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The Experiments of Rhythm Training on Speed in Short-Distance Crawl-Stroke Swimming

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Abstract The aim of this study was to study the experiments of rhythm training on speed in short-distance crawl-stroke swimming. In this quasi-experimental study, the male participants were divided into 2 groups, namely experimental and control groups. They were 18-20 years of age. They were interested in swimming and had basic swimming skills demonstrated through the skill assessment test and the assessment of 9 crawl strokes. The experiments were completed in a total of 8 weeks of training, 3 days a week. The data was collected before and after the experiments. The training program was carried out on the experimental and control groups. The training program was developed from the training guidelines of FINA and intervention with an experimental group trained with a rhythm machine in conjunction with the developed program. The swimming speed of a 50-meter method was used and a four-propeller drone with a high-angle camera was used to take photos. To compare the pre-test and the posttest scores, a paired sample t-test was used to compare the within groups and an unpaired t-test was used to compare the between groups. The results revealed that the physical fitness test in both of the groups tends to improve. However, when the two groups were compared, a significant difference was found. The speed in the 50 m crawling stroke showed that after training the experimental group (1.21±0.17; $p \leq 0.018$) was higher than the control group (1.00±0.18; $p \leq 0.003$). It was also found that the stroke length in the control group had a higher mean ($p \leq 0.041$), and the stroke index in the experimental group had a higher mean ($p \leq 0.004$). Thus, it can be concluded that the rhythm training can develop the speed and motor skills of the body which are suitable for young people.

Keywords Rhythm Training, Crawl Stroke, Speed, Swimming

1. Introduction

Swimming takes time as a deciding factor. The person with the least time in the competition will be the winner. The swimmers who can do the shortest time must be trained to have good basics and techniques of swimming. This consists of good starting, using the legs, using the arms, breathing, turning, and reaching the finish line. Swimmers must practice these techniques until they can move automatically. They can practice continuously for the interrelationship among the skills [6]. Such practice includes swimming training with the correct and appropriate rhythm of swimming strokes. In terms of science, it is said that when swimmers swim in the correct and appropriate positions according to the rhythms of swimming, it results in efficiency in pushing the body

through the water very well with low resistance.

However, the current problem in swimming lying in most training sessions is the time or distance, trying to find a training method that can improve the swimmers. In this way, swimmers may not be as successful as they should be. This is because the intensity of training in accordance with the appropriate use of arms or frequency rhythms of swimming used in training is not clearly defined. Thus, swimmers use their arms from the rhythms they have created for use in swimming training. From the reasons mentioned above, the idea of practicing rhythms is strongly correlated with faster swimming. The rhythm training must be controlled with the use of strokes. This is a major obstacle for swimmers to hear the rhythms from the trainer. Sometimes, the sound is one of the elements that hinder communication while swimming [7]. Moreover, swimmers wear swim caps or have water in their ears, so the instructors' voice is rarely heard. As a result, swimmers use the rhythms of their arms to swim and accelerate according to their own aptitude.

The tool to give a rhythm acts as an assistant in training in personal speed training or gives a rhythm that swimmers will hear when training in the water. The metronome will sound an alarm that can be brought into the water. The metronome can adjust the appropriate tempo, and it is consistent with the training program [4]. The most effective training device is a metronome which works similarly to a musician's metronome. It can be done by setting it according to the desired frequency or speed and attaching it under the swimming cap behind the ears or putting on straps of glasses that can easily be heard. However, previous studies on the use of a tempo trainer among a group of 50-meter young swimmers with butterfly strokes showed significant differences [1]. The results revealed that there were changes in the timing of the arm stroke between week 1 and week 2 for 2% while the changes in stroke rates during weeks 3 and 4 which were ranged from 1 - 2%. Also, the stroke rates of changes during weeks 4 and 5 were in the range of 0 - 2%. However, there is no research to study the effects of rhythm training in crawl stroke swimming for a short distance.

Therefore, the objective of this study is to determine the effects of rhythm training on speed in short-distance crawl-stroke swimming.

2. Materials and Methods

2.1. Research Design

The purpose of this study was to determine whether the rhythm training of crawl stroke swimming increased the speed and physical fitness of male swimmers more than the swimming training without rhythm. In this quasi-experimental study, a two-group pretest / posttest design was employed. The pre-test and post-test were taken 2 days before and after the training program. The measurements were based on the variables to prevent fatigue and injury to the participants. This process was assessed by the researchers and research assistants. A total of 8 weeks of training were conducted, 3 days a week without interrupting the process.

2.2. Participants

The sample group was male undergraduate students who were interested in swimming. These participants were included through basic swimming skills evaluated using the swimming skill assessment test with 9 lists and were enrolled and passed a swimming subject majoring in Physical Education and Sports Science at Roi Et Rajabhat University at the age of 18 - 20 years old. They were healthy as assessed with the Physical Activity Readiness Questionnaire (PAR–Q) and had never received. Basic anthropometric data of the participants in both studies are presented in Table 1. The sample was obtained through purposive sampling which required them to perform a test of swimming speed at 50 meters. The time of the samples was sorted from 1 to 20 and ranged between good and weak to divide the samples as randomization using a table of random numbers. They would receive training in accordance with the swimming program based on the training guidelines of the FINA. Thus, the samples were divided into 2 groups, with 10 participants each. A priority power analysis using statistical software (G*power V 3.1.9.4) was completed to determine adequate sample size. A sample size of 10 participants per group was estimated in our main outcome, from previous studies at an alpha level of 0.05 with 80% power. For the exclusion criteria, the participants with physical disabilities and hearing loss cannot be trained. Also, the participants who were diagnosed as having heart attacks or heart diseases declined to voluntarily participate in the study or provide information. As ethical consideration, all the participants provided written informed consent before the study. The experiment was approved by the Ethics Committees of Khon Kaen University and was conducted in accordance with the ethical principles for medical research involving human subjects described in the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines. Reference No. HE642227.

Table 1. Basic anthropometric data of the participants in both studies (mean ± SD)

	EG group (n = 10)	CG group (n =10)
Age (yrs.)	19.3 ±0.43	19.3 ±0.82
Pulse (time/min)	78.1 ±13.23	82.5 ±19.56
Height (cm)	174.3 ±6.36	172.8 ±3.35
Weight (kg)	71.25 ±11.10	71.64 ±11.05

2.3. Training Protocol

Before the experiment, the researchers and the research assistants completed the basic swimming skills test with 9 aspects such as walking in water, blowing, diving, back-glide float, prone glide, back glide, tread water, kick crawl

stroke, and crawl stroke [9]. The sample group was required to take this test with a speed of 50 meters (Pre-test). The testing time of the sample was sorted from the fastest to the slowest, from the first to the twentieth. The control group was assigned an even number while the experimental group was assigned an odd number using a table of random numbers. The training is for 8 weeks, 3 days per week (Monday, Wednesday, and Friday at 4.00 – 5.30 pm), 1.30 hrs./day at the swimming pool of Roi Et Rajabhat University. The researchers instructed the swimmers not to do physical exercises outside the set program and they were required to continue their usual eating habits during the study. The researchers indicated different periods to measure the different variables between the 2 groups to reduce bias.

The control group applied the training program which was developed from the training guidelines of Fédération International de Natation (FINA) without the tempo trainer tool and increased their intensity by 10% between weeks 3 and 5. Then the intensity was increased by 20% for weeks 6-8 (Figure 2). The experimental group applied for the training program with the tempo trainer tool and increased their intensity by 10% between weeks 3 and 5. Then the intensity was increased by 20% for weeks 6-8 (Figures 1 and 2). The steps included warm-up and stretching for about 15 minutes, then practice according to the program for 60 minutes. Lastly, the cool down and stretching would take 15 minutes to prevent injury. The control group applied the training program which was developed from the training guidelines of Fédération Internationale de Natation (FINA) for 10 participants without the tempo trainer tool. The experimental group applied the training program which was developed from the training guidelines of Fédération Internationale de Natation (FINA) for 10 participants with the tempo trainer tool.

Figure 1. The tempo trainer tool applied among the participants in the training program

The measurements were based on the variables and conducted 2 days away to prevent fatigue and injury to the participants. On day one, the physical fitness was tested using the Thai Physical Fitness Test of the Sports Authority of Thailand [13] consisting of eight aspects. On day two, the researchers and the research assistants tested the speed at 50 meters, using a four-propeller drone and a camera to take photos at 50 Hz. The rotating camera was positioned at the center of the pool (25 m.) at a height of 15 meters above the pool edge [15]. A fly drone (Gd91 Pro) with a high-angle camera was used to take photos, which were captured at a height of 30 meters. The test was taken for approximately 1.30 hours at 09.00-10.30 am. When the training was finished, the post-test scores were collected for the same variables as the pre-test data, including the velocity of crawl stroke, rounds of stroke count of crawl stroke, tempo of stroke length of crawl stroke, stoke index, and physical fitness.

2.4. Outcome Measurement

The researchers indicated different periods to measure the different variables between the two groups to reduce bias using a single-blind trial. The participants were not informed of the duration of testing and used a sealed envelope to determine the duration of testing. All the participants were required to perform the test at the specified time and place. The participants in the same group did not attend the test at the same time. When the training was finished, the post-test scores were collected for the same variables as the pre-test data. Each participant was allowed to perform 2 swimming tests in which the best swimming time successfully made will be used for data analysis with a 15-second recovery between each swim.

The primary outcome data recorded from the camera and the ground camera were used to analyze the velocity of swimming test 50 m craw stroke, the stroke counts (SC) of arms per minute including the stroke length (SL) of single stroke count and stroke index (SI) of swimming performance based on the following principles and variables. Stroke count was the counting of arm circumferences in a 50-meter crawl swimming. It counts the number of arms each time the fingertips draw water. Stroke length was the length of arms in swimming combining the speed in 50-meter crawl swimming which can be calculated from velocity divided by stroke frequency. Stroke index was the index used to indicate the performance of the swimmer, especially in crawl swimming, which can be calculated from velocity multiplied by stroke length.

2.5. Statistical Analysis

Descriptive statistics in this study included the mean and standard deviation. In addition, inferential statistics were used for the analysis of data to study the results of stroke training in swimming training affecting the speed of male short-term swimmers using the data normality test analyzed by Shapiro-Wilk test. In addition, calculation was performed on Cohen's d to show how much increase on the pretest to posttest scores were the interpretation of the effect size divided into three levels; small effect size at 0.2, medium effect size at 0.5, and large effect size at 0.8. The calculation reported an effect size of 1.42. It was a large effect size which indicated the result of a sizable experiment. Finally, all the data were analyzed using SPSS version 19. A paired-sample t-test was then used to compare the pre-test and post-test scores. The analysis of the mean difference between the 2 groups included a t-test independent statistically significant at $p \leq 0.05$.

Training Program								
Day	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Monday	(1) ** FR 200 (2) * FR 4 x 50 ON 1.00 (3) SCAT 4 x 50 ON 2.00 (4) **2 x 200 ON 3.30 (5) C.D.200	(1) ** FR 1x400 Hold 8.30 (2) * FR 2x50 ON 1.00 *BA 1x50 ON 1.10 (3) **FR 2 x100 ON 1.30 Hold 1.15 (4) DPS200 (5) C.D.200	(1) **FR 200 (2) **Drill FR 4 x 50 ON 1.30 (3) *FR 4 x 25 ON 1.00 (4) DPS200 (5)***Kick FR 2 x 100 ON 2.00 (6) C.D. 200	(1) * FR 4 x 100 ON 1.45 (2) *Paddle FR 4 x 100 ON 1.40 Hold 1.19 (3) DPS200 (4) **Kick FR 6 x 50 ON 1.15 (5) C.D.400	(1) *FR/BA 2 x 100 ON 1.50 (2) **Drill FR 4 x 50 ON1.15 (3) **FR 3 x 100 ON 2.30 (4) DPS 200 (5) * FR 10 x 25 ON 1.00 ***Kick 4 X 50 ON 1.00 (6) C.D. 200	(1) **FR 2x200 ON 3.15 (2) *FR 8 X 25 ON 1.00 (3) DPS200 (4)***Kick 6 x 50 ON 1.30 (5) C.D.200	(1) **Warm Up 1X400 ON 7.00 (2) *Drill FR 6X50 ON 1.00 (3) **Easy 200 (4) FR 20x25 ON 1.00 Kick 20x25 ON 1.00 (5) C.D. 400	(1) *Drill FR 5x50 ON 1.10 (2) **FR 4x50 ON 1.30 (3) **Easy200 (4) ***Kick 6X50 ON 2.00 (5) C.D. 200
Wednesday	(1) **FR 1 x400 1 x 200 1 x 100 (2) **Drill FR 4 x 50 ON 1.40 (3) **FR 2x200 ON 3.00 (4) DPS400 (5) *** Kick 2x100 ON 2.15 (6) C.D.200	(1) *FR/BA 2x50 (2) **Drill FR 2 x 100 ON 2.30 (3)**SCAT 4 x 50 ON 1.30 (4) Drill FR (Paddle) 2 x 100 ON 2.30 (5)***Kick 2x50 ON 1.20 (6) C.D.200	(1) *FR 200 FR/* BA 4 x 50 (2) Drill + **Swim FR 2 x 100 ON 2.00 (3) DPS200 (4) *** Kick FR 2x100 ON 3.00 Hold 1.30 (5) C.D.200	(1) ** FR 4X100 ON 1.45 (2) Drill + **Swim FR 2 x 100 ON 2.15 (3) DPS400 (4) *FR 4x50 ON 2.00 (5) C.D.200	(1) FR 2 x 50 MAX (2) *Drill 4 x 50 ON 1.30 (3) **FR 6 x 25 ON 1.30 (4) DPS200 (5)** Drill 4 x 50 ON 1.30 (6) * FR 6 x 25 ON 1.30 (7) DPS 200 (8) *Kick 4x50 ON 1.30	(1) **FR 3x300 ON 4.10 Hold 3.55 (2) DPS200 (3) *FR 6x25 ON 1.00 (4) ***Kick 4 x 100 ON 2.00 (5) C.D.200	(1) **FR 1X400 (2) *FR 4x50 ON 1.00 (3)***Kick 4x50 ON 1.30 (5) **FR 2x200 ON 3.00 (6) C.D.200	(1) **Warm Up 400 (2) **FR 4X100 ON 3.00 *FR 4X50 ON 1.00 (3) **Easy200 (4) C.D. 200
Friday	(1) * FR 1 x 400 Hold: 9 min (2) DPS 200 (3) **FR 1 x200 (5) DPS200 (6) ***FR 2 x 100 ON 2.30 (7) C.D.200	(1) *Drill FR 4 x 50 ON 1.30 (2) SCAT 4 x 50 ON 2.30 (4) **FR 1x100 ON 3.00 2x50 ON 1.30 4x25 ON 1.40X2 (5) DPS200 (6) *** Kick 4x50 ON 2.00 (7) C.D.400	(1) *FR 2x100 ON 1.50 (2) **Drill FR 4 x 50 ON 1.15 (3) SCAT 4x50 ON 1.30 (4) DPS200 (5) *Swim FR 4x25 ON 1.00 (6) C.D.200	(1)** FR 2x100 ON 1.30 (2) **Drill FR 2x100 ON 2.00 (3) SCAT 4x50 ON 1.20 (4) *FR 4x50 ON 1.00 (5)**SCAT 4x50 ON 1.30 (6) C.D.200	(1) ** FR 400 (2) **Drill FR 6x100 ON1.30 (3) DPS 200 (4) Kick 3x100 ON2.30 (5) C.D.200	(1) **FR 400 (2) **Drill 4x50 ON 1.30 (3) **FR 3x100 ON 3.00 (4) DPS200 (5) * FR 6x50 ON 1.45 (6) ***Kick 4x100 ON 2.00 (7) CD.200	(1) **FR 2X100 ON 1.45 (2) **Drill BA 2x100 ON 2.00 (3) * FR 4x50 ON 1.00 (4) **Easy 400 (5)***Kick 6X50 ON 2.00 (6) C.D.400	(1) Warm Up 2X200 ON 7.30 (2) **Drill FR 4x50 ON 1.20 (3) ***Kick 4X100 ON 2.00 (4) *FR 6x50 ON 1.00 (5) C.D. 400
EG CG	Practice according to the regular program		Experimental Group - Increase the intensity by 10% and 20% in Modes 2 and 3 with rhythm adjustments and rest periods in weeks 6-8. Control Group - Increase the intensity by 10% and 20% in Modes 2 and 3, rest periods between sets in weeks 6-8.					

Figure 2. The training program developed from the training guidelines of Fédération International de Natation (FINA).

3. Results

The comparative study of the results of physical fitness test between the 2 groups from the rhythm training on speed in short distance crawl stroke swimming. The researchers tested physical fitness by using the physical fitness test of Thai people of the Sports Authority of Thailand [13]. It was found that there were differences in body weight (69.20±11.52; p≤0.004), and the percentage of body fat were reduced (14.78±4.26; p≤0.049), and grip strength (0.67±0.99; p≤0.006), vital capacity (63.44±8.89; p≤0.036) and maximal oxygen consumption (40.36±7.05; p≤0.043). In the control group, there were differences in the variables of the average grip strength (0.67±0.12; p≤0.000), flexibility (13.37±6.90; p≤0.034), vital capacity (60.49±10.85; p≤0.043), and maximal oxygen utilization (40.88±5.53; p≤0.003). The results of the comparison between the 2 groups revealed that all the variables before and after training had no statistically significant differences (p≤0.05). The results indicated that the physical fitness test in both of the groups tends to improve (Table 2).

The effects of the speed in the 50 m crawling stroke after training in the experimental group (p=0.018) were higher than the control group (p=0.003). The comparison between the groups showed no statistically significant differences. However, it was found that the stroke length in the control group had a higher mean (p=0.041), and the stroke index in the experimental group had a higher mean (p=0.004) (Table 3).

Table 2. The comparison of the effects of the physical fitness test within the groups and between the groups from the rhythm training on speed in short-distance crawl stroke swimming

Variable	Period	EG (n=10)	CG (n=10)	P-Value *EG	*CG	**Between
Weight	Pre	71.25±11.53	71.74±11.07			
	Post	69.20±11.52	66.80±8.79	0.004*	0.114	0.939
Body fat	Pre	15.65±4.31	19.19±3.03			
	Post	14.78±4.26	17.92±3.44	0.049*	0.085	0.670
Grip Strength	Pre	0.61±0.10	0.61±0.13			
	Post	0.67±0.99	0.67±0.12	0.006*	0.000*	0.751
Leg strength	Pre	1.95±0.33	1.83±0.36			
	Post	2.10±0.38	1.93±0.33	0.063	0.079	0.770
Flexibility	Pre	14.00±5.97	12.19±6.71			
	Post	14.53±5.68	13.37±6.90	0.450	0.034*	0.637
Vital capacity	Pre	57.49±6.80	56.79±11.60			
	Post	63.44±8.89	60.49±10.85	0.036*	0.043*	0.994
$\dot{V}O_2max$	Pre	37.36±5.85	35.96±4.65			
	Post	40.36±7.05	40.88±5.53	0.043*	0.003*	0.831

*P≤.05 (*Within groups **Between groups significant at the 0.05 level)

Table 3. The comparison of the results of the rhythm training on speed in short-distance crawl-stroke swimming

Variable	Period	EG (n=10)	CG (n=10)	P-Value *EG	*CG	**Between
Velocity	Pre	1.10±0.19	0.90±0.16			
	Post	1.21±0.17	1.00±0.18	0.018*	0.003*	0.380
Stroke count	Pre	25.50±1.71	26.20±2.48			
	Post	23.70±2.90	26.70±2.90	0.095	0.504	0.689
Stroke length	Pre	0.73±0.05	0.74±0.07			
	Post	0.68±0.08	0.76±0.08	0.110	0.460	0.041**
Stroke index	Pre	0.79±0.11	0.68±0.10			
	Post	0.77±0.15	0.76±0.09	0.073	0.018*	0.004**
Number of stroke	Pre	51.00±3.43	52.40±4.97			
	Post	47.40±5.81	53.50±5.91	0.095	0.467	0.716

*P≤.05 (*Within groups **Between groups significant at the 0.05 level)

4. Discussions

The comparison of the results between the pre-and post-training of physical fitness to short crawl stroke speed. The comparison of the results between pre- and post-training in the experimental group found that the experimental group had a lower mean body weight and percentage of subcutaneous fat. The average grip strength, vital capacity, and maximum oxygen consumption competence were higher. Similarly, the control group had a higher average grip strength, vital capacity, and maximum oxygen consumption competence with statistical significance ($p \leq 0.05$). When comparing the physical fitness between groups, there were no differences between pre-and post-training among each variable at a statistically significant level of $p \leq 0.05$. This revealed that the training with a tempo trainer in the experimental group and the training with the program of the control group did not affect the physical fitness. The effect of improved physical fitness can be a result of the training program that can help improve physical fitness. The training using a similar program for both the groups gained stimulation of the brain or nervous system with the functions of perception (Sensory Neuron) and sent them to the central brain (Central Nervous System) to operate and control movements as well as develop co-relations skills. The brain is the control center of the human body for commands when receiving sounds, rhythms, or other stimuli. The brain commands through various organs from the spinal cord to the nerves and controls the strength of muscles and the movements of joints. This was relevant to the music that would stimulate interest and fit into the rhythms, starting with a slow tempo and increasing the speed [10]. Listening to music with melody can help to concentrate, relieve tension, stimulate, and enhance the development of physical, mental, emotional, social, intellectual, and movement changes. The training program would increase the efficiency of the body and provide the basis for speed improvement. The swimmers should concern with the improvement of swimming efficiency [14]. There are many parameters that lead to better swimming performance. According to the analysis of the parameters emphasized in the study of swimming training related to tempo stroke, it was revealed that swimmers with crawl stroke should use 70 percent of their arm muscles and 30 percent of their leg muscles [11]. This showed that swimming athletes use their arms much more to significantly increase swimming speed. Therefore, neither the tool nor the program had any effects on the swimming stroke training in terms of physical fitness. It was probable that the improved physical fitness was from the training program. In addition, the training from a program with a well-defined intensity level can also improve physical fitness for both the groups. This was relevant to Khampromrat that speed is the capacity to quickly move from one place to another. It is a skill-related physical fitness consisting of power speed which is in the sudden change of the tempo or direction of movement. It can be revealed that the capacity of an individual controls and commands the body to perform various tasks [5]. This may be due to the purpose of the training programs to improve velocity and can improve physical fitness.

According to the comparison within the experimental group, it was found that the velocity at 50-meter swimming was increased after training the same as the control group. The quality of the stroke index was also improved. This may be because both tempo training and self-tempo could increase velocity. Additionally, in terms of science, swimming at the proper tempo would promote efficiency by allowing the body to go through the water with less resistance. Training in the experimental group employed a tempo tool that provided sound waves because the brain is regarded as the core component of the nervous system. The brain is in charge of controlling and regulating movements, and behaviors, and maintaining balance within the body. The stimulation sounds start from the spinal ganglion in the organ of corti to the auditory cortex at the temporal lobe to perceive and interpret the direction of loudness and the frequency of the sounds heard. This research used sounds to determine the tempo of training and movement that conveyed the nerve signals to the brain for interpretation and from the motor system to the control of muscles and movement. Some reactions moved nerve waves to the brain, from the brain to muscle which had a distance that required more time to transmit data via synaptic relay as well as more decision-making than silent movements. Nerve signals can be sent to the Motor Cortex which was the charge of controlling body movements immediately. It was clear that tempo training could affect velocity, which is essential for swimming. In addition to swimming stroke tempo, position, angle of movement, rolling, and maintaining balance were taken into account to improve timing in swimming. Similar to previous studies, the training of Six-Beat Kick had a statistically significant impact on 50-meter freestyle swimmers [8]. It can be seen from the comparison between pre- and post-experiment. The fact that velocity increased demonstrated that swimming stroke training was the cause of the increased velocity. This is due to the correlation between the nervous system and muscles which are part of velocity and agility. The velocity and correlation between the nervous system and muscles are part of agility [2]. By developing a movement, regular practice reduced the time needed to decide to move the body correctly. The comparison of the tempo training within the control group found an improvement in stroke index quality. This indicated that stroke was used effectively. This might be because the training program was similar to the experimental group, but it was used without the tempo tools. As a result, the training of the control group performed without sounds which can immediately send nerve signals to the Motor Cortex that is responsible for controlling body movements. Consequently, it was possible to control the swimming technique and more accustomed to the stroke.

When comparing between the groups, it was found that

the tempo of pre-training in all variables was similar. However, it showed that the mean trend in the experimental group was better than the control group except for stroke length. When comparing the stroke after training, it was found that there was a difference in the variable of the stroke length and the quality of the stroke index. The variable of stroke length in the control group had a higher mean after training than the experimental group which might be due to swimming training. Regular training programs would help swimmers relax and be able to use stock techniques effectively. Using arm strokes in swimming without worrying about sound and regular training programs in the control group were able to send nerve signals to the Motor Cortex which is responsible for controlling body movements immediately. The stroke length or stroke arm was used effectively by the mechanism of power or repulsion generated by the athletes themselves. Therefore, this regular training might be appropriate for athletes who are preparing for competition. Furthermore, the front crawl stroke or freestyle would overcome the water resistance by the propulsive phase with velocity [3]. This velocity is mainly formed by the movement of the stroke arm at 85%. Besides, Ralph Richards explained swimming training for young swimmers that the development of mental skills should include various abilities or skills such as setting goals, creating a dream, controlling emotions, interests, intentions, etc., which swimmers need to understand the nature and environment along with swimming training. It is one of the mechanisms involved in swimmer development [12]. The variable of the stroke index indicated that the experimental group had a higher mean after training than the control group may be because tempo training was control over the stroke rate of the arm and stabilized the stroke rate. Therefore, the participants followed the training program with greater precision since the key is to provide the tempo tool, which is also related to the intensity of the training utilizing sounds to identify the tempo of training and movement. This led nerve signals to being interpreted in the brain, and from the brain motor to the control of muscles and movement. Some reactions used nerve waves to move into the brain, from the brain to the muscle. It was shown that when the experimental group was trained with the tempo tool. They were able to swim in better swimming positions. This may be due to the focus on the stimulation of the tempo together with the use of proper swimming techniques. The quality of the stroke index was better than that of the control group with tempo and stroke. Training with the tempo tool was able to develop motor skills by stimulating the tempo into swimming movements in combination with the use of effective techniques. Therefore, tempo training was suitable for young people who want to be athletes. In line with Khampromrat, the method of training for velocity development must come from the right movement. There was a system of the nervous system that is related to the muscles which can develop the appropriate use of force to improve velocity [5].

This study has some limitations in that the participants in this study were not athletes at a competitive level, with no experience in competition. The trainers can apply the stroke results from the analysis to improve swimmers to be youth swimming athletes. According to the results of the tempo trainer tool, it was unable to test whether the participants' tempo matched the tempo of the stroke arm. However, recommendations for further study should focus on programs and tempo training tools for short swimming. This should be used in female participants or at the youth swimmer level. For further study, the duration of the reassessment period may be extended to observe changes, and tempo training should be used for the content of swimming position analysis such as backstroke, breaststroke, and butterfly, which should be extended by adding a camera for video recording and underwater photography. The trainers may use a tool with proof of accuracy such as the installation of an accelerometer on the wrist.

5. Conclusions and Suggestions

In conclusion, that stroke training was associated with short-term crawl stroke speed. It can help increase the speed of the 50-meter crawl stroke swimming. It can also improve the stroke for a better trend without affecting physical fitness. The effects of improved physical fitness may be due to an appropriate training program. However, there are some limitations in this study even though the findings are statistically significant. It is suggested that the participants in this study were not athletes at a competitive level, with no experience in competition. The trainers should apply the stroke results from the analysis to improve swimmers to be youth swimming athletes to improve speed and stroke quality as well as practicing the program as usual with athletes who have mastered basic skills. As a result, the brain can instantly send nerve signals to the body parts in charge of regulating body motions.

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