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Effect of Eccentric Isometric Exercises on Developing Legs Muscle Endurance and 800m Running Performance in Youth

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Abstract

Study purpose. The goal of this study is to enhance muscle strength, particularly stamina, to the point where the individual can run the desired 800 meters. This will be achieved through the use of the most effective exercises, which focus on contracting the muscles in the direction of movement, such as eccentric isotonic exercises.

Things and ways to do them. To conduct the study and solve the problem, the researcher employed an experimental method with a control group, utilizing an identical design. The sample of the researcher consisted of ten young people from the Al-Qurna Sports Club who participated in running 800 meters. Then the sample was selected, comprising eight players. Two players were left out due to their level of success, which altered the homogeneity and equivalence. The sample was randomly allocated to two groups, namely the control and experimental groups, each consisting of four players.

Results. The results of this study demonstrated that both the control group and experimental group improved on the research factors, primarily the strength and endurance of the legs and the ability to run 800 meters. Here is proof that both groups completed the tasks and achieved the training goals.

Conclusion. This study found Eccentric isotonic exercises achieved the training goal of developing leg muscle endurance and completing the 800-meter run for young men. It was recommended that Eccentric isotonic exercises be adopted because they achieved the training goal of developing leg muscle endurance and completing the 800-meter run for young men.

Keywords: Isotonic Eccentric, Muscular Endurance, Running Performance, Middle Distance Running.

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Introduction

The progress and development witnessed by the world did not occur spontaneously or automatically, but rather through scientific research presented by scientists in various fields, including education, pedagogy, and even sports. This research is considered the fundamental basis for advancement, development, and addressing the problems facing human progress in

these fields (Townsend et al., 2022). Sports has become the field of greatest interest to physical education scientists, with the aim of achieving athletic and moral gains from practicing sports and achieving sporting accomplishments and championships (Karasievych et al., 2021). Scientific research in the field of sports training addresses problems that help provide the best possible picture in selecting or developing appropriate exercises and training that raise the level of the player to achieve specialized accomplishments after they have been scientifically verified, tested, and their results determined based on the achieved accomplishments, for all team and individual sports (Mohammed Jihad & Abdulelah Kareem, 2023). In track and field sports, especially in the 800-meter race, which is considered one of the most difficult events and requires an important and essential physical aspect, such as endurance, which is considered one of the physical abilities necessary to achieve success in this event.(Torres-Ronda et al., 2022) Therefore, (Khazaal, 2025) consider endurance to be "a necessary physical element for performance in most sports, such as team sports, track and field events, swimming, cycling, rowing, wrestling, and others" (Khazaal, 2025).

Meanwhile, (Wirth, 2022) views muscular endurance as "the athlete's ability to continue exerting maximum successive effort with specific resistance and overcome it through high-speed muscle contraction for the longest possible time during a race or competition".(Wirth et al., 2022). To train track and field athletes, especially in medium-or long-distance running events, it is necessary to utilize exercises similar to the performance, which work to lengthen or shorten the muscle in addition to muscle strength exercises (de Azevedo Sodré Silva et al., 2023). Therefore, we find that eccentric isotonic exercises are similar to this activity. (Wilk, 2024) believe that eccentric isotonic exercises are "a moving muscle contraction in which the muscle lengthens and retracts in the face of increased resistance" (Wilk et al., 2024). Hence, the importance of research in raising the level of muscular strength, especially strength endurance, to achieve the achievement of running (800 meters) through the use of appropriate and effective exercises that address muscle contraction in the direction of movement, as in eccentric isotonic exercises (Proske & Morgan, 2001). Running the 800m is a medium- and high-intensity event designed to cover the distance at a constant speed and achieve the required time (Popowczak et al., 2022). This requires training to adapt to the required strength endurance and the use of exercises that enhance muscle contraction in the direction of movement and throughout the race distance (Ding et al., 2024).

Noted that the times achieved in the 800m run are not consistent and do not contribute to participation in international competitions (Emirzeoğlu M., 2021). Which believes it is necessary to use more effective exercises to build the physical aspect of the players in this event particularly muscle endurance.(Jabbar et al., 2025) using exercises that aid eccentric stretching and induce high-level muscle contractions (Guo, 2022). This may help us address the research problem and achieve the desired results in this event. The study aims to identify the effect of eccentric isotonic exercises on developing leg muscle endurance and achieving the 800m run for youth. And as a study hypothesis there is a positive effect of (eccentric isotonic) exercises on developing leg muscle endurance and achieving 800-meter running for youth. The study fields included Al-Qurna Sports Club players in youth track and field games for the 2024-2025 season, the study lasted from 11/10/2024 to 24/12/2024.

Materials and methods

Study participants

The researcher employed the experimental method, utilizing an equivalent control and experimental group design. The researcher defined the research population as ten juvenile runners who took part in the 800-meter event at the Al-Qurna Sports Club. Then, the sample consisted of eight participants. Two players were eliminated as a result of their accomplishment, and this affected homogeneity and equivalence. The sample was randomly

allocated into two groups: a control group and an experimental group, each consisting of four members. To make the sample as similar as possible, we used the coefficient of variation for each group. In order to learn whether the two groups were the same, we used the t-test for unrelated data.

Table 1. Shows the degree of similarity of each group and of the samples of the control and experimental groups.

Variables	Control group		Experimental group		Coefficient of variation	Calculated t-value	Sig. level
	M.	St.d	M.	St.d			
Height (cm)	160.47	1.457	160.45	1.748	1.089	0.015	Insig.
Weight (kg)	62.325	0.895	62.452	0.967	1.548	0.167	Insig.
Muscle strength endurance/sec.	37.45	0.78	37.64	0.88	2.337	0.28	Insig.
Achievement/min	2.04	0.03	2.05	0.04	1.951	0.357	Insig.

* The table value of (t) at a degree of freedom of (6) and a probability of error of (0.05) is = 2.447

Study organization

The investigator used an experimental method with an equivalent control and experimental group design. In order to achieve the research goals and find an answer to the issue, the research variables must be defined.

After reviewing sources, references, and previous research, the researcher found the variables under study to be important in addressing the research problem, including muscular endurance and effective running (800 meters).

Tests Used

1. Strength Test: Leg Muscular Endurance, Determine of the test to estimate strength endurance, equipment used: Running Track-Stopwatch–Whistle. Performance Description: The player stands behind the 200-meter line, i.e., the starting point for the 200-meter run. The tester then gives the command (get ready), then begins and jumps (running in alternating jumps) for a distance of 200 meters to the finish line, where the tester completes the test (Van der Woude et al., 2022).
2. Running accomplishment test: The researcher conducts a test according to the global athletics law, giving two attempts to run a distance of 800 meters, and calculates the best time for all players who started the competition (Liao et al., 2021).

Exploratory Experiment

The researcher conducted an exploratory experiment on October 11, 2024, on the original research sample. He applied some exercises to standardize the experiment and determine its suitability for the research sample. Pre-tests**.** Conducted on October 20, 2024.

Exercises Used.

The required type of exercises was explicitly prepared to train endurance in the leg muscles. During these movements, eccentric isotonic training was employed to lengthen the muscles, thus enabling the individual to achieve the desired time in a 1,600-meter race. These activities were conducted as follows: Two months, eight weeks, 24 train units, with Unit days on Sunday, Tuesday, and Thursday. It was 90-100% intense, with a noise level calculated by determining the maximum intensity of the performance and its repetitions. Rest: Pulse indicated the time to rest (120130 bpm between reps, 110120 bpm between sets).

The training load was set once the exercises were completed in their final form, and then a pilot test was administered. It has been installed in the main section of the trainer training equipment and implemented in the additional time to prepare. The training commenced on 21 October 2024 and was completed on 23 December 2024.

Statistical analysis

The authors used (SPSS) program by using statistics processes such like mean, standard deviation, standard error, calculated t values, and coefficient of variation.

Results

Results of control group in physical tests

Table 2. Are the mean scores before and after testing, the standard errors, and the calculated versus tabulated t-values for the control group in the physical tests

Physical Tests	Mean Pre-test	Mean Post-test	Standard error	Calculated t values	Significance level
Muscular Strength Endurance/Second	37.45	35.12	0.674	3.456	Sig.
Achievement/Minute	2.04	1.78	0.084	3.095	Sig.

Table value of (t) at a degree of freedom (3) and under a probability of error (0.05) = 3.182

Results of experimental group in physical tests

Table 3 In Table 2, The pre- and post-test means, their respective standard errors, together with the computed and reference t-values for the control group in the physical evaluations are reported

Physical Tests	Mean Pre-test	Mean Post-test	Standard error	Calculated t values	Significance level
Muscular Strength Endurance/Second	37.64	33.24	1.245	3.534	Sig.
Achievement/Minute	2.05	1.58	0.099	4.747	Sig.

Table value of (t) at a degree of freedom (3) and under a probability of error (0.05) = 3.182

Results of control and experimental groups in physical variables

Table 4. Shows means, post-test standard deviations, and calculated and tabulated t-test values between the control and experimental groups in physical variables.

Physical Tests	Control group		Experimental group		Calculated t values	Significance level
	M.	St.d	M.	St.d		
Muscular Endurance/Second	35.12	0.674	33.24	0.689	3.381	Sig.
Achievement/Minute	1.78	0.086	1.58	0.079	2.985	Sig.

Tabular value of (t) at a degree of freedom of (6) and under a probability of error of (0.05) = 2.447

Looking at Tables (2) and (3), we can see that both the control group and the experimental group improved in the study variables. This was particularly the case for the strength and endurance of the legs and how well they performed in running 800 meters. As demonstrated by Khazaal Jabbar and Shanta Faraj (2025), the tasks used with both groups were practical and met the training goals. see "exercises in their general concept as 'a group of physical movements performed by the various body parts according to educational principles and scientific foundations based on physiological, anatomical and natural foundations. These may be performed once or several times in a smooth and complete harmony" (Khazaal Jabbar & Shanta Faraj, 2025). Achieving success in the variables that are being trained on gives an indication of achieving the training objectives set. For this reason, (Schneider, 2018) believes that "sports training aims to improve the player's physical abilities according to the sporting activity practiced. Therefore, those working in the sports field need to develop the player's physical level in addition to the necessity of being familiar with the information related to training methods and means because of their impact on the development of general and specific physical abilities".(Schneider et al., 2018)(Christiani et al., 2021).

By observing Table (4), we find that the experimental group outperformed the control group as a result of using the correct exercises (eccentric isotonic) to train muscle endurance, which is necessary for achieving athletic achievement. (Brígido, 2022) believe that "performance in all athletic activities depends on how the body moves. Muscles control body movement by contracting and relaxing to move limbs from one position to another. The stronger the muscles, the more effective these contractions are, and consequently, the better the movement". (Brígido-Fernández et al., 2022). Using the correct exercises also helps develop and advance the desired level of achievement. (Shareef, 2025) If the goal is to hit the highest levels of athleticism, then one sign that the training is working is if the level of athletic performance goes up. Since Akbar and Ali Yassin (2024) wrote "the big change in training methods is because more people are interested in finding new ways to train players and using scientific principles to plan and create training programs that help them improve their numerical levels." Nikoder et al. (2022) For Sonchan (2019) eccentric exercises "increase muscular strength to a greater degree than other exercises because they allow the use of higher weights and greater muscle load" (Sonchan et al., 2017).

Conclusions

Based on the research results, the methods used, and the limitations of the sample and data collection instruments, the researchers concluded that eccentric isotonic exercises achieved the training aim of developing leg muscle endurance and achieving 800-meter running for young men. Successful achievement in the 800-meter run requires eccentric muscle stretching, which is achieved in training using weights in the direction of muscle movement corresponding to the performance. Based on the research results and conclusions obtained, the researchers recommend that adopt eccentric isotonic exercises because they achieved the training goal of developing leg muscle endurance and achieving 800-meter

running for young men. To achieve success in the 800-meter run, it is necessary to work on muscle stretching. Eccentric training involves using weights in the direction of muscle movement corresponding to the performance.

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Conflict of interest

There is none

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