SPORT TK-EuroAmerican Journal of Sport Sciences

https://revistas.um.es/sportk Online ISSN: 2340-8812

Received: **05/12/2021.** Accepted: **01/01/2022.** Published: **31/01/2022**

Effect of varying resistance exercises on the skill of smash serve in volleyball

Heider Sadiq Maki[1], Heider Shamkhi Jabbar[1], Hussein Mhaibes Tuama[2]

[1] College of Physical Education and Sport Science, Thi-Qar University, Thi-Qar, Iraq

[2] College of Physical Education and Sport Science, Al-Ayen University, Thi-Qar, Iraq

* Correspondence: Heider Sadiq Maki; hydersadiq101@gmail.com

ABSTRACT

The present study analyzed the effect of varying resistance exercises on the skill of smash serve in volleyball. The study had an experimental design. Young players, of age group between 16-18 years, were recruited from the specialized center for volleyball in Shatrah district as the participants of the study. A total of 14 players were selected for the primary experiment and 6 players constituted the sample for the pilot trial of the study. The participants were allocated in two groups, i.e. experimental group and control group, with 7 players in each group. The present study was conducted in the College of Physical Education and Sports Sciences of the University of Dhi Qar. Exercise sessions were performed by the players of the experimental group for a period of eight weeks, with three training units per week (Sunday, Tuesday, and Thursday). The curriculum focused on developing and improving abilities related to the lower extremities. The total number of training units was 24. Control group participants performed traditional training. Based on the findings of the present study, it was concluded that resistance exercises produced a significant effect in developing the values of the strength-time curve of the experimental group.

KEYWORDS

Resistance exercises; smash serve; volleyball.

1. INTRODUCTION

Biomechanics holds a significant impact in improving the level of performance of the players in sports including volleyball. Biomechanical aspects are characterized by strength, direction, its point of impact through its impact on the paths of the body or the necessary angles in which these

elements are used in harmony with the physical characteristics of the player, because the human body has both mechanical and vital properties. The appropriate understanding and application of biomechanical principles is required in order to raise the overall performance of the players in their game. Hence, a lot of focus is given to the training methods incorporating various methods based on scientific foundations in order to identify the characteristics of the force-time curve and then clarify the positive and negative aspects of its performance. Despite the scientific progress in the field of training, more researches must be conducted to arrive at many scientific facts in order to reveal the best ways and methods to develop the performance of players in their sport event in an optimal manner (Misjel et al, 2022).

In the volleyball game, the defensive and offensive skills are equally essential for the players to reach the basic goal of achieving victory in the competitive games. The experts and trainers have sought various methods and techniques to develop these skills among players (Marín et al, 2010; Saleh Al-Thubaini, 2022). The present study was based on developing playing skills amongst players by using varying resistance exercises. Movements under variable conditions might help the players to get exposed to the different situations that they are supposed to encounter in their primary sport, as well as developing the values of the force-time curve for the player, to reach the best biomechanical conditions and thus develop the skill of the ace.

The level of performances of the volleyball players can be improved with key consideration to the various mechanical factors in their training sessions. These factors might affect the final output of their game. To the best of researcher's knowledge players have huge variability in level of their accuracy in their performance. The poor performance is attributed to the existing methods and techniques of the training sessions of the players. These training sessions are not based on the scientific foundations and do not give consideration to the mechanical factors which may hinder their skill of game and level of achievement in the game. Hence, the present study was based on developing playing skills amongst players by using varying resistance exercises based on the mechanical foundations and rules to raise the level of muscular strength and the level of skill towards the best.

The aim and objective of the present study was to prepare different resistance exercises to develop the force-time curve to develop the skill of smashing serve of the players in the volleyball game. To find out the statistical differences and the rate of development between the pre and post tests for the control and experimental groups of the force-time curve of the skill of smashing serve in

volleyball and to identify the statistical differences between the control and experimental groups in the post-test of the force-time curve for the skill of smashing serve in volleyball.

The research hypothesis was that statistically significant differences would be found between pre-test ad post-tests for the control and experimental group in the force-time curve for the skill of smashing serve in volleyball and in favor of the post test. In addition, it was hypothesized that a statistically significant difference would be found between the post-tests of the control and experimental groups in the force-time curve for the skill of the volleyball smasher in favor of the experimental group.

2. METHODS

2.1. Design and participants

The present study had an experimental design in which participants were randomly allocated into two groups. The research community was determined by deliberate method. The research community included young players in the specialized center for volleyball in Shatrah District, Dhi Qar Governorate. The study was conducted in the indoor gymnasium hall in the College of Physical Education and Sports Sciences, Dhi Qar University, and the Volleyball Specialized Center Hall in Dhi Qar Governorate, Shatrah District. A total of 20 players were recruited as sample for the study. The age of the participants varied between 16 to 18 years, who represented the youth category. Out of 20 players, a total of 6 players were recruited as the exploratory sample and 14 players represented the sample for the primary experiment. Participants were equally allocated into two groups, i.e. experimental group and control group, with n=7 in a deliberate way (to ensure the distribution of players in the two groups according to heights and playing centers).

2.2. Sample homogeneity

Statistical means by means of arithmetic mean, standard deviation and coefficient of variation for morphological measurements were used to find out the reality of the difference or not, and Table 1 shows that. Furthermore, statistical means were used by means of arithmetic mean, standard deviation, t-test for independent samples and significance level, between the experimental and control groups, before applying the method, as shown in Table 2.

Table 1. The homogeneity of the research sample for morphological specifications and measurements using the coefficient of variation

Measurements	Unit	Arithmetic mean	Standard deviation	Variation coefficient (%)
Chronological age	Month	207.161	4.352	2.1007
Training age	Month	45.103	3.161	7.008
Weight	kg	72.095	5.057	7.014
Height	cm	178.361	1.936	1.085
Arm length	cm	71.264	2.361	3.313
Torso length	cm	61.027	1.065	1.745
Leg length	cm	97.268	3.362	3.456

Table 2. The arithmetic means, standard deviations, T value and p value for the control and experimental groups in the pre-test.

Variables	Unit	Pretest for the control group		Pretest for the experimental group		T	p
		Mean	SD	Mean	SD		
Chronological age	Month	210.168	8.469	205.973	7.361	0.312	0.493
Training age	Month	39.460	6.125	38.493	5.712	0.113	0.739
Weight	kg	68.405	4.642	67.813	8.439	0.150	0.535
Height	cm	180.371	5.991	181.439	7.159	0.721	0.671
Arm length	cm	81.561	7.364	82.197	9.127	0.646	0.543
Torso length	cm	62.097	3.648	63.167	9.373	0.682	0.490
Leg length	cm	109.110	8.146	110.027	5.671	0.811	0.362
Maximum force for the first push in the seam stage	N	903.7143	9.41121	901.2857	12.9963	0.400	0.696
Time to reach the maximum force of the first impulse in the solicitation phase	Sec	0.0471	0.01113	0.457	0.01272	0.224	0.827
Maximum strength in absorption phase	N	724.5714	11.85829	728.5714	17.0084	0.510	0.619
The time to reach the maximum strength effect in the absorption phase	Sec	0.0443	0.09761	0.0429	0.07560	0.306	0.765
Maximum power in the final thrust stage	N	1237.7143	15.09651	1235.571	11.0733	0.303	0.767
Time to reach maximum force effect in the final thrust stage	Sec	0.2729	0.04030	0.2714	0.03716	0.069	0.946
Area under the curve	N/S	231.4286	6.45128	234.5714	6.94879	0.877	0.398
Time area under the curve	Sec	0.3649	0.03631	0.3629	0.04645	0.090	0.930

2.3. Devices, means and tools used in the research

In the present study, many tools, devices, and aids were used for the purpose of data collection. In order to achieve the objectives of the research, various literature sources were referred by the researcher. The equipment and tools used for assessment, observation and for data collection included measuring tape, office supplies (i.e. papers, pen), Japanese-made whistle, medical scale, Swedish-made force platform, laptop computer and 2 DVDs.

2.4. Tests and Experiments

Accuracy test of the skill of smash serve

This test was intended to measure the accuracy of the skill of smash serve. Various tools were required for the measurement of this test, including a legal volleyball court, 5 official volleyballs, and a colored tape to divide the areas of the opposite court, as shown in Figure 1. The participant player was asked to stand in the middle of the final line of the player court, at a distance of 9 m from the net. The player takes the score of the area in which the ball is located for each correct serve. Each participant was given 5 attempts. The maximum score for this test is 20 degrees, noting that in the case of the fall of the ball on a line separating two zones counts for the test player the higher zone score (Al-Wazir and Taha, 1999). (Figure 2).

Force-time curve variables

Force-time curve variables included: 1) The maximum force of the first thrust in the contact phase i.e. the largest value recorded on the curve in the first thrust phase before leaving the ground, and it is extracted directly from the program after collecting the results of the four sensors and its unit of measure is the Newton. 2) Time to reach the maximum force of the first thrust in the contact stage i.e. the time taken to the nearest fraction of a second is obtained from the moment of contact with the platform until the maximum force is recorded in the first thrust stage and its second unit of measurement. 3) Maximum power in the absorption phase i.e. the smallest value recorded on the curve in the absorption phase and is extracted directly from the program after collecting the results of the four sensors and its unit of measure Newton. 4) Time to reach the maximum force in the absorption stage i.e. the time taken to the nearest fraction of a second is obtained from the moment of absorption with the platform until recording the lowest force in the absorption stage and its second unit of measurement. 5) Maximum force in the final thrust stage i.e. the largest value recorded on the curve in the final thrust stage before leaving the ground, and it is extracted directly from the program after collecting the results of the four sensors and its unit of measure, the Newton. 6) Time to reach

the maximum force in the final thrust stage i.e. the time taken to the nearest millisecond from the moment of contact with the platform until recording the maximum force in the final thrust stage and its second unit of measurement. 7) Area under the curve i.e. the amount of thrust effect between the beginning and end of the final thrust, or the thrust that is equal to the amount of thrust equal to the change in the amount of movement and is measured in (newton/second) (Mashjal, 2017). 8) Time of area under the curve: i.e. the time taken to the nearest millisecond of the area under the curve until the contact is broken to record the force in the final thrust stage and its second unit of measurement (Al-Abadi, 2015).

The primary experiment

The present study was conducted on weekdays in the closed hall for sports in the College of Physical Education and Sports Sciences, University of Dhi Qar. A total of 6 volleyball players were recruited from the research community as the participants for the pilot trial. The accuracy of the crush transmission and the purpose of this experiment to verify the tools and equipment to be used in the main experiment, to know the specific distances for the force platform, to know the appropriate time and place for conducting the study, to codify these exercises and find the components of the load for them (intensity, size and comfort) on the experimental group and to know the extent of the experimental group's ability to apply these exercises.

Pre-test of the research sample

The pre-test measurement and testing was done by the research for experimental group and control group on weekdays in the closed hall for sports at the College of Physical Education and Sports Sciences - University of Dhi Qar), before starting the implementation of the training curriculum. The main experiment was conducted on the 14 players, recruited as the participants for the study. The researchers, along with the supervisor and the assistant work team, tested the accuracy of the volleyball ace, and the platform was placed in its designated place.

Varied resistance exercises

In order to establish the effectiveness of the exercises, researcher enriched the information regarding resistance exercises and reviewed the existing literature using modern sources and references with the science of sports training and opinion of the specialists having expertise in the sports training, biomechanics and volleyball game in order to develop resistive exercise program for the players. Exercise sessions were performed by the players for a period of eight weeks, with three training units per week (Sunday, Tuesday, and Thursday. The curriculum focused on developing and

improving abilities related to the lower extremities. The total number of training units' 24. The average intensity of the experimental group was extracted to standardize the intensity and start with one starting line. The researchers developed the resistance exercises protocol by taking into account the components of the training load (intensity, volume, and comfort).

Post-test measurements

Followed by successful completion of the curriculum application period, which took 8 weeks, post-test measurements were conducted in the in the closed hall for sports in the College of Physical Education and Sports Sciences - Dhi Qar University under the similar conditions of the for the pre-test for the technical (technical) performance test of the skill of the volleyball ace (Al-Zayoud and Alyan, 2005).

2.5. Statistical analyses

The researchers used the statistical methods that helped in processing the results and testing the research hypotheses through the use of the Statistical Package for the Social Sciences (IBM SPSS), version 24. Averages, standard deviations and t-tests were used to analyze the data.

3. RESULTS

The results of the pre and post tests for the control group are shown in the Table 3. The results were statistically processed by *t* test for interconnected samples. The significant difference was found between the pre and post-test of the control group for the maximum force of the first push in the contact stage, the maximum force in the final push stage, the area under the curve, the time of the area under the curve, with *p* value less than 0.05. However, non-significant results were obtained for other variables**.**

As per the results described in the Table 3, a significant difference was found between the pre and post-tests of the force-time curve variables for the control group, in some variables and a high and medium development rate for all variables. The reason for the significant findings is that, the curriculum was characterized by comprehensiveness, gradualness and diversity in exercises based on the scientific foundations in terms of the intensity of the exercise, the number of repetitions and rest periods. The findings of the study are in accordance to a study conducted by Clutch et al (1983), who stated that the result of structured training improves, especially if the training contains weights suitable for the players' abilities, with the gradation of these loads according to the improvement of their abilities.

Table 3. Comparison between pretest and posttest in the control group

Variables	Unit	Pretest for the control group		Posttest for the control group		T-test	Evolution Rate	Sig.
		Mean	SD	Mean	SD			
Maximum force for the first push in the seam stage	N	903.7143	9.41121	931.5714	10.11364	5.456	2.9903	0.002*
Time to reach the maximum force of the first impulse in the solicitation phase	Sec	0.0471	0.01113	0.0429	0.01380	0.548	8.9171	0.604
Maximum strength in absorption phase	N	724.5714	11.85829	733.7143	2.49762	2.210	1.2461	0.069
Time to reach the maximum strength effect in the absorption phase	Sec	0.0443	0.09761	0.0314	0.01069	2.274	29.1196	0.063
Maximum power in the final thrust stage	N	1237.714	15.09651	1277.857	18.82754	4.597	3.1414	0.004*
Time to reach maximum force effect in the final thrust stage	Sec	0.2729	0.04030	0.2400	0.03109	1.766	12.0556	0.128
Area under the curve	N/Sec	231.4286	6.45128	240.7143	2.21467	3.537	3.8575	0.012*
Time area under the curve	Sec	0.3649	0.03631	0.3214	0.02610	2.585	11.9210	0.041*

The usual daily training holds an important place in an athlete's preparation program at all the levels. Since it helps in developing the elements of comprehensive and specific physical fitness by developing muscular abilities, while maintaining the flexibility of movement and controlling the joints, which Relative development in the arithmetic circles in the variables of the force-time curve. The relative development in the arithmetic circles in the variables of the force-time curve of the control group and the development was sufficient for the variable of maximum force in the final push stage and the area under the curve and its time, as the daily exercises followed by this group have affected the development of these variables that the volleyball player needs in performing the basic skills, especially the aces.

Through the analysis of the skill of crushing transmission by computer and using the force platform, the results of the pre and post-tests of the experimental group are shown in Table 4. Significant differences were found between the pre-test and the post-test for the experimental group, with p value lower than 0.05.

Table 4. Comparison between pretest and posttest in the experimental group

Variables	Unit	Pretest for the experimental group		Posttest for the experimental group		T-test	Evolution Rate	Sig.
		Mean	SD	Mean	SD			
Maximum force for the first push in the seam stage	N	901.285	12.99634	1089.5714	37.80149	10.797	17.28	0.000*
Time to reach the maximum force of the first impulse in the solicitation phase	Sec	0.457	0.01272	0.214	0.01069	5.050	53.17	0.002*
Maximum strength in absorption phase	N	728.571	17.00840	786.1429	10.09007	7.877	7.323	0.000*
Time to reach the maximum strength effect in the absorption phase	Sec	0.0429	0.07560	0.0200	0.08163	5.435	53.37	0.002*
Maximum power in the final thrust stage	N	1235.57	11.07335	1392.8571	10.02378	21.502	11.29	0.000*
Time to reach maximum force effect in the final thrust stage	Sec	0.2714	0.03716	0.1986	0.02268	3.837	26.82	0.009*
Area under the curve	N/Sec	234.571	6.94879	268.7143	6.52468	10.375	12.70	0.000*
Time area under the curve	Sec	0.3629	0.04645	0.2657	0.03780	3.512	26.50	0.013*

Most of the curves were similar in shape having two peaks. The first peak appeared after touching the force measurement platform, which represented the landing area on the platform and is the beginning of the movement, linked to the preparatory part. The second peak appeared after extending the knees and was linked to the major part of the movement. It is the largest area in the curve, started from the moment, the player started pushing and is done simultaneously and mechanically in a coordinated way.

Most of the curves were similar in shape having two peaks. The first peak appeared after touching the force measurement platform, which represented the landing area on the platform and is the beginning of the movement, linked to the preparatory part. The second peak appeared after extending the knees and was linked to the major part of the movement. It is the largest area in the curve, started from the moment, the player started pushing and is done simultaneously and mechanically in a coordinated way. The two peaks were separated by the lowest point of the curve's path after the first peak, which is the boundary that divides the curve into two regions and it is called the absorption stage. The first peak is called the collision, drop or contact peak, and the second peak

is called the tidal or thrust peak, and between them is the absorption region for the drop or collision force (Omar, 2012).

Through the previous presentation and analysis, it was found that there were significant differences in the results of the strength-time curve values, and the researchers attribute those differences in the maximum strength of the first push in the contact stage and the time to reach it to the method in which the components of the training load were formed for the different resistance exercises, which had a significant effect on the events. The compatibility between the muscle fibers as well as the working muscle groups, which led to the development of the torque and direction of the force of the contact leg.

All the exercises that were used to develop the values of the force-time curve increased the efficiency of the internal force represented by the continuation of the muscle contraction force, and the strength of the ligaments in the production of torque force. It helped by increasing its intensity while performing and the contact time achieved with the platform gave an indication of the player's rush (his speed) and this time was prolonged or shortened depending on the obstruction of the vertical velocity, and then the player tried at the maximum flexion (absorption) to convert the horizontal velocity to semi-vertical in the later stage. On the similar grounds, the speed Great approximation required large contact time in order to impede the vertical velocity and add it to the horizontal velocity, and the effect of this will move to the maximum force in the final thrust (Hassan, 2006).

As for the significant differences in the maximum strength variable in the absorption stage and the time to reach it, the researchers attributed them to the different resistance exercises that were applied according to the correct mechanical foundations of the skill, with different intensity and repetitions that continued throughout the application period of the training curriculum. It appropriately developed and enhanced the performance of the players by increasing the load sharing of the muscles working in the movement of the joints, thereby increased their efficiency in resisting the flexion at the moment of fixation and preparing for the advancement of the performance of the crushing serve.

The time of the absorption force increases its output and this affects the time of the maximum force, which is considered the total time of the movement. Its output and speed was more which helped the player in gaining more thrust through a large force in shortest period of time. In a study conducted by Ismail (2014), the authors of the study stated that the absorption force becomes clear when the knee joint is taken into bent position to do the preliminary movement. The force of gravity works to bring the body downwards, so the muscle force works to stop this decline and its effect is in

the opposite direction to the force of gravity, i.e. upwards. When the center of gravity of the body is at a lower position than the beginning of the original jump movement, and this force is called the absorption force.

Significant development in the maximum strength in the final push-up stage and the time to reach it through the use of different resistance exercises, which had a direct impact on the development of the maximum force for thrust in the muscles of the legs, occurred as a result of the high intensity and maximum effort on the working muscles when performing the various exercises. Exercises in eccentric contraction, followed by concentric contraction works in a cycle of lengthening and shortening the muscle fibers to produce a movement characterized by great strength within a short time. This is positively reflected as the development of the maximum force of thrust in the muscles of the legs. The results were in accordance to the study conducted by the Ismail,2014. Authors of the study stated that, in order to obtain the results of a high level of (eccentric) contraction, the (central) contraction that follows the (eccentric) contraction of the muscles must occur immediately (Ismail, 2014).

The results of the post-tests of the control and experimental groups are compared in Table 5. Significant differences were found between the posttests of both groups, with p values lower than 0.05. The characteristics of the curve showed difference between the terms of the distribution of the force recorded on the curve and the time of its impact on the length of the performance stages of the skill of the volleyball ace on the power-measuring platform device. Most of the curves were similar in shape having two peaks. The first peak appeared after touching the force measurement platform, which represented the landing area on the platform and is the beginning of the movement, linked to the preparatory part. The second peak appeared after extending the knees and was linked to the major part of the movement. It is the largest area in the curve, started from the moment, the player started pushing and is done simultaneously and mechanically in a coordinated way, where the driving foot was fixed on the ground after a good pivot to move to the thrust stage. The two peaks were separated by the lowest point of the curve's path after the first peak, which is the boundary that divides the curve into two regions and it is called the absorption stage. The characteristics of the curve showed a difference between them in terms of distribution the force recorded on the curve and its effect time along the performance stages of the volleyball aces on the power measuring platform device (Gambetta, 1989).

Table 5. Comparison between posttests in the control and experimental groups

Variables	Unit	Pretest for the experimental group		Posttest for the experimental group		T-test	Sig.
		Mean	SD	Mean	SD		
Maximum force for the first push in the seam stage	N	931.5714	10.11364	1089.5714	37.80149	10.965	0.000*
Time to reach the maximum force of the first impulse in the solicitation phase	Sec	0.0429	0.01380	0.214	0.01069	3.248	0.007*
Maximum strength in absorption phase	N	733.7143	2.49762	786.1429	10.09007	13.345	0.000*
Time to reach the maximum strength effect in the absorption phase	Sec	0.0314	0.01069	0.0200	0.08163	2.248	0.044*
Maximum power in the final thrust stage	N	1277.8571	18.82754	1392.8571	10.02378	14.265	0.000*
Time to reach maximum force effect in the final thrust stage	Sec	0.2257	0.01813	0.1986	0.02268	2.474	0.029*
Area under the curve	N/Sec	240.7143	2.21467	268.7143	6.52468	10.752	0.000*
Time area under the curve	Sec	0.3214	0.02610	0.2657	0.03780	3.209	0.008*

4. CONCLUSIONS

Based on the findings of the present study, it was concluded that resistance exercises produced a significant effect in developing the values of the strength-time curve of the experimental group. The different resistance exercises work directly on developing the variables and characteristics of the strength trait, which was shown in the development of the values of the force-time curve. Hence, the use of resistance exercises gave a clear picture of its preference over the traditional program, having a positive effect on the skill of smash serve in volleyball. Therefore, relying on modern and advanced methods, based on the scientific foundations in the field of sports training, may help the volleyball players in enhancing their level of performance in the competitive games.

5. REFERENCES

1. Al-Abadi, H. A. (2015). *The Basics of Writing Scientific Research in Physical Education and Sports Science*. Amman: Al-Ghadeer Printing and Publishing Company.
2. Al-Wazir, A. A. & Taha, A. M. (1999). *The Coach's Guide to Volleyball: Tests, Planning, Records.* Cairo: Dar Al-Fikr Al-Arabi.

3. Al-Zayoud, N. M. & Alyan, H. A. (2005). *Principles of Measurement and Evaluation in Education*. Dar Al-Fikr for Publishing and Distribution.
4. Gambetta, V. (1989). *Plyometric for Beginner*. Roma: I.A.A.F.
5. Hassan, U. J. (2006). *Study of the characteristics of the force-time curve and some biomechanical variables for the skill of head-shooting from jumping*. PhD thesis, University of Basra, College of Physical Education and Sports Sciences.
6. Ismail, M. A. (2014). *The biomechanical differential between players of different levels in some kinetic actions using an electronic system for acceleration*. PhD thesis, Alexandria University, Faculty of Physical Education for Boys.
7. Marín Guillén, M., López Sánchez, G. F., & López Sánchez, L. (2010). Comparación entre el voleibol adaptado y su equivalente en 'válidos'. *Revista Digital. Buenos Aires, 15*, 144.
8. Mashjal, N. R. (2017). *A comparative study in the values of some biomechanical properties of the methods of performing the skill of the wall of the blocks 4 and 2 of the national volleyball team players*. Master's thesis, University of Dhi Qar.
9. Misjel, N. R., Jabbarb, A. S., Tuama, H. M., & Jabbard, H. S. (2022). Influence of dynamic training on the biomechanics and height of volleyball spike in young players. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, *11,* 9. https://doi.org/10.6018/sportk.509461
10. Omar, H. M. (2012). *Force Measurement Platform.* PhD thesis, University of Dhi Qar.
11. Clutch, D., Wilton, M., McGown, C., & Bryce, G. R. (1983). The effect of depth jumps and weight training on leg strength and vertical jump. *Research quarterly for exercise and sport*, *54*(1), 5-10. https://doi.org/10.1080/02701367.1983.10605265
12. Saleh Al-Thubaini, A. H. (2022). Correlation between types of strength and blocking volleyball skills in young volleyball players. *Atena Journal of Sports Sciences, 4*, 2.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

COPYRIGHT