

The effect of Some Cross-Fit trainings on the technical performance of the(rotation - Throwing and Disposal) phases and the achievement level of discus throw players

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1/1 Introduction and Research Problem:

The science of sports training witnessed a remarkable development, especially at the end of the twenty-first century, in keeping with the requirements of the modern era in the use of the scientific method through the application and diversity of training programs, where sports performance is closely related to other sciences, such as sports training science, sociology and sport physiology, where scientific research and studies in the sports field aim to raise the level of sports achievement and reach record numbers by developing different training techniques and methods, among the modern techniques and methods of training: the plyometric training method, the hypoxic training method, the differentiated training method, circuit training method, fartlek training method, compressor training method, as well as Cross-fit training method, which is a method of training that works on developing physical fitness and eliminating monotony in training of using traditional methods (8:12) (7:530).

Greg Classman (2002) believes that the exercises are a mixed group of different exercises that first start with a warm-up and then the player moves to exercises such as (abdominal exercises, running exercises, pull-ups, weight-lifting exercises, aerobics exercises, gymnastics exercises, exercises, rowing exercises, swedish exercises, in addition to kettle bell exercises, as Werner and Sharon (2011 AD) indicate that Cross-fit training is a method of training that works on developing physical fitness and eliminating monotony in training of using traditional methods (3:5).

McNeill (2012) also showed that Cross-fit training means practicing a variety of training activities such as snowboarding, cycling, swimming, hiking, climbing and circuit training, all of which are options offered by participating in one of these activities that help build strength, in addition to running that develops physical fitness (15:95).

Throwing competitions are among the field competitions in athletics, and they fall under the type of sole movement, and also aim to achieve the largest possible distance, and among these competitions is the (discus throwing), which requires the player to take advantage of the biomechanical foundations during the skillful performance on which the throwing distance depends. The positions of the body parts during the technical stages also play an important role in obtaining the best starting speed to reach the highest starting point of the discus throw by the most appropriate angle during the release process, the success of the movement in it, in terms of form and quantity (quantity, quality), depends on the extent of interconnectedness and the kinetic sequence between the technical stages in which the body and its parts involved in the movement pass without stopping (2:115).

In order to achieve the goal of the competition, which is to record the best numerical level, it was necessary to integrate the elements of special fitness and skill performance to reach the desired goal, the researcher has noticed, through her experience in the field of training, as she is a throwing coach at the Al-Jazira Youth Center, and in the field of judging athletics, as she is a second degree referee and participated as a referee in many throwing competitions in general and discus throwing in particular that there are some recurring technical errors in the performance of players, especially in The two stages (Rotation - throwing and release), which are based on the numerical level and the skill performance of the discus race, as most technical errors in the player's performance appear in the two stages (Rotation - throwing and release).

From the foregoing, the idea of the research came in an attempt to use modern physical exercises suitable for discus throwing, such as Cross-fit training, as an attempt to improve the level of technical performance for the two stages (Rotation - throwing and release) by reducing the existing technical errors, which in turn affects the numerical level.

1/2 Research Importance:

1/2/1 Scientific Importance:

- The scarcity of research that used this type of training, which is Cross-fit training, in field and track competitions in general, and in discus throwing competitions in particular.

1/2/2 Practical importance:

- The suitability of these exercises in the various training programs for throwing races in general and discus throwing in particular.
- The appropriateness of these exercises in using them to develop the various elements of physical fitness, especially those that depend on (muscular ability - maximum strength - speed - flexibility - agility - compatibility - balance).
- Diversity of the use of tools in these exercises in proportion to the different training methods.

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1/3 Research Goals:

The research aims to identify the effect of some Cross-fit exercises on:

1. The technical performance of the (Rotation) stage of the discus throwers.
2. The technical performance of the (Throwing and release) phase of the discus throwers.
3. The numerical level of discus throwers players.

1/4 Research Hypothesis:

1/4/1 There are statistically significant differences between the pre- and post-measurements of the research sample in the technical performance of the (Rotation) stage of the discus throw race in favor of the post-measurement.

1/4/2 There are statistically significant differences between the pre- and post-measurements of the research sample in the technical performance of the (Throwing and release) stage of the discus throw race in favor of the post-measurement.

1/4/3 There are statistically significant differences between the pre- and post-measurements of the research sample in the numerical level of the discus throw race in favor of the post-measurement.

1/5 Related Studies:

1/5/1 Arabic Studies:

1/5/1/1 Faten Abulsaod Imam “(2020 AD) (10): “The effectiveness of a training program using Cross-fit exercises on some elements of physical fitness and the numerical level of the 200-meter race, knowing the effectiveness of a training program using Cross-fit exercises on some elements of physical fitness and the numerical level of the 200-meter race, the experimental method, The research sample was selected in a deliberate way from the students of the second year, and the number of the actual research sample consisted of (25) students, and (5) female students were

excluded to conduct the exploratory study on them, so that the basic research sample consisted of (20) students, they were divided equally into two groups, one experimental and the other Control, the results of the study showed that the training program using Cross-fit exercises had a positive effect on the physical fitness components of the 200-meter race.

1/5/1/2 Ghaida Abdel Shakour, Mohamed Ali Hassan (2017 AD) (9): "The effectiveness of using the Cross-fit method in improving special motor abilities and the level of skill performance on the balance beam device", to identify the effectiveness of using the Cross-fit method in improving the special motor abilities of (muscular strength, muscular endurance, speed, agility, compatibility, balance, flexibility) and the level of skill performance on the balance beam device for female athletes, the experimental approach, the sample was deliberately selected of (8) players From the first and second division team in Al-Ahly Club, there is a noticeable improvement in each of the motor abilities of (muscular strength and endurance, speed, agility, compatibility, balance, flexibility) and the level of skillful performance of the players.

1/5/2 English Studies:

1/5/2/1 Gerhart (2013 AD) (14): "A comparison between Cross-fit training and traditional anaerobic resistance exercisers in selected fitness areas that represent general athletic performance", the purpose of this study was to evaluate the effects of two different types of exercise programs on selected fitness areas. The two groups were Cross-fit (CF) exercises and traditional anaerobic resistance (TAR) exercisers, the experimental approach. The sample size included (19) male participants in each group, and there was a significant improvement in performance for Cross-fit exercisers compared to traditional training practitioners in the following variables (Body composition, flexibility, aerobic capacity, and muscular endurance) excluding (maximum strength) there were no differences between the two groups (CF), (TAR).

1/5/2/2 Paine et al. (2010 AD) (16): "The effectiveness of a fitness program using CrossFit exercises in developing the physical fitness of US Army soldiers.", Testing the effectiveness of a fitness program using Cross-fit training in developing the physical fitness of US Army soldiers in the US General Staff, the experimental approach, a sample of (14) male and female students from the Military Staff who have varying levels of physical fitness and experiences in Cross-fit exercises, there is an improvement in the physical and physiological abilities, as the oxygen capacities achieved an improvement rate (14.38%) and the results also showed an increase in the rate of energy production by (20%) Although the participating sample

are athletes, they showed a development in the ability to perform and exercises with a high intensity.

1/6 Research procedures:

1/6/1 Research Methodology:

The researcher used the experimental one-group approach by applying (Pre- and post-measurements), due to its suitability to the nature of the research in line with the objectives and hypotheses.

1/6/2 Research community and Sample:

The research community consists of the discus throwers under 18 years' old who are registered in the records of the Egyptian Athletics Federation for the year (2020-2021 AD), and their number is (33), (20) males and (13) female, and the Al-Ahly club players were selected for the approval of the club and the coach to apply study on them, and their number is (5), (3) Males and (2) females for their suitability and the nature of the research.

Table (3)
Description of the research sample

Total No.	Total (%)	Sex			
		Male		Female	
		No.	(%)	No.	(%)
5	15.2%	3	15%	2	15.4%

Sample selection conditions:

- Players must be registered with the Egyptian Athletics Federation.
- The player must be under 18 years old.
- All players should be from one club, in order to undergo the same training program with the same coach on the same dates set for the exercise, due to the stability of the variables.
- Commitment to the training program and the exclusion of those who were absent more than 3 times.
- The approval of the coach in charge of the training to complete the training for the players.

Table (3)
The arithmetic mean, standard deviation, and skew coefficient for pre-measurement of physical test

(N=5)

Elements	Test	Unit Of Measurement	Arithmetic Mean	Standard Deviation	Skew Coefficient
Maximum strength of the arms	Tensile test to the highest number of times in a time of (30) sec.	No.	3.60	3.28	-0.609
Elements	Test	Unit Of Measurement	Arithmetic Mean	Standard Deviation	Skew Coefficient
Maximum strength of the legs	The test of sitting on the bench and the bar (15) kg on the shoulders and then standing with it.	Repetition	47.00	17.88	-0.653
Flexibility	The trunk flexion test from a standing position.	CM	54.80	3.56	-0.391
Agility	Zigzag running test between the barriers, a distance of (5) m in time.	No.	22.40	0.547	0.609
Arm speed	Test the speed of rotation of the arm around the basket for (20) sec.	No.	42.20	3.96	-0.849
Leg speed	30 m running test from flying start.	Second	5.67	0.579	-0.532
Speed-Characterized strength of the legs	The wide jump stability test	Meter	2.05	0.464	-0.202
Speed-Characterized strength of the arms	Pushing a medicine ball (3) kg with one hand to the farthest distance.	Meter	8.07	2.42	-0.367
Compatibility	Skipping rope test for (30) seconds.	No.	19.60	14.77	-0.160
Balance	Standing with the feet (longitudinal) on the crossbar.	Second	9.40	2.50	0.196

Table (3) shows that the skew coefficient of the physical tests under study was limited between (+3, -3), which indicates the moderation of the data.

Table (4)

The arithmetic mean, standard deviation, and skew coefficient for pre-measurement of technical performance and numerical level of the discus throw race

(N=5)

Variables	Unit Of Measurement	Arithmetic Mean	Standard Deviation	Skew Coefficient
Evaluate the full technical performance of the skill (20) (Degree)	Degree	12.00	1.22	-1.36
Rotation stage (8) (Degree)	Degree	3.40	0.651	0.541
Throwing and release stage (7) (Degree)	Degree	3.50	0.612	-1.036
Numerical Level (Meter)	Meter	35.35	5.41	1.77

Table (4) shows that the skewness coefficient of the skill tests was limited between (+3, -3), which indicates the moderation of the data.

1/7 Data Collection Tools:

1/7/1 Devices used in the research:

- Stop watch to calculate time
- Legal discus
- Legal cage

1/7/2 Tools used in the research:

- Cones
- Jumping rope
- Training Barriers
- Plyometric Box
- Weight wheels (2,5Kg - 5kg)
- Dumbbells (15-20kg)
- Resistance ropes (Heavy)
- Medicine ball (4Kg)
- (4Kg) Kettle bell

1/8 Research Application Procedures:

1/8/1 Pre-application stage:

- Design a form to collect data for each player (Attached 1)
- Make a form to determine the most appropriate elements of physical fitness for the two stages (Rotation - throwing and release) and present it to the experts for the homogeneity of the sample.

- Inventory of Cross-fit exercises from Arab and foreign references and scientific theses that used these exercises and design a form and presented it to experts to know the suitability of these exercises to the technical performance of the two stages (Rotation - throwing and release).
- Design a form to find out (the number of units - the best time for training and the unit - the most appropriate period in the training season to perform the exercises) and presenting it to the experts attached (2). The conditions for selecting experts were as follows:
 - To be a throwing coach in athletics, or a faculty member in the track and field training department in one of the faculties of physical education.
 - Not less than 10 years of experience.
 - To be still in the field of training if he is a coach.
 - A tripartite committee has been identified to evaluate the technical performance of the two phases (Rotation - throwing and disposal) from members of the Track and Field Competitions Training Department at the Faculty of Physical Education for Girls in Helwan University, provided that their experience is not less than 10 years and their scientific degree is not less than a Ph.D. (5).
 - A personal interview was conducted with the coach of Al-Ahly Club on Monday (10/25/2021 AD) to choose the most appropriate exercises that can be used and the most appropriate time to implement them attached (3).
 - Pre-measurements were made on two days, Saturday and Sunday, corresponding to (6, 7/11/ 2021 AD) as follows:

First Day, Saturday (6/11/2021 AD):

- Anthropometric measurements were made on the research sample (height - weight).
- Physical tests under investigation have been carried out:

Physical Elements	Test	Unit Of Measurement
Maximum strength of the arms	Tensile test to the highest number of times in a time of (30) sec.	No.
Maximum strength of the legs	Sitting on the bench and the bar (15) kg on the shoulders and then standing with it.	Repetition
Flexibility	Bend the trunk from standing position.	CM
Agility	Zigzag running between the barriers, a distance of (5) m in time (30) sec. of	No.

	barriers' count.	
Arm speed	Speed of arm rotation around the basket for (20) sec.	No.
Leg speed	Running for (30) m from flying start.	Second
Speed-Characterized strength of the legs	The wide jump stability test	Meter
Speed-Characterized strength of the arms	Pushing a medicine ball (3) kg with one hand to the farthest distance.	Meter
Compatibility	Skipping rope for (30) sec.	No.
Balance	Standing with the feet (longitudinal) on the crossbar.	Second

Second Day, Sunday (7/11/2021 AD):

- Video was filmed for three attempts for each player, taking into account the stability of the shooting angle in each attempt for each player individually, in order to evaluate the technical performance of the two stages (rotation - throwing and release) through a performance evaluation form that was designed by the Committee for Measurement and Evaluation at the Faculty of Physical Education Girls Al-Jazira and was presented to the tripartite commission.
- The numerical level of the three attempts was measured and the best numerical level of the player was recorded.
- The attempts that were filmed for the player were presented to evaluate the technical performance by the Tripartite Committee in the two phases (rotation - throwing and release) and the numerical level in order to know the extent of the homogeneity of the sample.

1/8/2 Application Stage:

- Through a survey of experts' opinion, the number of months - number of weeks - the unit - and the time of training within the unit was determined as shown in Table (4). The program was implemented from Saturday (13/11/2021 to Friday 4/2/2022 AD), Its duration is approximately three months, or twelve weeks, with one weekly unit, or twelve training units, according to the opinions of experts.

Table (5)
The period of applying exercises

No. of Months	No. of Weeks	No. of Units	Unit Time Duration	Cross-fit Training Time Inside the Unit
3	12	12	90 – 180 Minutes	30 – 45 Minutes

Table (6)
A model of a training unit using Cross-fit exercises

Parts of The Training Unit		Time	Trainings	Repetition by Number or Time	Groups	Rest Periods
Warm up		15 Minutes	Run a training lap to prepare the body			
The main part	Physical exercises		- Discus throw	10	3	2 Minutes
			- Snatch	6	6	10 Seconds
			- Bench	5	3	10 Seconds
			- Rising off	5	3	10 Seconds
	Cross-fit exercises		- (2)	5	5	15 Second
			- (3)	5	5	15 Second
			- (4)	5	5	15 Second
			- (21)	5	5	15 Second
		- (11)	5	5	15 Second	
	- (18)	5	5	15 Second		
	- (19)	5	5	15 Second		
Calm down		5 Minute				

1/8/3 Post-application stage:

- Post-measurements were made on two days, Saturday and Sunday (5, 6/2/ 2022 AD) as follows:

First Day, Saturday (5/2/2022 AD):

- It was taken into account that the measurements should be under the same conditions and in the same order as the performance of the physical tests that were made in the pre-measurements.

Second Day, Sunday (6/2/2022 AD):

- Video shooting was done for three attempts for each player, taking into account the stability of the shooting angle in each attempt for each player individually, in order to evaluate the technical performance of the two stages (rotation - throwing and release) through a performance evaluation form that was designed by the Measurement and Evaluation Committee at the Faculty of Physical Education Girls Al-Jazeera and was presented on the tripartite committee.
- The numerical level of the three attempts was measured and the best numerical level of the player was recorded.
- The attempts that were filmed for the player were presented to evaluate the technical performance by the Tripartite Committee in the two phases (rotation - throwing and release) and the digital level in order to know the extent of the homogeneity of the sample.

- A combined form was designed for all players in all physical measurements and technical performance (for the rotation-throwing and disposal stages) attached (4).

1/9 statistical treatments:

Statistical treatments (arithmetic mean, standard deviation and torsion coefficient) and improvement ratios were made.

Table (7)

Arithmetic mean, standard deviation and torsion coefficient in post measurement For the skill performance of the two phases (rotation - throwing and disposal) and the score level of the disc throwing competition

(N=5)

α_3	s	\bar{X}	Unit of measurement	variables
- 0.518	1.49	15.60	Mark	Assessment of the technical performance of the full skill (20) marks
0.441	1.02	4.90	Mark	Rotation phase (8) marks
- 1.36	0.612	5.00	Mark	Throwing and Disposal phase (7) marks
1.46	5.59	40.66	M	Score level (m)

It is clear from Table (7) that the values of the arithmetic mean of the sample responses on the technical performance tests of the phases (rotation - throwing and disposal) and the score level of the experimental research sample differ in the post measurements, where the torsion coefficients of skill tests was limited to (+3 and -3), which indicates the moderation of the data

Table (8)

Differences between pre and post measurements of the research experimental sample in the technical performance of (rotation - Throwing and Disposal) phases and the score level of the disc throwing competition

(N=5)

significance	Z	sum	mean	Number	direction	variable
0.042	*2.03	15.00	3.00	- 5 -	- + =	Assessment of the technical performance of the full skill (20) marks

0.042	*2.03	15.00	3.00	- 5 -	- + =	Rotation phase (8) marks
0.039	*2.06	15.00	3.00	- 5 -	- + =	Throwing and Disposal phase (7) marks
0.042	*2.02	15.00	3.00	- 5 -	- + =	Score level (m)

***significance <0.05**

It is clear from Table 8 that there are statistically significant differences in all technical performance tests of the two phases (rotation - throwing and disposal) and the score levels of the research experimental sample in favor of the post measurement.

Table (9)

The improvement rate in the performance of the two phases (rotation - throwing and disposal) And the score level of research experimental sample

(N=5)

%percentage	Measurement difference	Variables
30	3.6	Assessment of the technical performance of the full skill (20) marks
44.1	1.5	Rotation phase (8) marks
42.8	1.5	Throwing and Disposal phase (7) marks
15.02	5.31	Score level (m)

It is clear from Table (9) that the improvement rates of the experimental sample in the full skill performance and the two phases (rotation - throwing and disposal) as well as the score level differ, where the highest percentage of improvement in the technical performance of the (rotation) phase was recorded and was 44.1%, equivalent to (1.5)degrees, which it's not a small number and the lowest percentage of improvement recorded was in the score level of 15.02 % equivalent to (5.31) m which

it's not a small number in the improvement of the score level of disc throwing competitions.

1/10 Results review and discussion:

1/10/1 assumption explanation and discussion:

The results shown in Table (4), (7), (8), and (9) showed that there are statistically significant differences between the pre- and post-measurements in favor of the post measurements of the research experimental sample in the rotation phase, where the improvement rate for the (rotation) phase came by (1.5) degrees of improvement percentage equals (44.1%) led to the strength of active muscles - non-stop rotation - non-stop of the torso during rotation - rotation without jumping - non-steady rotation or a short distance).

Greg Classman (2002) and Mohamed Jaber Ahmed (1997) also confirmed that Cross-Fit exercises improve fitness elements (speed, flexibility, balance, agility), which in turn affect the level of technical performance such as the rotation phase in the disc throwing competition (12 : 7) (8: 13-91)

The studies of **Faten Abu Al-Saud (2020) (9), Ghaida Abdel Shakour, Mohammed Ali Hassan (2017) (8), Fatima Salah Jumaa (2020) (10), Amira Yahiya Mahmoud Afifi (2020) (1)** confirm that Cross-Fit exercises work to improve the elements of fitness (speed, flexibility, balance, fitness, compatibility, strength).

The researcher also reduces this improvement to the use of Cross-Fit exercises in the training program designed by the trainer, which contributed to the improvement of the fitness elements of the rotation phase, which in turn showed an improvement in the level of performance, as it depends on the elements (agility, balance), and from the above the validity of the first assumption, which states that:

"There are statistically significant differences between the pre-and-post measurements in the research sample in the technical performance of the (rotation) phase of the disc throwing competition in favor of the post measurement."

1/10/2 assumption explanation and discussion:

The results shown in Table (4), (7), (8) and (9) showed that there are statistically significant differences between pre and post measurements in favor of the post measurement of the experimental sample in the (throwing and disposal) phase, where the improvement rate for the phase of (throwing and disposal) came by (1.5) degrees which equals an improvement ratio of (42.8%) led to the speed of disk disposal - straightening the entire body -

adequate push for the moment of throwing - fixing the joints of the left side of the body when throwing).

Greg Classman (2002) also confirmed that Cross-Fit exercises improve fitness elements (speed, flexibility, agility, strength), which in turn affect the level of technical performance such as the throwing and disposal phase in the disc throwing competition (12 : 7)

The studies of **Faten Abu Al-Saud (2020) (9)**, **Ghaida Abdel Shakour, Mohammed Ali Hassan (2017) (8)** confirm that Cross-Fit exercises work to improve the elements of fitness (speed, flexibility, balance, fitness, compatibility, strength).

The researcher also reduces this improvement to the use of Cross-Fit exercises in the training program designed by the trainer, which contributed to the improvement of the fitness elements of the rotation phase, which in turn showed an improvement in the level of performance, as it depends on the elements (strength, endurance), and from the above the validity of the second assumption, which states that:

"There are statistically significant differences between the pre- and post-measurements in the research sample in the technical performance of the (throwing and disposal) phase of the disc ejection race in favor of dimensional measurement."

1/10/3 assumption explanation and discussion:

The results shown in Table (4), (7), (8) and (9) showed that there are statistically significant differences between pre- and post-measurements in favor of the post measurement in the research sample at the score level, where the rate of improvement in the score level came by (5.31) meters, an improvement ratio of (15.02%).

Greg Classman (2016) also confirmed that Cross-Fit exercises improve the score level. (12:7)

The studies of **Fatima Salah Juma (2020) (10)**, **Amira Yahya Mahmoud Afifi (2020) (1)** also confirm that Cross-Fit exercises work to improve the elements of fitness (strength, ability, speed, flexibility, balance, agility, compatibility) and the score level.

The researcher reduces this improvement of the score level to the Cross-Fit training, where it depends on the elements (muscular strength - muscle ability - flexibility - agility - speed - balance - compatibility), and from the above is the validity of the third assumption, which states that:

"There are statistically significant differences between the pre and post measurements in the research sample in the score level of the disc throwing competition in favor of the post measurement."

1/11 Conclusions:

Within the limits of the research problem and its importance, and in view of its objectives, its assumptions and the nature of the sample and within the framework of statistical treatments and the interpretation and discussion of the results, the researcher was able to reach the following conclusions:

- 1- Relying on the principle of gradualness and diversity of trainings and tools has ended the training unit with the same strength and motivation at its beginning.
- 2- Cross Fit exercises led to a clear and noticeable improvement in the (rotation, throwing and disposal) phases.
1. Cross Fit training programs have a positive impact on the score level.

1/12 Recommendations:

Based on the data and information provided in the context of this research, and based on the conclusions derived from statistical analysis and the discussion of the results, the researcher recommend the following:

- 1- The need to properly plan training programs, including the use of modern training methods, taking into account the conditions and specifications necessary for the use of these tools.
- 2- Applying the training program using CrossFit training to improve physical variables, technical performance and the score levels.
- 3- The importance of applying Cross Fit exercises for players to develop fitness elements and raise the level of performance.
- 4- Work on conducting other studies on different variables and samples in terms of (age and gender) in addition to studies in various sports activities.
- 5- The need to pay attention to the preparation of trainers and workers in the sports field by making training courses to raise their level of training and keep pace with the progress and change in the methods and techniques of training and the latest instruments and tools used and how to benefit from them to reach higher levels.
- 6- Work to make educational courses to clarify the importance of practicing crossfit for everyone, because of its positive effects on physical variables and technical performance.

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