accuracy of correction. Accordingly, it is considered one of the training methods for learning the skills of shooting with air weapons, where the aids have an effective impact on the learning and training process. As well as its fundamental role in developing the skill side of the shooters. According to this modern trend, educational devices and aids are manufactured from raw materials available in the local environment at a low cost in order to develop the accuracy of correction in the air pistol for young female shooters.

Accuracy is one of the main requirements in shooting (Khalid., 2019), as Researchers use many methods to find out the most important errors that occur when shooting with an air pistol. These

errors included the most suitable for the shooting skill, which is the radial, constant, and variable error measures because most of the skills deal with accuracy mainly. The error measures are also adopted at present in order to be clear to the shooter and the coach in order to know the causes of the committed errors that result in poor performance. Hence the research's importance lies in developing a training program for dry training using aids to know the errors that occur at an accuracy of correction with an air gun and the extent of the shot deviation from the center of the target by means of error measures. The researchers aimed to reduce and treat performance errors and weaknesses as much as possible in order to raise the skill capabilities of the accuracy of correction with an air pistol.

- **Research problem:**

Shooting with air weapons depends on a lot of educational and training programs for the basic skills of shooting as an important basis for progress. These programs make the trainers spend most of the time teaching and training shooters to the performing basic skills and teach them using traditional methods. The old-style method does not meet the purpose as a result of the great development in the methods of learning to shoot with air weapons imposed by the game rules. Therefore, the researchers thought that dry training should include the use of aids associated with dry training since traditional dry training without aids does not give the required results, but dry training using aids helps to quickly master shooting skills and acquire them. The researchers noticed that there were failures in the accuracy of correction with the air pistol among the young female shooters and that they obtained results below the required level and did not rise to international standards. As well as the lack of benefit for the trainers from the dimensions of the error measures to identify the amount, direction, and error variance, they used dry training by using aids accompanying training in order to improve the efficiency and accuracy of air pistol shooting.

- **Research objectives:**

1. Preparing a dry training program using aids in air pistol shooting for young female shooters.
2. Identifying the effect of the dry training program using aids on the results of error measures (radial and constant) on the accuracy of correction of young female shooters.
3. Identifying the effect of the dry training program using aids on the results of accuracy of correction with the air pistol for female shooters.

- **Research hypotheses:**

1. There are statistically significant differences between the pre-and post-tests in the results of the error measures (radial and constant) in the accuracy of correction of the female shooters, in favor of the post-test.
2. There are statistically significant differences between the pre- and post-tests in the results of air pistol accuracy of correction for female shooters, in favor of the post-test.

- **Research areas**

- Human area: female air pistol shooters.
- Temporal area: for the period extending from 10/9/2022 to 20/11/2022.

- Spatial area: the shooting range for air weapons of the Iraqi Central Shooting Union.

### ***Research methodology and field procedures***

- **Research Methodology:**

Research methodology is “the method followed by the researcher to answer the specific questions raised by the subject of his research (Ali and Nabil: 2005: 9). Thus, the researchers used the experimental approach by designing one group with two pre- and post-tests due to its suitability to the nature of the problem to be solved because it is the one that determines the approach the user in the research to obtain accurate information and results. As "The experimental methodology is one of the most widely used scientific research methods in the field of sports, as it is based on direct and realistic dealing with various phenomena and is based on two basic pillars, which are observation and experiment of all kinds" (Abdul Moati et al., 2002: 79-80).

- **Research community and its sample:**

The research community included (15) female shooters of Iraqi clubs with air weapons (pistol/rifle), and female participants in the 2022-2023 sports season. (7) female shooters were chosen by an intentional way, represented by female shooters of the air pistol weapon, at ages (12-14) years, which represent (46.666%), which will be subject to the application of the training program prepared by the researchers. However, (4) female shooters were selected as a sample for the exploratory experiment, then they are excluded from the main work sample.

- **Means of collecting information:**

The means of collecting information also include the devices and tools used in the research, as follows (Arab and foreign sources, tests and measures, international information network (Internet), personal interviews, observation and, air pistol (7)). Besides, (the ammunition for air weapons caliber (4.5) mm, field Olympic shooting for air weapons (10 m), legal paper targets for air weapons, rubber ropes, sponge balls, artificial clay, sponge pieces, wooden materials, mirror, wrist strap).

- **Field research procedures:**

The accuracy of the correction test (Ghusun: 2004: 64) was selected, and the error measures test (radial and constant), and the following are the details of each test:

- 1. Air pistol accuracy of correction test:**

The test purpose: To measure the level of accuracy of correction with the air gun.

Test tools: air pistol, stationary paper targets (numbered according to international shooting law.

- Performance description:
- The female shooter stands on the shooting line facing the fixed target at a distance of (10) m.
- The shooter carries the air pistol and fulfills all requirements for performance.

- The female shooter begins by shooting at the target and then shooting at the center of the target.

Scoring method: Each female shooter is given (10) shots to be thrown at the target from a distance of (10) m at (2) targets. They are used in succession at a rate of (5) shots at each target, and whenever the shots are closer to the center of the target, this indicates the accuracy of correction. The best shot is (10) points, which is called the center of the target, and the lowest value is (0), and the time for each shot is set at (1.15) minutes for one shot.

## 2. Error test (radial and constant) in the accuracy of correction:

"Error measures allow us to evaluate the performance of skills that require accuracy, and there are three error measures (radial, constant, and variable) that can be calculated to evaluate error measures in one direction and in two directions" (Muhammad: 2013: 31). Given that the researcher's work is related to the shooting sport, which depends on the two-way scales, therefore, the error measures test (radial and constant) will be used using the following equation:

$$RE = \sqrt{(v)^2 + h}$$

h= (horizontal), v = (vertical) for a series of iterations.

The teacher or coach works on a qualitative assessment of bias and consistency by looking at the real pool of potential. For example, if the shooting players (A - B) both put five shots in the shooting card and it is as follows:

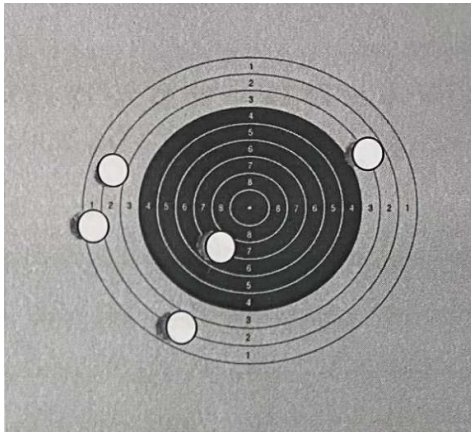


Figure 1 shows the shooter A

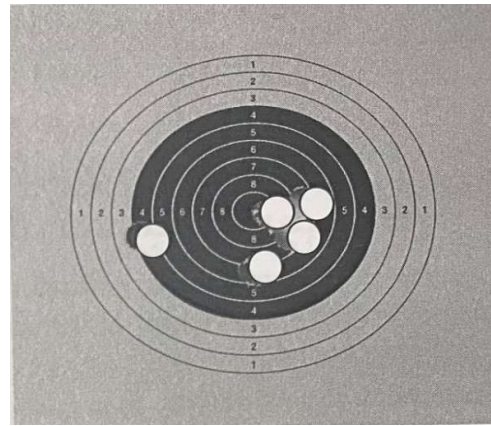


Figure 2 shows the shooter B

It is noted from the two figures that the shooting sport gives an example of the quality of the assessment, an error resulting from the two-way performance. Besides that the shooters in the shooting sport (A and B) put five shots in the shooting card, and it is noted that the five shoots (A) are within high scores for the performance variables. While the shooter (B) shows a strong bias in performance by placing the shots on the right side, the quick evaluation of the shoots of shooting sports players revealed that the players have privacy, but there are various problems in the performance results to develop their shooting performance. Although both players managed to put five shots into the target, player (A) spread the other shots around the target,

which indicates a movement consistency problem. In comparison, player (B) collected the other five shots on the right side of the target, which indicates a movement bias problem (Richard and Magill: 2017: 33-34).

• **Exploratory experience:**

The exploratory experiment was conducted using the (test and re-test) method on Saturday 10/9/2022 in the shooting range for air weapons of the Iraqi Central Shooting Union on a sample consisting of (4) young female air weapons shooters in the error measures test (radial and constant) in the accuracy of correction with the air pistol. The experiment was repeated on Wednesday 14/9/2022 in the same field and for the same tests and on the same sample, by calculating the simple correlation coefficient between the scores of the two tests. It was concluded that the value of the correlation coefficient calculated for the two tests was (0.0846, 0.866) respectively, and the values of its calculated significance level were (0.000, 0.000) respectively, which is smaller than the value of the approved significance level of (0.05). These results indicate the existence of a significant correlation between the test and re-test, which indicates that the two tests had reliability.

• **Research Procedures:**

- **Pre-tests:**

The two researchers conducted pre-tests on the same research sample, represented by young women shooting with an air pistol in the two research tests (error measures (radial and constant) in the accuracy of correction with an air gun on Saturday 17/9/2022 in the Olympic Shooting Range for air weapons. Before starting the statistical treatments, the two researchers performed a test (normal distribution) using the (Shapiro-Wilk) test for the tests error measures (radial and constant) in the accuracy of correction and accuracy of correction with the air gun, whose values were (0.793, 0.834) respectively. Since all the values of the significance level are greater than the approved significance level of (0.05), this indicates that the data follows a normal distribution. Therefore, the researchers must use parametric statistics. Consequently, the (T) test was used for non-independent and correlated samples in the work of the two researchers, as shown in Table (1).

Table (1) The two test values of the error measures (radial and constant) in the accuracy of correction and the accuracy of correction with the air pistol in the Shapiro-Wilk test

Seq.	Tests	Shapiro-Wilk		
		Statistic	Degrees of freedom (df)	Sig.
1	Error measures (radial and constant) in accuracy of correction	0.793	7	0.088

2	Accuracy of correction with the air pistol	0.834	7	0.511
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**- The main experience:**

The application for the training program was started on Monday 19/9/2022. It included (10) various exercises using aids of dry training that were prepared by the two researchers to develop the accuracy of correction with the air pistol. The exercises were divided into (5) exercises for each month, and they were repeated and applied in each training unit. The implementation of the main experiment (the training curriculum) took a period of two months by two training units per week (Saturday - Monday). Noting that the first week of each month has changed, low-intensity and high-intensity training were used, and the experiment ended on 19/11/2022. The number of training units designed by the researchers according to the aids for dry training reached (16) training units distributed by two training units that include (5) exercises designed per week. Noting that all the exercises were conducted under the direct supervision of the researchers in the main part of the training unit, which has a time to apply the exercises from (15-25) minutes from the time of the total time of the training unit which is (60) minutes. The exercises in the first and second weeks were at the same time and repetition but with an increase in the time for each exercise to (15) seconds with fixation of repetition and rest. The principle of gradually applying the exercises from easy to difficult was used.

**- Post-tests:**

After completing the implementation of the training program according to exercises using aids for dry training, the researchers conducted the post-tests in the same order and procedures followed when conducting the pre-tests, at the same time, in the same stadium, on the same sample, as well as the same auxiliary work team on 20/11/2022.

**• Statistical means:**

The program (IBM SPSS Statistics Ver 25) was used to extract the statistical treatments: (arithmetic mean, standard deviation, median, coefficient of skewness using moments method, Shapiro-Wilk test for normal distribution, T-Test for correlated samples, Pearson's simple correlation coefficient), and the effect size was calculated using the equation (Eta squared) by the following equation (Johnny: 2006: 237):

$$\text{Eta squared} = \frac{t^2}{t^2 + N - 1}$$

***Presentation, analysis and discussion of the results:***

To find out the significant differences between the pre and post-tests in the test of error measures (radial and constant) in the accuracy of correction and air pistol accuracy of correction, the researchers used the (T. test) for non-independent and correlated samples as shown in Table (2).

Table (2) The arithmetic means, standard deviations, and calculated (T) value for the two tests (pre and post) in the error measures test (radial and constant) in the accuracy of correction and air pistol accuracy of the correction

Seq.	Tests	Pre-test		Post-test		Total difference	Total squares of the deviations of the variances	T value	Sig.	Significance	effect size %
		arithmetic means ,	standard deviations	arithmetic means ,	standard deviations						
1	Error measures (radial and constant) in the accuracy of the correction	8.272	0.505	3.978	0.663	4.294	0.364	11.768	0.000	S.	16.09 %
2	Air pistol accuracy of the correction	66.142	4.140	80.571	2.572	-14.428	1.836	7.855	0.000	S.	11.60 %

It was observed from Table (2) that there are significant differences in the error measures (radial and constant) in the accuracy of correction and in favor of the post-test. The researchers attribute this to the use of error measures in directing the training units to track the error in order to find out its causes and find out about it for modification. By testing the error measures to extract the error (radial and constant), the amount and direction of the errors that the shooters fall during the performance are diagnosed. Thus, the researchers were able to reconsider and design the errors according to their performance requirements every week so that the errors are treated according to the privacy of each shooter. As well as identifying the amount and quantity of repetitions in the case of (assembly in a certain direction) or in the case of performance reliability, which represents the amount of deviation of the response from the center of the target.

As the response dispersion in a certain direction was an indication of the existence of a technical and motor error. The researchers believe that the effect size that appeared is due to the variety of aids, which led to an increase in the ability of young female shooters to perform and deviate from the norm, which had a role in the accuracy of performance. The researchers also revealed that the use of aids in the training units has a specificity in increasing the process of facilitating and accelerating the ability of good performance. The result reached by the researchers is consistent with what was mentioned by (Mohamed Fahmy 1992). Furthermore, the devices and auxiliary tools help to simplify skills as well as work on the transfer of knowledge, information and various and multiple skills and raise the ability to develop motor skills and abilities faster (Muhammad: 1992: 55). It also agrees with what was indicated by (Thaer and Ghusoon Natiq 2022) quoting (Ibrahim Abdullah 2006) "The visual field is the distance that an individual can see and it is measured in degrees. A person with normal vision can see a range of (150°-160°) with one eye and (180°-200°) with both eyes when looking horizontally" (Thaer and Ghusoon : 2022: 10835). It is also noted from Table (2) that there are significant differences in the accuracy of correction with the air pistol in favor of the post-test. The researchers attribute this to the fact that the nature of the exercises prepared using aids was appropriate to the level of the research sample. It likewise had the appropriate effect in improving and increasing the effect size of the accuracy of correction, which indicates the effect of dry training, which had the primary role in developing the sense and awareness of the exemplary technical performance. The result reached by the two researchers is consistent with what was indicated by (Saba, 2008:29) quoting (Wajih Mahjoub 2001) "that in the sensory skill there is movement, but decisions was important and this depends on the reaction whose importance differs from one skill to another as it develops through training and practice" .Therefore, the researchers believe that the exercises prepared within the training units during (16) training units have led to an impact and the emergence of effective training. The usual traditional exercises have led to the stability of the skill level and to a change in the training method in air pistol shooting. Also, the addition of aids for dry training to deviate from the usual, had an effective role in increasing the effect size for all the technical and mental requirements for air weapon shooting in general and the air gun in particular. It is worth noting that the effectiveness of shooting is one of the sports that requires a speed of response and accuracy in developing performance. The result reached by the two researchers is consistent with what (Saba, 2008: 43) pointed out: "It is no longer necessary to interpret the nerve commands through the nervous system, but rather the exhortation becomes implemented when it reaches the spinal cord and returns to the executing muscles. Thus, the exercises prepared for the synergy between the technical performance, the throwing time and the speed of decision-making" . It also agrees with what was indicated by (Thaer and Ghusoon, 2022: 13185) quoting (Muhammad, 1985) "The standardized and regular training programs according to scientific foundations work to develop the physical and skill level of the players"

***Conclusions and recommendations:***

- Conclusions:
  1. There is a positive effect of dry training exercises prepared using aids in increasing the effect size of the air pistol accuracy of correction.
  2. The use of error measures (radial and constant) had an impact on directing training units and addressing errors that occur during performance.

3. There are ratios to the effect size of the exercises prepared using the aids in the results of the accuracy of correction with the air pistol.
  - Recommendations:
    1. The need to use error measures (radial and constant) as an indicator in tracking training programs to increase the effect size of the air pistol accuracy of correction.
    2. The need to use auxiliary devices and means within the training units, which had a role in increasing the effect size of the performance in shooting air weapons.
    3. The need to conduct similar studies on samples, age groups, and both sexes in shooting of all kinds.

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