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The effect of special exercises to correct the angle of shoulder inclination and the accuracy of aiming with the 10-meter air pistol for the Iraqi junior national team

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Abstract

It is easy to detect the technical errors that a young shooter makes at the beginning of the educational stages, which have a clear impact on the actual performance if modern technological means are used that help the coach make the right decision in correction, as most coaches rely on abstract or simple, non-technical self-observation. Which makes the process of identifying errors marred by some shortcomings due to the speed of motor performance or the multiple and overlapping technical stages of the activity or skill.

The importance of the research also lies in addressing one of the most important problems for beginners, which is the correct shooting position, as the aim of this study is to determine the error that a budding shooter makes during training and during the first periods of training with an air pistol. This study also aimed to address and correct errors during exercise and to identify factors that positively affect changes in the path of movement through the curriculum prepared for this study, which aims to correct the situation through special exercises aimed at strengthening the muscles of the upper body through 18 training units of 3 Units per week. The sample in this study was three female air pistol players with an average of (age: 13.75 years, height: 152.50 cm, body mass: 59.55, training age: 1.25 ± month).

Results: In terms of actual imaging results, the average score was shoulder inclination angle in the pre-test.

Conclusion: Developing and applying a training program that focuses on the special muscle groups responsible for muscle performance in lifting the air pistol and strengthening them.

Keywords: Technical errors, young shooters, educational stages

Introduction

The sport of shooting has developed greatly over the years, in addition to the amazing technological progress it has witnessed in the manufacture of toy rifles and pistols. Shooting competitions were limited to only five events in the first Olympic Games in 1896, but now the Olympic Games have included 15 events, and shooting competitions have not been absent. About the Olympic program from the first Olympic edition in 1896 until now. The events are divided into three groups according to the type of weapon: (rifle, pistol, hunting rifle). Rifle and pistol competitions are held on special Olympic shooting ranges. The shooter shoots at targets 10 meters, 25 meters, and 50 meters away. In shotgun competition, shooters shoot at targets made of hard clay that shoot through the air in a variety of different directions (Ibrahim Marzouq, 2002) ^[1].

Shooting is considered one of the most important sports that depends on the individual performance of the player, which in turn is affected by all influences. The basics of technical performance for effective shooting with an air pistol include the shooter's readiness and performance speed, distance and target, the ability to constantly maintain shooting movements, breathing rhythm and timing (Uh, C. H. & Lee, G. S. 2000) ^[2].

Ibrahim Marzouq: Sports Encyclopedia, Amman, House of Culture for Publishing, 2002, p. 117.

(Uh, C. H. & Lee, G. S. (2000) ^[2]: The biomechanical analysis of rapid fire. Korean Journal of Sport Biomechanics, 9(2), 81-101.

During shooting, the dynamic and static shooters must be compatible at the same time, so that no part of the body must be moved except for the fine muscles responsible for pulling the trigger, which is the index finger (Seo, HC. 2007) ^[10].

Since the ultimate goal of shooting is to hit the target with the highest accuracy, there must not be any swaying during the aiming and throwing phase. However, it is impossible to constantly maintain the stability of the weapon, whether it is a rifle or a pistol, and this is due to the main reasons that have a fundamental effect, which are the instability of the throwing position and breathing.

Research specialized in air pistol shooting has also revealed that the impact of the body and the movement of the pistol affect the accuracy of aiming with the pistol. It has been revealed that body sway affects the vertical drop of the shot, and body sway and gun movement have been concluded to be almost independent of each other. The importance of the time spent during the scoring process was explained. The research revealed a high degree of variation in the factors that affected the accuracy of individual shooters.

Previous studies in shooting with an air pistol have proven that body balance affects shooting by 53%. Mason states that balance and little movement of the gun while pulling the trigger are essential determinants of the successful shooter's performance, especially for beginners. It has been proven that the role of stable balance is important for shooting performance. With an air pistol, therefore, additional training programs may be used to develop and develop balance in shooting exercises that help beginners improve their performance (Mason B, Cowan L.F, Gonczol T. 1990) ^[5]. It has also been shown that peripheral muscle fatigue resulting from short-duration, high-intensity exercises affects static balance, as evidenced by a weak ability to maintain a stable and upright position (Dickin, C & Doan, J.B. 2008) ^[3]. (Goonetilleke) mentions that the effect of fatigue is doubled in shooting with an air pistol, as

the movement of the shooting arm and the body also affects shooting performance (Goonetilleke, R.S., Hoffmann, E.R., & Lau, W.C. 2009) ^[3]. Air pistol shooting requires extreme precision as any involuntary or uncontrolled movement can easily cause failure. According to the experience of coaches, one of the main factors that determine performance in air pistol shooting is the effect of body movement. It seems reasonable to assume that athletes with less body mobility have an inherent advantage in becoming better shooters.

(Pellegrini & Schena) also confirm that the ability to stabilize the weapon is achieved by the work of the shoulder and forearm muscles (Pellegrini B, Schena F. 2005) ^[9].

Olympic shooting requires the utmost concentration and precision to achieve high-level performance. Therefore, any error may exceed the angle of 0.016 degrees for the rifle shooter (Zatsiorsky V, Aktov A. 1990) ^[11]. And 0.066 degrees for a pistol shooter (Mon D, Zakyntinaki MS, Cordente CA, Monroy Antón A, López JD 2014) ^[6]. The process of scoring the ideal 10 points, which is considered the desired goal, may fail. In addition, the performance level of elite shooters is very high and equal between men and women nowadays (Mon-López D, Tejero González CM, CaleroS. 2019) ^[7].

Materials and Methods

Research method

The researchers used the experimental method due to its suitability and the nature of the research, with a one-sample design (an experimental sample with a pre- and post-tests) to achieve the research objectives.

Sample

Three female pistol shooters participated in this study. All participants were the main national Iraqi Olympic team in the junior category of air pistol shooting.

The mean \pm median and standard deviation values of the group characteristics are shown in Table (1) to avoid extraneous factors that affect the results of the experimental work, homogeneity was calculated for the sample members in the following variable.

Table 1: It shows the homogeneity of the research sample in terms of length, weight, age, and training ages

Variable	Unit of measurement	N	Mean	Median	Standard deviation
Length	Cm	3	152.50	152,000	3.622
Weight	Kg	3	59.55	59,000	10.591
Age	Year	3	13.75	13,500	1.211
Training age	Month	3	2.25	3,000	2.168

Tools and devices used in the research

- 10-meter range.
- 10-meter air pistol (3).
- Official Targets.
- Official Shots.
- (HP) laptop computer.
- Digital camera (1) (Casio EX-ZR200) with a speed of 120 images/second, for the purpose of photographing and kinematic ally analyzing the performance.
- Camera (1) to photograph the main experimental procedures.
- Kinetic analysis program (Kinovea).

Test design

The protocol consisted of two tests performed twice (test & pre-test). Both tests were performed on the official training

time. During the first test According to the ISSF rules and regulations for championship we estimated the same measurements with the ISSF Pistol & Rifle electronic Target, with official targets and monitor were used, The data collection was designed as a simulated qualifying round (60 competition shots under 75 minutes) with 15 minutes of preparation time (dry and loud firing allowed). All shooters took place at pre-existing indoor shooting ranges according to the rules and regulations for air pistol competitions. Shooters were instructed to perform all their normal routines before and during the test session. They were also instructed to try to achieve the highest score possible during the match. All shooters used their own competition equipment (pistol, clothing, shoes etc.). During the second test video were taken with the camera distance from the shooter sheet was 2 meters for kinetic analysis to measure the inclination of the

shoulder angle during the test of shooting accuracy with a 10meter air pistol, the angle was measured starting from The midpoint between the feet and the high point of the shoulder

(during the real pistol shooting position) using Kinetic sport analysis program (Kinovea).



Fig 1: Kinetic analysis of shoulder angle during 10 m air pistol shooting

After conducting the test and video recording of the kinematic variables of the research sample, the researcher prepared a training curriculum consisting of special exercises to correct the angle of inclination of the shoulder

and develop and accuracy of aiming with the air pistol, and the training curriculum consisted of 18 training units by 3 units per week. The duration of each training unit ranges from 60 to 75 minutes,

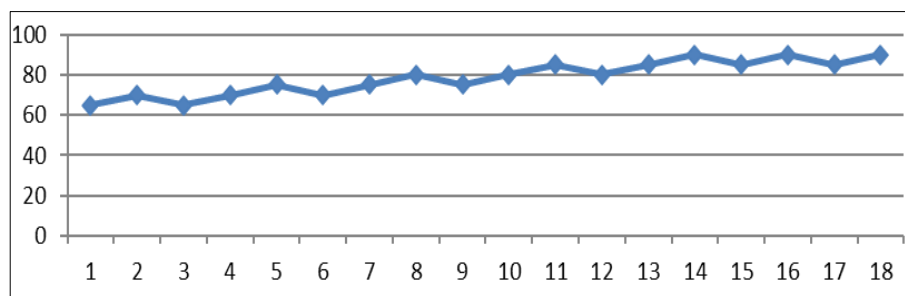


Fig 2: Distribution of daily training intensity

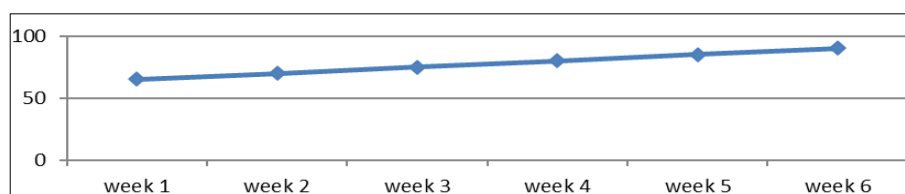


Fig 3: Distribution of weekly training intensity

The same conditions were maintained for re-testing after the completion of the proposed training curriculum for the trainer. The statistical analysis of the variables was performed using SPSS Statistics.

Results

The researchers used the (T) test for correlated sample, to find out the significant differences between the pre- and post-test for the research sample in the accuracy of aiming

10 meter air pistol results and the inclination of shoulder angle.

Table 2: The mean and standard deviations of the research sample

Variable	Mean	N	Std. Deviation	Std. Error Mean
The inclination of shoulder pre-test	14.8000	3	.60828	.35119
The inclination of shoulder post - test	10.4667	3	.64291	.37118
the accuracy of aiming 10meter air pistol pre-test	518.0000	3	4.35890	2.51661
the accuracy of aiming 10meter air pistol post-test	543.0000	3	8.18535	4.72582

Through the results in table 2, which include the mean and standard deviations of the research sample and this indicates that there are significant differences between the pre- and

post-tests of the research sample, and this means that there is an improvement in the result of re-test, as compared to the result of the test in the inclination of shoulder.

Table 3: The mean standard deviations and (test) of the research sample

Variable	Mean	Std. Deviation	Std. Error Mean	T	DF	Sig. (2 tailed)
The inclination of shoulder the pre- and post-tests	4.333	.585	.338	12.809	2	.006
the accuracy of aiming 10meter air pistol the pre- and post-tests	25,000	5.291	3.005	-8.183	2	.015

The values of (t-test) at the level of significance (0.05) and a degree of freedom (2) between the pre- and post-tests, it is clear that the statistical evidence is with a value of (0.006) for the inclination of shoulder. Which is less than the level of significance (0.05), and (0.015) for the accuracy of aiming 10meter air pistol test which is less than the level of significance (0.05). This indicates that there are significant differences between the pre- and post-tests for the research sample

Discussing the test Results

It is clear from the results shown in tables 2 and 3, that there are significant differences between the pre- and post-tests of the research sample and control research groups, in favor of the post-test of the research sample, The researcher attributes the reason for this development in the results of the post-test on the accuracy of aiming with an air pistol to the diversification of the special exercises that researchers designed based on sport motor analysis, which helped in developing performance in the post-test, "as he believes that the ability to learn motor is linked to receiving and assimilating motor information and then giving it as commands to the motor system. It affects the action of the muscles and their work to solve the motor task in a mechanical way" and their repetitions and progression from easy to difficult, The researchers also used video recording to show obvious errors in performance, and all of this made the position fixed in kinetic memory and long-term memory "It helps in integrating the senses of the learner, which makes the learning process easier, easier, and more attractive and exciting, as a result of the association of sound and image in the shown movie." In addition to strengthening the control of neuromuscular work, which was helped by the special exercises used that gave the ideal position in shooting, in the same conditions in which they were performed. The measurements adjusted in the video recording, which gives the performing player the ideal position, avoiding any defect that could lead to damage to shooting accuracy, and the improvement helped increase the aiming accuracy of the shooters in the optimal use of performance, the results of which were clear.

And The effect of the training program that was applied to the research sample, in addition to the fact that the researcher indicated that the exercises that started from the standby pause to the rest of the stages of performance are according to a logical and objective progression to correct

and develop the performance with the air pistol, which is the cornerstone for the rest of the stages of performance.

Conclusion

The study demonstrates the significant impact of targeted training programs on improving the technical performance of novice air pistol shooters. Through the use of modern technological tools for error detection and performance analysis, the study effectively addressed common technical errors among beginners, particularly focusing on the correct shooting position.

The research highlighted the importance of using advanced methods, such as video recording and kinetic analysis, to identify and correct technical faults that are not easily detected through traditional coaching methods. The implementation of a structured training curriculum, which involved 18 training units spread over six weeks, was instrumental in improving both the accuracy of aiming and the shoulder inclination angle of the participants.

The results revealed a notable improvement in the shoulder inclination angle and shooting accuracy from pre-test to post-test. Specifically, the average shoulder inclination angle decreased from 14.80 degrees to 10.47 degrees, and the accuracy of aiming increased from 518 to 543 points. These improvements underscore the effectiveness of the specialized exercises and training program in enhancing the technical skills of young shooters.

In conclusion, the study validates the benefits of integrating technological analysis and a focused training regimen to optimize shooting performance. The findings suggest that such approaches can be crucial in refining the skills of beginners and achieving better outcomes in air pistol shooting. Future research could explore the long-term effects of these training programs and their applicability to a broader range of shooting disciplines.

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