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The effect of resistance training with and against the locomotor track on some biomechanical variables of the 100-meter freestyle for young men

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Summary

The training programs for swimmers 100 m freestyle must be directed to enhance the physical abilities of this competition, especially muscle strength of various kinds according to the nature of external resistance faced by the swimmer in the water and for a relatively long time, so the researchers resorted to preparing exercises with resistances and against the direction of movement of the swimmer in order to mobilize and activate additional motor units to create a state of adaptation and Alastharain these units to produce Fast kinetic action to overcome external resistances represented by the aquatic environment, improve biomechanical variables and achievement. The research was applied to a sample of the youth swimming team amounting to (6) swimmers, and the researchers conducted a swimming test for a distance of 100 meters (pre-test) and the biomechanical variables were measured during the performance stages with the smart data sensor Triton Wear), and the exercises were applied to shine resistance with and against the direction of movement of the swimmer and for distances And limited times, taking into account the components of the training load to make a development in the internal strength of the research sample and improve the mechanical conditions, and for a period of (6) weeks by (3) training units per week and after completion the post-test was conducted, and the researchers concluded, the emergence of an improvement in all biomechanical variables (swimmer's speed, length and frequency of blows, force exerted at start and rotation time) and achievement.

Keywords:

Resistance to the direction of movement, resistance against the direction of movement, relatively long time, freestyle.

The training of swimming for different distances and rubber ropes according to the direction of movement and its reversal while adhering to the scientific limits of the components of the training load represents a training trend aimed at improving the link between the start (start) and the flow of water for the swimmer as well as other biomechanical variables for the stages of the race of this competition, in accordance with the specific mechanical requirements and the consequent development of explosive and rapid power and its components for the muscles working in performance, the matter Which gives limits to the level of speed for the stages of swimming 100m freestyle and the amounts of instantaneous forces required by repeating training by these means and the consequent integration of the required muscular force and the mechanical conditions associated with performance when exerting these forces and improving the strength when starting and rotating associated with achieving the best achievement.

Training with these resistances helps to force the athlete to exert forces unaccustomed to them, to achieve new requirements for the components of the blow from) The length and frequency of the blows (as far as possible and outside the pattern to which the player is accustomed.

In his study, he argues (Tellez & James, 2000, p. 141)that there is a need to use the explosive force of high horizontal velocity to produce a large resultant velocity in the right direction.

A study also suggested (Jacoby & Fraley, 1995, p. 43)that resistance training should achieve a high ability to cope between muscle contractions. This is also the (Schiffre, 2011, p. 18) case that rapid strength training and resistance training should enhance the integration of acceleration required by exchanging blows when swimming in harmony and achieving harmony between the arms and legs.

Studies have indicated that to develop speed, training should be done according to technical performance according to achieving the correct push towards movement. Nerve stimulation training should be performed, especially during the start of the starting platform anddolphin blows to produce maximum thrust in a very short time.(Al-Fadhli, 2007, p. 86)

Some external influences can be used to increase the athlete's speed above the usual maximum speed (with the direction of movement) and one of the methods that are commonly used in its development is pulling in a direction opposite to the direction of the race.(Al-Bishtawi and Al-Khawaja, 2006, p. 342)

The researchers noted that the achievement depends largely on the level of development of physical capabilities, especially speed, rapid power and explosive power so that these conditions are constantly changing for the better with continuous work to raise the level of development of physical abilities. The repetition of speed training includes swimming for short distances in order to reach the maximum speed with water resistance, and that these exercises generated a kinetic pattern in young 100-meter freestyle swimmers, which made that (Al-Fadhli and Ibrahim, 2012, p. 153) The improvement in the level of some special abilities is limited and almost intangible or apparent when applying the stages of performance of the competition, and some researchers have pointed out that traditional speed training is what causes the level of speed to stop and often appears in beginner swimmers who are exposed to speed training very early during training. The roots of this phenomenon lie in the fact that training is at a certain speed to perform a certain movement that is believed to be insurmountable, not as fast as possible, even if the physical potential (such as strength, reflexes , flexibility) improves with training. Therefore, the researchers wanted to go into this study to solve this problem by using resistance exercises with and against the direction of movement of the swimmer with water (with help or disability).) when training to improve the reactions (neuro-muscle) of the existing muscle groups performance, which is one of the most important problems suffered by these competitions. And measure the biomechanical variables (Sajit, 2011, p. 46) to be achieved for the 100m freestyle competition using a new special device (Triton Wear smart data sensor) and its improvement. Therefore, this study came to develop some solutions that contribute to the improvement and development of these variables, using auxiliary means such as rubber ropes by facilitating and makingit difficult for the purpose of achieving integration in physical capabilities and performance mechanics, especially during the launch and beyond the stages of acceleration and achieving good (Al-Jaber, 2012, p. 32) achievement associated with this development and emphasizing the importance of measuring with (smart data sensor) and control training.

The importance of the research comes in emphasizing the development of special muscle strength to improve biomechanical variables and the achievement of 100 m freestyle swimmers for young people by training with resistances towards or against the direction of movement using rubber ropes, which is an important factor in achieving good achievement as well as commitment to technical and mechanical limits and performance that is supposed to be emphasized When using training methods that force the swimmer to break the usual pattern, she must apply the movements of maximum speed and explosive and rapid force and its impact on (Clark, et al., 2009, p. 1164) some special physical abilities and biomechanical variables and the achievement of swimming 100 meters freestyle for young people.

Therefore, the research aimed to prepare rubber rope exercises towards or against movement for the research sample. And identify its impact on the special biomechanical variables for some stages of performance and achievement in swimming 100 m freestyle for young people, and the researchers imposed that there are statistically significant differences between the pre-tests in the rate of speed, length and frequency of steps and the amounts of force to start and rotate for the research sample and achievement.

Procedures

The research sample was selected in a deliberate way amounting to (6) swimmers in the 100 m freestyle competition from the swimmers of the specialized swimming school of the Ministry of Youth. They were under 20 years of age according to FINA rules and the morphologicalmeasurements of the eye were as follows:

Table (1) Homogeneity of the sample members

Physical measurements	Mean	standard deviation	Mediator	skewness
Length(m)	1.77	0.03	1.75	2
Body mass(k)	65	3.5	66	0.86
Training Age(y)	7.5	1.6	7	0.93

The researchers used sources and references, electronic information network, observation and experimentation, personal interviews, tests and measurements, a device for measuring height and weight ,a stopwatch, and cones (signs). Kinova kinetic analysis software, 1-meter scale, rubber cords of different lengths, and smart data sensor.

The researchers conducted an exploratory experiment on (2/12/2022) on a sample of 2 players who are training in the specialized school, in order to know the time required toexperiment, identify obstacles, ensure the efficiency of the device used, and measure variables.

And BatariKh (3/12/2022). The pre-test was conducted for the research sample, which included swimming for a distance of 100 m freestyle, and the sensor device was placed under the head cover of each swimmer (behind) in order to extract the biomechanical variables under research for the starting and acceleration stage for a distance of 15 m, the rotation stage, the average speed per 50 m, the length and frequency of the strokes in them, and the total time for a distance of 100 m swimming (achievement) and the application of the test was supervised by a specialized team, and The researchers prepared resistance training using rubber ropes and bands, including swimming with the help of rubber ropes in a positive direction of movement, and exercises against the direction of movement, and the number of training units was (14) training units and a period of two months (6) weeks and two units per week, the training was applied on (9/12/2022) until (21/1/2023), and the exercises in the main section of the training unit as complementary exercises, and the training load is graded by (1:3) in order for the training to be effective and effective based on scientific foundations. The intensity for the rubber ropes was determined as the maximum length reached by the rubber rope, and after completion, the post-tests were conducted on (25/1/2023) in the same way as the pre-tests.

Results

Table (2) arithmetic means, standard deviations, differences, and their deviations, calculated T value, significance level, and difference function for the pre- and post-tests of the biomechanical variables of the research sample.

Statistical methods Variables	mean		standard deviation		P-	p p	Calculated T	Level of significance	indication
	Pre-test	Post-test	Pre-test	Post-test					
Start time (s)	0.78	0.56	0.12	0.09	0.22	0.069	3.147	0.022	In
Time 15 m (s)	6.93	6.13	0.18	0.136	0.80	0.27	2.924	0.015	In
Time(1) 50m(s)	29.56	26.53	0.203	0.178	3.025	0.876	3.453	0.006	In
Time(2) 50m(s)	32.44	28.34	0.406	0.349	4.095	1.062	3.854	0.005	In
Achievement 100m (s)	59.88	56.35	0.139	0.204	3.53	1.098	3.215	0.000	In

D at the significance level of 0.05, and the degree of freedom is 5

Table No. (3) Arithmetic means, standard deviations, differences, and their deviations, calculated T value, significance level, and difference function for the pre- and post-tests of the step variables of the experimental group.indication at the significance level of 0.05 , and the degree of freedom is 5.

Statistical methods Variables	mean		standard deviation		P-	p p	Calculated T	Level of significance	indication
	Pre-test	Post-test	Pre-test	Pre-test					
S.L 50 m (M)	1.28	1.34	0.39	0.025	0.071	0.006	10.95	0.000	In
S.L 50 m (m)	1.06	1.26	0.062	0.066	0.048	0.018	2.63	0.046	In
S.R First 50 M	1.16	1.23	0.24	0.18	0.07	0.022	3.10	0.032	In
S.R Thani 50 m	1.15	1.21	0.34	0.19	0.06	0.020	2.951	0.036	In
V. First 50 m (m/s)	1.73	1.79	0.98	0.84	0.06	0.0210	2.851	046. 0	In
V. Second 50m(m/s)	1.66	1.72	0.76	0.68	0.06	0.0215	2.786	0.041	In
F. for Start(BW)	2.45	3.65	0.95	1.02	1.20	0.387	3.10	0.014	In
Rotational force(BW)	2.35	2.55	0.89	1.10	0.20	0.061	3.25	0.023	In

The nature of the exercises based on the use of the researchers was performed with different training intensities, which positively affected the improvement of the times of the 100-meter freestyle performance stages and the improvement of the 15-meter distance times and the 50-meter time and achievement, as Resistances with and against the direction of movement affected the generation of special adaptations in the working muscle groups, increased control of the movements of the legs and trunk, and increased angular velocity, which affected the increase in the linear velocity of the arms and legs and thus increased the speed of the center of gravity of the body, as the angular velocity has to do with linear (circumferential) velocity, if this speed is associated with a revolving body(Alhassan, 2010, p. 71). This is what led to the development of achievement together, and this means controlling the movement of body parts during performance, which caused the swimmer to take positions with the arms and legs, includingTinAsb and overcome their inertia during performance, as this resistance decreases by reducing the radii and increases if these halves increase(Al-Fadhli, 2004, p. 23).

On the other hand, speed training with rubber bands against the direction of movement made it imperative for the swimmer to control the position of his center of gravity during the performance, as the training made the swimmer exert increased muscle contraction against the resistances used in the muscles of the arms and legs as well as control the spatial field (the distance that the swimmer has in water during training). This gives positive responses in increasing the muscle strength required to gain specific distances while performing running movements.

The improvement in the times of covering special distances, inevitably accompanied by an improvement in the length and frequency of the strokes in both parts of the race distance, as there is a positive relationship between the increase in the length and frequency of the strokes in the final speed achieved (achievement), as well as the improvement of the amounts of force exerted by the arms and legs when starting and starting and when pushing during the rotation, as the exercises with ligaments The inflatable, in addition to the water resistance when training, caused the mobilization of other muscle fibers unusual in order to overcome these resistances, which increased the strength, effectiveness and excitability of these muscles to ensure the correct response and good coordination between the length and frequency of the blows.(Mooney, Corley, Godfrey, Quinlan, & YLaighin, 2015, p. 23)

From the data provided to us by the sensor, important mechanical variables such as speed are always lower in the second part of the race during each stage, both for certain parts of the body and for the body as a whole. Therefore, techniques for accurately identifying this valuable information can be used to report flaw detections during performance. Starts are usually defined as the duration from the moment of start until it reaches the mark of 15 m. The roles were determined according to the requirements of the trainers and included varying distances when approaching and leaving the wall after each finish (the first part) of the race. Analyzing the competition using the sensor helped determine the times of the parts and the magnitudes of the force exerted at the start and at the push from the wall before and after turning from the wall. The results of the research showed that Carrying out swimming strokes during each part in the best way that occurs during the competition, as these temporal, spatial and kinetic variables were measured, and according to the results of the smart sensor, which facilitated the measurement of these variables related to each part of the distance, and this was evident in the results of all the variables discussed above.

Theresearchers concluded to a number of conclusions, the most important of which appeared a development in the variables of partial distance times for the effectiveness of 100 m free clearly for the sample members who used rubber bands. As well as improving the variables of swimmers' strokes such as the length and frequency of the blow to serve the spatial and temporal field to improve the speed rate represented by the final achievement, as well as improving the level of momentary strength in the legs and arms as a result of this training .

The researchers recommend adopting a special training approach in developing mechanical variables and monitoring the smart sensor to achieve a better level for the 100m freestyle. As well as the followers of modern scientific methods are effective to develop the level of technical performance and break the usual traditional training pattern to bring about a development in the physical and mechanical abilities of swimmers.

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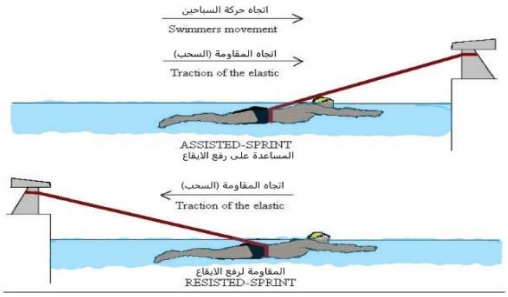
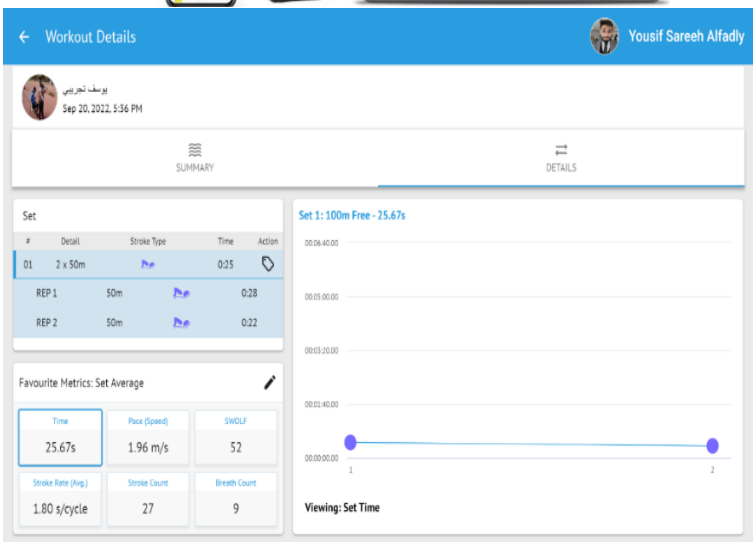
Appendix No. (1) Method of placing rubber ropes with and against the direction of movement





Appendix No. (2) The device and the method of operationof the

Appendix No. (3) Some of the exercises applied

Week	unit	Exercises	strength	reiteration	rest	collections	rest
First week	Unit One	Swim for 15 meters with rubber rope resistance.	90%	10	-	3	-
		Starting and swimming for 10 meters using rubber ropes in the direction of movement.	90%	10	1 min	2	2min
	Unit Two	With the direction of movement swim with the help of the rope for a distance of 20 meters.	80%	10	1 min	2	-
		Jogging with the resistance of the colleague a distance of 15 meters and then freeswimming.	90%	6	1min	3	-
Second week	Module Three	Swim a distance of 20 meters with a pull with rubber ropes towards the movement.	90%	8	1min	2	2min
		Jump with the legs in place and pull the knees to the chest with rubber ropes with water.	90%	12	1min	3	2min
	Unit Four	Perform swimming 30 mwith rubber rope and direction of movement.	90%	8	1 min	2	2min
		Partridge (10) times opposite direction of movement.	90%	6	1min	3	2min