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# EFFECT OF TWO-PHASE TAPERING METHOD ON CERTAIN PHYSIOLOGICAL VARIABLES, FATIGUE RESISTANCE, STROKE RATE AND RECORD LEVEL OF 200M FREESTYLE FOR YOUTH SWIMMERS

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**Abstract**

*Purpose***.**Duringthe stage Tapering in order to determine the best of these methods and suitability for specialized distances for swimmers, and to guide researchers to study the different variables of methods of decline in size and determine the training, physiological, physical, and psychological effects of the use of methods for selected samples Roll of swimmers.

This research aims to identify the effect of two-phase of Tapering method on some physiological variables Creatine Phosphokinase (CPK), lactic acid rate, heart rate), fatigue resistance, and stroke rate. in addition, explore the relationship between physiological variables, fatigue resistance, stroke rate, and the record level of 200m freestyle.

*Methods.* The sample was chosen from the swimmers of 6 October City Sports Club for the stage of 17 years of males, (10) male swimmers.

*Results.* Statistical analyses showed a positive correlation with statistically significant relationship between fatigue resistance and the record level of (200m freestyle), while there were no correlations with statistical significance between the other variables and the record level.

*Conclusions.*

Under the conditions of our study, the two-phase decrease in volume (Tapering) affected in all variables, while it did not affect swimmers' ability to resist fatigue during a 200-meter race distance, possibly due to the nature of the 200-meter high-speed race.

*Key words:* Tapering, Swimming, Creatine Phosphokinase (CPK), Fatigue Resistance.

## Introduction.

Planning sports training in the 21st century is no longer as difficult or complicated as it was in the early part of the last century, and the identification of goals and objectives, including building physiological, physical, and skillful, for swimmers during the successive stages of the training plan is clear, and at the end of the training season comes It is the culmination of the various capabilities acquired, in which the swimmer gets an appropriate level of rest. This stage is known as the period of calm period Taper, and the purpose of this stage is the physical and mental processing to achieve the best achievement in competitions.

( Nort, & Dick, 2012) point that the physical construction of the swimmer by swimming different distances is gradually reduced during the Tapering phase, and that the swimmer should spend more time in the mental preparation, and the perception of the performance of the race in its various stages from the beginning of the jump through the organization of speed Step through the parts of the race to the end point, in order to achieve the desired record level.

(Scott & Scott, 2015) outlines four factors for the formation of the Tapering phase: the appropriate time period for each individual swimmer, the Tapering phase shape, the appropriate training loads for the stage, and the appropriate methods for preparing swimmers using various distances and disciplines.

While ( Mujika, 2009) explains that the goal of the Tapering phase is to increase the level of performance, which is related to the degree of hospitalization of physiological variables that increase or decrease the result of training in previous periods, and manifestations of adaptation during the Tapering phase to minimize the physiological accumulations and daily psychological stresses of training, Also increased endurance, increased different training adaptations.

(Olbrech, 2007) believes that one of the objectives of the Tapering phase is the ability of the trainer to make the swimmer fit, active, and

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perform at maximum capacity at the start of each race, by including high-volume modules and short, high-intensity groups. With enough time to reach the Super Compensation stage.

To plan the Tapering phase (Bompa& Haff, 2009; Elkot, 2013) agree on some guidelines, including that the stage is individually constructed according to the capabilities of each swimmer, the ideal Tapering period is 8-14 days. The volume of training is reduced from 41-60% of the highest volume in the training season.

(Elkot, 2013; Mujika, 2009) defines the Tapering phase as "a gradual decline rather than a pedometer to carry training over a period with the aim of reducing physiological and psychological stresses for daily training for best athletic performance.

(Elkot, 2013; Maglischo, 2015; Scott & Scott, 2015) agree that there are four methods of decreasing the size of the training load during the Tapering phase that help swimmers to achieve the best possible achievement: Slow Gradual Decline, Rapid Gradual Decline, Sudden Decline Method: First: The Liner Taper is a reduction in the size of the training degree after the degree of the beginning of the cooling down to the end, and this method is usually used with high training loads, and this method is designed for the purpose of gradual rest With the swimmer not to endure with complete comfort, secondly: The Slow Exponential T Third: The Fast Exponential Taper, which is a rapid decline in size at the beginning and then decreases, and the purpose of this method is to get the swimmer to rest quickly at the beginning of the cooling off period. The first two phases of a sudden decline, then the second phase steady decline throughout the Tapering phase, this method is used to preserve the training gains of physiological, physical, performance, and gained by the swimmer from previous training phases.

(Maglischo, 2015) notes that although scientific research has declined in the four methods of volume decline during the cooling off phase, it has proven that the Fast-Exponential Taper is the best method for swimmers, followed by The Slow Exponential Taper and then the Step-Down Taper.

(Mujika, 2009) argues that there is no ideal way to design a Tapering phase, but the coach and swimmer must design different approaches to the individual adaptation of each individual swimmer.

(M. Elkot, 2013, W. Maglischo, 2015) cite a new method of volume reduction during the cooling-off phase, called the Two-Phase Taper method, which is to use the traditional method of volume reduction (gradient decline) in the first period. In the second period there is an increase in the volume of training for the last three days before the competition by 50% of the size of the special preparation stage (mid-season).

(Maglischo, 2015) adds that the purpose of using this new method is to remove the boredom and lethargy factor from Tapering methods that reduce volume further and avoid losing the degree of adaptation that can occur when using a Tapering method.

From all the above, the researcher believes that the method of Two-Phase Taper may be suitable for medium-distance swimmers (200-400) meters, which is always their goal to maintain maximum tolerance and increase their self-confidence, with the ability to perform well.

(Cecilm, 2002) said that the Tapering phase should be linked to training during the previous months, and the optimal identification of the rest period in terms of duration and quantity allows full recovery from the effects of accumulated fatigue, helping the swimmer to reach the stage of over-compensation and withstand the pressure to achieve the best possible achievement.

(Elkot, 2013) also indicates that the training load during the sedation phase should be reduced to try to reduce the accumulated fatigue of the body, considering that this decrease does not cause the lack of training adaptations acquired by the swimmer during previous periods.

(Abul-Ela & Haytham, 2019; Elkot, 2002) agree that the causes of fatigue in middle and long-distance swimming are damage to Sarcoplasmic, as well as lack of sources of glycogen, fat, and amino acids.

(Abul-Ela & Haytham, 2019) defines fatigue as time decrease in the ability to continue to perform work and can be measured from its external manifestations by the amount of mechanical work performed.

(Steven, Jake, 2000) argues that Resistance Fatigue in swimming means "the ability of the swimmer to maintain the level of speed in long distances is comparable to the level of speed in short distances.

Through the experience of the researcher in the field of competitive swimming training and his work in several Egyptian clubs with different groups of swimmers, and access to different scientific sources, he noted the lack of research on the methods of decline in size in general, and the two-period method of decline in size in particular, and this is the first study of The type of approach to this method, also through the interview of some swimming instructors, the researcher noted the use of a standardized method of decrease in size during the Tapering phase for all swimmers of different specialized distances, and explains what he pointed out. (Scott & Scott, 2015) suggest that both trainers

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and training specialists must collaborate to determine the optimal method and duration to suit each individual swimmer. The researcher also noted that the trainers did not know enough information about the importance of using different methods of volume reduction and the suitability of these methods for swimmers, in addition to the fear of some swimming instructors of the use of methods of volume reduction. Record level required.

Hence, the importance of the research and its need to clarify the importance of the two-period method of volume reduction for medium-distance swimmers, and its impact on the improvement of the record level, also provide a database on this method, in addition to directing swimming instructors to use different methods of different size decline during the stage Tapering in order to determine the best of these methods and suitability for specialized distances for swimmers, and to guide researchers to study the different variables of methods of decline in size and determine the training, physiological, physical, and psychological effects of the use of methods for selected samples Roll of swimmers.

This research aims to identify the effect of two-phase of Tapering method on some physiological variables Creatine Phosphokinase (CPK), lactic acid rate, heart rate), fatigue resistance, and stroke rate. in addition, explore the relationship between physiological variables, fatigue resistance, stroke rate, and the record level of 200m freestyle.

**Samples**

The sample was chosen from the swimmers of 6 October City Sports Club for the stage of 17 years of males, (10) male swimmers.

**Sample selection conditions:**

The swimmer should have participated in the Egyptian Swimming Federation championships during the previous year (Al-Gomhouria, Egypt Cup).

The sample is trained within the club under the same conditions and under the care of the researcher.

Approval of sample members to participate in the conduct of measurements during the (cooling down).

**Data Collection Tools:**

The researcher used the following tools and devices to perform search measurements:

**Basic measurements:**

Measurement of high (centimeter). Measuring weight (kilogram).

Body Mass Index (BMI) measurement using BMI = wt {kg} ÷ ht {m²}, unit of measurement (%)

**Physiological measurements:**

Measurement of phosphokinase Creatine (CPK), after swimming (200) m Freestyle, Micrograms Per Liter (mcg / L). blood collection instruments (plastic syringes, 10 cm sizes, numbered test tubes, ice box, antiseptic solution, adhesive tapes, Centrifuged 1000-3000) Rpm to separate the serum from the blood components, Gem Way device for measuring the radiation absorbed from the sample and chemical reagents to read the concentration of enzymes in the sample.

Measuring the rate of lactic acid in blood, using (Accusport), after the performance of 200m freestyle swimming, and the unit of measurement in mmol / L.

Measuring the heart rate, using the Polar Watch device, after performing 200m freestyle swimming, the unit of measurement pulse / minute.

**Fatigue resistance measurement:**

Swimming time (200) meters- (2 × swimming time distance (100) meters) / 2 x swimming time distance (100) meters × 100 = %

**Measuring Stroke rate:**

First: Calculate the time of 3 full strengths and then divide by 3, unit of measurement (seconds / cycle)

Second: 60 (sec) ÷ on the output from the previous equation, unit of measurement (rpm).

**Record level of 200m freestyle:**

200m freestyle was measured using a stopwatch Casio HS-80TW for the nearest 1/1000 second.

Preparatory steps for conducting the research:

The researcher undertook some preparatory steps before starting the application of the two-period sedation stage and conducting the measurements as follows:

A questionnaire was designed to record the data of the members of the research sample, for each individual swimmer to be unloaded and statistically processed. Fatigue resistance, Stroke rate, record level (200 m) freestyle.

Contacted the officials in charge of the management of the 6th of October City Sports Club to clarify the research and its importance to the swimmers, in order to obtain the approval of the management of the club.

Meeting with swimmers and their parents, to clarify the importance of the research, to obtain the consent of parents to make measurements.

The researcher recorded the time intervals for the start of training for the season 2016/2017, with the identification of the beginning and end of each stage of the training plan, so that the most appropriate timings to make measurements during the Tapering, so as not to affect the progress of the training process, were as follows: The general preparation stage lasted for (6) weeks from 5/9/2016 to 17/10/2016. The total volume of water training was (160.5) km. The special preparation phase lasted (9) weeks from 18/10/2016 to

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19/12/2016, the total volume of water training (303.2) km, while the stage of competitions (high-intensity training) lasted for 5 weeks from 20 / 12/2016 to 23/1/2017, the total volume of water training (158.6) kilometers, and finally the cooling-off phase, which lasted for three weeks from 24/1/2017 to 13/2/2017, and the total volume of water training (62.8) kilometers, The training has been carried out for the previous training phases in the swimming pool at 6 October City Sports Club.

In the training program for the season 2016/17, the researcher used the training methods for the classification of (W. Maglischo, 2003) and shown in the following table:

The two main themes of the two-phase taper design:

The researcher has taken into account the scientific foundations of the science of sports training to design a period of calm in a two-period style to decrease in size to allow to retain the physical abilities acquired by swimmers throughout the stages of the training season, and also the application of the principle of rest during this stage, according to scientific references

The implementation of the two-period pacification phase took three weeks 24 / 1-13 / 2 / 2017.The focus was on the specialized race distance with different specialized swimmers for swimmers. Also, the appropriate strengths and rest periods were considered for the swimmers' abilities. 62.8 km) and distributed as follows:

The first week on 24 / 1-30 / 1/2017 (7) days, the water training volume has been reduced by (25)% of the highest training volume in the season (36.5) km, the volume of the week (27.3) km, and continued training during This week the same training methods and the weekly ripple of the volume of training.

The two-week low-volume training method was applied to the second and third week.

The second week on 31 / 1-6 / 2/2017 (7) days, the volume of water training has been reduced by (50)% of the highest training volume of the season, the volume of the week (18.2 km), and the researcher applied the method of gradual rapid decline in size Fast Exponential Taper.

**Statistical analysis**

The computer was used to process the data using SPSS 13.0 program. To achieve the research objectives and hypotheses, the researcher used the following statistical methods:

The third week on 7 / 2-13 / 2/2017, and took training during this week only four days, during this period has been increased the size of the last three training units of the cooling program by (50)% of the volume of week (12) (mid-season) (34.6) km, (W. Maglischo, 2015) . bringing the training volume of the last three training modules (17.3 km).

The researcher developed a training plan for the training week (first, second and third) of the Tapering phase of the experimental group, the Volume of the training methods was rounded to the nearest (+ 50, -50) meters.

The total volume of Basic Endurance Training (End-1) per week (I, II, III) of the pacification phase (53,800) meters, illustrated by (W. Maglischo, 2003) indicates that basic endurance training contains (Warm-ups, Swim-down, Stroke Drills, Leg Strokes, Arm Movements, Recovery (15: 661-663), and total anaerobic Threshold Endurance Training (End-2) (5300) meters. (W. Maglischo, 2003) noted that anaerobic threshold exercises are performed three times per week and range in size. Between 1200 and 2000 meters for middle distance swimmers.

The total speed trainings for the Lactate Production Training (SP-2) and Maximum Power Training (SP-3) method were (3200) meters. This is indicated by (W. Maglischo, 2015). 300 to 600 meters per week. Race-Pace (600) has a total volume of 600 meters, (W. Maglischo, 2003) reports that during this stage, the speed regulation exercises range from 200 to 300 meters per week. while (R. Christina, 2010) indicated that speed training exercises for swimmers (400) meters or less should be between 10% and 15% of the total water training, during the phases of the training season, and this percentage is slightly reduced by 5% during the weeks of the Tapering phase gradually. It is also clear that 93% were concentrated in the Basic Endurance Training (End-1) method, which reached (16200) meters of the total volume of water training for this week. However, high-intensity workouts should not be increased during the last three days before the competition, as increasing them will help delay the elimination of the effects of fatigue with muscle fibers, especially fast.

- Arithmetic mean, median, standard deviation.
- T-Test Paired Samples

The significance level at (0.05) was selected to confirm the significance of the statistical results.

**Results.**

**Table 1. Anthropometric Characteristics and age of the groups (Mean ± SD)**

| Group | N | Age [years] | Weight [kg] | Height [cm] |
|---|---|---|---|---|
| **Experimental** | 10 | 17.45 ± 0.24 | 64.67 ± 2.84 | 176 ± 2.80 |

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Table 1 shows the age and anthropometric characteristics of the subjects. There were no significant differences observed in the anthropometric characteristics and age for the subjects.

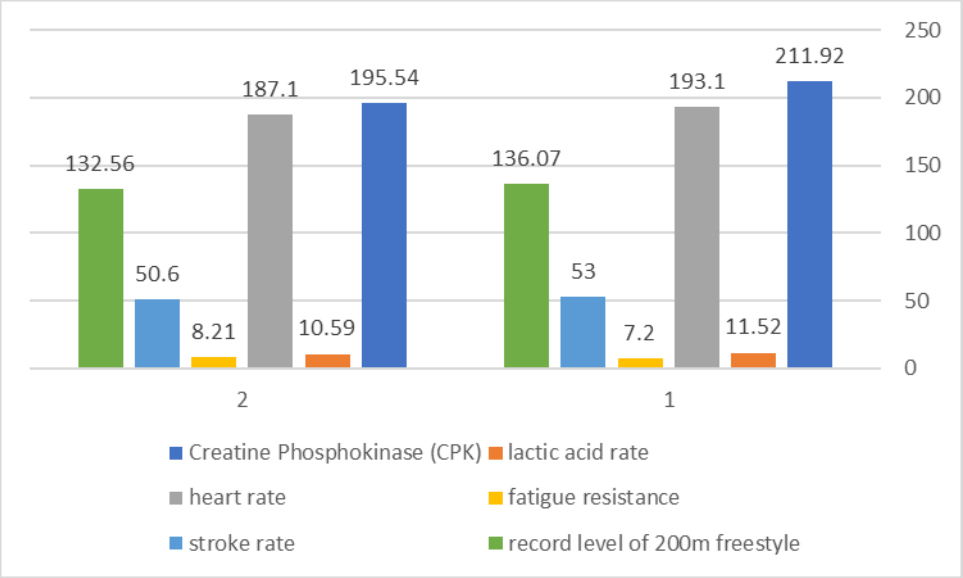


**Fig 1. • show the two-phase of (Tapering) affected in all variables, while it did not affect swimmers' ability to resist fatigue during a 200-meter race distance, possibly due to the nature of the 200-meter high-speed race.**

**Discussion.**

The results indicate that there are statistically significant differences in the physiological variables, and these results are consistent with the study results of (W. Saber, 2015). The researcher attributes this to the decrease in high intensity training loads during the cooling down phase, which helps to reduce the concentration of the enzyme in the blood. Both (I. Mujika, 2009; M. Elkot, 2013) report that creatine phospho-kinase (CPK) decreases in high-level athletes as a result of reduced training loads during the sedation phase.

value of lactic acid rate in the experimental group was a significant level (0.05) and a percentage change (-8.07). Constant with (S. Fakhry, 2014; W. Saber, 2015). the researcher attributes this to the reduction of fatigue levels due to the reduction of the intensity and endurance training, and speed training in general, (Bompa& Haff, 2009; Elkot, 2013) indicates that during the tapering reduced fatigue levels are accompanied by a gradual rise in general fitness levels and improved performance . (Maglischo, 2003) explains that the speed level can be reduced by (3) seconds to (10) Meter for aerobic endurance drills.

The researcher believes that the use of the two-Phase decrease in volume did not have a negative effect in increasing the level of creatine enzyme phospho-kinase (CPK), and the rate of accumulation of lactic acid in blood after increasing the volume of the last three exercises of the sedation phase, to perform basic endurance exercises (End- 1) low intensity of 93% of the total volume of water training.

This result is not consistent with the results of the study (Christina, 2010) while consistent with the results of the study of (Saber, 2015), the researcher attributes this to the achievement of swimmers a high degree of adaptation to the performance of distances and specialized swimmers, and improved efficiency The heart muscle is generally result of the use of high intensity endurance exercises during the previous stages of the training season, which distinguishes the training of middle distance swimmers. This explains according (Colwin, 2002) shows that swimmers during most stages of the training season do not achieve the best times when traveling different distances the result of hard training, which is necessary to take place in practice Adaptation, and when training loads decrease during the pacification phase occurs a number of vital processes within the bodies of swimmers to reach the stage of over-compensation, and these operations perform the same effort that was previously performed for heavy loads. (Elkot, 2013) argues that the resting heart rate, the lower pulse, or the maximum pulse do not change during the sedation phase.

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There are no statistically significant differences in the measurement of fatigue resistance of the experimental group, but this progress in the level was not enough to achieve the level of statistical significance, the researcher attributes this to the approximate speed level between swimming (100) meters first race (200) meters and swimming time (100) The 200-meter high-speed races in which the times of distance travel closely converge, and (W. Maglischo, 2003) show that most swimmers at 200 meters perform a distance of 100 meters. The first meter has a time exceeding their best time (2-3) seconds, and the distance of (100) meters more than the second race (200) meters (1-3) seconds over the time of (100) meters. (W. Maglischo, 2003; T. Nort, & H. Dick, 2012) suggest that mid-distance swimmers have the same percentage of fast muscle fibers and slow muscle fibers, because of To finish the race as fast as you want.

The results in measuring the Stroke rate indicate that there are statistically significant differences for the experimental group, and this result is consistent with the results of the study of (Saad, 2010). the researcher attributes this to the reduced cumulative effects of fatigue due to reduction The Stroke of the high-Stroke exercises in the pacification phase, allowing swimmers to increase strength and thus increase the efficiency of the tensile and pushing stage, reducing the Stroke rate, and (Maglischo, 1993) pointed out that swimmers when fatigue appears, especially in the last stages of the race have less length of Stroke and then The Stroke rate increases to keep the speed level constant. Tudor (Bompa& Haff, 2009) also explains that during the sedation phase the rate of strength and muscle capacity of swimmers increases by 8-25%.

The results show that there are statistically significant differences in measuring the record level for (200) meters free, and this is consistent with the study (Bosquet, et.al. 2007) attributes this to the increase in both the level of strength and ability while increasing the efficiency of the work of fast muscle fibers, which increases the level of speed, and explains (Elkot, 2013) that during the Tapering phase occur some physiological changes, including physical increase muscle capacity, Increased anaerobic capacity, increased number of fast muscle fibers. (Maglischo, 2015) also states that the rate of improvement in the level of speed of swimmers at the end of the pacification phase ranges between 3-7% of the swimmer's time.

These results are not consistent with the results of study (Fakhry (2014). His study pointed to the existence of correlations between the accumulation rate of lactic acid, fatigue resistance, Stroke rate, and the record level of (200) meters free, and the researcher attributes the absence of correlations between variables, the record level of (200) meters in the tribal measurements to the small number of members of the sample conducted by the research, in addition to conducting these (Pretests) measurements in the high-intensity training phase, which is characterized by large loads and high intensity, making swimmers to achieve times Good when racing distances is extremely difficult, and N then decrease the accumulation of lactic acid in blood rates, low pulse rates, low intensity rate.

The results show that there is no statistically significant correlation between the correlation coefficients for the variables (creatine phospho-kinase (CPK), blood lactic acid accumulation rate, heart rate, severity rate), and record level, and these results are inconsistent with the study results of (S. Fakhry, 2014), However, the researcher considered that there should be a logical correlation between (concentration of creatine phosphate kinase (CPK), measure the rate of accumulation of lactic acid in blood, measure the Stroke rate), and the record level, and the relationship is shown when the rate of accumulation of lactic acid in blood, Creatine phospho-kinase (CPK) increases the damage to muscle tissue As a result of excessive effort and thus increased fatigue negatively affected the rate of Stroke and level of performance, and this explains the signs of fatigue in activities with a single movement frequently reduced the level of muscle contraction force when tensile in swimming, increasing the frequency of Stroke Then the performance level decreases. The researcher attributes the lack of correlation between the previous variables and the record level to the performance of dimensional measurements after the Tapering stage, which increases the degree of hospitalization for swimmers and achieve an appropriate level of excess compensation, and then achieve a good record level with low rate of accumulation of lactic acid in blood, and also not increasing the level of enzyme Creatine phosphate kinase (CPK), and then the Stroke rate constant during the distance travel.

While the results indicate a statistically significant correlation between fatigue resistance measurement and the record level, and this result is consistent with the study results of (Fakhry, 2014), his study showed that the lower the rate of accumulation of lactic acid in blood in the race (200) free, the greater the capacity The researcher attributes this to the increased adaptability of swimmers to perform high-Stroke training loads, especially aerobic exercises, which are important pillars in the training programs of middle distance swimmers in the period before the cooling-off period, and with low training load. Tapering and achieving an appropriate degree of over-

compensation, swimmers' ability to resist fatigue is increased by convergence between the first 100-meter travel time and the second 100-meter travel time from 200-meter to ultimately improve the record distance. (200) meters free.

**Conclusion**

- The two-phase decrease in volume (Tapering) affected in all variables, while it did not affect swimmers' ability to resist fatigue during a 200-meter race distance, possibly due to the nature of the 200-meter high-speed race.
- There is a positive correlation with statistically significant relationship between fatigue resistance and the record level of (200m freestyle), while there were no correlations with statistical significance between the other variables and the record level.

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