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The Effect of a Method for Controlling the Formation of Training Load Degrees on the Development of Some Physical Abilities, Basic Cellular Efficiency, and Pulmonary Respiration in Volleyball Players

Nada Abdulsalam Sabri[1], Sundus Mousa Jawad[2], Alyaa Hussein Farhan[3], Suhad Qassem Saeed Al-Mousawi[4*], Huda Badwi Shbeeb[5], Asadollah Asadi[6]

[1]College of Physical Education and Sports Sciences for Women, University of Baghdad, Iraq.
[2]College of Physical Education and Sports Sciences for Women, University of Baghdad, Iraq.
[3]Department of Student Activities, University of Baghdad, Iraq.
[4]College of Physical Education and Sports Sciences for Women, University of Baghdad, Iraq.
[5]College of Languages, Student Activities Division, University of Baghdad, Iraq.
[6]Department of Biology, Faculty of Science, University of Mohaghegh Ardabili, Iran.

ABSTRACT

The purpose of this paper is to prepare exercises using two methods to control the formation of the proposed training load levels in developing some specific physical abilities, basal cellular efficiency (lactic acid and sodium bicarbonate), and pulmonary respiration in volleyball players, and identify the effect of exercises using two methods to control the formation of the proposed training load levels in developing some physical abilities, basal cellular efficiency (lactic acid and sodium bicarbonate), and pulmonary respiration in volleyball players. Therefore, the researchers used the experimental approach, which is appropriate for the research requirements and the appropriate way to prove the hypothesis. The community and sample research was choosing a sample that represents the original population is an important step that must be taken into account, taking into account the criteria required the sample to accurately represent the population. The researcher selected the research sample from (16) junior volleyball players at the Specialized School. (4) Players were excluded for refusing to participate in training. The sample was divided into two experimental groups using a random grouping method, resulting in 12 players. One of the most important results reached by the researcher is that: The two methods for controlling the formation of training loads are important in developing some specific physical abilities and offensive skills in volleyball. One of the most important recommendations recommended by the researchers is that: Adopting the two methods for controlling the formation of training loads is important in developing some specific physical abilities and offensive skills.

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1. Introduction

Volleyball is a game with its own fans and players, and one that brings enjoyment because competition is not easy. The developed world has also begun to provide the requirements for this game to advance it towards the best in terms of sports training, innovating appropriate methods and techniques, and how to control the training load. This has begun with the different age groups, from juniors and youth to advanced players, because each age group has its own specific training needs and physical, skill, and tactical requirements [1]. Volleyball has become a joy for onlookers due to its beauty and its distinctive features, due to the rapid development that has taken place in recent years [2]. Volleyball has enjoyed this development through the development of players' physical and skill capabilities, all of which has led to the development of skill and

CONTACT Suhad Qassem Saeed Al-Mousawi: suhad@copew.uobaghdad.edu.iq

tactical performance, which has necessitated the development of some of the game's rules [3]. The youth stage, the second stage of sports training, requires players to possess speed and accuracy in skill performance, as well as sufficient flexibility and increased other physical abilities [4-7]. These factors contribute to the success of the tactical aspect in the final stage, the advanced stage, and are evidence of players' advanced physical and skill capabilities. All they need to do is focus on the tactical aspect of their performance. Physical and functional abilities are one of the pillars upon which physical and skill preparation depends. They are important for most sports and events, as they enable athletes to perform their movements in the best possible way. Their importance increases in volleyball skills, as they are crucial for achieving a goal.

Hence, the importance of research in clarifying the formation of the training load and the correct training method for it, serving the skill aspect, in addition to using the correct rationing of the required load for players, helping them advance their specific physical abilities. Here, science and scientific research come in handy in choosing a successful training formation. Thus, we may contribute to the advancement of youth volleyball by experimenting with this training.

Research problem:

As is well known, volleyball is a game that requires special physical abilities that enable the player to perform basic skills with great effectiveness. There is abundant evidence of this in the game, as we observe that our local youth teams perform poorly or inconsistently in these skills. Based on these observations, the researchers noted that young players lack the muscular capabilities appropriate for basic skills. This may be due to a weakness in jumping strength and the ability to maintain performance until the end of the training session or compete at the same level.

The researchers noted that the lack of progress among volleyball players in most local and international competitions is due to fluctuations in performance, resulting from weaknesses in both physical aspects. It is important to pay attention to studying the cellular environment in order to activate it to meet the requirements of skill performance, based on the nature of their needs. This knowledge can only be achieved by avoiding speculation when assessing the physiological state of volleyball. Hence, the necessity of academic research to determine the details of the balance between salt and base in the cellular environment, which tends toward alkalinity to complete the biochemical processes that produce energy to the fullest. Face, and then delay the onset of fatigue, which is the goal of every coach. Therefore, we decided to lay the foundation for addressing this weakness during youth. This is achieved by using appropriate training according to the required load configuration.

Research objective:

- To prepare exercises using two methods to control the formation of the proposed training load levels in developing some specific physical abilities, basal cellular efficiency (lactic acid and sodium bicarbonate), and pulmonary respiration in volleyball players.
- To identify the effect of exercises using two methods to control the formation of the proposed training load levels in developing some physical abilities, basal cellular efficiency (lactic acid and sodium bicarbonate), and pulmonary respiration in volleyball players.
- To identify the results of the differences between the pre- and post-tests of the two experimental groups in some physical abilities. Baseline cellular efficiency (lactic acid and sodium bicarbonate) and pulmonary respiration in volleyball players

Research hypotheses:

- There are statistically significant differences between the pre- and post-tests of the two research groups using the two methods of controlling the formation of training load scores in developing some physical abilities, basal cellular efficiency (lactic acid and sodium bicarbonate), and pulmonary respiration in youth volleyball.
- There are statistically significant differences between the post-tests and the two research groups using the two methods of controlling the formation of training load scores in developing some physical abilities in basal cellular efficiency (lactic acid and sodium bicarbonate) and pulmonary respiration in youth volleyball.

Research fields:

- Human field: Young players of the Specialized School
- Time field: (5/1/2025) to (22/4/2025)
- Spatial field: Specialized School Sports Hall

2. Materials and Methods

2.1 Research Methodology:

Choosing the right approach depends on the nature of the problem to be studied, as the problem requires research into effective methods and conditions through experimentation. Therefore, the researchers used the experimental approach, which is appropriate for the research requirements and the appropriate way to prove the hypothesis.

2.1 Community and sample research:

Choosing a sample that represents the original population is an important step that must be taken into account, taking into account the criteria required the sample to accurately represent the population. The researcher selected the research sample from (16) junior volleyball players at the Specialized School. (4) Players were excluded for refusing to participate in training. The sample was divided into two experimental groups using a random grouping method, resulting in 12 players. To determine the degree of equivalence and homogeneity of the sample, the researchers calculated the research variables, as shown in Tables (1)

Table 1. show the homogeneity of the research sample.

Variables	Measuring unit	Mean	Std. Deviations	Median	Skewness
Age	Year	16.21	0.25	16.00	0.511
Height	Cm	174.11	1.68	1.74	0.452
Mass	Kg	65.14	1.733	65	0.712

Data Collection Methods:

2.3 Research Equipment and Tools:

- American-made (Life Fitness) stationary bike with a capacity of (9700) (hand and foot robot).
- Electronic stopwatch.
- (1) stethoscope.
- Portable lactic acid meter (Lactic-pro).
- Cobas e 411 device for biochemical analysis of blood samples.
- Hematology separation device (Electronic Centerfuge 80-2).
- Medical syringe for drawing blood (5 ml).
- Heparin-free blood sample storage tubes (Test tube).
- Medical cotton and methanol sterile solution.

2.4 Field Research Procedures:

2.4.1 Defining Research Variables:

The research variables were determined based on the researchers' opinions and scientific sources and references, which they believe are important to the specificity of the game of basketball and the youth research sample. They also serve as an indicator of the success of the training used.

Tests Used:

2.4.2 Physical Tests:

1- Vertical Jump Test from Motion [1].
2- Medicine Ball Throw Test (2 kg) [8].
3- Maximum Distance Load Test [9].
4- Arm Flexion and Extension Test [10].

2.4.3 Exploratory experiment: On February 3, 2025, the researchers conducted an exploratory experiment on the main experimental research sample, applying some exercises used for the purpose of standardizing the training load and determining the load components (intensity, volume, and rest) appropriate for the exercises used.

2.5 Field Experiment:

2.5.1 Pre-tests:

Pre-tests were conducted on February 9, 2025.

2.5.2 Training Used:

To measure basal cellular efficiency according to sports technology and using the latest devices in accurate data acquisition tests, I adopted a test to measure the concentration of lactic acid (Lactic Aside in blood) and sodium bicarbonate (NaHCO3 in blood) after (5) minutes of effort on a stationary bike, type (life fitness), with a capacity of (9700) American-made (hand and foot robot) with an electronic digital screen to mechanically monitor its speed and fix the resistance of each test subject in this study by multiplying the weight (mass) in kg x 0.075 = the required resistance, and performing the effort for (90) seconds, and conducting the measurement after (5) minutes have passed from the end of the physical effort in a unit of measurement (millimol/liter) for

each of the indicators of basal efficiency (concentration of lactic acid and sodium bicarbonate in the blood) , and measuring the number of respirations (RF) directly by means of a stethoscope as a field physiological test immediately after completing this effort, and it was prepared (24) High-intensity arm and leg training units, with a variety of training methods, including plyometric and ballistic training, were applied in (3) units every other day per week for a period of (8) training weeks.

- The first method (less than maximum - average - less than maximum) Abdullah Mohsen, A2025
- The second method (maximum - average - less than maximum): i.e., controlling the training load according to the main section of the trainer's units, and the load intensity was used within the load levels used.

2.5.3 Post-tests:

Post-tests were conducted on May 20-21, 2025.

2.6 Statistical methods: The (SPSS) statistical package was used to find:

- Arithmetic means.
- Standard deviations.
- T-tests for correlated samples.

3. Results and discussion:

3.1 Presentation, analysis, and discussion of the results of the physical tests:

Table 2 . Shows the arithmetic means, standard deviations, and calculated (T) values for the first experimental group.

Variables	Pre-test		Post-test		T value calculated	Level Sig	Type Sig
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Vertical Jump Test	13	1.17	15.12	2.11	3.214	0.004	Sig
Medicine Ball Throw Test	3.14	0.54	5.98	1.32	2.478	0.01	Sig
Maximum Distance Load Test	14.67	1.87	16.18	1.02	3.214	0.021	Sig
Arm Flexion and Extension Test	9.13	1.08	10.88	1.70	3.87	0.006	Sig
Lactic Aside in blood	13.63	1.506	12.21	1.56	5.48	0.011	Sig
NaHCO$_3$ in blood	13.88	1.959	14.98	2.54	4.23	0.004	Sig
(RF)	52.38	3.292	48	0.145	6.57	0.008	Sig

Table 3.shows the arithmetic means, standard deviations, and calculated (T) value for the second experimental group.

Variables	Pre-test		Post-test		T value calculated	Level Sig	Type Sig
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Vertical Jump Test	13.17	1.21	17.23	1.47	4.32	0.004	Sig
Medicine Ball Throw Test	3.42	0.63	6.051	1.02	5.68	0.002	Sig
Maximum Distance	15.41	1.24	17.97	1.928	4.86	0.007	Sig

Load Test							
Arm Flexion and Extension Test	9.01	1.7	11.44	1.55	2.541	0.013	Sig
Lactic Aside in blood	14.43	1.397	9.25	1.54	5.121	0.001	Sig
NaHC O_3 in blood	14.71	1.799	16.54	1.88	4.940	0.000	Sig
(RF)	51.86	2.673	41.65	1.21	3.415	0.000	Sig

By observing Tables (2) and (3), it is clear that there was a physical improvement in both experimental groups in the physical research variables, but the advantage was for the experimental group. The researchers attribute the improvement of the first experimental group to their commitment to daily training and regular application of the exercises they used. This is evidence that sports training facilitates development, as confirmed [7]. The basic cellular efficiency improved with a decrease in lactic acid concentration, an increase in sodium bicarbonate concentration, and a decrease in the number of lung respirations among the players in the two research groups. The results of the post-test comparison between the two groups showed that the players in the experimental group outperformed their peers in the control group in measuring all of these dependent variables, which indicates the group's development [6].

As for the second experimental group, its development was due to the training used, which proved successful in the physical aspect, as the use of load training with maximum intensity had an impact on physical performance and met the requirements in terms of speed. In terms of motor speed, response speed, and strength, the extreme-speed game also played a significant role in the successful development of the physical attributes under study. High intensity positively affected the efficiency of the cellular organizations operating in muscle cells, which was facilitated by adapting the physical load, focusing training on reducing the metabolic waste produced by muscle cells due to their exposure to high-intensity plyometric and fartlek physical exertion. Appropriate rest periods played a positive role in restoring balance. Proper standardization and application of these exercises played a positive role in activating the work of carboxylase transporters, assisted by enzymes, by eliminating lactic acid buildup resulting from high-intensity exercise. The two exercises used also helped to link the measured physical attributes and yielded good results for each attribute separately. This is confirmed . "The modern trainer must consider each physical attribute according to interrelationship (interdependence and interdependence) with other attributes, and by no means in isolation."

Table 4. Shows the arithmetic means, standard deviations, and calculated (T) value for the two experimental groups

Variables	First Experimental Group (Submaximum - Average - Submaximum)		Second Experimental Group (Submaximum - Average - Submaximum)		T value calculated	Level Sig	Type Sig
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
Vertical Jump Test	15.12	2.11	17.23	1.47	3.51	0.005	Sig
Medicine Ball Throw Test	5.98	1.32	6.051	1.02	4011	0.01	Sig
Maximum Distance Load Test	16.18	1.02	17.97	1.928	2.451	0.001	Sig

Arm Flexion and Extension Test	10.88	1.70	11.44	1.55	3.410	0.004	Sig
Lactic Aside in blood	12.21	1.56	9.25	1.54	3.251	0.012	Sig
NaHCO$_3$ in blood	14.98	2.54	16.54	1.88	2.98	0.001	Sig
(RF)	48	0.145	41.65	1.21	3.251	0.000	Sig

After this presentation of the skill aspect in Table (4) it was also evident that there was a development in the two training groups in physical performance, and the second experimental group performed better in the post-tests.

As we mentioned in the physical aspect, the development of the first experimental group came from their use of appropriate exercises and appropriate maximum and effective loads [12].state, "Exercises are organized and purposeful movements through which motor and skill qualities are developed in the fields of life and sports." The second experimental group developed to the maximum load used and its role in achieving success and physical development, which was reflected in the development of the skill aspect, that is, in other words, in the case of lacking the necessary physical qualities for performance, it will not be possible to improve the accuracy and speed of performing skills on the field. Therefore, the researchers resorted to the maximum training method for reasons, the first of which is the development of the physical aspect and the second is the development of the skill aspect related to the physical aspect. confirms that “athletes in various sporting events cannot master the basic skills that distinguish each event in the case of their lack of the necessary physical qualities specific to the sporting activity. Therefore, we find a close connection between the skill level and the special physical requirements in each activity.” [11] also pointed out that "skill is only achieved with special physical abilities" [12] . The physiological response to the small number of breaths also helped express the sufficiency of pulmonary respiration to rid the body of metabolic products and reoxidize acids, which increased the body's ability to lean toward alkalosis through a good balance between sodium bicarbonate, which increased at the expense of a decrease in lactic acid, and the release of vital energy appropriate for the physical efforts exerted by the players. Specialized, precise physical exercises were also used to raise skill levels and increase the effectiveness of rapid performance, as[10] states, "Speed and strength play a major role in enhancing performance effectiveness the innate level or natural readiness for abilities, especially the body's ability to respond to training and improve skill performance, are considered the basic keys to success in sports, as all sports activities involve muscular activity, and each of us has A maximum limit for his ability to perform any task involving muscular effort. However, "energy metabolism" remains a vital element in successful performance [13].

As a result of increased accuracy in performance combined with speed, we need to increase training volume, i.e., increase repetitions in training units. This was confirmed by [14] "Repetition and training give the skill greater mastery, greater competitiveness, and more precise motor brilliance." Thus, the repetition training method is considered a successful method for advancing the game of volleyball. It is believed that muscle exercises with dynamic contraction improve muscle fiber coordination and utilize the mechanisms for storing and releasing energy in the muscles.“The phosphate buffer system is a mixture of phosphate (HPO4) and phosphoric acid (H2PO4) and acts like a bicarbonate system. If a strong acid, such as hydrochloric acid (HCL), is added, it replaces the weak phosphoric acid, changing the pH toward normal. When the lactic threshold (4 mmol/L) is exceeded, the blood pH decreases, which can become dangerous when vital systems are unable to neutralize the blood and internal organs and systems are unable to eliminate lactic acid [15]. Training also achieves physiological aspects within the body, represented by improving functional efficiency within the body and the efficiency of the muscular and nervous systems [17] “Specialized training must bring about special adaptations in the biochemistry of the muscles that are directly proportional to the difficulty placed on the athlete, which is to reach a distinct level of physical fitness for this group and enjoy physical health appropriate to the biological age of the sample exercises were appropriate to the level of the research participants, were built on correct scientific foundations, and were properly implemented by the training coaches and the players. In addition to this, these exercises included more than one physical attribute at one time during the performance[16], confirms that scientific training standardized in physical abilities leads to changes in most muscle components that develop kinetic energy and then skills related to performance [1], This process is closely related to the intensity and duration of the physical effort, and these changes appear in the form of physiological adaptation, so we call it physical training [18,19] the researcher paved the way for the preparation of physical exercises. Preventatively, then incorporate physical exercise

4. Conclusion

- The two methods for controlling the formation of training loads are important in developing some specific physical abilities and offensive skills in volleyball.
- The second method (maximum, average, submaximal) has a direct impact because it reaches the peak of training and yields better results.
- The two methods for controlling the formation of training loads at high intensity positively affect the development of basal cellular efficiency by decreasing lactic acid concentration and increasing sodium bicarbonate concentration in young volleyball players, outperforming their peers who train without it.
- The two methods for controlling the formation of training loads at high intensity positively impact the reduction in the number of lung respirations in young volleyball players, outperforming their peers who train without it.

5. Recommendations:

- Adopting the two methods for controlling the formation of training loads is important in developing some specific physical abilities and offensive skills in youth basketball.
- Adopting the second method (maximum-average-submaximum) has a direct impact because it reaches the peak of training and yields better results.
- Standardized and effective training yields good results. Both methods, in controlling the formation of the load, were effective in improving skill performance and improving it to the best.

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