



THE EFFECT OF COMPLEX TRAINING ON ANTIOXIDANTS, CERTAIN PHYSICAL EDUCATION AND RECORD LEVEL OF 50M CRAWL SWIMMING FOR YOUNG SWIMMERS

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Abstract

Aim. Complex training is a workout comprising of a resistance exercise followed by a matched plyometric exercise. The logic behind these matched pair of exercises is that the resistance work gets the central nervous system (CNS) into full action so that more Type IIb fibres are available for the explosive exercise, hence a better training benefit. The aim of study is to reveal effectiveness of complex training on antioxidants, certain physical education and record level of 50m crawl swimming for young swimmers.

Methods. Twenty young swimmers participated in this study (mean \pm SD age, 14 \pm 2.1 years), divided into (2) groups (experimental group -10 young swimmers) and (control group -10 young swimmers), the experimental group participated in the complex training program to 3 times per week for (2) months. The tests were measured before and after the complex training program.

Results. The results indicated that, improvement significantly in antioxidants level in blood, power and strength, no improvement in record level of 50m crawl swimming.

Conclusion. These data show that complex training program which suggestion from the researcher was affectedness on power and strength, antioxidant but failed to improve record level of 50m crawl swimming.

Keywords: complex training, power, young Swimmers

Introduction

Success in many sports depends heavily upon the athlete's explosive leg power and muscular strength. In jumping, throwing, swimming events and other activities, the athlete must be able to use strength as quickly and forcefully as possible. This display comes in the form of speed-strength or power. (Yessis, Hatfield, 1986).

Swimming is one of the types of water sports that take advantage of aqueous medium to move, where the brunt of the movement of the body and the offering is located forward on the arms and legs movements. (Fawzi, 1990)

The importance of swimming aerobic activities as involving the entire major muscles in the body, and as a result, they provide a comprehensive physical preparation of the individual more than many other sports.

Swimming as a form of water sports competitions are numerous physical and physiological requirements, which contribute significantly to the improved performance level and achieve the best digital levels and this requires a stand on these requirements to work on development and more development. (Salama, 2000)

Hamza, (2014) refers that swim coach should

be fully aware of variables physiological associated with general training and the training of swimming in particular, where it is setting performance intensity and adapt Physiological resulting from loads of different training, by identifying the physiological responses to those swimmers on an ongoing basis.

Abdel-Fattah (1998) indicated that the roots of oxygen atoms combine a great extent in the cells causing damage to the muscle cell components, especially DNA.

Ashton et al. (1998) notes that free radicals increased in some tissues in response to physiological and physical exertion is destroying muscle cells and thus a muscular fatigue.

Hamza, (2014) mentions that antioxidants play an important role in protecting the cell from oxidative stress, and lack of antioxidants leads to increased oxidative tissue injury, and antioxidants classified into three categories:

- Vitamins such as E, A, Beta-Carotene
- Glutathione and sulfate
- Antioxidant enzymes.

In addition, refers Akira Morikawa et al. (2004) that the enzyme Super Dismutase dioxide is one of the most important antioxidant which works

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on protecting Mitochondria cell from damage, due to the accumulation of free radicals in the body. Which produced naturally during breathing as the ratio ranging from 1-5% of the user to breathe oxygen it is one of the free radicals.

While Sjodin et al. (1990) estimated that there is a ratio between 2-5% of the total oxygen consumer has the ability to formation at rest and during physical exertion different forms

And refers Astrand & Rodahl (1986) that this oxygen is material and wide destruction Super resulting from escaped electron dioxide It is understood that during the physical training increases the maximum oxygen consumption 10-20 twice any (35-70 ml / KG of weight / min). As well as the Free radicals are caused by the escape of oxygen increases, this has been mathematically estimate the amount of oxygen during the training, which have the ability to form free radicals as follows: $0.6 \times 3.5 \text{ ml / KG / min}$.

Muscle strength is a physical fitness that plays an influential role in the short swim components where Wilmore & Costill (1999) states that the muscle power of the most dynamic factors affecting the motor performance, where the amount of traffic to stop the relationship between the size of the force and the amount of resistance and improve that training.

And refers Hamza, (2014) that inadequate power adversely affect the level of proficiency and develop performance skills as the swimmer's body moves forward by the outcome of the power generated by the arms movements and blows the two men into the water and adds that special skills performance swim requires a maximum limit of the strong muscle.

Fox & Mathews (1981) also confirms that the muscle power to help increase the speed and capacity.

Moreover, confirms Lamb (1984) that the development of muscle strength for swimmers using resistance training is very important and weightlifting; to the fullest extent, and that the amount should increase continuously until development intern in muscle strength occur.

Coaches and athletes have modified training method in an attempt to develop explosive power, Some researchers showed that combining plyometric with weight training could have more effectiveness,. More specifically, complex training alternates biomechanically similar high load weight training exercises with plyometric exercises, set for set, in the same workout. An example of complex training would include performing a set of squats followed by

a set of jump squats. Anecdotal sources have described the application of complex training (Chu, 1998; Ebben, Blackard, 1998; Fees, 1997; Fleck, & Kontor. 1986; Reddin, 1999; Roque, 1999)

Previously, Ebben, & Watts, (1998) reviewed the complex training literature and described the effectiveness of combining weight training and Plyometrics. These authors offered suggestions for designing complex training programs.

A number of studies demonstrate the effectiveness of Plyometrics compared to non-exercising control groups. [Blakey, Southard, 1987; Diallo, et al. 2001). Other studies demonstrate an enhancement of motor performance associated with plyometric training combined with Weight training or the superiority of Plyometrics, compared to other methods of training [Adams, et al., 1992; McLaughlin, 2001; Vossen, et al. 2000). The evidence indicates that the combination weight training and Plyometrics are effective.

Types of training methods contains:

■ Individual training

- Olympic lifts only
- Plyometric exercises only

■ Combination training

- Train both Olympic and Plyometric exercises during two different training sessions

■ Complex training

- Train both Olympic and Plyometric exercises during the same training session

■ Complex circuit exercises

- A series of Olympic and/or Plyometric exercises coupled together to form a set (Chu, 1996)

While Duthie et al. (2002) sees that the training patterns used by athletes are:

■ Traditional Training: It uses the groups of Plyometrics followed weights Groups

■ Complex Training: It uses the weights followed Plyometrics groups.

■ Contrast Training: It uses the rotation between weightlifting sets and Plyometrics groups.

Ebben et al. (2000) noted that the composite training is high is a training weights strongly followed directly Plyometrics exercises aimed at improving the physical one recipe which is explosive power. In addition, lead the weights group first and then Plyometrics group within the training series are similar mechanically, which muscle groups must use to be in training Weightlifting is the same used in the Plyometrics exercises.

Hamza (2014) add that the concept of post activation potentiating considered modern training



concepts in the field of sports. where is intended to develop muscle strength using a preliminary stage, a nervous activation and physiology of the muscles working, by raising the largest amount of muscle fibers before starting to use strength training, composite training one of the main forms of this phenomenon is the training (post activation potentiating).

The sport of swimming sports that require different fitness components and in different proportions among them according to the way swimming and distances events. Through access to what made available to researchers from previous studies and in the limits of his knowledge. The researcher noted the absence of any study on the link between the training vehicle and anti-private oxidative enzyme in the field of sports in general and in the sport of swimming in particular, where she studies dealt exercises vehicle in the sports field aims to identify the compound training effects on urine catecholamine and record achievement for swimmers (Hamza, 2014). Alternatively, to identify the effect of using composite training the way low-intensity in the rehabilitation of injured athlete's weak muscular lower limbs (Hamza, 2014). On the other hand, to identify the compound Training Lower Party on the muscle power of the volleyball players influence (28). or to identify the effect of the compound training painter electrical muscle and speed of reaction of the players skating (Duthie, et al. 2002). or to identify the Plyometrics training and training effect with weights on muscle power development Lower Party (Astrand & Rodahl 1986) or in order to identify kinetics effects of the compound of the training and the impact of periods of hospitalization on the performance of the vertical jump (García-López, et al. 2006). While studies on the enzyme Super Dismutase dioxide and its relationship to training sports has varied quality, exercises such as Akira Morikawa et al study. (2004) which dealt with a training program, or different sample such as Parise Gianni et al study. (2005) carried out on a sample of the elderly, and the study of Garcia Lopez et al. (2006) carried out on a sample untrained.

This prompted the researcher to conduct this study in order to identify the effectiveness of complex training on antioxidants, certain physical education and record level of 50m crawl swimming for young swimmers

Methods

Experimental Approach to the Problem

Two groups (experimental and control) performed a pre and posttraining designed intervention in which Vertical Jump Test

(VJ), Standing Long Jump Test (SLJ), Seated Medicine Ball Throw (SMBT), record level of 50m crawl swimming (RL50M) and Catecholamine urine test (VMA) were recorded. The experimental group (EG) (10 athletes) trained 2 hours per day 3 times a week on complex training besides the swimming training for eight weeks. The control group continued their normal training, while the experimental group completed a complex training program to see whether this type of training modality would have a positive or negative or no effect on (VJ), (LS), (BS), (SMBT), (RL50M) and (MDA)

Samples

Twenty young swimmers participated in this study (mean +/- SD age, 14 +/- 2.1 years), divided into (2) groups (experimental group -10 young swimmers) and (control group -10 young swimmers), the experimental group participated in the complex training program to 3 times per week for (2) months . The tests was measured before and after the complex training program. Subjects were required to read and complete a health questionnaire and informed consent document; there was no history of coronary heart disease, diabetes or recent surgery.

Training Protocol

The 8-week in-season training program consisted of a set of resistance exercises followed by a series of plyometric exercises. All sets of the weights exercise with a recovery of 60 seconds/set. A three-minute rest follows this before performing all sets of the matched plyometric exercise with a recovery of 90 second/set.

The complex training program is described in Table 1.

Testing Procedures

Subjects were assessed before and after an 8-week training program Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

Vertical Jump Test (VJ): The subject stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded.

Seated Medicine Ball Throw (SMBT): The subject sits with their back to a wall, on a mat facing the area to which the ball is to be thrown, and with



the feet extended and slightly apart. The ball is held with the hands on the side and slightly behind the center. The ball is brought to the chest, and then thrown vigorously out as far as possible. The back should remain in contact with the wall at all times. Three attempts are allowed. The distance from the wall to where the ball lands are recorded. The measurement is recorded to the nearest 10 cm. The best result of three throws is used.

Static strength test (LS) (BS): A back dynamometer was used to measure the static leg strength. The subjects stood on the dynamometer platform and crouched to the desired leg bend position, while strapped around the waist to the dynamometer. At a prescribed time, they exerted a maximum force straight upward by extending their legs. They kept their backs straight, head erect and chest high. Three trials were allowed to the subjects and the best score was taken. Subjects had a rest between the trials.

Record level of 50m crawl swimming (RL50M): Evaluation the Performance levels of

record level of 50m crawl swimming by judges committee.

Blood Samples: (SOD)

In the rest period, blood drawn by venipuncture and used the Flow cytometry for counting and examining microscopic particles.

Urine Samples: The subjects should be avoiding the following foods and fluids for 2 to 3 days before having this test: Caffeine, such as coffee, tea, cocoa, and chocolate .Amines. These are found in bananas, walnuts, avocados, fava beans, cheese, beer, and red wine. Any foods or fluids with vanilla. Licorice. Aspirin

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between two groups were reported as mean difference $\pm 95\%$ confidence intervals (mean diff $\pm 95\%$ CI). Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The $p < 0.05$ was considered as statistically significant.

Results.

Table 1. Complex training protocol.

Complex	Exercise	Reps	Rest/Set
Complex 1	Squats	3 × 12RM	60 seconds
	Vertical Jumps	3 × 10	90 seconds
Complex 2	Bench Press	3 × 12RM	60 seconds
	Medicine ball chest pass	3 × 10	90 seconds
Complex 3	Barbell Lunge	3 × 12RM	60 seconds
	Step Jumps	3 × 10	90 seconds
Complex 4	Lat Pull down	3 × 12RM	60 seconds
	Medicine ball overhead pass	3 × 10	90 seconds
Complex 5	Abdominal crunches	3 × 12RM	60 seconds
	Medicine ball sit up and throw	3 × 10	90 seconds
Complex 6	Decline press	3 × 12RM	60 seconds
	Zigzag drill	3 × 10	90 seconds

Table 2. Mean \pm SD for (SMBT) ,(VJ), (SLJ), (RL50M) and (MDA) for the control and experimental groups

Variables	Control			Experimental		
	pre	post	change%	pre	post	change%
LS	68.55 \pm 2.98	70.11 \pm 2.47	2.29	69.41 \pm 3.11	74.28 \pm 4.09	3.49
BS	49.00 \pm 3.88	50.24 \pm 3.76	1.23	48.77 \pm 3.73	52.11 \pm 4.15	2.59
VJ	37.12 \pm 1.75	38.66 \pm 2.82	1.86	36.5 \pm 1.61	41.24 \pm 2.64	12.99
SMBT	6.42 \pm 0.82	6.51 \pm 0.12	2.49	6.32 \pm 0.64	7.66 \pm 0.3	17.49
RL50M	35.00 \pm 0.19	34.85 \pm 0.36	1.04	34.99 \pm 0.14	34.37 \pm 0.28	2.22
SOD	93.65 \pm 7.22	96.43 \pm 7.04	0.97	91.33 \pm 6.37	105.24 \pm 7.68	8.98
MDA	11.34 \pm 1.41	11.11 \pm 0.76	1.02	11.14 \pm 1.23	10.09 \pm 1.24	3.21

Shown in Table (2) the presence of significant differences between tribal measurements and post experimental group in the leg strength and the strength of the back muscles variables and the ability of leg muscle



and the ability of arm muscle. the lack of statistically significant differences in the time of 50m free, and improvement rates ranged between 2.22 % to 17.49%

Discussion

The main findings from this study were the significant Increases in the height of (VJ), the distance of the (SMBT), and in Record level of 50m crawl swimming, which proved the Complex training efficacy.

There are a number of potential explanations for these findings.

In the fact that complex training stimulates the neuromuscular system. That is, it activates both the muscular fibers and the nervous system, so that slow-twitch fibers behave like fast-twitch fibers. (Chu, (1998). Furthermore, resistance training increases motor neuron excitability and reflex potentiation, which may lead to better training conditions for subsequent plyometric exercises (Ebben, Watts, 1998); higher EMG activity was discovered in the hamstring muscles during depth jumping indicates that more fast-twitch fibres were being recruited, which in time could have provided more propulsive power.

This fact may have contributed to the increments observed in the present study.

It is postulated that the resistance exercise will have a performance enhancing effect on the plyometric activity. (Ebben, Watts, 1998)

Another explanation, the muscles were involved in a very rapid switch from the eccentric phase to the concentric phase (Stretch-shortening cycle). This SSC decreases the time of the amortization phase that in turn allows for greater than normal power production. (Hamza, 2008) According to Rahimi, & Behpur, (2005). In the SSC the muscles undergo transition energy (from eccentric to concentric muscle action), so that to train and enhance this transition phase requires a complex training, such as the programs used in this study. Thereby, weight training increases muscular strength and plyometric training exploits the SSC; therefore, the strength acquired by the weight training protocols will be used in this cycle (SSC) to produce a more forceful concentric muscle action and increase anaerobic power. The results of this study showed that complex training has a more significant effect.

These results are in accordance with previous studies that have been shown as being equally effective. (Adams, et al., 1992; Fatouros, et al., 2000) Resulting in increased power output, and increased efficiency of the SSC behavior. Enhanced the Record level of 50m crawl swimming. the Muscles will best

respond to complex training when utilized through their full range of motion, this is also beneficial to the Swimming practitioner as techniques are executed through their full range of motion and therefore the training program consider to train in this manner .

Research has found the complex training can be beneficial to athletic performance (Comyns, et al. 2007; Evans, et al., 2000). While the opposite has also been reported. (Jones, Lees, 2003)

Researchers have turned their attention to whether weightlifting power could be enhanced by the prior performance of a plyometric exercise.

In their article Hamza, (2008) suggested that a greater muscular power may be related to a more effective and contributing to the improvement in the lung technique for fencers.

Practical Applications

Upper and lower body explosively levels of female swimming players can be improved with a combined program of Plyometrics and resistance training. These power level improvements are usually seen as essential in swimming performance. The use of complex Training which contain of both resistance and plyometric training in the same workout is an adequate strategy of training process organization, having highly positive effects on practice of swimming.

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