Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XXIII, ISSUE 2, 2023, Romania
The journal is indexed in: ERIH PLUS, Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengage Learning, Cabell's Directories

Science, Movement and Health, Vol. XXIII, ISSUE 2, 2023
June 2023, 23 (2): 199 - 203
Original article

EFFECT OF FLYWHEEL EXERCISES ON CERTAIN PHYSICAL VARIABLES AND 100M SPRINT TIME FOR FEMALE EGYPTIAN PLAYERS

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Abstract

Aim.

inertial treadmill for multidirectional movements in certain sporting conditions leads to greater improvements in performance compared to traditional training, so the use of environment-centered overload training applied by the inertial treadmill, to stimulate neural adaptations of athletes In general, and in team games in particular, in addition to improving their skills, and in particular the accuracy of shooting. The aim of this study was to investigate the effectiveness of flywheel exercises on certain physical variables and 100m sprint time for female Egyptian players.

Methods.

Three female sprinters from Egyptian national team were participated in this study as an experimental group which practiced 8-weeks flywheel training. The data collected before - after the training programs for the experimental group.

Results.

Statistical analyses showed that:

- Significant Difference between the pre- and posttests for the experimental group in Grip strength (right), Grip strength (left), Dynamometer of leg Strength, Dynamometer of back Strength, 100m time for posttest of experimental group.

Conclusions.

Under the conditions of our article, the researcher's conclusion that eight weeks of flywheel training contributed to improving strength and power and 100m sprint record for Egyptian female national.

Key words: flywheel exercises, Power, 100m sprint.

Introduction.

Strength training programs can be designed to improve either maximal muscle strength, power, hypertrophy, or muscular endurance. Therefore, it is of utmost importance for training to be efficient, safe, and effective, to understand the interaction between training variables (De Salles, et al. 2009).

Amr Hamza (2021) indicates that Eccentric Overload Training using the Flywheel has become very popular in the sports field, as it allows the athlete to move his maximum potential from muscular strength to advanced levels.

Timmins et al. (2015) that the beginnings of the practice of longitudinal overload training were in bodybuilding and weightlifting halls, then sports scientists began subjecting it to scientific experimentation to explore its multiple benefits, then it became a major part of the programs of sports teams, until it is now being implemented with advanced methods.

Franchi, et al. (2014) that resistance training (RT) can be performed through (3) different types of muscle movements, concentric, eccentric, and isometric. Concentric movement occurs when a muscle produces force while it is shortening; Lengthening actions occur when a muscle produces force during its elongation; Isometric (isometric) actions occur when a muscle produces force without a change in its length.

Schoenfeld (2016) adds that among these three procedures, it has been hypothesized that lengthening movements are the most important when improving muscle strength. This hypothesis is supported by the findings that stretching training leads to higher levels of muscle protein synthesis and greater increases in intracellular anabolic signaling and gene expression versus central exercise.

Friedmann-Bette, et al. (2010) that a lengthening contraction is an active movement of a muscle, as it is lengthened under load. Also known as "negatives", in old-school bodybuilding, every resistance lift we do in the gym will have an eccentric (lengthening) element in it. He adds that, for example, while doing a basic squat exercise, the muscles work eccentrically on the descent.

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However, extension training (also known as AEL - accentuated eccentric loading) typically uses a variety of means to overload the eccentric part of the lift. This intense (central) loading can take many different forms, with more scientific reasons than others.

Giovanni Fiorilli, et al. (2020) that the inertial treadmill method attributes its effectiveness to the combination of benefits of both variable resistance and stretching with overload training.

Amr Hamza (2021) indicates that the use of the inertial treadmill for multidirectional movements in certain sporting conditions leads to greater improvements in performance compared to traditional training, so the use of environment-centered overload training applied by the inertial treadmill, to stimulate neural adaptations of athletes In general, and in team games in particular, in addition to improving their skills, and in particular the accuracy of shooting.

Maroto-Izquierdo, et al. (2017) that in spinning wheel training, the athlete uses force first to speed it up, and then re-uses it to slow it down. This means that there is constant resistance in both the "pulling and returning" movements, that is, in the contraction phases of (central) muscle contraction and (eccentric) muscle lengthening. Whereas with conventional weights, the weight is fixed, so resistance is felt only in the shortening (central) contraction phase.

Festa, et al. (2019) that with spinning disk training, the athlete feels resistance when rising and when squatting. He uses his strength to spin the disk, and then to slow the momentum of the disk. This allows for continuous increased stimulation of the muscles in both the central and the decentralized phases.

Amr Hamza (2021) indicates that the spinning wheel tool, which is commercially called the kBox, is a simple and easy-to-manufacture tool, as it is a wooden box, a double rope, and a small iron bar with an iron pulley, at the end of which a rotating disk (with multiple weights) is attached.

In addition to what Brad Schoenfeld, & Jozo Grgic (2017) has pointed out that temporal adaptations are not necessarily generalizable to long-term adaptations, the results of long-term studies examining muscle movements and hypertrophic adaptations are somewhat equivocal in this regard. While some studies show that lengthening contractions promote muscle growth more than central and isometric contractions, others fail to show significant physical differences in their studies.

Methods

Three female players from Egyptian national team were participated in this study as an experimental group which practiced 8-weeks flywheel training. The data collected before - after the training programs for the experimental group.

Tools and means of data collection:

- A stadiometer to measure length to the nearest 1 cm.
- A medical scale to measure weight in kilograms to the nearest 1/2 kg
- Measuring tape for lengths to the nearest 1 cm
- Stop watches (30w Casio) are recorded to the nearest 1/100 of a second.
- Panasonic camera 250 frames per second
- Dynamometer to measure the strength of the muscles of the legs and back - to the nearest 1 kg
- A fist dynamometer to measure the strength of the fist (left and right) to the nearest 1 kg
- Bounce boxes
- Iron bars
- kBoxes (manufactured by the researcher)

physical exams

- Testing the strength of the muscles of the legs using the dynamometer.
- Testing the strength of the back muscles using the dynamometer.
- Grip strength test (left and right)
- Testing the muscular ability of the two men (broad jump from stability).
- Testing the muscular ability of the arms (throwing a medicine ball weighing 5 kg)

Suggested training program:

General objective of the program:

- Improving the level of physical and skill abilities by using the longitudinal overload exercises with the roller wheel in question.
- Fundamentals and criteria for developing the program:
- Considering the research objective, the researcher set the following foundations and criteria:
- That the program achieves the objective for which it was set.
- Availability of security and safety factors during the application of the program.

The content of the program should be appropriate to the nature and characteristics of the dental stage in question.

- Be sensitive to the individual differences among the research sample.

- The program should be integrated through its various stages.
- Availability of capabilities, tools, and devices appropriate to the nature of the program.

Specifics of the proposed program:

Considering the objective of the research and knowledge of the general criteria and foundations of the proposed program, the following determinants were reached:

Program period:

- The researcher decided that the duration of the program should be (8) weeks, at the rate of (3) units per week, with a total of (24) units. Accordingly, the stages of the program applied to the members of the experimental group were determined.
- The intensity used in the program was determined according to the heart rate through the following equation: (220 n/s - chronological age) x intensity percentage.
- The number of exercises used is (20) exercises, including the upper and lower limbs and the center area.
- Considering the gradation in the performance of the longitudinal overload exercises using the spinning wheel from simple to complex.
- The model is given, and the explanation is performed by the researcher.
- Use the waved load 2:1

Statistical analysis

The researchers were used SPSS statistical package version 22.

- Means, standard deviations (SD).
- Student's t-test, Confidence intervals (± 95%).

Results.

Table 1. Characteristics of experimental group (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	3	21.13 ± 0.3	74 ± 4.9	175 ± 3.41

Table 1 shows characteristics of experimental group. There were no significant differences were observed in the variables.

Table 2. Differences significant between the pre- and posttests for the experimental group

Variables	Experimental group		Sign.
	Before	After	
Grip strength (right)	23.40 ±0.12	25.81 ±0.15	S
Grip strength (left)	21.70 ±0.14	23.18 ±0.32	S
Dynamometer of leg Strength	85.35 ±3.11	88.15 ±2.83	S
Dynamometer of back Strength	79.26 ±2.89	82.57 ±2.67	S
100m time	11.18±0.04	11.14 ±0.03	S

Table 2 shows that:

Significant Difference between the pre- and posttests for the experimental group in Grip strength (right), Grip strength (left), Dynamometer of leg Strength, Dynamometer of back Strength, 100m time for posttest of experimental group.

Discussion.

The researchers attribute these differences in the physical variables to the good planning of the longitudinal overload training program, the rationing of the training loads in a scientific manner appropriate to the dental and training stage of the research sample, and to the use of the spinning wheel exercises as a major part of the longitudinal overload training with the aim of developing muscle strength.In this regard, Schoenfeld (2016) confirms that lengthening exercises are the most important when improving muscle strength. This hypothesis is supported by the findings that prolonged exercise leads to higher levels of muscle protein synthesis and greater increases in intracellular anabolic signaling and gene expression versus central exercise. Amr Hamza (2021) confirms that the longitudinal overload training compared to the central exercises, we find that the skeletal muscles are able to produce 20-50% more force during the maximum lengthening contractions, so it is logical that the player is able to bear more load on the spinning wheel during extension training. Anderson & Aagard (2010) add that preferential recruitment of type II fibers can be obtained through lengthening hyperexercise training—these fibers have greater growth potential than type I fibers, and are arguably more important fibers for high-intensity activities such as soccer. American football, volleyball, basketball. Roig, et al. (2009) that there is a growing body of studies showing that lengthening hyperload training has a greater effect on muscular strength when compared to core training. The researcher believes that the relationship between the skillful performance of the sport of athletics and its various physical requirements is a close relationship that must be taken into account when preparing the youth, because the level of the player's physical

condition is considered one of the important reasons that contribute to achieving many victories. The high level of physical fitness of the fencer enables him to perform A successful sports season, in addition to the high physical fitness of the fencer increases the coach's confidence in his player, and the coach tries most of the time to benefit from it and maintain it.

This is confirmed by Kamal Abdel-Hamid and Subhi Hassanein (2001) that success in any basic defensive or offensive skill requires the development of necessary physical components that contribute to its performance in an ideal manner, and that each basic skill contributes to its performance according to its nature more than a physical component. This is confirmed by Cronin, et al. (2003) (10) that the strength characteristic of speed plays a decisive role in the 100m running competition. Amr Hamza (2021) confirms that greater intensity can be obtained through supramaximal eccentric training. This has several positive effects. More strength means more adaptation. Extension training does this by increasing levels of neural drive. The results of the study are consistent with those of Suarez-Arrones, et al. (2018), Francisco Javier, et al. (2018), Luca Festa, et al. (2019), Joey Brien, et al. (2020), Giovanni Fiorilli, et al. (2020), Alejandro Azze, et al. (2020) that prolonged overload training contributes to improving the physical and skill abilities of the experimental group.

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