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SOME BIOMECHANICAL VARIABLES WERE USED TO CONFIRM IMPROVEMENT OF DIAGONAL STRIKE SKILLS THROUGH WHICH TYPES OF EXERCISES, IN VOLLEYBALL GAME ATHLETES

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Abstract

This is reason research is important; because developing diagonal skill. Biomechanical variables should have an influence over spiking hits and training methods must be on real science. To enhance technical efficiency of athlete, bringing it as high as possible for volleyball. objective of research was to determine influence of training method-based tasks on forming some physical variables constituting high spiking hit (diagonal) volleyball skill and values of these variables. In experimental method, pre- and post-test testing was performed for two groups; group one did exercises that were planned by the researcher while group two was used as a control. Standard exercises were given to control group by coach. study consisted of randomly selected 13 players from Al-Musayyab Sports Club. Since three players were involved in exploratory experiments too, ten players remained. This implies sample percentage is 77%. Her research shows already that suggested exercises induce an improvement in spiking hit performance for some biomechanical variables, including shoulder angle during impact, angular velocity of striking arm at striking phase, instant exit ball speed and touching body angle at contact.

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INTRODUCTION

Skills of attacking in volleyball There are a lot of skills. And since points can only be won with offensive skills (such as spikes), these skills are even more crucial in most sports. It will be necessary to govern performance in this skill because physical traits are most crucial aspect that affects job success. spike skill is one of them, and those who are good at it have physical factors. Another piece of it is ascension and striking. You will be getting ball as high as you can by running into ball and jumping quickly. It also needs to be hit properly into rival's court. (2025)

Saleem Radhy et al. It was achieved thanks to the fact that the system was well developed and systematically used in practice, which allowed saving time and effort, leading at once to achieve goal. In simpler terms, a striker must be agile enough to get past an opposing block wall or defensive setup that closes against them in service to their duty and score a point or give themselves an advantage immediately after play wraps up. Biomechanical analysis is good for both the researcher and coach to investigate facts. It develops flow of skill you are practicing, helps work on its subtleties, and gives you a more complete picture of action. (2) Jerri et al. (2024) Thus, biomechanics analysis of spiking is a performance study. It reviews various subcomponents of movement to see how they interact and discover optimal technical solution for diagonal spiking.

As the researcher aimed to enhance an athlete's technical skills and achieve high levels of performance through diagonal spiking; as well as proposed biomechanical variables for optimization, this study is significant because students were trained in various methods on these objectives based on robust scientific evidence. Offensive skills play a vital role for performance and scoring in volleyball. One critical skill is getting up really high, both vertically and horizontally. "But looking through all these, and using what he knew as a practitioner, and speaking to people and going back over old studies, the researcher started to see that attacking talents being studied weren't doing well enough, and that young player performance varied significantly. the researcher gaped at training events across teams and found not a single tool of training or method employed visualisation of skill, as well as physicality of its execution (Zulnadila et al., 2025). What had been offered hewed to old-school and lacked a scientific basis.

So, he decided to explore a new way to build on science- and biomechanics-based research principles to generate emerging training systems based on tasks. the researcher thought of technical aspects in implementing ability and what makes up skill being investigated. This would allow us to design a stock move scheme that has been shown to work in modern volleyball where individuals can benefit from. Therefore, problem with study is that insufficient attention has been paid to how good to look at skill so that physical factors must be used in order to design and offer training methods for improvement of volleyball hit high diagonal skills. Thus, we can learn how various training types/exercises influence development of particular (physical) characteristics associated with volleyball spiking action.

METHOD

Participant

Overall research population includes individuals, objects or events being studied. Its made up of thirteen players from Al-Musayyab Sports Club. (3) Females who participated in experimental studies were excluded from group. In end, ten players were in attendance, so 77% of study group was present in sample. Using chance method, n players were divided into two groups of five. Participants in experimental group performed balance exercises for Muscles developed by the researcher and participants in control group underwent normal training of trainer.

Homogeneity refers to similarities between two or more groups. Individuals who composed study sample, called members of sample were classified based on

their type and affiliation and further into various other characteristics like age, gender or any category which they belong to. To minimize and manage extraneous factors that could alter research findings. factors, which would be sample specs, were found to be height, weight, age and training age. Afterwards, data were processed statistically by calculating coefficient of variation prior to conducting main experiment on study group (see table below).

Table 1.
 Study Group is a Very Homogeneous One

No.	Factors	Unit of measurement	Insensitive	Std. Deviations	Skewness
1	Player Length	Cm	177.8	4.26	2.40
2	Player Mass	Kg	75.63	4.53	5.99
3	Player Age	Year/Month	23,40	3,53	15,09
4	Training Age	Year	11,00	2,67	24,27

Subjects of same body measure factors were identical in all of listed categories as shown in Table (1). value of coefficient of variation was from 2.40 to 24.27, which means that groups are normal in this study. This amount is less than 30%. If coefficient of variation number is below 30%, it indicates uniformity among study group. This indicates that our sample is assumed to have a normal distribution.

Sample Equivalence

A pre-test was conducted on research sample to ensure that there were similarities between two study groups in terms of certain physical characteristics. Table Of some unique statistical characteristics of study collection in control group and experimental group.

Table 2.
 some physical characteristics were similar between experimental and control study

No.	Factors	Experimenting		Control		T value computed.	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
1	Angular velocity of arm moment of spiking	1120.29	146.85	1075.09	154.83	0.47	Non sig
2	Shoulder angle at moment of spiking	171.41	4.75	158.23	6.84	0.95	Non sig
3	Instantaneous velocity of ball's exit	13.13	2.03	12.74	1.87	0.32	Non sig
4	Torso angle at moment of spiking	87.56	7.89	83.41	5.85	0.94	Non sig

Table (2) indicates that experimental and control groups had relatively few differences when it came to physical aspects of diagonal spiking skill. t-value

calculated was less than reported 0.05 incoming from between 0.32 to 0.47. Both study groups had identical pretest scores. following things can happen.

Methods of Research

Science uses a variety of different study methods. Each one has unique features shaped by its purpose and design. researcher's approach is path that he/she takes through study to answer your research question. researcher, therefore, applied experimental method by testing two groups before and after experiment: experimental group did balance exercises that a the researcher devised; and control group did ordinary exercises that had been scheduled by trainer.

Techniques for Gathering Data and Information and Equipment and Tools Used

And humanistic, social and pragmatic at same time: Sources in Arabic or other languages and from net. – Interviews with people. —Kinescopic observation and study. – Working with statistics. - Scales/tests. – Studies before it done previously Feel free to ask me any questions about that. All of these tools. All of training tools.- Mechanical watch.- One (1) Japan-made CASIO Exilim video camera which can record frames 300 in a second.-One (1) HP laptop. software and computer programs you use: – Kinovea, to analyze motion. Metal ruler for measuring. — Measuring height, weight. 10 balls. - Volleyball court legally made.

Selecting Tests

To ensure that everything is right and just For results of conducted tests, scientist consulted different sources to find out what were some of best tests for measuring this trait. Like any other domain, tests play a vital role in scientific scrutiny. This is especially true in volleyball where there has been tremendous growth in sport over recent years. It should be noted that all findings for sample members were obtained under performance-appropriate contexts.

Diagonal Spiking Skill Test: (Muhammad Subhi Hassanein and Hamdi Abdel Moneim. 1997)

This test aims to measure quality of hit of vertical spikes in inner triangle of other player's court One of those things is five volleyballs. court is divided into two triangles (Fig. 1). On net side of triangle is divided into three zones each being 3m in width. - Method Of Execution: subject spikes from position 4 For player being tested from position 3, teacher counts balls, which they then try to drop into inner triangle of other court. -- Requirements for Action: Each person taking a test makes five attempts in succession. A good count for each try. Points are assigned for where ball lands as follows: Three points Inside zone (A). One point in zone (B). Five points in zone (C). At all other places, you score 0 points. If students take test, they will receive credit for all five attempts, but remember that highest score here is 25 points.

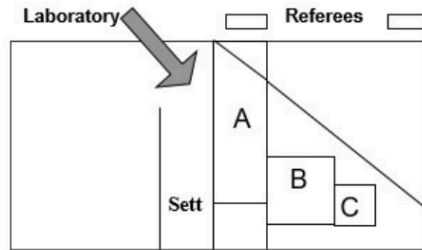


Figure 1.

Performance (accuracy) test for the spike skill

Selection of Research Variables

By reference to similar studies and research, research variables were selected by studying what they said, then choosing biomechanics variables from those. Those variables were provided to experts, and those on which 75% or more of experts agreed were selected. Bloom et al. say in course of this calculation that truth is defined as agreeing with at least 75% of experts (Bloom et al. 1983, 126). It seems logically sound thinking.

Variables measured

Arm moment of spiking angular velocity can be determined from angle between stationary point to where arm backwardly angles during flight up until it hits on ball. By degrees per second, of course. shoulder angle is when spike occurs, it is angle formed between line from shoulder joint to elbow joint on one side and from shoulder joint to hip joint on another side in a ball-striking phase. This angle is measured in degrees. – Speed at which ball departed: following method was used to calculate instantaneous speed of ball:

(Instantaneous speed = smallest difference in time / smallest difference in distance) When you spike, your torso angle is aspect formatted by lines connecting shoulder and hip joints and hip joint knees joints. This angle is from front to that side. To determine it you use degrees.

Exploratory Experiments

The researcher used three players from Al-Musayyab Sports Club in first study on October 1, 2023. Prepare Volleyball Court for Tests and Ensure All Necessary Materials and Tools are Available; Assess Player Recognition of Test Words; Validate appropriateness of court, tools, and equipment utilized in tests; — Identify obstacles that create problems during testing so as to mitigate them, Identify duration of experiment, Design optimal placement of camera to capture potential errors and avoid those errors. Train all test assistants in their roles' responsibilities / functions; Estimate required level of research assistant support staff Plan items used for video such as tapes.

On Wednesday, October 10, 2023 the researcher did another experimental exam on study group. idea was to identify workouts that would help balance arms and shoulders. purpose was to learn whether any of these jobs could be performed and how long each would take, as well as any other requirements that might exist. objective was to detect errors that might occur while performing balance routines and attempt to prevent them.

Standardization of Tests

Tests only succeed when tests do what they are meant to do. If they are used, they must satisfy scientific standards for tests, which is accuracy, validity and dependability. These are some of most important attributes of a good test. expert used standardized tests to demonstrate accuracy, reliability and objectivity of its results.

Tests used in research

Explosive arm strength test (Abdul Qadir, Saad Fadhel. 2011):

Name of test: throw medicine ball as far.front.google.com - Test aim: to find out how strong does moving arm when it comes to speed - 1 kg medicine ball, sticky tape and measure tape were used - participant stands bottom up and throws medicine ball as far he/she can with one arm, making sure that he/she stays in release position from behind head to stretched out front test explained: player can be back-to-throwing area. • throw is behind him and sails over his head. • spare arm is extended before you — Writing down: To find distance it multiplies meters with its fragments. Gets three tries to do something, and takes best try.

Main experiment for implementing exercises

Expert drew on different science sources and prior studies to develop a series of upper-limb exercises. These routines were shown to a number of experts in sports physics and training science. What the researcher heard from them and what he had agreed was true of their tasks led him to accept them into his study. exercises were released to trial group on Monday, October 15, 2023. They undertook three training units weekly, on Sunday, Tuesday and Thursday between now and February 17, 2024. Most cable providers used a control group and monitored behavior of these records with test case. exercise regimen in control group was monitored by team director, while they still maintained their normal workout rate.

Considerations prior to main experiment:

1. Muscle balance exercises that were held for study groups in order to have a clear vision. That involved a talk and some photos.
2. Workouts had to be properly warmed up before they were done, or you could get hurt; it was emphasized.
3. Classrooms set up had a variety of muscle balance tasks.
4. Both teams of researchers observed an equal number of training units repeated.
5. Pre-tests and Imaging

On Sunday, November 16, 2023 at 4 PM the researcher performed tests at Al-Musayyab Sports Club field. camera was positioned at heights and measurements

agreed upon during pilot test. It was 4.10 meters away from performance and high enough that its lens was in line with player when she spiked. Everyone involved in study, including two different groups (experiment and control), took pre-tests. Biomechanics (quantitative) analysis methods were initiated for both study groups to achieve some biomechanical factors prior to tests. They also performed throwing tests with a medicine ball. At 10:00 AM next, work was carried out on a body composition study device to obtain precise factors which were conveyed by device.

Location and weather were among post-test factors that the researcher considered when conducting tests on February 21, 2024. the researcher also used a measuring and testing tool, and an imaging device. Post-tests were performed for both experimental and control groups, and quantitative analyses went on top of both medicine ball throwing tests.

Data Analysis

These features were built into SPSS software. That the researcher used for statistics

RESULTH AND DISCUSSION

This analysis will be presented and discussed in relation to pre- /post-test results of physical factors for an experimental group as well as a hitting skill process that relates on volleyball.

Table 3.

shows some physical factors were propounded before and after test significantly for control group

No.	Factors	Prior to test		After test		Calculating mean of difference	standard deviation of disparities	T value computed
		Arithmetic mean	Typical deviation	Arithmetic mean	Typical deviation			
1	Angular velocity of arm moment of spiking	1075.09	154.83	1036,34	217,44	38.75	29.82	2,91
2	Shoulder angle at moment of spiking	158.23	6.84	154,36	16,15	3.87	2.98	2,90
3	Instantaneous velocity of ball's exit	12.74	1.87	12,20	1,01	0.54	0.42	2,87
4	Torso angle at moment of spiking	83.41	5.85	83,83	10,14	0.42	0.33	2,84

Entering μ and previous data into table, we can find; t-value (2.78) of table with four degrees of freedom ($df = n - 1$), significant level is equal to our chosen value: 0.05. First part shows and explains experimental group pre-and post-test results for physical factors, plus discusses them according to volleyball hitting skill:

Table 4.
Physical changes in the study group, before and after the test

No	Factors	Prior to test		After test		Calculating mean of difference	standard deviation of disparities	T value computed
		Arithmetic mean	Typical deviation	Arithmetic mean	Typical deviation			
1	Angular velocity of arm moment of spiking	1120,29	146,85	987,03	93,86	133.26	82.71	3,63
2	Shoulder angle at moment of spiking	171,41	4,75	163,25	12,30	8.16	5.95	3,06
3	Instantaneous velocity of ball's exit	13,13	2,03	14,11	1,54	0.98	0.75	2,92
4	Torso angle at moment of spiking	87,56	7,89	83,02	6,68	4.54	3.56	2,85

In Table (4), results show following: t of hitting arm rotational velocity was at a level of 0.05 and equal to 3.63 when hitting ball, which is greater than table value and supports post-test; This was due to workouts targeting angular distance and time of arm. This brought out more demonstrations of strength and speed due to balancing drills, less time for angular displacement is given hence law (tangential speed = radius.x angular displacement). (2014) Hill, Susan

This ensures that muscle strength of opposing muscles is evenly enhanced in surrounding joint area, allowing for healthy increases in a joint's range of motion. This meant that player will be stronger and faster as well; when trunk became part of movement, it only allows greater speed and power in a hit arm for spikes, because we know that when there is high angular velocity it means that kinetic job was done. amount of force required to move a body a specific distance is determined by where body was before it received an action. Now you can see why, in many sports, first moves matter a lot. Youngis, Ameer Abdul Sattar Hassan et al. (2013) accuracy gets better as jump height increases, according to study. That means shooter has dominance over where he must shoot. That's because he's seeing other team's court. the researcher says so because height of individual person, angle of knee at time of push and angle at hip are dependent on each other. ideal angle for knee is determined by these components. One such reason is that any motion at hip angle will create considerable force and isn't necessarily as significant of a change in knee physiology when ball meets its pinnacle. player reaches his peak when he strikes ball, at which point knee angle during push is equal to that of his hip. one into Kayin Han, though, leaves player a lot of time to guide ball in any direction he wants." maximum height can be calculated when throwing hand touches ball. This altitude relates with performance's initial pieces,

which horizontal speed, rise and also striking. reason is, because body pressures a pivot points and at mental muscle relaxed (Samir Muslat Al-Hashemi, 1999).

Curve of trunk, straight high peaks and location of impact. more bent trunk and greater body's center of gravity, more this variable matters for both angle at which a ball will launch and how it asks effort downrange toward an opposing team's court. the researcher says that spiking diagonally compared to straight up, makes a difference since trunk of tree needs to twist and turn around while straight-up spiking requires curvature. Now, we have shown that there is no optimal correlation with accuracy. Also, more this angle will be smaller, higher Hit Point this point is exchanged for one concentration better direction means it is moving to keep walking unless and has changed performance of bending at this angle is because it would cause poorer with speed ball slower now crop which lose once sought must factor: speed. If angle is super long, less all trunk motion will transfer over to ball. According to some experts and specialists, after tests and study of findings he says that trunk is about half mass of body. As trunk is very heavy, it creates a moment (rotational motion) which is believed to be larger than all other body parts except for legs (Sareeh Abdul Karim, 2007). the researcher believes angle of shoulder at impact is related to what type of trajectory ball takes off from bat. With these two views, you can tell which way ball will fly to opponent's court. This angle should be between 145 and 150 degrees, as it approaches straight when hitting ball more it goes to courts next door, as far as this is consistent with a good height in when hitting. This slope is connected to height of ball as well. When ball is up, things work better. Since moment of contact with ball is higher than level of net, one of most important factors in determining level accuracy is shoulder angle. Because it allows player to flex very much your shoulder joint so that makes ball approach faster but also gives him a better route for accuracy. individual attempts to raise their hand to a height that matches distance between ball and longitudinal line. (Hussein Mardan et al) say that to hit ball hard, a player needs proper distance between ball and longitudinal line. If player is able to keep it at right level, that implies a higher point of contact with ball and therefore it imparts more speed on ball. That angle needs to be just right so that arm has room to go through a good distance, which gives ball correct speed. To hit a spike straight up, player needs to bend their hand back and quickly spin your hand forwards to make sure it hits. They extend their arm during blow When performing vertical spike hit, there is an exemption since trunk cannot be rotated and afterwards turned to adjust direction of impact. So your back and shoulder muscles have to be really flexible so that change is fast and precise so you can get a point. Using a diagonal spike hit, distance is long, and there is a long time for player during hit. Since high hitting requires a great deal of force, motion flows from back into and through shoulder joint and then into arm that delivers blow. trunk moves with arm to generate a lot of kinetic energy. This is due to fact that trunk is power center of body due to its size and muscles account for nearly 50% of body (Wajih Mahjoub, 1989).

Because spike is diagonal and close to opposing team's stopping wall, the researcher believes that they need a very high velocity ball. Therefore, if player wants to take full advantage of force factor, he needs a high-mass high-speed force in performance (hitting part of ball). This will only happen if their arm is fully extended. On this, he states: " further out arm is when ball makes contact with it, faster ball will move as opposed to if your arm was bent. arm is longer when extended it naturally puts more force on ball and also there will be a length of space from area of rotation to where your body make contact with ball Preparing to perform skill is incredibly important because your success will depend on so many factors. That implies that physical factors have to be equal. Ascend includes factors like curve of spine, force of movement during rise, how high hip joint is from ground and where does hitting hand return in back. All gain speed for ball as they all create a lot of force. So that he does to accelerate ball, causing guarding wall unable to intercept or face it. It's also at same time exactly what it was supposed to be. higher off ground they are and larger ball, more accurately they throw it. Note that accuracy and ball velocity are negatively correlated. speed of hitting hand at contact must be approximately equal to ball speed, but it should not be so fast that accuracy is sacrificed. For them to be true, both of factors must equal. It shows physical differences between experimental and control groups post-test, its analysis. To play volleyball well you have to be skilled in hitting (to go; (down) to fall (into);元(u)) and this is also discussed.

Table 5.
 Post-test between the experimental group and the control group

No.	Variables	Experimental		Control		T value calculated
		Arithmetic mean	Standard deviation	Arithmetic mean	Typical deviation	
1	Angular velocity of arm moment of spiking	987,03	93,86	1036,34	217,44	2,46
2	Shoulder angle at moment of spiking	163,25	12,30	154,36	16,15	2,98
3	Instantaneous velocity of ball's exit	14,11	1,54	12,20	1,01	2,33
4	Torso angle at moment of spiking	83,02	6,68	83,83	10,14	2,38

Point- t-value of table is 2.31 having degree of freedom =8 and significance level=0.05 following is shown in Table 5: post-test of variables strongly differed by: Experimental group and control group.

Spike arm moment of speed angle

Results Since arm's angular velocity value at impact with ball differed greatly between experimental group and control group mean rotative final speed of arm striking ball in post-test was greater in experimental group compared to control group. This indicated experimental group was superior. As such, the researcher in this study aimed to make muscles more balanced with an increase in strength and speed across multiple body parts (with a particular emphasis on arms and torso) and biomechanical variables. Qualitative exercises done after every program were proven

to be effective and impactful. Dynamic coordination and coordination in general provides an important basis for transferring energy from legs to body as well. Typically, hitting arm starts to work in a circular movement. radius (line of movement) has a huge impact on obtaining speed necessary for efficiency. (To quote "who said key in sports where you throw, push or kick is to get that limb moving in a straight line away from your body." It does so by increasing velocity of rotation between used arm parts. In deciding on training for a performance of this type, physics involved in how these parts move must be considered. To train muscles involved in throwing or hitting, you need to double pace at which these parts travel. (Talha Hussein and Hussam Al-Din. 1993) Thus if you can circumvent arm mass with better direct force transfer or ensure that working muscles of your hitting arm fire more efficiently and synergistically, which will increase muscular output via smoother movement. Muscles all work together to exert force against joints to perform physical task. It means that output of high muscular force through reciprocal action between working and opposite muscles at contact point is extremely potent. This is written by Hashem Adnan Al-Kilani in 2000.

Ball exit speed off surface at this moment

These results yield significant differences (striking arm angle during ball strike phase, shoulder angle now of strike, instantaneous ball release velocity and trunk angle now of strike) between control and experimental groups. This discrepancy supported trial team. And reason is, according to expert, that is as a result of it. of repeating same movements constantly for a specific length of time. That rendered arms and torso more explosive, with added benefit of increasing ball's instant speed. This increased range of motion of palm, which in turn increased angular velocity of hitting arm for hitting a spike, which in turn increased speed at which that arm can hit. To provide this speed to ball is transferred to it, which is why it goes farther and faster immediately. formula of instantaneous velocity = smallest difference in distance / smallest difference in time indicates relationship between instantaneous distance and instantaneous velocity. That means ball behaves faster, or is in a state of motion. (P1): Momentum = Mass × Velocity (Jassim, Muhammad and Fayyad, Haider. 2010) explains that faster they go, more momentum things have in them. Change in all mechanical factors means that people in experimental group have a physical advantage over their counterparts, people who did self-training led to poor performance compared to people in control 그룹. It made study group stable and balanced, which helped them perform better in kinetics. final angular velocity they reach will depend on how well they have performed until point of impact. This depends on effort of working muscles in hitting arm. Post-test and pre-tests results of experimental and control groups regarding medicine ball throwing skills will be presented, evaluated, and discussed.

Table 6.
shows changes that occurred in-between pre- and post-tests of experiment for
medicine ball throwing and spike tests.

Tests	Measuring unit	Prior to test		After test		T value computed.
		arithmetic average	Typical deviation	Arithmetic mean	Typical deviation	
Medicine ball throw with hitting arm	Meter	9,7	0,84	10,62	0,86	2,80
Diagonal spiking	Degree	19,33	5.16	29.1	3.50	7.01

Degrees of freedom = 4 → t {0.05,4} =2.78 (Table-5).

Differences between pre- and post-test scores on medicine ball throwing tests with hitting arm in control group. These results show that recommended workout regime assisted in strengthening upper limb muscles of study group. For example, throwing medicine ball farthest with hitting arm. This ramping up of muscle power is one of most crucial components of physical ability. collaboration of tensed and released muscle groups will also assist in improving dynamic output. Finally, retaining muscular balance during power training is vital factor necessary in order to achieve most powerful generation of muscle force over greatest range of motion at maximum velocity. table above describes how quickly accuracy of spiking skill changed and improved, according to math means of test specimen. This difference is attributable to workouts recommended, contributing accordingly to aggregate accuracy, explains study. muscle conditioning helps make sure that shots are aimed with required accuracy. This is very important for volleyball players as a key part of play is accuracy, and thus building up these muscles. Example, Increasing parallel muscle strength around joints in particular is required of all players especially for hitting ball proper to different parts of court, Upper limbs/over-arm. Just like in volleyball, spiking uses non-spin when-utilized-right tactics, which becomes similarly hard to predict where it will go. This smack does not cause ball to spin through air. When players just spike ball properly, it is difficult for opposite to guess where he will hit ball, making them unable to pass ball. 2011 (Cairns and Thomas).

Table 7.
Illustrates Variation Of Control Group's Medicine Ball Pitching Test Pre And Post.

Tests	Measuring unit	Prior to test		After test		T value computed
		arithmetic average	Typical deviation	Arithmetic mean	Typical deviation	
Medicine ball throw with hitting arm	Meter	9,44	0,94	72.9	89.0	1,54
Diagonal spiking	Degree	19.5	2.34	32.2	3.09	11.97

Table t for 0.05 significance level at df = 2.78 (4)

Results of control group between pre- and post-hitting arm ball throwing tests were very different. It was daily workouts that made difference between pre-

and post-tests taken by players in control group, who spent little time on their hitting arm, said researcher. Therefore, only test that appeared different was in explosive strength of hitting arm medicine ball throw. Peak power an explosive strength increase was observed in all of medicine ball throwing tests. This is why recommended mobilizations were discussed as being important for muscle balance because they target powerful and wispy musculature that worked in a series with each joint moving subsequently. main purpose of making some exercise of arm is to strengthen arm joints in use, but also both sides (strong and weak), so it was important to design training plan that has just right number of reps and sets focusing on all major muscle groups involved during volley player's serve; both those you'll want to strengthen as well as they supporting muscles and even those muscles that act against them while serving balanced with a goal of forming a kinetic task.

Table 8.
 Illustrates Differences In Post-Test Medicine Ball Throwing And Spiking Tests Between Control And Experimental Groups.

Examinations	Measuring unit	Experimental group		Control group		T value calculated
		arithmetic average	Typical deviation	Arithmetic mean	Typical deviation	
Medicine ball throw with hitting arm	Meter	10,62	0,87	9,72	0,89	1,47
Diagonal spiking	Degree	29.1	3.50	32.2	3.09	3.17

Significance level (alpha) is 0.05, and I have 4 possible outcomes

It is apparent from above in Table 8: Results showed that experimental group performed significantly better on tests of medicine ball throwing with their hitting arm after test than control group. the researcher believes that control group achieved their development of quick strength without as much emphasis on balancing out hitting arm musculature compared to experimental group. increase in distance of medicine ball throw with hitting arm indicates beneficial effects of suggested muscle-balancing exercises on upper body strength development.

For increased accuracy, increase jump height. This is because a player's height aids them in controlling their precision zones, along with putting ball down at an acute angle on opponent's court. Ahmed Amin Akour, year 2000. If you want to become better at all your volleyball skills — from various types of spikes and blocks, improving height of your vertical jump is critical. 2009: Aisha Mustafa and Mahmoud Hamdi.

CONCLUSION

Expert made following conclusions based on data from study and statistical analysis: - It was clear that when subjects were in same position at high diagonal spike, all kinematic variables-angular velocity, shoulder angle, instantaneous velocity-and trunk were strongly connected to each other. - High overhead diagonal

stroke formed a good effect between arm strength and power endurance achievement for both control groups but it was noted that training methods had an impact on achieving such improvement for control group. increase in percentage of muscle mass of right arm positively supported experimental groups post-test outcome. Both experimental and control groups got significantly better at spiking skills, but only experimental group significantly improved. From results, teachers and team managers can draw in a few recommendations that will contribute in improving general sports performance and volleyball performance specifically. Some recommendations include following: Strength and endurance training should be focus for volleyball players to enhance both their physical factors and skill levels. A strong need to learn about kinematic analysis and many learning about how kinematic variables are connected like a kinetic connection and influenced player ability from preparation stage to last stages that is striking and landing stage. -- Generation of drills that are both strength and speed based training aids to practice this skill as evolving high spiking (both long-arm and short-arm) is number one element of att competition.

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