The effect of a training program using total body resistance training T.R.X on some physical variables of the water polo goalkeeper

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Introduction and research problem:

The first steps of success in any society or any sports activity is to follow the steps of the appropriate scientific research method that aims to raise this society or activity to reach the highest possible levels and achieve the planned goals. Therefore, it has become necessary to use the scientific research method and apply it to the Egyptian sports environment.

Essam Abdel-Khaleq (2005) indicates that sports training as a science is one of the most important means to achieve the highest level of performance and win matches, because of its laws, principles, theories, foundations and principles that enable the successful coach to work on applying those foundations, principles and laws to reach the optimum

level, through Targeting modern training tools, means, and methods that are compatible with the requirements of his specialized activity (6 :25)

Mohammad al-kot (2016) also mentions that physical preparation in swimming is the acquisition of the basic physical characteristics by the athlete in a comprehensive, general, and balanced manner, which is to work to raise the level of the individual physically and kinesthetically to qualify him for skill performance in general, integrated with the comprehensive and integrated balanced development of all the individual's physical and motor abilities (9: 80).

Younis Abu Hasira (2020) and **Abdel Moneim Abdel Wahed (2021)** indicate that training with resistance is the main and complementary part of the preparation period for players during the training season by developing different aspects. Studies and scientific research have proven an improvement in the level of physical fitness for young players by following the steps and instructions Correct resistance training programs (19:3) (1:5)

SUKHGVAN SINGH (2015) mentions that resistance training (T.R.X) is symbolized by the symbol, which means total resistance exercises for the body, and it is suitable for beginners and those with high levels. Fixed or movable fulcrums relative to the attachment point (18:40).

The researchers believe that the use of training aids in training makes training interesting in addition to the effectiveness of these tools in attracting the interest of athletes, and resistance training using rubber ropes is one of the exercises that rely on strong tensile strength against resistance that directly affects muscle mass, and it is a suitable tool for

men, women and stages It has become very common for all ages to use it in the current period, because it helps in tightening the body in general and also getting rid of flabbiness, and even gradually strengthening joints, ligaments and bones, and it is recommended to use it to develop the physical abilities of athletes and improve their physical and skill performance.

The sport of water polo has a special nature in its practice so that players can successfully implement motor duties and basic skills, which also requires special physical specifications for its practitioners, which represent the mainstay and influence in an effective manner in the way of performing those skills.

Through the foregoing, and by informing the researchers and the reference survey of many previous studies and related research, it was found that there are still some difficulties that many officials face in forming such teams. For muscles - as this is a prerequisite for practicing this sport, and there is a lack of use of modern tools and methods in training - so the idea of the research came to try to identify the effect of both TRX (total body resistance) exercises On raising the level of physical performance and skills of the water polo goalkeeper, in which the time course of strength in the working muscle groups during the exercise is similar to the time course of strength during the performance of the skill itself, as it is one of the most appropriate tools through which it is possible to improve physical abilities and thus improve the level of performance of skills and raise the level of physical abilities And the skill of the water polo goalkeeper.

Search Aims:

To identify the effect of a training program using total body resistance training **T.R.X** on some physical variables of the water polo goalkeeper.

Research hypotheses:

1. There are statistically significant differences between the averages of the tribal and remote measurements in some of the physical variables outside the water of the water polo goalkeeper under study and in favor of the dimensional measurement.
2. There are statistically significant differences between the averages of the tribal and remote measurements in some of the physical variables inside the water for the water polo goalkeeper under study and in favor of the dimensional measurement.

Search procedures:

Research Methodology:

The researcher used the experimental method due to its relevance to the nature of the research, using one of the experimental designs, which is the experimental design, the one-group system, by applying (pre-measurement - post-measurement) to it.

Research community and sample:

The research community included (48) water polo players in City Youth Center "A". The researchers selected (5) individuals for the basic sample and (12) individuals for the exploratory sample.

The average distribution of the research sample:

To verify the moderation of the distribution of the members of the research sample, the statistical measurements of the total research sample (5 players a basic sample + 12 players an exploratory sample) of water polo players, to find the torsion coefficients for the growth variables (age, height, weight and physical variables inside and outside the water) before Starting to implement the training program under discussion, and table (1) shows this:

Table (1)

Arithmetic mean, median, standard deviation, and torsion coefficient of the research sample in the growth variables, age, height, weight, and physical variables inside and outside the water of the sample under research (n = 17)

Variables	unit	AVERAGE	Mediator	s.t.dev	skewness
basic variables					
age	year	14.59	15.00	0.507	2.435-
height	cm	61.35	58.00	9.327	1.078
the weight	kg.	161.94	160.00	6.968	0.836
Physical variables outside of water					
Transitional speed (30m sprint)	sec	4.51	4.43	0.238	1.031
Explosive power (vertical jump)	cm	44.41	45.00	4.214	0.419-
Explosive power (Width jump from stability)	cm	181.41	185.00	11.248	0.957-
Strength tolerance (sitting from a prone position with arms crossed)	NU	30.65	30.00	3.952	0.491
Endurance Speed (5 x 30-meter sprint)	sec	22.88	22.76	0.767	0.481
Physical variables in water					
Maximum speed (25 meters Crawl)	sec	17.27	17.02	1.724	0.441
Endurance Speed (4 x 50m Crawl)	sec	172.59	164.00	19.033	1.354
Agility (omnidirectional swimming)	sec	45.01	45.18	0.956	0.526-
Respiratory endurance (400m Crawl)	sec	393.65	394.00	12.796	0.083-

It is clear from Table (1) that the skew coefficients of the sample under investigation in the variables of age, height, weight and physical variables inside and outside the water of the sample under research ranged between (-2.435: 1.354), meaning that they were limited between (±3), which indicates the moderation of the distribution of the research sample The presence of skew values within the moderation curve.

Data collection methods:

• First: Arab and foreign references:

The researcher reviewed the specialized scientific references and previous studies related to the field of research to benefit from them when conducting this research.

• Secondly the forms:

- Players personal data registration form prepared by the researcher.

Third: Scientific devices and tools:

The following devices and tools were used:

- Stopwatch.
- Medical scale for measuring weight.
- Resist meter for measuring length.
- trx resistance ropes
- Sandbags.
- The palms of the hands.
- Video camera.
- weights.
- Whistle.
- Collars.
- cones.

Fourthly, the tests:

Body measurements: appendix

- Length and its unit of measure (centimeter).
- Body weight and unit of measure (kg).

Physical Exams Out of Water: Annex

- A 30-meter sprint test to measure the transitional speed and its unit of measurement (second).
- Vertical jump test to measure the explosive force and its unit (centimeters).
- The wide jump from stability to measure the explosive force and its unit of measurement (centimeters).
- Tilting prone test, bending the arms, to measure the endurance of the force and its unit of measurement (number).
- A sprint test (5 repetitions x 30 meters) to measure speed endurance and its unit of measure (second).

Physical tests in the water:

- Crawl 25m to measure the maximum strength and its unit of measure (second).
- Crawl (4 x 50 m) sprint test to measure speed endurance and its unit of measure (second).
- Multi-directional swimming to measure agility and its unit of measure (second).
- A test (400m) Crawl to measure the periodic respiratory endurance and its unit (minute).

Scientific transactions for the tests under study:

The researcher calculated the scientific coefficients of the tests used in the research according to the following:

A. Validity: The validity of the tests under study was calculated by means of the validity of the peripheral comparison on a similar exploratory sample of the research community and from outside the main research sample, which numbered (12) twelve novice water polo players, and their scores were arranged ascendingly to determine the higher quadrants, which numbered (3) three players and quarters. The minimum number of them (3) is three players, and the significance of the differences between the two quarters was calculated as shown in Table (2).

The equivalence of the two search groups:

The following table shows the results of equivalence between the experimental and control groups in each of the growth variables (age, height, weight) and the numerical level in the short swims under study.

Table (2)

Significance of differences between the highest and lowest quartiles in the tests under study by the Mann-Whitney NON barometric Method (n = 6)

Variables	unit	top quarters		lower quadrants		U	W	Statistical Indications	
		total ranks	average rank	total ranks	average rank			Z	sig
PHYSICAL VARIABLES OUTSIDE OF WATER									
Transitional speed (30m sprint)	sec	6.00	2.00	15.00	5.00	0.00	6.00	2.236	0.046
Explosive power (vertical jump)	cm	15.00	5.00	6.00	2.00	0.00	6.00	1.993	0.050
Explosive power (Width jump from stability)	cm	15.00	5.00	6.00	2.00	0.00	6.00	1.993	0.050
Strength tolerance (sitting from a prone position with arms crossed)	NU	15.00	5.00	6.00	2.00	0.00	6.00	1.964	0.046
Endurance Speed (5 x 30-meter sprint)	sec	6.00	2.00	15.00	5.00	0.00	6.00	2.236	0.046
PHYSICAL VARIABLES IN WATER									
Maximum speed (25 meters Crawl)	sec	6.00	2.00	15.00	5.00	0.00	6.00	1.993	0.050
Endurance Speed (4 x 50m Crawl)	sec	6.00	2.00	15.00	5.00	0.00	6.00	1.993	0.050
Agility (omnidirectional swimming)	sec	6.00	2.00	15.00	5.00	0.05	6.00	2.236	0.046
Respiratory endurance (400m Crawl)	sec	6.00	2.00	15.00	5.00	0.00	6.00	1.964	0.050

It is evident from Table (2) that there are statistically significant differences between the two groups of the highest quartiles and the lowest quartiles in the tests under discussion and in the direction of the group of higher quartiles, as the values of the probability of error are significant at the level of significance (0.05), which indicates the validity of those tests and their ability to distinguish between groups.

B. Stability: To calculate the stability of the tests under study, the researcher used the method of applying and re-applying the test on a sample of (12) twelve water polo players from the research community and from outside the original sample, with an interval of (7) seven days, to remove the learning effect between application and re-application, and the table (3It shows the correlation coefficients between application and re-application.

Table (3)

Correlation coefficients between Test and Re -Test in the tests under investigation (n = 12)

Variables	unit	Test		Re -Test		correlation coefficient
		average	s.t.dev	average	s.t.dev	
Transitional speed (30m sprint)	sec	4.54	0.25	4.57	0.713	0.88
Explosive power (vertical jump)	cm	44.07	4.446	43.9	3.892	0.91
Explosive power (Width jump from stability)	cm	180.71	12.34	181.09	9.002	0.79
Strength tolerance (sitting from a prone position with arms crossed)	NU	30.21	3.926	30.86	2.075	0.84
Endurance Speed (5 x 30-meter sprint)	sec	22.92	0.816	23.14	0.914	0.83
Maximum speed (25 meters Crawl)	sec	17.11	1.83	17.75	0.894	0.92
Endurance Speed (4 x 50m Crawl)	sec	173.50	19.65	174.01	12.07	0.84
Agility (omnidirectional swimming)	sec	45.01	0.891	45.98	7.869	0.82
Respiratory endurance (400m Crawl)	sec	393.07	13.73	392.46	12.92	0.85

(R) tabular value at significance level (0.05) = 0.576

It is clear from Table (3) that the correlation coefficients between the application and re-application of the tests in question ranged between (0.79, 0.92) and all of them are statistically significant correlation coefficients as the calculated (t) values are greater than the tabular (t) value at the significance level (0.05). This indicates the stability of these tests.

Research executive steps:

The survey:

The researcher conducted the survey from 24/7/2021 to 1/8/2021, To identify the suitability of the training program under consideration for the research sample, and to identify the validity of the tools and tests used. The exploratory study resulted in identifying and the various exercises and exercises used in the program and confirmed their validity and suitability for research.

Tribal measurements:

Tribal measurements of the research variables were carried out on the research sample during the period, From 3/8/2021 to 5/8/2021.

Program implementation:

The implementation of the training program took (6) weeks, and the application took place from 7/8/2021, to 10/9/2021 at the rate of (4) units per week, where the unit time was (120).

Dimensional measurement:

After completing the application of the program, the researcher made dimensional measurements of the research sample in the period from 11/9/2021 to 13/9/2021 and with the same conditions that were followed in the tribal measurement.

Statistical method used:

Considering the objectives and hypotheses of the research, the researcher used the following statistical methods: The researcher processed the data using IBM SPSS Statistics 26 statistical analysis program to obtain the following statistical treatments: - Arithmetic mean, mediator, Standard deviation, skew modulus, Mano-Whitney NON barometric Test, Wilkeson's NON barometric z-test for significance of differences, Pearson's correlation coefficient "Z", The researcher satisfied the significance level at the level (0.05) to ensure the significance of the statistical results of the research.

Presentation and discussion of results.

Presentation of the results and discussion of the first hypothesis, which states:

1. There are statistically significant differences between the averages of the tribal and remote measurements in some of the physical variables outside the water of the water polo goalkeeper under study and in favor of the dimensional measurement.

Table (4)

The significance of the differences between the mean of the tribal and remote measurements in some physical variables outside the water of the water polo goalkeeper under research and in favor of the dimensional measurement (n = 5)

Variables	Unit	Type of measurement	ranks	Average ranks	Sum of ranks	(z)	Sig
Transitional speed (30m sprint)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.043
		telemetry	Positive ranks	3.00	15.00		
		Total			5		
Explosive power (vertical jump)	cm	Tribal	Negative ranks	3.00	15.00	2.032*	0.042
		telemetry	Positive ranks	0.00	0.00		
		Total			5		
Explosive power (Width jump from stability)	cm	Tribal	Negative ranks	3.00	15.00	2.023*	0.043
		telemetry	Positive ranks	0.00	0.00		
		Total			5		
Strength tolerance (sitting from a prone position with arms crossed)	N	Tribal	Negative ranks	3.00	15.00	2.023*	0.043
		telemetry	Positive ranks	0.00	0.00		
		Total			5		
Endurance Speed (5 x 30-meter sprint)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.042
		telemetry	Positive ranks	3.00	15.00		
		Total			5		

*** Significant at the level of significance (0.05)**

It is evident from Table (4) that there are statistically significant differences between the tribal and remote measurements in some of the physical variables outside the water of the water polo goalkeeper under discussion and in favor of the post measurement, as the calculated (Z) value is greater than the tabular (Z) value at the 0.05 level.

The researchers attributed the improvement in the physicality outside the water of the water polo goalkeeper in question using body-weight floor exercises using the TRX tool, which relied on resistances like technical performance in training positions for the legs and arms and endurance training, which led to a significant improvement in muscular strength, speed, and endurance during Performing exercises, thus improving physical abilities.

In this regard, "**Mufti Ibrahim**" **(2020)** indicates that muscular strength is one of the elements on which an individual's access to the highest ranks of sports championship is based. It also greatly affects the development of some physical attributes such as speed, endurance, and agility, especially for the types of sports activities in which the use of Strength is one of the physical attributes (12:59)

This was confirmed by "**Ali Al-Baik**" **and** "**Imad Al-Din Abu Zaid**" **(2009),** "Cloud" and others, "**Cloud Bouchard et al (2009),** "**Hassan Allawi**" **and** "**Nasr Al-Din Radwan**" **(2008),** "**Essam Al-Din Abdel-Khaleq**" **(2003);** That muscular strength and endurance are among the most important physical abilities that characterize the player and that can be developed for him, and that there is a direct relationship between muscular strength, endurance, mastery and development of technical performance, and thus reaching higher levels and one of the most important physical abilities that affect the level of performance in sports activities. Muscularity is one of the basic capabilities of swimming players.

As **Owais Al-Jabali and Tamer Al-Jabali (2016)** explained the importance of muscular strength as the most important physical ability among other physical abilities in the sports field, and even in life in general, and thus coaches view it as a key to the progress of all sports activities alike. The level of these activities depends on the muscular strength of the athlete, with the difference in relation to the extent of their need for physical ability such as muscular strength (14 :122)

This is consistent with the findings of the study of **Nora Misbah (2020), Mahmoud Mokhtar (2019), Mustafa Ismail (2019), Aya El-Sayed (2019), Sukhjivan Singh (2015), Samah Mohammad (2016), Walid Mohamed (2017), Samaa Abdel Dayem (2016),** on the positive effect of TRX out-of-water training on physical abilities under their research.

Thus, the first hypothesis has been verified, which states: There are statistically significant differences between the mean pre and post in some physical variables outside the water of the water polo goalkeeper under investigation and in favor of the dimensional measurement

Presentation of the results and discussion of the first hypothesis, which states:

2. There are statistically significant differences between the averages of the tribal and remote measurements in some of the physical variables inside the water for the water polo goalkeeper under study and in favor of the dimensional measurement.

Table (5)

The significance of the differences between the mean of the tribal and remote measurements in some physical variables in the water for the water polo goalkeeper under research and in favor of the dimensional measurement (n = 5)

Variables	Unit	Type of measurement	ranks	Average ranks	Sum of ranks	(z)	Sig
Maximum speed (25 meters Crawl)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.043
		telemetry	Positive ranks	3.00	15.00		
		Total			5		
Endurance Speed (4 x 50m Crawl)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.043
		telemetry	Positive ranks	3.00	15.00		
		Total			5		
Agility (omnidirectional swimming)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.043
		telemetry	Positive ranks	3.00	15.00		
		Total			5		
Respiratory endurance (400m Crawl)	sec	Tribal	Negative ranks	0.00	0.00	2.023*	0.043
		telemetry	Positive ranks	3.00	15.00		
		Total			5		

*** Significant at the level of significance (0.05)**

It is evident from Table (5) that there are statistically significant differences between the tribal and remote measurements in some of the physical variables inside the water for the water polo goalkeeper under discussion and in favor of the post measurement, as the calculated (Z) value is greater than the tabular (Z) value at the 0.05 level.

The researcher attributes these results to the effectiveness of TRX exercises in improving the physical abilities in the water by including many exercises that are like the muscular work of the players, and the TRX exercises contain many diverse exercises that suited the sample under research, in addition to the scientific planning of the training program using TRX exercises. Which in turn contributed to the improvement of the dimensional measurements of the sample in question compared to the tribal measurements.

In this regard, **Ali Yalfani, et al (2021)** states that attachment exercises using TRX contribute to improving different physical abilities that vary in intensity, and the volume of attachment exercises can be increased in line with the age of the players to develop strength endurance by increasing resistance, whether by resistance Gravity or using weights and increasing the number of repetitions, which helps players to improve strength endurance to achieve physical development.

The findings are consistent with those of the studies of **Sittichai Pengkumpa, et al (2022), Serkan PANCAR, et al (2021), Ali Yalfani, et al (2021), Noura Mesbah (2020), Mahmoud Mukhtar (2019). Mustafa Ismail (2019), Aya Al-Sayed (2019),** which supported the

improvement of the physical capabilities within the water of the samples under those studies.

Thus, the second hypothesis has been verified, which states: There are statistically significant differences between the mean pre and post measurements in some physical variables inside the water for the water polo goalkeeper under study and in favor of the dimensional measurement

Conclusions:

Considering the aim of the research and the presentation of the results that have been reached, the researchers concluded the following:

1. The training program using total body resistance exercises T.R.X has a positive effect in improving the physical variables outside the water (transitional velocity - explosive force - explosive force - force endurance - speed endurance) for the water polo guards under study, where the results showed that there were statistically significant differences in favor of the measurement The dimension of the sample under investigation.
2. The training program using total body resistance training T.R.X has a positive effect in improving the physical variables inside the water (maximum speed - speed endurance - agility - periodic respiratory endurance) among the water polo guards under study, where the results showed that there were statistically significant differences in favor of the dimensional measurement among the sample is under investigation.

Recommendations:

Considering the research results, the researchers recommend the following:

1. The use of total body resistance training T.R.X to develop the physical variables outside the water of the water polo goalkeepers.
2. The use of total body resistance training T.R.X to develop the physical variables inside the water of the water polo goalkeepers.
3. Using the training program under discussion using the total body resistance exercises T.R.X to develop the physical variables of the water polo goalkeepers.

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