



## THE EFFECT OF IMPACT EXERCISES AND ELECTRICAL STIMULATION UPON CERTAIN ANAEROBIC LACTATIONAL ABILITY AND SMASHING SKILL IN BADMINTON FOR ADVANCED FEMALE ATHLETES

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### Abstract

The purpose of the study is to determine the impact of exercises with electrical stimulation on the anaerobic capacity and smashing skill of advanced badminton players as well as the effect of impact exercises without electrical stimulation on anaerobic capacity and smashing. The experimental approach relied upon the two equal experimental groups on a sample of advanced badminton players in Kirkuk Governorate, who were (8) players, distributed to the clubs of (Sulaf Sports and K-1 Sports), participating in the sports season (2021-2022). After defining the tests and experimentation for a period of (8) consecutive training weeks at a rate of (3) units per week to improve the muscular extension that produces the explosive ability of the legs and arms by using training tools suitable for the specifics of female badminton players. With regard to the direction of muscle contractions, emphasis has been made on the function of the key muscle groups identified as being necessary to accomplish this ability. These muscle groups are similar to their motor pathways. One training unit EMS (Electrical Muscular Stimulation) lasts for 10 to 15 minutes. As for the frequencies used during electrical stimulation, they depend on the gradient from 150 Hz to 250 Hz. After the completion of this experiment, the results were processed using (SPSS) system to form conclusions and applications that the application of impact



training and electrical stimulation helps in the development of anaerobic and non-lactic ability. As they work to build and strengthen each of them, advanced badminton players who exercise with trainings without electrical stimulation can increase their forward smashing abilities. When experienced badminton players use training and electrical stimulation, it is vital to pay attention to the use of joint physiological testing in the lab to monitor their training state.

**Keywords:** Impact training, electrical stimulation, anaerobic anaerobic ability, badminton.

### **Research Problem and Importance:**

Training physiologists are still looking for training strategies, techniques, and tools that help athletes enhance their physical skills and performance in accordance with the demands of various sports, hence increasing their capacity to perform skillfully. The skill of smashing is one of the basic offensive skills in badminton in which the player needs the explosive ability. Among these exercises that have found applications in various games and activities are the impact exercises, which are known as "reflexive muscular strength exercises. This name is derived from plyometric exercises." (Gambetta, 2005:14). It was also known as "one of the types of plyometric training in which performance is evaluated based on the time with the ground. It must be performed through a set of bounces without delay in the time of landing on the ground, with a rapid continuation of the cycle of lengthening and shortening the working muscles." (Khairiya and Muhammad, 2005 : 38) Based on a scientific reality that the muscle can produce greater power or effort if it is extended before action, impact exercises are a targeted muscular activity that help people increase their degree of strength." (Shereen, 2019: 75). The cycle of extending and shortening, which is a unique technique for creating explosive force, is used to improve the elasticity of muscular strength. In a dynamic action like a rebound leap, it depends on the moments of acceleration and halting that happen because of the weight of the body. (Shereen, 2019: 76).

The electrical muscular stimulation is a modern term in training and a technical supplement in sports training to contribute to developing muscle strength, which has a peculiarity in skillful performance. Recently, there has been a noticeable



interest in making use of electrical muscle stimulation as a method of qualitative training, especially after the success of electrical stimulation in the therapeutic aspect, and in psychological treatments for many types of deficiencies in the nervous and muscular systems. In terms of quantity, quality, and timing, this kind of exercise represents one of the greatest levels of specialization in the development of muscular strength. This approach is based on electrical muscular stimulation, in which the length, intensity, and muscle regions that must be stimulated to contract are all regulated. (Talha, 1994: 211) Anaerobic capacity is defined as “the efficiency of the muscle to produce anaerobic energy that the athlete uses to perform strong and fast movements” required by playing conditions.” (Abu El-Ala and Ibrahim, 1994: 219). When kinetic performance requires muscular work at maximum speed or maximum force, the processes of directing oxygen to the working muscles cannot meet the need for rapid muscular work of energy. On this basis, the production of energy without oxygen, i.e. in an anaerobic manner. (Abu Ela and Ibrahim, 1993: 87).

Though there were researchers with the players of Sulaf Sports Club and K-1 Sports Club in Kirkuk Governorate and track over the exercises that the players were conducting in the club and for the championship that took place in Erbil Governorate for the classification and nomination for the national team for the sports season (2021) bringing many coaches to know the methods and techniques of their training, they noticed their focus is on traditional methods when developing anaerobic lactational ability. This is mirrored in the weakness in the advanced player’s smashing skill. This may be the reason for the insufficient means and methods of exercises for the game requirements. Hence, it is necessary to prepare and apply exercises that are compatible with the nature of performance and the privacy of the advanced players. This prompted the researchers to detect, investigate and make a scientific attempt to try to raise the level of the anaerobic ability and the skill of smashing. The researchers tended to study the use of the exercises accompanying the electrical stimulation mediated by the (EMS) device to influence it as an attempt to contribute to supporting the game with scientific research, to upgrade it and reach the best levels.



### **Research Objectives:**

1. Recognizing the effect of impact exercises and electrical stimulation on the anaerobic capacity and the female badminton player's smashing skill.
2. Recognizing the effect of impact exercises without electrical stimulation on the anaerobic capacity and the badminton player's smashing skill.

### **Research Hypotheses:**

1. There are statistically significant differences between the results of the pre-test and post-tests of the two experimental research groups in the anaerobic non-lactic ability and the smashing of badminton players.
2. There are statistically significant differences between the results of the post-tests of the two experimental research groups in the anaerobic ability and the smashing skill of badminton players.

### **Research Methodology**

According to the determinants of the research problem, the experimental method was adopted, which is defined as the method in which we treat and control an independent variable to see its effect on a dependent variable, noting the resulting changes and doing their interpretation, whether the experiment includes an independent variable and a dependent variable or more than an independent variable or a dependent one . (Majdy, 2019). In accordance with what was assumed in the current research and the two independent research variables, the experimental design with two equal experimental groups with tight control in the pre and post tests was chosen.

### **The research Community and Sample:**

The limits of this available community are represented by the advanced badminton players in the Kirkuk governorate, who were (8) players, distributed to the two clubs (Sulaf Sports and K-1 Sports), participating in the league (2021-2022). The main total sample of the research was selected from these two sports clubs with a percentage of (100%) out of their community. They were treated as one total sample and then divided into two experimental groups of equal number.



## Measurement and Procedures:

The following tests were adopted: a test of lactic Phosphagenic ability (Ghosoun, 2006: 81-82), and a test of the skill of forward smashing with a shuttlecock for 20 attempts on a court divided into (5) areas with a maximum degree of (100) degrees (Ma'in, 2001: 65). The experiment was conducted for the players of the first experimental group with exercises and electrical stimulation, while for the players of the second experimental group, the experiment was conducted with exercises without electrical stimulation for a period of (8) consecutive training weeks of (3) units per week. The exercises included movements to improve the muscle elongation that produces the explosive power of the legs and arms by using training tools suitable for the specifics of female badminton players. Attention was paid to the work of the most important muscle groups specified to perform this skill, and they are similar to their motor paths in terms of the direction of muscle contractions.

The stimulation time (EMS) ranges from (10-15) minutes in one single training unit. As for the frequencies used during electrical stimulation, they depend on the gradient from (150) Hz to (250) Hz to stimulate the largest possible number of muscles to strengthen their work and synergy. The player's ability and the extent of their acceptance of such type of electrical stimulation must be taken into account by adopting the principle of gradient in the degree of electrical stimulation. These waves reach the muscle in the form of regular impulses, not continuously. After finishing the experiment, the results were processed and verified by the researchers through using the Statistical Package of Social System (SPSS), to calculate the percentage values, the mean, the standard deviation, the Leven test for homogeneity of variance, the t-test for correlated samples, and the (Leven) test for homogeneity of variance. t-test) for uncorrelated samples.

## Results

Table (1) shows the results of the tribal tests for the equivalence of the two experimental research groups in the dependent variables

Tests	(Sig)	(t)	(Sig)	(Liven)	Standard deviation	Arithmetic mean	Group	Significance
Phosphogenic ability	0.925	0.098	0.393	0.848	3.791	32.073	(1) exp	Non-sig.
					3.216	32.315	(2) exp	
Forward smashing skill	0.963	0.048	0.438	0.689	5.598	63	(1) exp	Non-sig.
					8.77	62.75	(2) exp	





**Strd Dev = (4) In each group, the degree of freedom (Strd Dev 1 + Strd Dev 2-2) = (6) is not significant if the degree of (Sig) < (0.05)**

Table (2) shows the results of the pre and post tests for the two experimental groups

Test and measuring unit	(Sig)	(t)	Deviation of differences	Mean of difference	Standard deviation	Arithmetic mean	Comparison	Group	Significance
Phosphogenic ability (kilowatt)	0.006	6.859	3.667	12.578	3.791	32.073	Pre	exp (1)	Sig.
					0.129	44.65	Post		
	0.014	5.129	2.681	6.875	3.216	32.315	Pre	exp (2)	
					0.914	39.190	Post		
Smashing skill (degree)	0.010	5.784	5.965	17.25	5.598	63	Pre	exp (1)	Sig.
					0.957	80.25	Post		
	0.040	3.481	6.608	11.5	8.77	62.75	Pre	exp (2)	
					2.217	74.25	Post		

**For each group, (Sig) ≥ (0.05) at the level of significance (0.05) and the degree of freedom (n) - (1.)**

Table (3) shows the results of the post tests between the two experimental groups

Test and measuring unit	Degree of (Sig)	Calculated -T	Standard deviation	Arithmetic mean	Number	Group	Significance
Phosphogenic ability (kilowatt)	0.000	11.828	0.123	44.65	4	(1) exp	Sig.
			0.914	39.19	4	(2) exp	
Smashing skill (degree)	0.003	4.968	0.957	80.25	4	(1) exp	Sig.
			2.217	74.25	4	(2) exp	

Significance of difference (Sig) ≥ (0.05) at significance level (0.05) and degree of freedom (std.dev1 + std.dev 2-2) = (6)

Referring back to the results of Table (2), it is clear that the advanced players in the two experimental research groups all enhanced the level of non-lactogenic phosphogenic ability and improved their skill of impact in the results of the post tests than what it was in the results of the pre-tests. By reviewing the results of Table (3), it is clear that the advanced female players in the first experimental group outperformed the advanced players in the second experimental group in



the development of the level of non-lactic phosphagenic ability and showed an improvement in their smashing skill. The researchers attribute the results of this development in this physiological ability between the pre and post tests of the two research groups to the positive impact of the role of exercises in facilitating the processes of muscle contraction and sliding of threads in the muscle fibers through the lengthening and shortening cycle. In addition, the training tools of throwing medical balls were used in accordance with the impact exercises and boxes for the lower limbs, which enabled the players to master the lengthening and shortening cycle while saving the energy needed for this physical effort in these exercises.

The increase in high kinetic energy work was offset by an economy in the energy spent in the phosphagenic system. Here, the matter is limited by the lack of internal resistances that were imposed on the working muscles, including muscle viscosity and improving the flow of neuromuscular stimulation according to what the work required of these alerts and the lack of random movements accompanying the contraction with excessive movements that require muscle contractions that consume a loss of vital energy. This is due to the proficiency of the players of the two groups of the cycle of lengthening and shortening, which was the result of the positive impact of the impact training, and high economic capacity. The effect of training on the efficiency of the motor system strengthens the nerve signal in the muscle, stimulates the movement centers in the cerebral cortex, and inhibits the centers of emotion, in addition to affecting the cycle in the muscles, reducing muscle viscosity, the efficiency of the metabolism process, and the elasticity of the connective tissue.” (Seddik et al., 2014: 165)

Moreover, sports training leads to various physiological changes involving all vital body systems. These changes occur at the level of cells and tissues as well, and include anaerobic and aerobic changes to produce the energy needed for athletic performance. Owing to the breadth and depth of dealing with sports physiology during recent years, researchers have been able to obtain the important physiological information and facts that contributed to developing the sports training. (Omar, 2018: 43). Furthermore, it is possible to obtain maximum efficiency for muscle work once contracting the muscle at a moderate speed. In the case of slow contraction or no kinetic output, large amounts of maintenance heat will be lost during the contraction process even though no work or some



work is done. Thus, the adequacy of muscle contraction is reduced, and the highest effectiveness is obtained when the rate of contraction reaches (30%). (Sylvia, 2001: 874).

In addition, when the electrical charge of the cross-bridges reaches to the muscular fiber, it causes a change in the myosin heads and activates them or then binds these heads with actin, while changes occur in the myosin heads in their activated arrangement, which causes them to be removed. This causes the heads to be pulled from the thin filament, passing towards the center of the sarcomere. This work represents the electrical blow to the bridge-crossing cycle. The energy is spontaneously released leaving behind (ADP) and inorganic phosphate originating from the myosin heads, while its new ATP molecule binds to the myosin heads again.” (Christian, 2007: 129)

As for the superiority of badminton players in the first experimental group over the players in the second experimental group in the development of phosphagenic ability, the researcher attributes this superiority to the role of local electrical muscular stimulation (EMS) for each of the muscles working in the stage of constant contraction that precedes the exercises. These exercises had a positive effect on the cellular metabolic system, especially increasing the efficiency of the effectiveness of the rapid reactions that occur in the sarcoplasm of the cell for the production of rapid force at the time of the first anaerobic phosphagenic system. Impact training with stimulation supported these developments in the reactions responsible for energy production. The stimulations in static contraction were directed towards improving the contractions of protein molecules and non-kinetic bioenergy in electrical stimulation of static contractions. In addition, the recovery time that was between electrical stimulation and impact training was sufficient, as it had a role in bringing about metabolic balances to get rid of the residues of chemical reactions and recycle them to invest in the energy of phosphagenic power. When calcium and ATP are available in sufficient quantities, the filaments react to form actomyosin and shorten by sliding over each other. When the electrical signal actively passes along and below the sarcolemma, the calcium pump releases calcium from the sarcoplasmic reticulum into the sarcoplasm, and subsequently acts to activate and contract the capillary row. This stimulation begins with the arrival of the nerve stimulus to the muscle membrane through the motor end plate (motor unit).” (Sylvia, 2001: 874). Training leads to





physiological changes that include the body systems. The level of athletic performance progresses whenever these changes are positive in order to achieve adaptation, the physiology of the body systems, and then the physical load and skill performance." (Baha', 2018: 179)

### Conclusion and Application

1. Applying the impact exercises and electrical stimulation helps in developing the anaerobic and non-lactactic ability of advanced female badminton players. It also contributes to developing each of them in advanced badminton players who train with impact exercises without electrical stimulation.
2. Applying the impact exercises and electrical stimulation contributes to improving the skill of forward smashing of advanced female badminton players. It also contributes to trying to improve it in advanced badminton players who train with impact training without electrical stimulation.
3. It is necessary to pay attention to adopting laboratory and joint physiological tests to track the training status of the advanced badminton players when they apply impact exercises and electrical stimulation.

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