

Effect of Muscular Endurance Improvement on Prolactin and Adreno Corticotrophic (ACTH) Hormones and the Skill Performance's Level of the Kata for Karate Players

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Abstract: The research targeted to identify the effect of the muscular endurance (dynamic and static) on Prolactin and Adreno - Corticotrophic (ACTH) hormones and the skill performance's level of the international kinetic unit for karate players. The researcher used the experimental method on a sample of 12 students in the fourth grade specialized in karate in Faculty of Physical Education for Girls, Zagazig University and they have got the black belt (first grade) DAN (1) at least and they represent the elected karate team of Zagazig University and they are registered in the Egyptian karate federation. The researcher did some biochemical measurements, took blood samples, made physical tests and measured the level of skill performance in KATA under consideration. The suggested training program affected the dynamic and static muscular endurance for the karate players in a positive way (the arms' muscles endurance, the abdominal muscles endurance , the back muscles endurance and the legs' muscles endurance). and The development of the dynamic and static muscular endurance affected positively the increase of the rates of Prolactin and Adreno - Corticotrophic hormones in blood for karate players. The development of the dynamic and static muscular endurance affect positively on the skill performance level of the international kinetic units (AMBY - KANKOSHO - ANSO). Also, results indicated improvement rates for the post measurement over the pre measurement in the muscular endurance (the dynamic - the static), the concentration rate of Prolactin and Adreno - Corticotrophic hormones in blood, as well as the skill performance level for the international kinetic units KATA for karate players.

Key words: Muscular Endurance % Prolactin Hormone % Adreno Corticotrophic (ACTH) Hormone

INTRODUCTION

In recent years the world has witnessed a great scientific progress in various fields of life, especially in the physical field, where this progress was fruitful for researches and scientific studies to improve the level of athletes' performance. So the methods of athletic training have multiplied and evolved to achieve the targeted goals, the science of sport physiology has contributed to the rise of the effectiveness of training load and its positive impacts on body's organs. So the study of physiological responses resulting from physical effort as an exterior excitant has taken a great interest by specialists and the scientists of sport physiology, to reach the best physiological responses to achieve the best athletic level.

Physical preparation is one of the most important duties for athletic training which works on the development and improvement of one's physical and

kinetic statue to achieve the requirements of athletic activity in the process of training and competition with the least physical effort and with the ability to speed recovery and getting back to one's natural status [1].

The importance of the connectivity of the physical abilities with the nature of skill performance in the player's specialized athletic activity, where the distinctive character of the basic kinetic skills for the type of the specialized athletic activity is the thing which determines the quality of the required physical abilities which should be developed and improved [2].

Karate sport includes two types of competitions and each competition has its own characters and requirements according to the nature of performance and the competition's terms and depending on the international law which organizes the karate competitions, the first type is the competition of actual fighting (kumite) which is a fighting in a specific period between two equivalent

players equal in the (belt rank) and weight, age group, and of the same gender each of them tries to thwart the other's attempts by attacking to score points by using limbs (arms and legs) in declared areas during attack and scoring within the articles of the law of karate sport [3].

The second type is the competition of illusion fighting (KATA) where Ferrie [4] indicates that KATA is a group of defensive and offensive skills which are being performed in imaginary way through the different positions of balance where the competition is in the form of individual and collective matches. And because the international kinetic unities (KATA) contains a lot of defensive and offensive skills and different balance positions the researcher sees the importance of highlighting the most important requirements and the special physical components which are necessary to perform KATA, where these components play a basic and pivotal role which is based upon it the acquisition and mastering the skill performance and when the player lacks the special physical components she is unable to do her kinetic duties which are related to her accurate specialty (kata) because the specific and guided training to develop the special physical components for players helps them to elevate the performance level and reach the highest level which is allowed through their abilities and preparation.

Wagieh [5] indicates that kata is composed from several kinetic units which are connected to each other and which were prepared previously according to what was known internationally. Good kinetic performance for international kinetic units (kata) requires a high level of special endurance and power which is characterized by speed, fitness, balance, compatibility and flexibility to be able to continue competing [2, 6, 7].

The process of physiological adaptation and response of body systems to perform the physical load through the different body organs containing the hormonal system and nervous system where the hormonal system works alongside with the nervous system to organize the rates of chemical activity of the different cells and tissues of the body [8]. The hormonal system response slower because it takes about 15 second for the secretion of endocrine to reach all body organs except that its affect is deeper and continues for longer time than the nervous system, so the changes in the hormonal system are responsible for a lot of functional responses and the adaptation of physical effort [9].

The human body depend mainly in his response to physical effort on adrenal gland where the adrenal cortex is activated by ACTH hormone which is secreted by pituitary gland and ACTH hormone is responsible for the

over secretion of hormones of the adrenal cortex and helping to develop them and it works on melting body fat and transfer it from its places in the body and also participates in controlling the level of sugar in blood [8]. Prolactin hormone which is secreted during physical training is considered very useful and important to maintain the rate of water in body and also moving fat to use it to produce energy. It also affects the secretor activity of the yellow body, so it has big effect on the secretion of progesterone hormone for women and testosterone hormone for men [10].

And considering the importance of preparation from all sides and what is depending on it of the possibility of performing the international kinetic units (KATA) in a high level during local and international competitions and from the experience of the researcher in the field of karate sport and her noticing for the first class players who have the black belt, the researcher has found that the performance level of the karate players for the international kinetic unities (KATA) was decreased during the last competitions rather on the local level or the international level as a result of failure and decline in the level of dynamic and static muscular endurance for KATA players which affected the decline of skill performance level for KATA in a comparison with the players of the develop countries such as Japan, France, Italy, Spain, Mexico and Canada which was obvious during the world championship in Mexico for the year 2004 and the Egyptian failure to achieve advanced results in KATA competition in this championship.

The researcher attributes the decline in the skill performance level for KATA specially during the series of local championships which were organized by Egyptian federation for karate during the last period to the concentration of many trainers on learning the performance without concentrating on developing the level of special physical components (dynamic and static muscular endurance) as one of the basic requirements which is concentrated on by the skill performance of KATA in karate sport.

The present work was designed to evaluate the effect of muscular endurance exercises on Prolactin and Adreno - Corticotrophic (ACTH) hormones and skill performance level of the kata in karate players.

MATERIALS AND METHODS

Research Design: The researcher used the experimental approach by using the experimental design with pre and post measurement.

Research Sample: The research sample was selected by the deliberate manner which included 12 students in the fourth grade specialized in karate in the faculty of physical education for girls, Zagazig University and they have got the black belt (first grade) dan (1) at least and they represent the elected karate team of Zagazig University and they are registered at the Egyptian karate federation and also 12 students were selected from the research society and outside the basic sample as exploratory sample for rationing physical and skill tests.

The Survey: The researcher made a survey on 12 students specialized in karate at fourth grade in Faculty of Physical Education, Zagazig University as an exploratory sample as a basic step to perform the basic research's experiment and it targets the following:

- C Making sure of the scientific transactions (sincerity - stability) for the tests under consideration.
- C Making sure of the availability of the tools and equipments used in the research.

Results of the Survey:

- C The appropriateness of the physical and skill tests for the members of the research sample.
- C The availability of the tools and equipments used in the research.

Physical Tests:

- C The improving diagonal prostration test bending arms.
- C Sit of lie down test.
- C Vertical jump from standing, knees bending to half test.
- C Dangling of the position of bending arms and stability test.
- C High lift breast of prostration test.
- C Raising the legs high and diagonal and stability of pre test.

The Biochemical Parameters: The researcher used the method of radio immunotherapy analysis (R. I. A) to measure the concentration of:

- C Prolactin hormone in blood.
- C Adreno Corticotrophic hormone (ACTH) in blood.

The Evaluation of the Skill Performance Level for Katas under Consideration: The level of skill performance level for KATAS under consideration through the player's performance for KATA in front of a committee consists of 5 judges each of them gives the player a degree of ten after finishing the performance then they eliminate the least degree and the highest degree and then they collect the remained three judges' degrees and this degree becomes the player's degree according to the international arbitration rules.

Aims of Muscular Endurance Exercises:

- C Developing the dynamic and static muscular endurance for karate players.
- C Improving the level of skill performance of the international kinetic unit (KATA) for karate players.

Steps of the Development of the Suggested Muscular Endurance Exercises: From the reference survey for the studies and scientific researches which are related to the preparation of the skill and physical training programs for karate sport, the following was defined:

- C The suggested training program's implementation period is 8 weeks.
- C The number of training units as 4 training units per week.
- C The training units' time where it reached 90 minutes.
- C Warm-up time as 15 minutes and conclusion time as 5 minutes.
- C Using the method of low intensity interval training.
- C Weekly load cycle in form 1:1 a day of above average load to a day of average load.
- C The interval load cycle in form 1:1 a week of above average load to a week of average load.
- C Raising the load intensity every two weeks by raising the trainings' number or by prolonging the overall performance time or by reducing the interval rest periods.
- C The training unit included its basic factors which is the introductory part which aims at physical preparation (warming up) and the main part which aims at the development of the dynamic and static muscular endurance in addition to develop the skill aspects for KATA which is under consideration then the conclusion part which aims at calming and relaxing to get back to the natural state.

The research refers to that Table 1 clarifies the timetable distribution for each of physical preparation (muscular endurance) and skill preparation on training units during the training program's weeks.

Table 1 shows the timetable distribution for each of physical and skill preparation on training units during the training program's weeks.

The Muscular Endurance's Training Definition: The researcher limited the special trainings of the dynamic and static muscular endurance through the reference survey and the researcher reached the number of 47 dynamic and static trainings distributed as the following:

- C 15 trainings for the arms muscles and shoulders strap.
- C 15 training for abdominal and back muscles.
- C 17 trainings for legs muscles.

The Implication of the Training Program: The training program was implicated on members of the research sample for (8) weeks by (4) training units per each week where the time of each training unit reached (90) minutes and the program was implicated in the confrontation hall at the Faculty of Physical Education for Girls in zagazig after finishing the school day at the faculty.

Statistical Methods: The researcher used the following statistical methods:

- C Arithmetic average - median- standard deviation - torsion coefficient - simple correlation coefficient - "T" test -improvement's rates%.

RESULTS AND DISCUSSION

Table 2 shows that there are statistical significant differences at the level 0.05 between the pre and post measurements for the members of research sample in the dynamic and static muscular endurance for the post measurement.

Table3 shows that there is improvement in the post measurement more than the pre measurement for the members of research sample in the dynamic and static muscular endurance ranged between 25.60 %: 14.49 %.

Table 4 shows that there are statistical significant differences between the pre and post measurements in concentration of Prolactin and Adreno Corticotrophic in blood for the post measurement.

Table 5 shows that there are improvement in post measurement over the pre measurement of Prolactin and Adreno Corticotrophic in blood ranged between 12.45 % and 15.41 %.

Table 6 shows the statistical significant differences between the pre measurements and the post measurement in the skill performance level of "KATA".

Table 7 shows the % improvement's of the post measurement over the pre measurement in the level of the skill performance for the international kinetic units "KATA" ranged between 18.57% and 13.22%.

Table 1: Time table distribution of the muscular endurance exercises

Week	Preparation type	Day							Total preparation time
		Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	
First	Muscular endurance skill	rest	45minutes ----- 25 minutes	45minutes ----- 25 minutes	rest	45minutes ----- 25 minutes	45minutes ----- 25 minutes	rest	280 minutes
Second	Muscular endurance skill	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	280 minutes
Third	Muscular endurance skill	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	280 minutes
Fourth	Muscular endurance skill	-----	35 minutes ----- 35 minutes	35 minutes ----- 35 minutes	-----	35 minutes ----- 35 minutes	35 minutes ----- 35 minutes	-----	280 minutes
Fifth	Muscular endurance skill	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	40 minutes ----- 30 minutes	40 minutes ----- 30 minutes	-----	280 minutes
Sixth	Muscular endurance skill	-----	30 minutes ----- 40 minutes	30 minutes ----- 40 minutes	-----	30 minutes ----- 40 minutes	30 minutes ----- 40 minutes	-----	280 minutes
Seventh	Muscular endurance skill	-----	35 minutes ----- 35 minutes	35 minutes ----- 35 minutes	-----	35 minutes ----- 35 minutes	35 minutes ----- 35 minutes	-----	280 minutes
Eighth	Muscular endurance skill	-----	30 minutes ----- 40 minutes	30 minutes ----- 40 minutes	-----	30 minutes ----- 40 minutes	30 minutes ----- 40 minutes	-----	280 minutes

Table 2: The differences in the dynamic and static muscular endurance between pre and post measurement (N = 12)

The statement Variables	Endurancetype	The unit of measure	The pre measurement		The post measurement		"T" value
			S1	A1	S2	A2	
The improving diagonal prostration bending arms	dynamic	number	11.60	2.15	14.00	1.84	*3.03
Sit of lie down	""	number	20.00	4.41	25.12	3.69	*4.14
Vertical jump from standing, knees bending to half	""	number	8.80	2.01	10.40	1.53	*2.61
Dangling of the position of bending arms and stability test	static	second	22.91	4.38	28.33	4.21	*4.25
High lift breast of prostration	""	second	48.73	5.96	56.21	5.55	*3.14
Raising the legs high and diagonal and stability of prone	""	second	51.55	6.19	59.02	5.46	*3.78

*(D) at the level of 0.05 (T) tabular value at 0.05 = 2.201

Table 3: Changes percentage the dynamic and static muscular endurance between pre and post measurements

The statement Variables	Endurance type	The unit of measure	Each group N= 12		
			Pre	Post	Improvement rates %
The improving diagonal prostration bending arms	Dynamic	Number	11.6	14	20.69%
Sit of lie down	""	Number	20	25.12	25.60%
Vertical jump from standing, knees bending to half	""	Number	8.8	10.4	18.18%
Dangling of the position of bending arms and stability test	static	Second	22.91	28.33	23.66%
High lift breast of prostration	""	Second	48.73	56.21	15.35%
Raising the legs high and diagonal and stability of prone	""	Second	51.55	59.02	14.49%

Table 4: Differences in Prolactin and Adreno Corticotrophic hormone concentration measurement (N=12)

The statement Variables	The measure's unit	The pre measurement		The post measurement		"T" value
		S1	A1	S2	A2	
Prolactin hormone	*Nano gram	6.10	1.81	7.04	1.19	*2.49
Adreno Corticotrophic hormone	Nano gram	71.31	14.94	80.19	10.72	*2.61

*(D) at the level of 0.05 "T" tabular value at 0.05 = 2.201

Table 5: Changes percentage in Prolactin and Adreno Corticotrophic hormones concentration between pre and post measurements

The statement Variables	The measure's unit	Training group "N =12"		
		Pre	Post	Improvement's rates
Prolactin hormone	*Nano gram	6.10	7.04	15.41%
Adreno Corticotrophic hormone	Nano gram	71.31	80.19	12.45%

Table 6: The differences in the skill performance level of KATA between the pre and the post measurement(N=12)

The statement Variables	The measure's unit	Pre measurement		Post measurement		T" value"
		S1	A1	S2	A2	
Kata Amby	Degree	5.90	0.45	6.68	0.31	*4.19
Kata Kankosho	Degree	5.60	0.39	6.64	0.28	*3.14
Kata Anso	Degree	5.80	0.42	6.80	0.33	*3.98

*(D) at the level of 0.05 "T" tabular value at 0.05 = 2.201

Table 7: Changes percentage of KATA skill performance between pre and post measurements

The statement Variables	The measure's unit	Each group N = 12		
		Pre	Post	Improvement rate %
Kata Amby	Degree	5.90	6.68	13.22%
Kata Kankosho	Degree	5.60	6.64	18.57%
Kata Anso	Degree	5.80	6.80	17.24%

DISCUSSION

Table 2 showed that there are statistical significant differences between the pre and post measurements in the dynamic and static muscular endurance (arms' muscles endurance, abdominal muscles endurance, back muscles endurance and legs' muscles endurance).

The results of Table 3 show that the changes (%) between the pre and post measurement more than the pre measurements in the dynamic and static muscular endurance ranged between 25.60 % and 14.49 %.

The researcher sees that these results are due to the efficiency of the training program content of the development of the dynamic and static muscular endurance for the muscles of the arms and abdominal and back and legs where the training program includes special physical trainings works on the same kinetic tracks of skills in addition to the specified time for the implementation of these trainings where a time was set which ranged between 30 and 40 seconds of working and also ranged between 30 and 40 seconds of rest to perform the trainings of muscular endurance, this is in addition to perform the KATAS under consideration in a regulated and repeatedly form and this works for the karate player specially the KATA player due to the nature and the time of skills performance within each KATA and what each KATA includes of composite skills need continuation of the performance of the movements in the form of sections and each section needs a powerful performance of the skills and in different speeds which requires that the player should have a big amount of dynamic and static muscular endurance.

The results of the present study are consistent with the results of the previous studies [3, 11-14] where their results showed that there are statistical significant differences between the pre and post measurements of the experimental group and for the post measurement in the dynamic and static muscular endurance as one of the special physical components for karate players. The scientific regulated training programs which fits the nature of karate sport in its two types, the actual fighting (KUMITE) and the illusionary fighting (KATA) leads to the development of the special physical abilities (special endurance and the power characterized with speed) and which is related to the nature of the player skill performance [2].

Results of Table 4 shows that there are statistical significant measures in the concentration of Prolactin and Adreno Corticotrophic in the post muscular endurance exercise measurement rate percentage (12.45 %: 15.41 %).

The increase of the concentrations of Prolactin and Adreno Corticotrophic hormones in blood is due to the efficiency of the suggested training program which takes into account the regulation of the used physical trainings where its intensity is not more than the above average load and is not less than the average load and this is throughout the training program implementation period, which contributed positively for the increase of the activity of the frontal lobe of the pituitary gland which secretes the Prolactin hormone which led to the increase of the rate of Prolactin and Adreno Corticotrophic in blood.

The continuous physical training without stopping for the athletic ladies leads to the increase of the prolactin hormone in blood which could be the main cause for the disorders of the menstrual cycle for them [15].

The increase of the Prolactin hormone concentration in blood maybe due to the increase of body temperature during the performance of training units throughout the training program implementation period and this is consistent with what was referred to by Fraioli *et al.* [16] that the increase of the concentration of the Prolactin hormone P.R.L. is due to the increase of body temperature and that there is a centrifugal relationship between the increase of body temperature after performing the physical trainings and the increase of P.R.L. The regulated physical training with lowest to the maximum intensity leads to increase the Prolactin hormone concentration rate P.R.L. for the sports' practitioner both (males - females) [17].

The increase of Adreno Corticotrophic ACTH hormone in blood maybe due to practicing physical training regularly increase of the rate of Adreno Corticotrophic (ACTH) hormone secretion where this hormone works on activating body's organs to fight muscle fatigue which is resulted from the practice of physical effort.

And the results of this study is consistent with prior study's results [17, 18] that the continuity in regulated physical training for long periods is accompanied by the increase of the rate of Adreno Corticotrophic ACTH hormone at secretion athletics.

Moretti *et al.* [19] see that the increase of Prolactin and Adreno Corticotrophic hormones in blood is the result of the physical trainings and muscle fatigue which affect the activity of both the pituitary and adrenal gland and this effect could be hormonal nervous effect and this is due to chemoreceptor in muscles which send signals through the spinal cord to the central nervous

system which also affects the Hypothalamus and so the pituitary gland which leads to the increase of the hormones secretion.

Table 6 shows statistical significant improvement between the pre and the post measurement in the skill performance level for the international kinetic units "AMBY - KANKOSHO - ANSO" ranged between 18.57% and 13.22%.

The improvement in the skill performance level of KATAS under consideration is because that the training program contains special physical trainings (muscular endurance) works for the same skill kinetic directions which compose these KATAS under consideration (AMBY - KANKOSHO - ANSO), also the training unit contains a main part which aims at training on the KATAS under consideration and this part was stable throughout the program implementation period through time periods ranged between 40 and 120 seconds of continuous skill performance without descending in the performance level or speed, what led to the improvement dynamic and static muscular endurance for the muscles of arms, back and legs what reflected positively on skill performance level of the international kinetic units (AMBY - KANKOSHO - ANSO).

These results are consistent with what was referred by previous studies [3, 20-24] that the kinetic performance of the KATAS' skill and movements requires the availability of special kinetic abilities during its performance represented in power and speed endurance which if they are available for the player he will be able to perform KATAS in high artistic level with the ability to economize in effort.

Training programs of karate sport specially the illusionary fighting (KATA) should be concerned with the development of the power which is characterized with speed and dynamic and static muscular endurance and fitness and compatibility and so the integrity of the third research hypothesis is achieved [25, 26].

CONCLUSION

The results of the present study revealed that muscular endurance exercises have a positive effect on dynamic and static a muscular endurance, Prolactin and Adreno Corticotrophic hormones and skill performance level for the international kata (AMBY-KANKOSHO-ANSO) for karate players.

Recommendation: Within the limits of the results of this study the researcher recommends the following:

- C Using the suggested training program for the development of the dynamic and static muscular endurance for its positive effect on improving the skill performance level for the KATAS under consideration.
- C The importance of making the measures for the concentration of body hormones through picking juniors athletes in karate sport where it is considered an indicator of the functional status and it could predict the junior's athletic future.
- C The importance of using periodic tests (Physical - skill - functional) to assess and evaluate the players' level before and during and after the preparation period.
- C Working on supporting the sportive organizations and institutions with the devices of medical analysis and functional measures to achieve the best use of them in evaluating the functional status of the players during the periods of training season.
- C Making more studies about the development of the special physical components for its importance to improve the skill performance level for KATA in karate sport.

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