

Impact of strength exercises on the level of performance of male discus throwers of the F40 category

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ABSTRACT

F40 category (short stature) athletes usually suffer from stability related problems. Due to these problems it is difficult for them to give their best performances, despite their regular strength training protocols. Hence, preparation and implementation of specific strength exercises might help them to perform better in discus throw. The present study aimed to find out the impact of specific strength exercises on the level of performance of male discus throwers of the F40 category. The athletes from the Dhi Qar Committee constituted the population of the study. The sample was selected by purposive sampling method. A total of five participants were recruited of F40 category. In the present study, statistical significant results were obtained on comparison between pretest and posttest findings. The results of this study showed that the program of strength exercises applied significantly improved the level of performance of male discus throwers of the F40 category.

KEYWORDS

Strength exercises; Double hierarchical style; Discus; F40 category.

1. INTRODUCTION

In the past decade, great efforts have been made by the researchers in raising the level of game and performances of the athletes in the respective sports. Scientists and researchers are still working tirelessly to find the best and optimum ways in the process of keeping pace with the scientific modernity. The hierarchical system, is a multi-modal work system. The training with this model is done by increasing the level of resistance in a gradual manner. In this method the load is increased continuously, simultaneously decreasing the number of repetitions in that group (Mahjoub,1993).

Presently, sports events of the disabled individuals hold a special place in the field of sports. These sports events help these special abled individuals by re-integrating them to the society, boosts their confidence to a great extent by decreasing their dependency on others and also create a competitive atmosphere for them to achieve high level in the sporting achievements, and raising the name of their countries in international forums on the other hand. One of the very important things is that sports events of disabled grab a lot of attention from the community, state and countries at national and international level (Marín et al, 2010).

The present study was an attempt to increase the level of performances of disabled athletes by incorporating modern methods of strengthening as a part of their training schedule. The present study was aimed to find out the impact of strength exercises in the opposite Double Hierarchical Style on some abilities in the performance of the discus throw for the F40 category (short stature) athletes. Training associated with correct scientific approach will help the athletes in achievement of their desired goals in the game (Alawi and Radwan, 1989).

The great amount of progress can be witnessed in athletic activities over the course of time. The probable reason is training of athletes based on scientific foundations. To the best of researcher's knowledge, as a former athletics player and officially accredited coach in the Athletics Federation for the challenged with disabilities currently, the disabled discuss throw athletes for the F40 category (men with short stature with height measuring 130 cm or less) are still struggling with the stability related issues in their game. Due to which, they fail to give the desired outcomes and reach the best records compared to other countries and other activities. Secondly, the effectiveness of discus throwing for class F40 for men and in forms were not used previously in their training (Al-Hakim, 2004). Hence the present study aimed to strengthen their weak zones by adapting new method of Strength Exercises in the opposite Double Hierarchical Style and identify its impact on the performance of the athletes.

The aim of the present study was to prepare a strengthen exercises protocol using opposite double hierarchical method, to improve the performance in discus throw male athletes of F40 category. With this purpose, we focused on identifying in our sample the statistical differences between the pre-test and the post-test findings on some physical abilities in the discus throwing.

2. METHODS

2.1. Design and participants

The present study had a pretest - posttest experimental group design. In the present study participants were recruited from Dhi Qar Committee from Athletics category F40 for men in discus throw. The recruitment was done within the timeframe of February 2021 to July 2021. The sample was selected based on purposive sampling method. A total 5 participants were recruited (Table 1).

Table 1. Average characteristics of the sample

Height	Weight	Chronological age	Training years	Arm length	Leg length
1.27 cm	70 kg	25 years	7 years	0.52 cm	0.28 cm

Homogeneity of the sample was established using skew coefficient of the variables under study in the tribal tests. The value of skew coefficient was confined between ± 3 , as described in Table 2.

Table 2. The tests of homogeneity and the value of the skew coefficient of the research sample

Variable	Measuring unit	Arithmetic mean	Mediator	Standard deviation	Skewness
Maximum leg strength	Kg	64.50	62.50	9.26	0.18
The speed characteristic of the legs	Repetition /10sec	9.60	9.50	1.26	0.54
The speed characteristic of the arms	Repetition /10sec	10.60	10	1.17	0.89
Explosive power of the legs	Meter	1.62	1.6	0.23	0.48
The explosive power of the aiming arm	Meter	5.63	5.75	-0.74	0.07
Max speed	Sec	5.51	5.26	0.59	1.59
Discus throw achievement	Meter	21	21.05	1.10	0.19

2.2. Means of collecting information, devices and tools used in the research

In the present study, many tools, devices, and aids were used for the purpose of data collection to achieve the objectives of the research, whatever those tools are of data, samples and equipment” (Mahjoub,1993). In the current study various resources were used by the researcher, which include Arabic and foreign sources (Khater and Albeek, 1996). Data collection was done by the method of personal interview of the participants of the study. Data was documented in data collection forms.

Variety of devices and tools were used by the researcher for observation and assessment for recording pre-test and post -test findings. Devices and tools used in the current study include manual calculator, manual stopwatch, iron bars, medicine balls (3 kg - 5 kg), iron nettles of different weights, Fox type whistle (4), dumbbells of different weights, laser disc, various measurement tools (metric tape to measure 50 meters long, rubber ropes of different colors and thickness, and push and pull heavy trolley.

2.3. Field research procedures

2.2.1. Variables and their tests

Researcher reviewed the existing literature and other valuable information from the text book, internet resources and opinions and suggestions from the eminent persons having expertise in the game of disc throw regarding most important special physical abilities characterized by athletes with disabilities of short stature of the F40 category. Researcher took the approval from the members of the subject approval committee prior to the start of testing their abilities (Table 3). Various tests were conducted which included; Maximum leg strength, the speed characteristic of the legs, the speed characteristic of the arms, the explosive power of the legs, the explosive power of the aiming arm and testing of maximum speed.

Table 3. Approval of tests for special physical abilities

Approval %	Experts	Tests	Special physical abilities
100	5	Run 30m from a flying position	Maximum leg strength
100	5	Throwing a medicine ball of 2kg with one hand	The speed characteristic of the legs
100	5	Long jump from stability	The speed characteristic of the arms
100	5	Half durban	Explosive power of the legs
100	5	10 sec front stand (girls stand)	The explosive power of the aiming arm
100	5	Half dabbani (half squat) 10 seconds	Max speed
100	5	Completion of discus throwing according to competition law	Discus throw achievement

Adopting a percentage of 70% of the value of the expert opinion agreement and excluding the tests that did not obtain this percentage, knowing that all abilities and their tests obtained a percentage of 100% from the opinions of the placement approval committee, which numbered 5 individuals, and their accreditation as experts.

2.4. Tests used in the research

The first test was aimed to measure the maximum speed of the participant. It is a test of running 30 meters from a high start (Mahjoub,1993). Instruments used for conducting the test included stopwatch, poles, gypsum and tape measure in meters. The participant was asked to stand directly behind the line. Upon hearing the start signal, the tester was asked to reach the final line in the shortest possible time. Time was calculated in seconds and to the nearest tenth of a second 1/100. Participant was given only one attempt to complete the test.

The second test was intended to measure the explosive force of the shooting arm. A medicine ball weighing 2 kg and a tape measure were used as measurement tools for the test. The participant was asked to throw the medical ball by keeping one hand over the head. Each participant was given two attempts to complete the test. The distance between the leading edge of the throwing line and the nearest point the ball places on the ground was measured.

The third test was intended to measure the explosive force of the legs. as the long jump test from a standing position (Alawi and Radwan, 1989). The participant was asked to stand behind the starting line by keeping their feet slightly apart and parallel so that the instep of the feet touches the starting line from the outside. The participant was asked to stand at the starting position by swinging the arms back, knees in the bent position and leaning forward. Followed by which, participant was asked to jump forward as possible by extending the knees and push the feet with swinging arms forward (Hassanein, 2004). Tools required for measurement of test included a suitable platform to measure the jump, with a width of 1.5 m and a length of 3.5 m, taking into account that it is level, a tape measure, colored pieces of chalk. The measurement was done from the starting line to the last part of the body that touches the ground. Each participant was given two attempts to complete the test.

The fourth test was intended to measure the strength endurance of the muscles of the legs. This is the test of the maximum strength of the muscles of the legs is half-dubbed (Al-Hakim,2004). The tools required for measurement of test included Al-Dubni device, and different weights. Measurement was done by placing the device's arms on the shoulders, with an assistant next to the player, with the knees bent and extended the halfway, twice.

The fifth test was intended to measure the speed characteristic of the two arms. This is the frontal leaning test performed by bending the arms and extending them from the leaning position in 10 seconds of leaning girls (Mahjoub, 1993). The tools required for measurement of test included an electronic clock, and a registration form. The participant was asked to lie on the floor, keeping arms

in the outstretched position. After the sound of start, participants were quickly asked to flex and extend his arms in 10 seconds. Scoring was done by calculating the number of times the arms are bent and extended in a time of 10 seconds is calculated. Only one attempt was given to each participant.

The sixth test was intended to measure the speed characteristic of the legs. This is speed-distinctive strength test for the legs - half-dear half squat 10 seconds (Ibrahim, 1998). The tools required for measurement of test included an electronic clock, a registration form and a training barrier of 40 cm height. The participant was asked to stand in front of the barrier. After hearing the sound of “start, Participant was directed to bend his legs while touching the barrier with the hands and to get up quickly within 10 seconds. Measurement was done by calculating the number of times the legs are bent and extended in a time of 30 seconds. Only one attempt was given to each participant.

The seventh test was intended to measure the throwing distance (achievement). This test is named as - Performance Achievement Test - Discus Throw in accordance with the terms and conditions of the International Athletics Law. The tools required for measurement of test included, an integrated throwing court, a throwing circle of 2.50 m in diameter, a measuring tape, throwing discs weighing 1 kg, and registration forms. The player was asked to stand inside a throwing circle. He was asked to throw the ball as far as possible. The best throwing distance was calculated from the inner edge of the circle to the first trace left by the disc when falling on the ground, and it is measured in meters and centimeters, and for three attempts only, the best is taken.

2.5. Validity of the tests

Honesty is one of the most important conditions for a good test. The honest test is “the one that succeeds in measuring what was set for it” (Hassanein, 2004). The stability indicator is “the validity of the experimental scores in relation to the real scores that were rid of the impurities of chance errors, and then the real scores are the scale or criterion to which the test’s sincerity is attributed, and this kind of honesty is felt through the square root of stability” (Hassanein, 2004).

2.6. Test stability

The stability of the test is based on “the method of conducting the test on a group of individual athletes and then repeating the same test on the same athletes after a period of time. Followed by which, scores of both attempts were correlated as test stability coefficient. The

researcher applied the tests to the exploratory experiment sample of 5 athletes with disabilities from the same research community, on Monday 15/2/2021, the tests were repeated after one week to be repeated on Monday 22/2/2021, under the same test conditions.

2.7. Objectivity of the tests

Objectivity is defined as “freedom from prejudice or intolerance and not introducing personal factors into the laboratory, such as his opinions, subjective whims, personal inclinations, and even prejudice and intolerance”. Objectivity means describing the athlete’s abilities as they really exist, not as we want them to be. For the purpose of verifying the objectivity of the tests, the researcher found the Pearson’s correlation coefficient between the scores of both the attempts. “The correlation coefficient between the assessment of the first judgment and the assessment of the second judgment is the coefficient of objectivity (Alawi and Radwan, 1989)”, noting that the research tests were carried out according to ease, clarity and remoteness. The tests used in the research were of a high degree of objectivity (Table 4).

Table 4. The practical bases of the tests used in the research

Tests	Stability coefficient	Self-honesty coefficient	Objectivity
Run 30m from a flying position	0.927	0.963	0.865
Pushing a medicine ball weighing 2 kg to the farthest distance	0.949	0.974	0.903
Long jump from stability	0.925	0.961	0.861
Half Durban	0.999	0.999	0.999
10 sec front stand (girls stand)	0.990	0.995	0.982
Half squat (half squat) 10 seconds	0.891	0.944	0.804
Discus throwing performance according to competition law	0.999	0.999	0.999

2.8. The exploratory experience of the research

The tests were conducted as a preliminary experiment on a representative sample of the population to be tested. And recording the various observations about the tests with regard to the validity of the instructions and the extent of the sample members’ understanding of them, and “taking notes from this experiment in preparation for amending them if necessary”. On the second day, the exercises had strength to regulate the loads and calculate the tension. The researcher conducted the

reconnaissance experiment on the research sample on Monday - Tuesday 15-16/2/2021 at four o'clock in the afternoon in the local administration stadium with the assistant work team (Radwan, 1998).

The purpose of the pilot experiment was to verify the validity of the tools used in terms of positive assistance, and the availability of safety to work on knowing the appropriateness of the exercises for this age group, knowing the difficulties that the researcher may encounter during the course of the study and providing appropriate solutions to them, knowing the time taken to perform the tests, legalizing training loads for exercises, the researcher conducted the tribal tests on Sunday, February 21, 2021 at exactly four o'clock in the afternoon and at the local administration stadium in Dhi Qar Governorate. Prerequisite preparation was done prior to the start of the experiment. Data was recorded by the assistant not related to the study directly or indirectly under the supervision of the researcher.

2.9. Main experiment

The researcher prepared a set of strength exercises protocol based on the opposite double hierarchical method. implemented during the preparation phase of the sample, the overall duration of the training curriculum was three months (12 weeks). The number of training units per week were three units. The overall number of training units in the curriculum were 36 training units. The training units used were short and medium. During the training units it was tried to find the average intensity of the group for each exercise and to adopt the principle of gradual intensity. In addition, it was taken into account the scientific foundations in training and the relationship between the components of the training load (intensity, size, comfort).

2.10. Post-tests for the research

Posttest assessment was done by the researcher after the successful completion of the strength exercises protocol by all the participants. Posttest assessment was done on Thursday, 20/5/2021, and at four o'clock in the afternoon. Posttest assessment was done under same environmental conditions in terms of time, place, in the presence of the same auxiliary staff, tools and devices in order to maintain the stability of the variables as much as possible (Khribit, 1989).

2.11. Statistical analysis

Statistical analysis of data was done using SPSS and Microsoft Excel. Arithmetic mean, standard deviation, distortion coefficient, and Pearson's correlation coefficient were computed. Also, t tests for correlated and independent samples were applied. The significant level was $p < 0.05$.

3. RESULTS AND DISCUSSION

In Table 5 a comparison between the results of pretest and posttest can be observed. The findings of the present study revealed statistically significant difference and percentages of development for the study variables under study, indicating that strength exercises in the opposite double hierarchical method are effective in developing abilities in athletes of discus throw of F40 category.

Table 5. Comparison between the results of pretest and posttest of the sample

Variable	Measuring unit	Pretest		Posttest		Evolution rate	T value	P value	Result
		M	SD	M	SD				
Maximum leg strength	Kg	64	11.40	71	9.61	10.93	5.71	0.00	Sig.
The speed characteristic of the legs	Repetition /10sec	9.20	1.30	12.60	1.51	36.95	6.66	0.00	Sig.
The speed characteristic of the arms	Repetition /10sec	11.40	1.14	14.60	1.14	28.07	8.55	0.00	Sig.
Explosive power of the legs	Meter	1.65	0.21	1.96	0.11	18.78	4.29	0.01	Sig.
The explosive power of the aiming arm	Meter	5.97	0.72	6.40	0.68	7.20	15.90	0.00	Sig.
Max speed	Sec	5.68	0.73	4.99	0.60	12.14	8.33	0.00	Sig.
Discus throw achievement	Meter	21.27	0.94	22.52	1.33	5.87	4.87	0.00	Sig.

The researcher attributed that strength exercises protocol using opposite double hierarchical method was developed taking into account the, the principles of training, correct codification of the components of the training load along with the appropriate repetitions and intensity for each exercise. The positive findings of the present study can be justified by the study conducted by El-Din et al. (2001) in which authors stated that "to the need to diversify the use of exercises or their method of performance, as one of the most prevalent training mistakes among trainers is the omission of the process of change in training excitement, and among these changes, for example, the change in the number of repetitions or the number of groups or through the intensity of the load used or the speed of exercise and rest periods".

In the present study, the training of athletes was totally focused on the deficits in the movement. The strength training using opposite double hierarchical method successfully helped the

athletes in gaining strength in the specific muscles required for raising their level of performance in the game.

Strength training by opposite hierarchical method is the training which helps the athletes in building special physical abilities associated with their game. The exercises protocol was designed according to the characteristics and requirements of the disabled athletes. The training coaches must give attention during implementation of strength exercises and the use of appropriate weights and appropriate doses that can reflect the effects for a positive in the development process (Azeez & Majeed, 2022; Mahjoub, 1993; Pérez et al, 2021; Rodríguez & Inglés 2020; Saleh Al-Thubaini 2022). The statistical analysis also revealed that the percentage of development for the post-tests increased with acceptable values. The test also indicated the effectiveness of this method in developing the skill performance in the participants when throwing the discus.

Strength exercises by the opposite double hierarchical method causes development of strength by alternating the muscle contractions inducing stability and mobility of the joints. Isotonic method of muscle contractions was used in which participant was asked to focus the targeted muscle overcoming internal or external resistance. It was observed that, when the special exercises prepared by the researcher were performed by the participants, for the targeted muscle, it contributed to the dimensional differences in the tabular t values with acceptable progression ratios in all tests of the variables under consideration (Khribit, 1998).

The researcher believed that the development of muscle strength according to the opposite double hierarchical method is an effective method to achieve the goal of reaching the sports effectiveness under study to the highest level of performance (Ghatouk, 1995).

4. CONCLUSIONS AND RECOMMENDATIONS

The findings of the present study revealed that the strengthening exercises using opposite double hierarchical method contributed in raising the level of performance of the athletes, reflected as increased values of all the dimensional tests with acceptable significant values as well as the emergence of values for the percentage of development among these tests in the participants of the study. The mechanism of implementing and applying the exercises prepared in the opposite double hierarchical method contributed to raising the level of physical abilities; this was reflected in the successful completion of the post-tests for these abilities.

According to the set of conclusions adopted and formulated by the researcher from the results obtained in this experiment, some recommendations were made by the researchers. The authors

recommended to conduct future research using the opposite double hierarchical method in developing the muscular strength of the athletes with disabilities for other categories, not only the athletic category F40. The researchers also recommended that strength training of athletes should be based on scientific foundations, realizing the importance of rationing the components of the training load for strength exercises in the opposite double hierarchical method, in a way that should be reflected in their performance related to their sport.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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