

The Effect of A proposed Training program (P.N.F) Using Neuromuscular Facilities on the Elimination of Muscle Soreness (DOMS) And the Numerical Achievement For The 1500m Runner

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Introduction and research problem

Proprioceptive Neuromuscular Facilitation (P.N.F) exercises are considered the latest methods for developing flexibility, and they became more popular during the eighties. They include the use of successive isometric contractions with muscle relaxation. It has when performing the movement over the full range of the joint. (2- 206)

P.N.F. techniques were developed by Dr. Herman Kabat in the 1940s as a way to treat neuromuscular conditions including polio and multiple sclerosis, and since then P.N.F techniques have gained popularity among physiotherapists and other specialists in Physical fitness, and P.N.F. techniques are one of the most effective stretching techniques for increasing range of motion. (61)

Prolongation by facilitation of neuromuscular sensory receptors (P.N.F.) includes several methods, including three basic types:

- 1- Hold – Relax
 - 2- Contract – Relax.
 - 3- Hold– Relax– Contract Stabilization and relaxation with muscle contraction.
- The theoretical basis of these methods is that they all depend on the lengthening of the working muscle to

the maximum extent possible (as this leads to the activation of the reflex of the muscle reaction, which is a protective reaction that calms the muscles to prevent injury). (61), (62)

Dealing with Delayed Onset Muscle Soreness is a phenomenon that the muscle may be exposed to at the end of the training unit. These muscle pains appear after (24-48) hours after the end of high intensity training, and muscle pain may persist for a period ranging from (3-4) days.

Christopher Norris (1993) points out that muscle pain associated with fatigue occurs as a natural result of exercise and does not necessarily lead to injury, but not getting rid of this pain before starting a new training dose may cause injury, and there are two types of Muscle pain, type 1, is acute muscle pain that occurs during exercise It increases with the increase in the intensity of training, but it disappears after the end of the training with a period ranging from several minutes to several hours, as the increase in pressure inside the muscle during training causes pressure or narrowing of the blood vessels feeding the muscle, which reduces the amount of blood incoming to the muscle and thus the lack of oxygen delivery Muscular

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pain occurs, and the accumulation of metabolic waste and lactic acid that causes fatigue is one of the most important causes of this type of pain. (17-111, 112)

While the second type of muscle pain is Delayed Onset Muscle Soreness, it was explained by "Jones, Newham, Torgan" (1989 AD) that it occurs within (24-48) hours after the end of high intensity exercises, and there are no reasons To occur, but it may occur as a result of increased muscle tension during eccentric contraction (short - medium - long) which may cause damage to muscle tissue and thus cause pain. (25-426)

From the above it is clear that there are several reasons that may result in the occurrence of muscle pain, such as increased activity of the sympathetic nervous system, which in turn leads to increased tension in the muscle, in addition to the accumulation of metabolic waste and lactic acid in the muscle and the lack of oxygen to it with the accumulation of pain-causing substances, which causes an increase in sensation with muscle pain.

The middle and long-distance races that are closely related to the "endurance" element of tolerance are therefore called "tolerance races" or "endurance races." The use of the anaerobic power system was greater than that of the aerobic power system, so both systems are used in those races.) (13- 144: 146)

Muscular fatigue is a complex phenomenon that can be defined as the inability to maintain the level of force production, or the decrease in the maximum force that the muscle can

exert, and results in the field of running medium and long distances, a decrease in the maximum speed of running, and an increase in the time of contact with the ground (time of landing). (9- 31)

And through the scientific and practical experience of the researchers in the field of training and sports medicine and the continuous follow-up to the training and competitions of middle distances as one of the members of the board of directors of the Assiut Athletics Region - the researchers noticed the appearance of signs of fatigue quickly and strikingly in the training unit, and in the middle and end of the 1500-meter race took place despite the regularity in the process Training, and that there is a complaint of muscle pain, especially contributing to the motor performance of the race and the inability to finish the race quickly.

The researchers also believe that if the feeling of muscle pain persists and the athlete is forced to participate in new training doses before getting rid of the pain he suffered after the previous training dose, the athlete may be exposed to poor performance, and a decrease in the player's recorded digital achievement, and the athlete may also be exposed to sports injuries. of different types and degrees.

From here, the researchers believe that the design of a proposed training program for the 1500-meter runners, which was carried out using the method of neuromuscular facilities for sensory receptors, may help in quickly eliminating muscle pain and responding to some indicators of inflammation such as (interleukin-6 and creatine kinase) before starting

additional new training, as well as increasing flexibility Joints and the development of motor range, which may contribute to improving the digital achievement of the 1500-meter race that took place, and this is consistent with what was indicated by the recommendations of the study "Ahmed Ismail Ahmed" (2019 AD) (5) that it is necessary to get rid of muscle pain resulting from training, especially high-intensity exercises before starting the additional new training.

Aim of the work:

The objectives of the research are to design a proposed training program for 1500-meter athletes using the method of "hold-relax with agonist contraction" as one of the neuromuscular facilitation methods (P.N.F) and study its effect on:

- 1- Some indicators of inflammation, physical abilities, and digital achievement of the 1500-meter race for the control group (the proposed training program + the traditional stretching method).
- 2- Some indicators of inflammation, physical abilities and digital achievement of the 1500-meter race that took place for the experimental group (the proposed training program + P.N.F method).
- 3- Studying the differences between the control and experimental groups in the indications of inflammation indicators, physical abilities and digital achievement of the 1500m race.

Research hypotheses:

- 1- There are statistically significant differences between the mean scores of the tribal and posterior measurements of the control group in some indicators of inflammation, physical abilities, and digital achievement for the 1500-meter race, which were in favor of the mean scores of the post-measurements.
- 2- There are statistically significant differences between the mean scores of

the tribal and posterior measurements of the experimental group in some indicators of inflammation, physical abilities and the digital achievement of the 1500-meter race, which took place in favor of the mean scores of the post-measurements.

- 3- There are statistically significant differences between the mean scores of the dimensional measurements of the control and experimental group in some indicators of inflammation, physical abilities and the digital achievement of the 1500-meter race, which were in favor of the average degrees of dimensional measurements of the experimental group.

Research plan and procedure:

Method used:

According to the nature of the research problem and its objectives, the researchers used the experimental method by designing two groups, one control and the other experimental, by applying the pre- and post-measurements as an experimental design, for its relevance to the nature of the study and to verify its hypotheses, and to control the variables related to it.

Research volunteers:

The **volunteers** of this research represented the middle-distance juniors under (18) years old, who were registered in the Egyptian Athletics Federation, Assiut Branch, for the year 2019/2020, and they numbered (16) juniors.

The research samples:

A deliberate sample of (16) youths representing 100% of the original population was chosen. (1) players with injury and (5) players without symptoms of myositis were excluded as a result of the pre-measurement of interleukin-6 (IL-6) and creatine kinase (CK- Total) were used to conduct the exploratory

research experiment and find scientific transactions for the tests used in the research, and thus the basic research sample became (10) juniors who were divided into two equal groups (the control group) and their number was (5) juniors who were applied to the proposed training program and the

traditional lengthening method The experimental group, numbering (5) juniors, was applied to the proposed training program and the (P.N.F.) method, and Table (1) shows the description of the research volunteers and sample.

Table (1)

Relative and numerical distribution of the volunteers and the research sample

Research Volunteer	Excluded		Survey sample		Basic Research Sample		Control group		Experimental group		All research volunteers	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
s	1	6.25 %	5	31.25 %	10	62.5 %	5	31.25 %	5	31.25 %	16	100 %

Suggested training program for 1500m runners:

Objective of the training program:

The proposed training program using the Hold - relax with Agonist Contraction method as one of the neuromuscular facilities (P.N.F) methods aims to get rid of muscle pain (DOMS), develop physical abilities and improve the digital achievement of the 1500m runners.

The foundations of the proposed training program:

Through the objective of the research and following the scientific

foundations to build the proposed training program according to the physiological principles of developing aerobic and anaerobic endurance, and the rate of oxygen consumption, the researchers relied on the following foundations:

1- Determining the load degrees for the proposed training program according to the heart rate (pulse) as a measure to evaluate the intensity of the stimulus on the basis of the training pyramid for developing energy fitness, as shown in Table (7).

Table (2)

Relationship between stimulus intensity levels and pulse "Youssef Dahab - on Zaczyorsky"

Body tolerance degree	Pulse/min
Low tolerance 30 – 50 %	Less than 130
Moderate tolerance 50 – 70 %	131 – 150
Above moderate tolerance 70 – 80 %	151 – 165
Below maximum tolerance 80 – 90 %	166 – 180
Maximum tolerance 90 – 100 %	180 – 220

* If the heart rate during performance does not exceed 150 r/min, then the load falls under the Aerobic System.

* If the heart rate exceeds 150 r/min and up to 180 r/min and above, it enters the anaerobic system. (13-167, 168)

2- The suitability of the training program for the age group of the research sample.

3- Take into account individual differences.

4- Stability of the load for a period that allows adjustment and then a gradual rise in the load.

5- Taking into account that the change in intensity is individual in proportion to the maximum limit for each player.

6- The training intensity of the special training distances was determined according to the target time for each player.

7- The researchers used high intensity interval training and repetitive training methods.

8- The principle of positive comfort was used.

Stretching exercises by facilitating muscle sensory receptors by means of stabilization and relaxation with contraction of the motor muscles Hold Relax with Agonist Contraction P.N.F exercises are developed through the following:

- Analysis of the muscle work of the skill performance of the 1500-meter race was conducted.

- Analysis of some documentary films developed by the International Amateur Athletics Federation.

- Personal interview with experts in the field of athletics training.

- The trainer's experience in the field of training.

- Presenting the suggested exercises to the experts.

Hold relax with Agonist Contraction

1- This method begins with a short stretch of the working or moving muscles that contribute to the motor performance during the exercise until the point of feeling and feeling pain for a period of (10) seconds (eccentric muscle contraction).

2- The player tries to (catch) the same muscle group, and the coach resists the movement so that the player cannot move the muscle group, and thus (fixed muscle contraction) occurs in the working muscles and lasts for (6) seconds.

3- Then the player is asked to relax and make a muscle contraction of the moving muscles against the resistance of the trainer, which allows the movement to occur and thus a central muscle contraction occurs that lasts for (6) seconds.

4- Then the trainer performs a short stretching again of the motivating muscles to the maximum extent possible, thus an eccentric muscle contraction occurs that lasts for (30) seconds, and the stretching rate must achieve the largest possible kinetic rate than the resulting stretch the first time. (61), (51-18)

Legalization of P.N.F. Exercises

- The exercises are performed within (80-95%) of the joint capabilities and range of motion at the beginning of the performance, and the range of motion in the joint continues to gradually increase until it reaches the maximum. (2- 260, 261)

- The eccentric muscle contraction time at the beginning of the exercise for the target muscles lasts for (10) seconds.

- The fixed muscle contraction time lasts for (6) seconds.
- The central muscle contraction time lasts for 6 seconds.
- The eccentric muscle contraction time at the end of the exercise for the same target muscle group lasts for 30 seconds. (61), (27-105)
- The number of repetitions of the exercise ranges from (2-4) repetitions.
- Rest time between repetitions (30-60 seconds). (54-96)

Muscle Contributions to propulsion and Support during running:

- Core muscles - Hip flexors – Glutes - Quadriceps muscles.
- Hamstring muscles - Calf muscles - Tibialis Anterior muscle.
- Upper body muscles (chest, back, shoulders, etc). (53)(64)(65)

Presentation and discussion of the results:

First: View the results:

To achieve the objectives of the research and verify the validity of the hypotheses, the results of this research will be presented in a number of tables that were reached by processing them statistically according to the appropriate statistical laws in an attempt to achieve the hypotheses presented in the theoretical introduction to this research according to the order of the research objectives as follows:

- 1- There are statistically significant differences between the mean scores of the tribal and posterior measurements of the control group in some indicators of inflammation, physical abilities, and digital achievement for the 1500-meter race, which were in favor of the mean scores of the post-measurements.

Table (3)
Significance of differences between pre and post tests in physical abilities and numerical level for control group (n=5)

Variables	Measuring Unit	Descriptive statistics						Wilcoxon Signed Ranks test						Effect size (Cohen's r)		
		Pre test		Post test		Negative ranks (Post test < Pre test)		Positive ranks (Post test > Pre test)		Equal ranks (both tests equal)	Z	Significance (P)				
		Mean	SD	Mean	SD	n	Mean Rank	Sum of ranks	n				Mean Rank		Sum of ranks	
Physical abilities	Maximum Speed	Sec	4.42	0.226	4.15	0.225	5	3.00	15.00	0	0.00	0.00	0	2.023	0.043*	0.640
	Speed Endurance	Sec	53.34	0.306	52.39	0.303	5	3.00	15.00	0	0.00	0.00	0	2.023	0.043*	0.640
	Muscular Endurance	count	89.40	1.140	91.00	1.000	0	0.00	0.00	5	3.00	15.00	0	2.032	0.042*	0.643
	Cardiorespiratory Endurance	Km	2.74	0.089	3.00	0.071	0	0.00	0.00	5	3.00	15.00	0	2.041	0.041*	0.645
Numerical level	Minute	4.74	0.080	4.63	0.017	5	3.00	15.00	0	0.00	0.00	0	2.032	0.042*	0.643	

* Significant at 0.05 ($p < 0.05$)
medium (0.3-less than 0.5), large (0.5 and greater)

It is evident from the results of Table (3) that there are statistically significant differences between the mean scores of the pre and post measurements of the control group ($P < 0.05$) in the physical abilities and

Effect size: small (0.1-less than 0.3), digital achievement in the direction of the dimensional measurement, where the (P) values ranged between (0.041 to 0.043), and that The effect size between the two measures is large in all variables and ranged between (0.640 to 0.645).

Table (4)
Significance of differences between pre and post tests in biochemical variables (n=5) for control group

Variables	Measuring Unit	Descriptive statistics				Wilcoxon Signed Ranks test								Effect size (Cohen's r)	
		Pre test		Post test		Negative ranks (Post test < Pre test)			Positive ranks (Post test > Pre test)			Equal ranks (both tests equal)	Z		Significance (P)
		Mean	SD	Mean	SD	n	Mean Rank	Sum of ranks	n	Mean Rank	Sum of ranks	n			
IL-6	pg/ml	12.57	0.027	18.72	1.830	0	0.00	0.00	5	3.00	15.00	0	2.023	0.043*	0.640
CK-total	u/L	335.00	2.000	392.20	29.878	0	0.00	0.00	5	3.00	15.00	0	2.032	0.042*	0.643
Lactate	mmol/L	6.79	0.011	6.71	0.042	5	3.00	15.00	0	0.00	0.00	0	2.023	0.043*	0.640

* Significant at 0.05 ($p < 0.05$)
medium (0.3-less than 0.5), large (0.5 and greater)

It is clear from the statistical data on table (4) that there are statistically significant differences between the mean scores of the two measurements, pre and post measurements for the control group ($P < 0.05$) in the biochemical variables in the direction of the pre-measurement of the interleukin-6 and creatine kinase variables, and in the direction of the post measurement in the lactic acid

Effect size: small (0.1-less than 0.3), variable, as The effect size between the two measures is large in all variables and ranged between (0.640 to 0.643).

2- There are statistically significant differences between the mean scores of the tribal and posterior measurements of the experimental group in some indicators of inflammation, physical abilities and the digital achievement of the 1500-meter race, which took place in favor of the mean scores of the post-measurements.

Table (5)
Significance of differences between pre and post tests in physical abilities and numerical level for experimental group (n=5)

Variables	Measuring Unit	Descriptive statistics				Wilcoxon Signed Ranks test								Effect size (Cohen's r)		
		Pre test		Post test		Negative ranks (Post test < Pre test)			Positive ranks (Post test > Pre test)			Equal ranks (both tests equal)	Z		Significance (P)	
		Mean	SD	Mean	SD	n	Mean Rank	Sum of ranks	n	Mean Rank	Sum of ranks	n				
Physical abilities	Maximum Speed	Sec	4.37	0.137	3.69	0.195	5	3.00	15.00	0	0.00	0.00	0	2.023	0.043*	0.640
	Speed Endurance	Sec	53.66	0.177	51.17	0.377	5	3.00	15.00	0	0.00	0.00	0	2.023	0.043*	0.640
	Muscular Endurance	count	89.40	1.140	106.40	1.673	0	0.00	0.00	5	3.00	15.00	0	2.121	0.034*	0.671
	Cardiorespiratory Endurance	Km	2.76	0.114	3.22	0.110	0	0.00	0.00	5	3.00	15.00	0	2.041	0.041*	0.645
Numerical level	Minute	4.72	0.012	4.33	0.186	5	3.00	15.00	0	0.00	0.00	0	2.032	0.042*	0.643	

* Significant at 0.05 ($p < 0.05$)
medium (0.3-less than 0.5), large (0.5 and greater)

It is clear from the results of Table (5) that there are statistically significant differences between the mean scores of the pre and post measurements of the experimental group ($P < 0.05$) in the physical abilities

Effect size: small (0.1-less than 0.3), and digital achievement in the direction of the dimensional measurement, where the (P) values ranged between (0.034 to 0.043), and the size of The effect between the two measures is significant in all variables and ranged between (0.640 to 0.671).

Table (6)
Significance of differences between pre and post tests in biochemical variables (n=5)

Variables	Measuring Unit	Descriptive statistics				Wilcoxon Signed Ranks test								Effect size (Cohen's r)	
		Pre test		Post test		Negative ranks (Post test < Pre test)			Positive ranks (Post test > Pre test)			Equal ranks (both tests equal)	Z		Significance (P)
		Mean	SD	Mean	SD	n	Mean Rank	Sum of ranks	n	Mean Rank	Sum of ranks				
IL-6	pg/ml	12.54	0.108	11.60	0.552	5	3.000	15.000	0	0.000	0.000	0	2.023	0.043*	0.640
CK-total	u/L	336.20	0.837	312.00	27.749	4	3.500	14.000	1	1.000	1.000	0	1.753	0.080	0.554
Lactate	mmol/L	6.79	0.011	6.24	0.055	5	3.000	15.000	0	0.000	0.000	0	2.032	0.042*	0.643

* Significant at 0.05 ($p < 0.05$)
medium (0.3-less than 0.5), large (0.5 and greater)

It is evident from the results of Table (6) that there are statistically significant differences between the mean scores of the pre and post measurements for the experimental group ($P < 0.05$) in all biochemical variables in the direction of the post measurement, except for creatine kinase, where the (P) values ranged between (0.042 to 0.080), The effect size between the two measures is large

Effect size: small (0.1-less than 0.3), in all variables and ranged between (0.554 to 0.643).

3- There are statistically significant differences between the mean scores of the dimensional measurements of the control and experimental group in some indicators of inflammation, physical abilities and the digital achievement of the 1500-meter race, which were in favor of the average degrees of dimensional measurements of the experimental group.

Table (7)
Significance of differences between Experimental and control groups in Physical abilities and numerical level after experiment ($n_1=n_2=5$)

Variables	Measuring Unit	Descriptive statistics				Mann Whitney test						Effect size (Cohen's r)		
		Experimental group		Control Group		Experimental group		Control Group		U	Z		Significance (P)	
		Mean	SD	Mean	SD	Mean rank	Sum of ranks	Mean rank	Sum of ranks					
Physical abilities	Maximum Speed	Sec	3.69	0.195	4.15	0.225	3.20	16.00	7.80	39.00	1.00	2.402	0.016*	0.760
	Speed Endurance	Sec	51.17	0.377	52.39	0.303	3.00	15.00	8.00	40.00	0.00	2.611	0.009*	0.826
	Muscular Endurance	count	106.40	1.673	91.00	1.000	8.00	40.00	3.00	15.00	0.00	2.635	0.008*	0.833
	Cardiorespiratory Endurance	Km	3.22	0.110	3.00	0.071	7.90	39.50	3.10	15.50	0.50	2.578	0.010*	0.815
Numerical level	Minute	4.33	0.186	4.63	0.017	3.00	15.00	8.00	40.00	0.00	2.635	0.008*	0.833	

* Significant at 0.05 ($p < 0.05$)
medium (0.3-less than 0.5), large (0.5 and greater)

It is evident from the results of Table (7) that there are statistically significant differences between the mean scores of the two dimensional measures of the control group and the experimental group ($P < 0.05$) in the

Effect size: small (0.1-less than 0.3), variables of physical abilities and digital achievement in the direction of the experimental group, where the (P) values ranged between (0.008 to 0.016), as well as The effect size between the two measures is large in all variables and ranged between (0.760 to 0.833).

Table (8)
Significance of differences between Experimental and control groups in
biochemical variables after experiment ($n_1=n_2=5$)

Variables	Measuring Unit	Descriptive statistics				Mann Whitney test						Effect size (Cohen's r)	
		Experimental group		Control Group		Experimental group		Control Group		U	Z		Significance (P)
		Mean	SD	Mean	SD	Mean rank	Sum of ranks	Mean rank	Sum of ranks				
IL-6	pg/ml	11.60	0.552	18.72	1.830	3.00	15.00	8.00	40.00	0.00	2.619	0.009*	0.828
CK-total	u/L	312.00	27.749	392.20	29.878	3.00	15.00	8.00	40.00	0.00	2.619	0.009*	0.828
Lactate	mmol/L	6.24	0.055	6.71	0.042	3.00	15.00	8.00	40.00	0.00	2.660	0.008*	0.841

*** Significant at 0.05 ($p<0.05$) medium (0.3-less than 0.5), large (0.5 and greater)**

It is evident from the results of Table (8) that there are statistically significant differences between the mean scores of the two dimensional measures for the control group and the experimental group ($P<0.05$) in the biochemical variables in the direction of the experimental group, where the (P) values ranged between (0.008 to 0.009), and the effect size Between the two measurements is significant in all variables and ranged between (0.828 to 0.841).

Discussion

Depending on the results of the statistical analysis of the study data, and guided by the scientific references and similar previous studies related to the topic of the research, the results will be discussed according to the research objectives and hypotheses, as follows:

1- Discussing and interpreting the results of the effect of the proposed training program using the traditional stretching method on some indicators of inflammation, physical abilities and digital achievement of the 1500m running race for the control group:

Effect size: small (0.1-less than 03),

From the results listed on table (3) and Figure (1); there are statistically significant differences between the mean scores of the tribal and remote measurements of the control group in the physical abilities and digital achievement of the 1500-meter race that took place in the direction of the post-measurement, where the average differences in the research variables and the size of the effect are as follows:

Maximum speed with a difference of 0.27 seconds and impact size (0.640), speed endurance with a difference of (1.05 seconds), impact size (0.640), general muscle skin with a difference of (1.60) (repetitions) and impact size (0.643), and respiratory periodic skin with a difference of (0.26). (kg) and impact size (0.645), and the average differences in digital achievement were (0.11) (s) and impact size (0.643).

The researchers attributed these differences and statistical significance and the improvement of average ranks in both negative and positive directions to the effect of the proposed training program, which was applied to the control group with the application of the traditional lengthening method, and

this is consistent with what was indicated by "Bastawisi Ahmed" (1997 AD) that middle-distance races are governed by the speed factor. More than the skin factor, so the use of the anaerobic power system was greater than the use of the aerobic power system, and thus the two systems are used in such races, and it agrees with what he also indicated, quoting from "Schmolonisky" stated that to improve the skin of the middle distance races, the method of high intensity interval training and repetitive training can be used, which is commensurate with the ability of the internal organs of the body to work, while noting the other components of the load such as size, comfort and repetition, and this is what was applied from the methods of implementing the proposed training program .(13-146: 150)

This result is consistent with what was indicated by "Mohamad Abdul Ghani Othman" (1990 AD) that the high intensity interval training method is one of the best methods used to raise the level of speed endurance among runners and middle-distance players, and the repetitive training method is one of the important methods in training track races, especially those that depend on anaerobic energy, and directly and powerfully affect the various body systems. (38-61, 62)

Also, the use of the proposed training program had a positive impact on the digital achievement of the 1500-meter race that took place among the members of the control group as a result of the improvement of special physical abilities.

This is consistent with the findings of the study of "Mohamed Abdel Mawgoed El Sayed" (2016 AD) (37), "Mahmoud Muhammad Labib" (2012 AD) (34), "Abeer Ramadan Salama" (2012 AD) (1), that the application of programs Codified training according to a scientific method leads to improving the physical abilities and digital achievement of the members of their research samples.

It is evident from the results of Table (12) and Figure (2) that there are statistically significant differences between the mean scores of the pre and post measurements of the control group in the biochemical variables in the direction of the tribal measurement of the interleukin-6 (IL-6) and creatine kinase (CK) variables with a difference of (6.15) (Pg/ml), (57.20) (U/L) and the effect size (0.640), (0.643), and in the direction of the dimensional measurement in the lactic acid variable with a difference of (0.08) (mmol/L) and the effect size (0.640).

The researchers attributed these differences and statistical significance and that the average ranks in the direction of the positive signal for each of the interleukin-6 (IL-6) and creatine kinase (CK) variables, as indicators of myositis, to that it is very common for runners, whether beginners or those who have not reached the stage of adaptation. Entering the stage of delayed muscle pain, and the degree of muscle pain depends on the intensity and intensity of training, and also elite runners who have trained for several years are exposed to delayed muscle pain if the training is high intensity.

Kenneth Ostrowki et al. (1999) (28) indicate that high-intensity exercise increases the inflammatory cytokines of interleukin-6 (IL-6) and reaches its peak at the end of training. (28-287: 291)

And "Michael Gleeson" (2000 AD) (36) indicates that many cytokines have effects on the brain and can be known by changing the mood and increasing the sense of fatigue, such as (IL-6), which works to increase central fatigue, and evidence that the stores of glycogen in the muscle It has reached the critical state, and that this muscle needs blood glucose as a source of energy. (36-1)

Study of Gustavo A. et al. (2017) (22) indicates that creatine kinase (CK) responses can be used as an indicator of muscle damage after strength training with weights and aerobic training, in addition to being used as an indicator in determining the degree of damage in muscle cell membrane (22-65:72)

Lukas Ciprian (2017) (32) indicates that the three high-intensity interval training programs lead to an immediate increase in both creatine kinase (CK) and interleukin-6 (IL-6). So, it is clear from the statistical data on table (4) that the proposed training program using the traditional stretching method led to an increase in the concentration of both interleukin-6 (IL-6) and creatine kinase (CK), and this is consistent with the results of the study of "Mohamed Hamed Fahmy", Al-Hassan Abdul-Majid Hassan" (2020 AD) (40) that the training units for strength endurance, aerobic endurance and speed endurance, led to an increase

in the concentration of interleukin-6 (IL-6) in the blood in the direct post-measurement.

The results of those studies also indicated that high intensity sports training leads to a statistically significant increase in the concentration of cytokines.

The researchers consider the importance of these biochemical indicators as one of the objective signs from which the sports coach infers the effects on the players as a result of the implementation of different training loads and through which the sports coach can make the required adjustments in the training program according to correct scientific foundations.

It also agrees with the results of the study " K Suzuki et al.", (1999 AD) (30) that endurance training affects blood cytokines, leukocytes, muscle breakdown, and the increase of interleukin-6 (IL-6) after exercise on an ergonomic bike until 90 Watt and for a period of (90 s). (30-7: 1360)

Accordingly, the first part of the hypothesis which states that there are statistically significant differences between the mean scores of the tribal and remote measurements of the control group in the physical variables and the numerical achievement of the 1500-meter race was achieved in favor of the mean scores of the dimensional measurements.

While it was not achieved with regard to the variables interleukin-6 (IL-6) and creatine kinase (CK) as indicators of myositis, while it was achieved with regard to the variable lactic acid (Lactate).

2- Discussing and interpreting the results of the effect of the proposed training program using the (P.N.F) method of stabilization and relaxation with the contraction of the motor muscles (Hold Relax With Agonist Contraction) on some indicators of inflammation, physical abilities and digital achievement of the 1500m race, which took place for the experimental group:

It is evident from the results listed on table (5) that there are statistically significant differences between the mean scores of the tribal and remote measurements of the experimental group in the physical abilities and digital achievement of the 1500-meter race that took place in the direction of the post-measurement, where the average differences in the research variables and the size of the effect were as follows:

Maximum speed with a difference of (0.68) (s) and impact size (0.640), speed endurance with a difference of (2.49) (s) and impact size (0.640), general muscle skin with a difference of (17) (repetitions) and impact size (0.671), and respiratory periodic skin with a difference (0.46) (km) and impact size (0.645), and the average differences in digital achievement were (0.39) (s) and impact size (0.643).

The researchers attributed these differences and statistical significance and the improvement of ranks level in both negative and positive directions to the effect of the proposed training program that was applied to the experimental group using stretching exercises in the manner of

neuromuscular facilitation of sensory receptors by applying the method of stabilization and relaxation with the contraction of the motor muscles Hold Relax with Agonist contraction, which led to Improving physical abilities, as the degree of muscle stretching affects muscle strength and endurance, which results in ease of movement and fluidity and increases the level of flexibility of the joints.

This is consistent with what was indicated by "Abu El-Ala Abdel-Fattah" (1997) that exercises to facilitate the neuromuscular sense organs (P.N.F) are the latest methods of developing flexibility as they improve the range of motion in the skeletal joints to a greater extent than the relaxation in the traditional way, and that flexibility exercises Usually it comes after strength exercises and thus increases the effectiveness of strength exercises, and flexibility exercises can be used interchangeably with speed exercises, as this achieves more success in performing speed exercises. (2-257: 260)

Nariman Al-Khatib, Abdulaziz Al-Nimr, Amr Al-Sukari (1997), and Abu Al-Ela Abdel-Fattah (2012) agree that the sports coach should strive to develop flexibility as a major part of the training program, because of its great effectiveness in preventing injuries. The different types, in addition to the ability to restore healing, remove pain in addition to increasing both the level of strength and speed for athletes, and that flexibility is linked to other physical attributes as well as skill and schematic performance, and the higher the degree

of flexibility, this is reflected in the level of sports results. (46-245, 246), (3-246)

Also, the use of the proposed training program had a positive impact on the digital achievement of the 1500-meter race that took place among the experimental group members as a result of the improvement of special physical abilities.

From the above, the researchers believe that the method of stabilization and relaxation with the contraction of the motor muscles, Hold Relax with Agonist Contraction had a positive effect in improving physical abilities contributing to the motor performance of the 1500-meter race and the digital achievement when used with the proposed training program, and this is consistent with what was indicated by the results of the study Each of "Najla Ibrahim Muhammad, Laila Gamal Mhenni" (2015 AD) (45) And the study of "Akram Hussein Jabr, Ayman Hamid Mohsen" (2016 AD) (7), and the study of "Mohamed Hamid Fahmy, Al Hassan Abdel Majid Hassan" (2020 AD) (40) in that the methods of neuromuscular facilitation of sensory receptors positively affect the improvement of motor range and variables Physical and digital achievement among the subjects of their research samples.

It is clear from the results that has been listed on table (6) that there are statistically significant differences between the mean scores of the pre and post measurements of the experimental group in all biochemical variables in the direction of the dimensional measurement, except for creatine

kinase, with a difference of (24.20) (U/L) that is not statistically significant and the size of the effect (0.554), a difference of (0.94) (Pg/ml) and the effect size (0.640) for the variable interleukin-6 (IL-6), and a difference of (0.55) (mmol/l) and the effect size (0.643) for the variable lactic acid (Lactate).

The researchers attributed these differences and statistical significance and that the average ranks in the direction of the negative sign for all biochemical variables as indicators of muscle inflammation, that the degree of muscle pain depends on the intensity and intensity of training, and despite that there is a lack of concentration of biochemical variables in the direction of the dimensional measurement as a result of the use of neuromuscular facilitation exercises to The proposed training program.

This is consistent with what was indicated in the study of "Hyum- Gyu Cha, Myoung- Kwon Kim" (2015) (24) that the method of neuromuscular facilitators of sensory receptors is beneficial in activating muscles and reducing stress from high intensity eccentric contraction exercises. (24-3275: 3277)

In concomitant with our study; Sarah M. Marek et al. (2005) (54) agrees that the use of neuromuscular facilitation is common in injury prevention, rehabilitation, progression, and return to activity (54-94: 103).

It agrees with what was indicated in the study "Peanshai Khamwong, Upon Pirunsan, Atit Paungmali" (2011) (49) that there is a protective effect of PNF training on

symptoms of muscle damage caused by eccentric contraction.

Accordingly, the second hypothesis of the study was achieved, which states: "There are statistically significant differences between the mean scores of the tribal and posterior measurements of the experimental group in some indicators of inflammation, physical abilities, and digital achievement for the 1500m race, which took place in favor of the average scores of dimensional measurements."

3- Discussion and interpretation of the results of the significance of the differences between the mean scores of the two dimensional measurements of the control group (traditional stretching method) and the experimental group (P.N.F) on some indicators of inflammation, physical abilities and digital achievement of the 1500m race. It is evident from the results listed on table (7) that there are statistically significant differences between the mean scores of the two dimensional measurements of the control group and the experimental group in all the variables of physical abilities and digital achievement in the direction of the experimental group, where the average differences in the research variables and the size of the effect are as follows:

The maximum speed with a difference of (0.46) (s) and the impact size (0.760), the endurance of the speed with a difference (1.22) (seconds) and the impact size (0.826), the general muscle skin with a difference of (15.4) (repetitions) and the impact size (0.833), and the respiratory periodic skin with a

difference (0.22) (km) and impact size (0.815), and the average differences in digital achievement were (0.30) (s) and impact size (0.833).

The researchers attributed these differences and statistical significance and the improvement of average ranks to the effect of the proposed training program in addition to (P.N.F) exercises using the Hold Relax With Agonist Contraction method, which led to an improvement in physical abilities. This is consistent with what was indicated by the results of the study of "Kayla B. et al.," (2012 AD) (27) that the goal of (P.N.F) exercises in the field of rehabilitation is to restore the functional range of motion (ROM) and increase strength in patients with From soft tissue damage or surgical procedures, as for sports preparation, it is to increase the range of motion, whether positive (AROM) or passive (PROM) and improve the performance of the target muscle (The Target Muscle (TM), And that the four methods (self-inhibition), (mutual inhibition), (contraction and relaxation), (control theory), used in the regulation of (P.N.F.) cause an increase in the range of motion, production of functional strength and improvement of athletic performance, if the legalization of (P.N.F.) Correct and coordinated. (27-105:113)

It agrees with the results of the study "Gidu Diana Victoria et al.," (2013 AD) (21) that enhancing flexibility, developing muscular strength and endurance, improving joint stability, or increasing neuromuscular compatibility, P.N.F methods are an important part.

of prolongation and rehabilitation programmes. (21-623: 628)

It agrees with the results of the study of "Melanie J. Shaurman et al.," (2006 AD) (35) that P.N.F methods are commonly used in the sports and rehabilitation fields to enhance motor activity, increase range of motion and improve motor performance, and that the use of techniques for (P.N.F) is more effective in stretching programs when the goal is to increase the range of motion. (35-929: 939)

It is also evident from the results listed on table (8) that there are statistically significant differences between the mean scores of the two dimensional measurements of the control group and the experimental group in all biochemical variables in the direction of the experimental group, where the average differences in the research variables and the effect size are as follows:

Interleukin-6 (IL-6) with a difference of (7.12) (Pg/ml) and trace size (0.828), creatine kinase (CK-Total) with a difference of (80.2) (U/L) and trace size (0.828), and lactic acid (Lactate) with a difference of (0.47) (mmol/L) and the effect size (0.841).

The researchers attributed this to the fact that muscle pain and the accompanying accumulation of inflammatory factors and fluids resulting from muscle damage were less in the experimental group as a result of using (P.N.F) exercises accompanying the proposed training program.

This is consistent with what was indicated by "Hussein Heshmat, Nader Shalaby" (2003 AD) that the feeling of

fatigue results from signals that come from the neurosensory receptors in the muscles, and this feeling is helped by the effect of acidity on the brain and a decrease in the amount of sugar in the blood, and there is a link between stress and the depletion of glycogen in the muscles. (23- 42)

It agrees with what was indicated by the results of the study "Peanshai Khamwong et al.," (2011) (49) that the use of the (P.N.F) method to prevent symptoms of muscle damage resulting from eccentric contraction exercises, and that this method may be useful to relieve the signs and symptoms of muscle damage. (49-507: 516)

The results of the current study are consistent with what was indicated by the results of the study "Lukas Ciprian" (2017 AD) (32) that the biochemical indicators of inflammation, oxidative stress and muscle damage were analyzed after (3) hours and (24) hours after exercise, all high training protocols caused Distress in an immediate increase in both interleukin-6 (IL-6) and creatine kinase (CK-Total).

From the foregoing, the third hypothesis of the study has been achieved, which states: "There are statistically significant differences between the mean scores of the dimensional measurements of the control group and the experimental group in some indicators of inflammation, physical abilities, and digital achievement of the 1500-meter race, which took place in favor of the average degrees of dimensional

measurements of the experimental group.”

Conclusions:

Within the limits of the research method and its sample, the tools used in data collection and the statistical analysis method followed, and in light of the findings of the researchers, the researchers present the following conclusions:

1- Hold-relax with agonist contraction method as one of the methods of Proprioceptive Neuromuscular Facilitation helps to reduce the concentration of (IL-6) and (CK-Total) in the blood as one of the indicators of inflammation after high intensity exercises better than using the traditional stretching method.

Recommendations:

1- Application of (P.N.F) Proprioceptive Neuromuscular Facilitation methods on different samples in middle distance races i.e. Use of Aerobic & Anaerobic energy Production System.

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