Effects of using the Tempo Trainer tool on numerical level of 50 meters butterfly Swimming

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Introduction.

That the main purpose of the training is to achieve the best numerical achievement for swimmer, and the 50 meters butterfly race considered one of important speed racing, which requires training for the development of both strokes length and stroke rate of arms, The arm rate is also an important indicator of both the tempo and timing of the butterfly swim. The very low stroke rate is a sign of slow movement of the arms and indicates that there is an instantaneous stopover during performance that effects on race time negatively. (1: 58)

Jim Montgomery & Mo Chambers (2009) emphasized that the tempo and timing of strokes are important and must be included in swimmer training programs for all levels. (7), and good tempo makes the butterfly swim more agile while bad tempo makes it less effective. (12:120) (9:136)

In view of the performance of the elite butterfly swimmers team, we find that they perform two strokes, the first one when the hands entering and extension in the water and the second one when the hands out of water in return for one arm cycle in order to increase speed. (11), (3), (12), (13)

While **Blythe (2016)** mentioned that the problem faced junior butterfly swimmers are to prolong the length of the arms sliding and stop them both in front of them, which cause losing of swimming tempo, lifting strength and speed. (4: - 270172), 5: 95).

The researcher believes that many trainers have to solve this problem by the launch Whistles to alert swimmers to adjust the arms strokes tempo during training or race.

Through the observation of the researcher of **Wadi Degla Club** swimmers during Cairo championship, the researcher found that there was a decline in the level of speed for some swimmers during the 50 meters butterfly, which made them in the decline order despite being ranked at the beginning of the race.

Also During the personal interview with the trainers to Check the swimmers records to make sure that There is no lack of physical fitness that may be causing Performance declines during races, the researcher refers the reason for the decline performance to the low arms strokes during the race, which reflected on the speed of swimmers.

Also, the researcher believes that the speed of swimming is determined by the arms stroke length and stroke rate, whenever the higher the stroke rate while maintaining the stroke length swimmer will be faster.

The idea of training swimmers to control the arms stroke rate by using Tempo Trainer tool, Which is an innovative tool that acts as a personal speed coach instead of the coach whistle witch Give sound alerts in the water (Beep) to decrease the length of sliding arms after entering them in the water, also Tempo Trainer tool can be adjusted to determine the ideal tempo speed for each swimmer.

The researcher did not find a previous study that use Tempo Trainer or any other tool to adjust and stroke rate during training, While **Abul-Ela Abdel-Fattah, Hazem Hussein Salem (2011)**, mentioned to the importance of using devices to control the stroke rate. (1: 58)

From previous introduction this study aims to improve the numerical level of the 50 m butterfly swim by improving the arm stroke rate by using Tempo Trainer tool.

Research aim.

This research aims to improve the numerical level of 50 meters butterfly swim by using Tempo Trainer tool.

Research hypotheses:

1- There are statistically significant differences between the pre and post measurements in the numerical level of 50 m butterfly swim for the benefit of post measurements**.**

Research terms:

Tempo training tool:

An underwater accelerator produces with audible sound designed to control the stroke rate and improve the distance per stroke. (14), (15), (16).

Search procedures:

Research approach:

The experimental approach used one experimental group with the pre and post measurement standard design**.**

The research community includes joiner swimmers registered at the Egyptian Swimming Federation for the 2018/2019 season.

Research Sample:

The subjects for this experiment were competitive butterfly swimmers of well-trained swimmers competing from Wadi-Degla club (n=7) divided to (2) swimmers (1) male, (1) female for the sample survey, and (3) males, (2) females for the experimental sample.

Table (1)

Mean ± SD and skewness for variables (age, height, weight, training age, 42 m butterfly stroke count, stroke length, strokes rate, 50 m butterfly swimming speed)

(N=7)

Variables	measuring unit	Mean	SD	skewness	Median
Age	years	14.20	0.45	2.24	14
Height	cm	167.8	2.59	1.23	167
Weight	kg	64.4	1.95	0.08	65
Training age	years	3.7	0.3	0.6	3.5
50 m butterfly	sec	35.45	3.19	-0.57	36.45
42 m stroke count	Num	24.60	2.07	-0.24	25
42 m stroke time	sec	28.87	3.14	-0.54	30.25
Stroke length	m / stroke	1.72	0.15	0.40	1.68
Stroke rate	cycle / sec	1.17	0.04	0.61	1.15
50 m butterfly	m / sec	1.47	0.17	0.65	1.39

Table 1 shows: observed in Age, height, weight, training age, swimming time 50 m butterfly - time and 42 strokes of the butterfly - strokes length - strokes rate -50 m butterfly swimming speed), ranging between (0.57 - 2.24) (± 3) indicating that the sample combined represents a moderate society in these variables.

Material and Methods:

Measurements tools:

- **Restameer** /for measuring length (cm).
- **Medical balance/** to measure the weight of the nearest half a kilogram (kg).
- **Stopwatch**/ for nearest (1 / 100^{s}).
- **Tape measure/** (cm).
- **Tempo Trainer tool**/ is a small water-resistant tool that easily installs under the head cover and transmits a quick audio signal facility (4).
- (Fins - floating board - ropes for the lanes).

Research Tests:

1- Tests to measure swimming performance.

- Test the numerical level of 50 m butterfly swimming by stopwatch to the nearest 1/100 w.
- Test time and 42 strokes of the butterfly by stopwatch for nearest 1 / 100th attachment (2).

Suggested exercises:

4- Aim of exercises.

- Improve the numerical level of 50 m butterfly swimming for swimmers age (15-14) years, using proposed Tempo Trainer tool exercises.

5- Foundations of the development of training:

- Attention to warm up and prepare the body for training.
- Suitable exercises using Tempo Trainer tool for the age and the performance level of the research sample.
- Giving consideration of differentiation between swimmers.
- Progressive of exercises from easier to harder and from simple to complex.

- Progressive in distances from shorter to longest.
- Variety of exercise inside the training units.

6- Prepare the exercises in the premier form:

The researcher prepared the exercises in the premier Refer to scientific references (4), (6), (7), (9), (10), and the method of operation of the Tempo Trainer tool was used. Also, the exercise presented to staff members specialized in the swimming field that have experience in the swimming field for a period not less than (10) years for their opinion about the exercises.

The program was implemented by the Department of Sports Activity at **Wadi Degla Club** on the same time of applied the research experiment of the training season.

The expert opinion reached the following:

- Experiment Duration (5) weeks.
- Number of units (15) units (3) units per week.
- The time required to apply the exercises (20) minutes in the training unit.
- Approval of the proposed performance tests.
- Approval of the proposed exercises.
- Training unit time (2 hours).
- Total training loads per day (2 km).
- Time distribution of the training module for the research sample (120) minutes divided as follows:
- Warm up (30 min).
- Specific event workout (80 min) divided into:
  - Exercises for the development of legs strokes, arms movements and breathing of butterfly swim. (60min)
  - Drills to improve the numerical level of swimming 50m butterfly using Tempo Trainer tool(20min)
- The Cool-down (10min).

Table (2) shows the time distribution of a training unit.

Table (2) Time distribution of a training module
For sample search Time = 120 (MIN)

Unit parts	Time	Experimental group
The Warm-up	**30 min**	
Specific Event Workout	**60 min**	**Exercises for the development of legs strokes, arms movements and breathing of butterfly swim.**
	20 min	**Drills to improve the numerical level of swimming 50 m butterfly using Tempo Trainer tool**
The Cool-down	**10 min**	

Research procedure:

Survey Study:

The Survey study was conducted on (2) swimmers from the research community and outside the experimental research sample from 3/10/2018 to 7/10/2018 to achieve the following objectives.

2- Training on adjusting the Tempo Trainer tool.
2 - Training (2) assistants to adjust the Tempo Trainer tool.

Premeasurement:

The measurements were applied from 10/10/2018 **to** 21/10/2018; the measurements and tests included the following variables: (Height - Weight - numerical level of swimming 50 meters butterfly - Time and the number of42 m butterfly strokes - calculation of each of strokes length, strokes rate, swimming speed 50 m butterfly).

The researcher calculated the number of arm strokes for (42) m butterfly, eliminate (8) m after the start with a mark where the length of the

swimming pool was 50 m, in order to eliminate the distance in which the arm strokes were not being used. (6: 696) 58), (6: 696), (1: 58)

Also the scientific reference has been determined to eliminate (10) meters from the beginning and then marked and begin to calculate both time and number of 40 meters strokes, also the researcher found that only 8 meters from the beginning This is the period of slippage that swimmers take and then start to appear on the surface of the water. This is consistent with **Sheila Taormina (2014)** in the method of calculating the number of s stroke rate. (11)

The researcher used the following equations to calculate the stroke length, stroke rate, and the swimming speed during the pre-measurement:

- Stroke length (SL) (meter / stroke) = Distance traveled ÷ Number of stroke cycles.
- Stroke Rate (SR) (stroke / second) = cycle time ÷ Number.
- Velocity (m/s) = Strokes Length (m/stroke) ÷ Stroke rate (strokes / sec)
- Velocity (meters / sec) = distance ÷ time

(1: 62-63), (6: 696- 698), (10: 244- 245)

Research implementation:

The research experiment was implemented at **Wadi Degla Sports Club** swimming pool, from 24/10/2018 to 25/11/2018 a pre-competition period, Which were characterized by loads from (80% to 90%), for (5 weeks), (15) units, (3) days per week (Sunday - Wednesday - Friday), The researcher calculated the arm's rate of (42) m for each swimmer where it was considered a pre measurement, During the duration of the research experiment, the time of tempo Trainer was reduced weekly to each swimmer with the calculation of the change rate To follow the ability of swimmers to adjust the tempo of their strokes, the researcher used Mode (1) to determine the tempo of strokes ,with range from (0.2 sec to 99.99 sec) as shone in table (3).

Table (3)

Adjustment Progression of the stroke rate time using Tempo Trainer tool for experimental Sample

(N=5)

weeks	1			2				3				4				5			
swimmer	Training U	Training U	Training U	Training U	Training U	Training U	change Rate between the second and the first week	Training U	Training U	Training U	change Rate between the third and the second	Training U	Training U	Training U	change Rate between the fourth and the third week	Training U	Training U	Training U	change Rate between the fifth and the fourth week
1	1.11	1.11	1.11	1.09	1.09	1.09	-2%	1.07	1.07	1.07	-2%	1.06	1.06	1.06	-1%	1.04	1.04	1.04	2%-
2	1.12	1.12	1.12	1.1	1.1	1.1	-2%	1.08	1.08	1.08	-2%	1.07	1.07	1.07	-1%	1.07	1.07	1.07	0%
3	1.13	1.13	1.13	1.11	1.11	1.11	-2%	1.09	1.09	1.09	-2%	1.07	1.07	1.07	-2%	1.07	1.07	1.07	0%
4	1.19	1.19	1.19	1.17	1.17	1.17	-2%	1.15	1.15	1.15	-2%	1.13	1.13	1.13	-2%	1.11	1.11	1.11	-2%
5	1.21	1.21	1.21	1.19	1.19	1.19	-2%	1.17	1.17	1.17	-2%	1.15	1.15	1.15	-2%	1.13	1.13	1.13	-2%
Mean	1.15	1.15	1.15	1.13	1.13	1.13	-2%	1.11	1.11	1.11	-2%	1.10	1.10	1.10	-1%	1.08	1.08	1.08	-1%
SD	0.04	0.04	0.04	0.04	0.04	0.04	0.0	0.04	0.04	0.04	0.0	0.04	0.04	0.04	0.0	0.04	0.04	0.04	0.0

Table (3) show: that the time change rate of the arms stroke for the sample between the second week and the first week as well as the third week and the second was (2%), while the change time stroke rate between the fourth and third weeks ranged from (1% to 2%), and the time change rate of stroke between the fifth and fourth week (0% to 2%).

Post measurement:

Post-measurements for all research variables were applied from 28/11/2018 to 2/12/2018, on numerical level of swimming (50) m butterfly, time and number of strokes (42) m butterfly, and the calculation of each stroke length, stroke Rate and swimming speed of (50) m butterfly.

Statistical analysis

All statistical analyses calculated by the SPSS statistical program. The results reported as means and standard deviations (SD).

- Arithmetic Mean.
- Standard Deviation .
- Skewness.
- Median.
- Paired Samples T-Test
- Percentage of improvement rates.

Results.

Table (4)

Significance of differences between the pre and post measurement of (numerical level of 50 meters butterfly swimming - Time and number of 42 m butterfly strokes - strokes length - strokes rate - 50 m butterfly swimming speed). (N=5)

Variables	measuring unit	Before		After		(T) value	Sig	Rate of change
		mean	SD	mean	SD			
50 m butterfly	Sec	35.45	3.19	34.43	3.52	5.01	0.01	-2.9%
42 m stroke count	Num	24.60	2.07	26.00	2.35	5.72-	0.00	5.7%
42 m stroke count	Sec	28.87	3.14	27.85	3.37	5.01	0.01	-3.5%
Stroke length	M / Stroke	1.72	0.15	1.63	0.15	7.67	0.00	-5.3%
Stroke rate	Cycle / Sec	1.17	0.04	1.07	0.04	17.49	0.00	-8.8%
50 m butterfly	M / Sec	1.47	0.17	1.53	0.20	3.50-	0.02	3.9%

(T) value of T is the table at a significant level (0.05) (4) = 2.776

Table 4 shows: Significant Difference between the pre and post measurements in 42 m butterfly stroke count, stroke length, stroke rate, 50 m butterfly swimming speed and the change rate varied between (-8.8%: 5.7%).

Discussion:

The results of Table (4) show that there are statistically significant differences between the pre and post measurements in both of 50 m butterfly numerical level and the 50 m butterfly speed in benefit of post measurements. The calculated (T) value is higher than the tabular value (35.45 s - 34.43 s) with a change rate (2.9%), while the average of 50 m butterfly swimming speed between the pre and post measurements (1.47 m / s - 1.53 m / s) with a change rate (3.9%).

Also the results of Table (4) show that there are statistically significant differences between the pre and post measurements in the arms stroke number of 42 m butterfly swim, and stroke rate for the benefit of the post measurements where the value of "T" calculated higher than the table value , where the table shows that the average number of strokes in The pre and post measurements ranged (24.6 strokes - 26 strokes) with a change rate (5.7%), while the average of strokes rate between the pre and post measurements (1.17 cycles / s - 1.07 cycles / s) with a change rate (8.8%).

The results of Table (4) also showed that there were statistically significant differences between the pre and post measurements in the stroke length of butterfly swim in benefit of the premeasurement. The calculated (T) value was higher than the tabular value. The average of stroke length was in the pre and post measurement (1.72 meters / stroke - 1.63 meters / stroke) and the change rate between the two measurements (5.3%).

The researcher believes that the speed of swimming depends on two main variables (arm stroke length - arm stroke rate) as **Maglischo (Ernest W. 2003) (6: 697)** mentioned, as the results of Table (4) showed that there was an increase in the stroke number with a small stroke length. This is consistent with the aim of using Tempo Trainer tool which reduced the stroke time, which ranged from (28.87 s to 27.85 s), so the number of strokes (24.60 strokes - 26.0 strokes) in 42 meters butterfly.

That also resulted in decrease of stroke length ranging from (1.72 meters - 1.63 meters), the result is consistent with what **Maglischo (Ernest W. 2003)** suggests that the increase in the number of arm stroke is inversely proportional to the stroke length and vice versa. (6: 698), Consequently, the average stroke rate improved from (1.17 cycles / s - 1.07 cycles / s) , The result is also consistent with what **Maglischo (Ernest W. 2003)** suggests that to increase the speed of the swimmer it increases the stroke rate even if the length of the stroke is reduced. (6: 698), it is also consistent with the findings of **L. SEIFERT1, D. (et al., 2007)** that there is a correlation between increased speed and increased stroke rate (8: 135), also **Al Rabadi, w and others (2017)** found a significant correlation between swimming time of 25 meters butterfly and the rate of motor frequency (2: 385). The researcher found that the result of the improvement of the average speed from (1.47 m / s to 1.53 m / s) with change rate (3.9%), had a positive impact on the numerical level of 50 m butterfly swimming witch improved from (35.45 s - 34.43s) with change rate(2.9%).

Thus, the search hypothesis has been proved "There are statistically significant differences between the pre and post measurements in the numerical level of 50 m butterfly for the benefit of post measurements.

Conclusion:

1- Training with the Tempo Trainer tool has improved the numerical level of 50 meters butterfly swimming for junior swimmers age (15-14).
2- There is a difference in the change percentage between the pre and post measurements of the research sample on the numerical level of 50 meters butterfly with a change rate of (2.9%) for the benefit of post measurements.

Recommendations:

4- Using the Tempo Trainer tool to improve the numerical level of a 50-meter butterfly for junior swimmers age (15-14).
5- Trainers should give careful consideration to developing the stroke rate for swimmers during training units.
6- Conducting such a study on crawl, breast, Backstroke swimming.
7- Conducting such a study on other age stages.

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