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PHYSICAL EDUCATION AND SPORTS

MASTER THESIS

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DEDICATION

This research paper is dedicated to my Father, entire family and well-wishers.

HAKAR ZIBARI

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All praise and thanks to Allah S.W.T who created human and thought them what they knew not. It is by His grace that I have been able to attain this point in my life.

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ABSTRACT

HAKAR BARKE. The relationship between some bio kinematic variables and strength function-time of jump serve in volleyball. Near East University, Institute of Health Sciences, School of physical education and Sports, Master Thesis, Nicosia,2017.

The study aims at identifying the relationship between some bio-kinematic variable and strength function–time of jump serve in volleyball. The research sample was selected and 10 male right handed volleyball players of Erbil club who had average to excellent level of jump serve participated in the study. The average mean and standard deviation of the players for height,weight and age were found to be 188.1cm ± 6.48 cm,78kg ± 9.29 kgand 24± 4.86(years), respectively. Kinematic and kinetic were measured for collision, absorption, pushing, maximal arch, hitting, landing and variables between stages during jump serve in volleyball. Both anticipatory and directional effects were seen for many of the variables including angle of right knee, angle of right shoulder, angle of right hip, distance between the feet, time, height of C.G and height of C.G in the moment of hitting. The kinematic data were recorded by using Sony camera and analyzed by skill Spector V 1.3. This study utilizes quantitative approach in finding the relation between some kinematic variables and strength function-time of jump serve in volleyball. Also, the research uses descriptive statistics such as mean and Standard deviations to determine the responsiveness of the variables to a change in either a situation or strategy. In statistics, correlation r measures the strength and direction of a linear relationship between two variables and SPSS version 20 was used for this. The current study revealed that only nine variables the include relation between kinematic variables for jump serve with minimum force variable on the platform of volleyball players, this include significant difference $r=-0.69$, $p\leq0.02$ for angle of right hip at the moment of push with less force on platform, $r= 0.72$, $p\leq0.01$between the angle of right shoulder variable the moment of hitting the ball with less force, $r= 0.66$, $p\leq0.03$ for angle of tendency for hip C.G with horizon variable at landing stage with less force time on platform, $r=-0.65$, $p\leq0.03$ for angle of tendency with a vertical line, one $r= 0.64$, between the angle of right of knee in the collision stage with foul touch time on platform, one $r= -0.64$, $p\leq0.04$ for the angle of tendency of the vertical

line in hitting moment with foul touch time on platform, r= 0. 61, p≤0.05 for the angle of tendency of the vertical line in hitting moment with foul touch time on platform, r= -0.64, p≤0.04for the angle of tendency of the vertical line in the landing stage with foul touch time on platform, one r= 0. 66, p≤0.03 for the angle tendency of hip of the horizontal line in the landing stage with foul touch time on platform. Thus, the remaining variables show insignificant relation thereby rejecting the hypothesis.

Keywords: Volleyball, Jump serve, Kinematic, Strength function-time, Variable.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

NEU	**:**	**Near East University**
TRNC	**:**	**Turkish Republic North Cyprus**
USA	**:**	**United States of America**
N	**:**	**Number of sample**
GB	**:**	**Great Britain**
UN	**:**	**United Nations**
SPSS	**:**	**Statistical Package for the Social Sciences**

CHAPTER 1

INTRODUCTION

Technical and scientific development in the area of life contribute to the achievements, desires and aspirations of all the athletes on winning, breaking records and improving performance, each according to his field and activities. This requires reliance and use of natural science and chock, including the science of Biomechanical, sport training, physiology and movement learning for what this science is of great importance and the inevitable necessity in the development of performance and improvement of skill, (Al Smaedae,2011).

As it is known, the human body and movement apparatus specifically characterized by numerous mechanical characteristics when applying mechanical conditions, which means has to be the perfect technique for any skill properties or sports movement.The access to the upper levels of the important things that require knowledge of the most important mechanical variables that contributes to the perfection skills as well as on movement performance of less effort.The most important procedures of strengthens for cases of technical and tactical performance is to identify areas of strength and weakness by finding a strengthen way for analysis and diagnosis, represents in noticing that are specified by the quantity quality of errors during the competitions, To establish the correct methods that help to overcome the mistakes and address weaknesses, And evaluating the training curriculum according to scientific basis based on mechanical analysis organized and scheduled, For the purpose of performance analysis and evaluate it to help the coach to get the player to the upper levels (Susan, 1995).As well as to study and clarify and analyze spiker movements will contribute to arriving at the best technique, The study of the mechanical properties gives us a clear perception of the existence of the differences in kinetic possibilities among players, and volleyball skills requires from the player in multiple kinds, whether offensive or defensive skills, that the performance is high speed and high accurate (Sandor, 1997) and explosive strength of legs muscles representing in pushing the legs that is characterized by required speed and precision in the opposing team's court (Khatayba, 1996). And that require the player to achieve harmony by force as a result of the movement of the various parts of the body within a body mass, which generates totality what is calledinstantaneous force at jumping which means the process of movement transfer from the ground and legs to the arms (Jawad, 1997).

Johnson (Jenson, 2000), indicated that the analysis is the sorting and classifying of numerous data for key elements and then process them statistically and logically and summarize them into digital results being whereby the appropriate interpretation of the shift from quantitative endocrine to a comprehensible format.

The mechanical kinetic studied analysis is a way of improvement methods in the performance level and development and particularly in achieving sports accomplishments, and it has been associated recently with athletics including volleyball which occupies a privileged position in the world like the rest of other sports, to get squads to higher levels such as selection of modern training methods, and the interest in aspects of physical, physiological and psychological that interfere in the drafting of the typical form of the skill or activity. It also requires some high physical capacities, and especially transmission overwhelming strike skills in which the transmission has become the most important point that can focus on in most of the matches internationally, as a result of the effective impact on facing the opposing team, as well as the use of the transmission strikes for all players who know the effective impact (Simon, 2001).

Mechanical analysis is one of the important bases in the study of the movement of the human body which is divided into two main sections (kinematic and kinetic) (Al Hashimy, 1999; Al Khaqany, 2001), Which kinematic is interested in studying the external phenomena and describing it in terms of time and space apart from causative forces.

The concept mechanics has been associated with kinetic analysis which requires those who are interested knowledge in aspects of the technical performance of the skill and full knowledge of anatomy and kinesiology, and analysis kinetic, can be either qualitative, to identify the movement through observation without the use of tools - which is not enough to study the movement and search in it - or be quantitative achieved by the use of tools and devices to see how much kinematic variables of performance, and studying the factors of kinematic whether linear or rotational movement and kinetic forces associated with the movement (Al Gailany, 2007).As well as on the analysis in volleyball helps to choose the appropriate achievement athlete correct movements.The researcher should be familiar with the field of mechanics and concepts of engineering and anatomical, physical and mathematics to determine information on the amount of movement and the time and distance, strength and ability, after that there would be conceptual frameworks of the movement and that he had to deliberate scientific plan to estimate the ideal performance of the movement on the basis of mechanical quantities to perform the steps that are improved performance based on the description of the movement and the diagnosis of these factors (Husamaddin, 1994; Wilson, 2006).

The mastery of skills and tactical and physical performance for those transmissions means a lot within the strategic team calculations, and the kinematic analysis of jump serve skill in Volleyball is important to increase its impact, and to know the strengths and weaknesses in their implementation and thus achieving the good technical performance that enters in the formulation of the standard format for that skill, motor performance of the skill has become the subject to the laws and calculations through the discovery of new methods and analysis and clarify of sports movements, and improve the movements and Sports technique and resolve the issue related to the analysis and diagnosis of sports movements to answer many of the questions that are related to accomplishment, and help the coach and the player to avoid mistakes and correct perception of the movement (Mahjob, 1987; Al-Gailany, 2003). and this kinetic analysis contributes to the strengthen of all activities and sports competitions because it contributes to monitor the details of the movement parts and requirements and the causes of their occurrence, which lead to raise the skill level of the player in terms of technique and performance of this skill automatically and fast, and that hoped the player through intensive and continuous training (Al-Gailany, 2006).

To achieve success and win the volleyball game requires us to invest all the skills of the game well, especially the transmission skill for being offensive skill that the player can achieve a point for his own good, without being exposed to harassment by the opponent, and in view of the fact that a transmission is multicast sides in terms of performance then we must make sure that the jump serve is one of most important transmissions that are common amongst the world's most advanced teams. For example, if we take the transmission skill, we find that this action is done and the body is at the top of flying point and to increase the force the player tend to rotate his body and thereby increase his speed, forcing the player to take the position for his feet in order to be of an equal distance for the purpose of increasing the radius of the shortcomings for its parts around this axis, as the rotation of the legs is done at speed below the speed at which spins out the trunk and fulfill the goal out of the strike, since the player can land safely and securely and he is facing the network again (Husamaddin, 1994; Abdulbaseer, 1998).

The purpose of the jump is to increase the horizontal speed to convert the horizontal vehicle into vertical, and the expansion of the legs in front of the weight center of the body absorbs the driving force horizontal generated through their gymnasts steps, then switch the subsequent efficient into vertical driving force in which flying timing of the body is about (20 - 25) milliseconds, and the jump length varies between (1.20 - 2.40) meters (Al Jumaily, 1997; Arie, 2000).And an impact occurs during the flight phase between the palm of the player and the ball after it precedes with a large speed of the striking arm at the wrist joint and the elbow and shoulder and thus the ball passes into the opposing team's playground.

In addition the strike strength returns to what is characterized by the striking arm of muscular strength and speed of kinetic, though path of the ball can be either straight and occurs when hitting the ball in the center, or circular when hitting the ball top and bottom of the center, and the ball takes final shape after striking when it is placed in the opposing team's playground, the ball shape depends on the strength of the strike, the more powerful the strike is the more changes on the balls size and shape (Qotob, 1985).

The scientific studies have effective impact on motor performance through the phenomena affecting the movement that contributed to the occurrence of significant progress accomplishment athletic, through the creation of mobility solutions resulting from the good exploitation of athlete's self-forces and the associated of external forces directly affect the movement (KhaledNajem, 1997).

And the researcher may choose the appropriate method of analysis of the movement and effectiveness to be analyzed and that are appropriate to the nature of work, and at the present time modern scientific instruments been used to help describe the movement and carefully analyzing, detecting all the factors that go into that analysis.” The best use of devices that give a thorough analysis of the movement in the kinetic analysis is a fast computer.

Performance of volleyball skills such jump serve is affected by mechanical conditions that reflect the ideal reality of performance and related biomechanical variables with each other directly relevant to provide force, speed and their conclusion (mechanical force), and through the study of the mechanical ability and variables kinematic performance skills to help trainers identify the most important variables contributing with their proportions as a result of launching the ball.

The close relationship between achieving bio-kinematic conditions and the performance of jump serve skill rely basically on the variables of the corners of the joints of the body, especially that rely on the kinetic path for the center of the weight of body mass and maintain a balance and kinetic transport from the ground to the moment of contact with the ball and strike it, as well as rising to the highest point through movement of the top forward and get a good curvature of the trunk towards the movement.

From here lies the importance of research in the study and analysis of jump serve movement through dividing them into several stages, and the analysis of some bio-kinematic variables caused by the body for each stage of the jump serve movement from the moment of preparing for transmission and taking steps and then push from the earth and upgrading and to the moment of the strike and end of the movement as well as determine the explosive force obtained by the player through upgrading to a the highest point closely with the dynamics third law for each action there is a reaction equals in value and opposite of its direction.

The importance of the platform strength lies on the study of the amount of explosive force obtained from the use of force and time measuring platform to get to know the momentum of the various stages values (collision and absorption and then pushing and flying) and this in turn will give the role of extreme importance for the coach to know his capabilities and abilities and thus control the jump serve movement successfully when the study of variables are positive and good and therefore serve the main movement which is jump serve successfully and achieve points against the opposing team, and at the same time giving the momentum and the confidence to the player to continue to improve this type of transmission.Such as this study may be helpful for volleyball coaches to realize how they could analyze the jump serve and its levels. In addition this study may help volleyball players to improve the requirements of their jump serve.

1.1 Statement of research problem

The skill of jump serve is one of the basic offensive skills that plays a crucial role in the outcome of the game, the researcher noticed and through following up to many of the games that most players of clubs in the Iraqi League and in Kurdistan specifically, after their performance of jump serve, weakness of the ability to continue playing to defend the stadium or to participate in the attack from the second line, which means that most of the players consume a significant amount of force for the purpose of performing this serve, meaning that the performance skills they have are not economical, the researcher believes that the reason for this could be due to lack of players ability to create a consensus bio-kinematic through the correct binding between the force and apparent change required for the skill, such as achieving good curvature for the purpose of obtaining the determination of the force required. The researcher finds it difficult to locate unless examine the relationship between the strength indicators and kinematic variables to perform jump serve skill, like the speed to hit the ball or coincided maximum height with the correct kinetic path of the arm strike.

The researcher felt to study the skill of jump serve in bio-kinematic and bio-mechanic aspects to get to know the amount of explosive force that the player put on the ground, and raise up and implement the serve measured by the platform of force-time, because through this platform the period of contact with the ground as well as the maximum force when pushing can be estimated.

The research questions are as follows:

1. How much force to perform jump serve and what is the time of touching and flying achieved?
2. What are the bio-kinematic variables that contribute in a successive jump serve?
3. What is the connectivity relationship as an indicator of bio-mechanical compatibility between kinematic and kinetic indicators when performing jump serve?

1.2 Hypotheses

The research hypotheses (H1) of the study states that there is correlation with a statistical indication $p \leq 0.05$ between kinematic variables and strength functions-time during the execution of the jump serve in volleyball. This includes:

1. There is correlation between collision force variable on platform for volleyball players with Kinematic variables for jump serve stages.
2. There is correlation between Kinematic variables for jump serve stages with minimum force variable on platform of volleyball players.
3. There is correlation between collision force time variable on platform of volleyball players with Kinematic variables for jump serve stages.
4. There is correlation between Kinematic variables for jump serve stages with Minimum force time variable on platform of volleyball players.
5. There is correlation between Kinematic variables for jump serve stages with push force time on platform of volleyball players.
6. Connectivity relations between Kinematic variables for jump serve stages with full touch time on platform of volleyball players.
7. There is correlation between Kinematic variables for jump serve stages with pushing force on platform of volleyball players.

1.3 Significance of the research

1. The results of this study will help coaches and players to understand the right picture ofjump serve and the required force for it.

2. This study will help increase and strengthen the bio-mechanical information consideringto link between kinematic variables with force-time formula.
3. This study will give us a broad base for further research regarding jump serve bio-mechanic.

1.4Objective of the study

1. Identifythe values of certain bio-kinematic variables of jump serve skill performance of Volleyball player.
2. Identify the values of some forms of schedule force function, specifically theexplosive force of the stages of the movement during the push and upgrade of thevolleyball players
3. Findarelationship between some bio-kinematicvariables and the strength function-time during the push movement to the jump serve of Volleyball.

1.5 Study Limitations

1. The sample population and that the sample was non-random and identified a very specific group of individuals which could affect external validity.
2. The participants were drawn from players of sports Erbil club of volleyball in the Iraqi Kurdistan Region. Results from this study may not be applicable or transferable to recreational or social levels of these sports.While investigating significant differences of correlation, results of this study cannot imply causality, nor can it conclude a circular relationship.
3. This study is concerned only with examining the links between certain bio-kinematic variables the variable in strength function-time during the execution of the jump serve movement in Volleyball.

   It is assume that the players perform the experiment (jump serve) in similar way as it is in the real game.

1.6 Delimitations

The delimitations of this research include:

The human field: Volleyball players of Erbil sports club\Iraqi Kurdistan.

Spatial field: Interior hall of the Faculty of Physical Education – Dohuk University.

Temporal field: The period between July 1st 2016 and August 10th 2016.

1.7 Study Terms

1.7.1 Movement analysis

Is the study of the movement and learn the descriptive variables and causing the raise of the movement of performance level that intended to be achieved, and that the study of kinematic characteristics allows the analysis and judgment on the level of mastering performance.

1.7.2 Kinematic Analysis

The kinematic analysis is one kind of mechanical analysis that cares by describing objects movement without considering the causes they occur (Ali, 2007). and the description is the first step in the analysis in the quantification as many of the researches dealt with description of studied phenomenon through the fragmentation of the movement into several parts and the description of each of these parts separately, and opened the way for the study of quantum research which determines the amount of the contents of the parts of the movement and the subject of measurement and calculation, such as (distance, speed, acceleration and angle) and other variables of kinematic (Hussain&Mahmood, 1998).

1.7.3 Kinetic analysis

It is the second part of mechanical analysis, and the purpose of this kind of analysis is to study the reasons of occurring the movement, taking into consideration the internal and external forces surrounding the movement (Al-Hashemi, 1991), considering that the movement that occurs in the sports field or in normal life is a reciprocal effect between internal forces (muscular) and external forces (gravity-friction) and other forces surrounding the body and that directly affect in performance (Hussain&Mahmood, 1998).

1.7.4. The Center of gravity

the body mass is sober and important issue in the study of bio-mechanic, and the only point which around the body mass is even in distribution in all directions known as the (center of mass), or (mass centroid) of the body. When analyzing the subject of objects gravity, the center of mass can also be demonstrating to the center of gravity which is the point that the weight of the body around it is equal and balanced in all directions, or the point that around the total torque generated by the weight of body parts is zero (Al-Khaledi& Al-Ameri, 2010).

CHAPTER2

GENERAL INFORMATION

2.1 Game of Volleyball

Volleyball got its origin more than 100 years ago, by the American physical educator William Morgan (Seminati, &Minetti, (2013).It is a sport described by repetitive high and moderately-high jump and land efforts accompanied by short recovery periods. In addition to match-play, volleyball players experience high weekly jump counts during training, estimated in excess of 650 impacts per week for average male participants, while anecdotal evidence suggests that these counts are in the thousands for national teams (Charlton et al, 2017).The game of volleyball is among the popular games plays nowadays around the world both professionally and armaturse. It has minimal risk of injuries due to the fact that, there is no direct contact between the competing teams, although some specific actions like player leaps and hit or block the ball with anticipation of landing safely may result to some degree of injuries. According to De Loes (1995) who stated in his study that, volleyball is the number eight in ranking of sports professions when it comes to terms with injury occurrence, resulting to three incidents per 1000h of the game.

2.1.1 Mechanical Analysis of the Movement

The mechanical analysis of movement is among the vital methods of mechanic sciences which handles body movement analysis both quantitatively and qualitatively in order to obtain a good understanding of mechanical variables and how they affect body performance and movement. It is an explanation for large scientific sizes which is required to be investigated in depth in order to obtain clarity on variables relationships and also confirm the fact that evolution performance has connection with kinesthetic true path.The study of mechanical aspects of the movement performance based on the objective measurement methods using mechanical analysis which is an important aspect of the evolution of movement(Hussein and Mahmoud, 1998). An excellent explanation of different sports activities need an in-depth investigation of the principle and mechanical basics that made up the movement skills(victor, 1983)based on the foundation that, the understanding of exact principles and mechanical basics allow for the objective way to investigate the performance and evaluation of movement skills, through the application of mechanical laws on movement performance (Omar and others, 2001).The application of mechanical laws on the ecosystem of humans during the performance of their movement skills are of paramount importance because it identify the exact rules for movement and the possibility of appreciating it under different circumstances, it also determine the error in the movement track by discovering and correcting the error. Also part of the importance is the performance appraisals to find a final result of the movement path and its compatibility mode when the goal is tally with the desired performance movement (Ali, 1998).

Mechanical analysis is an important way that aids the training drills in raising the level of movement performance via the application of precise scientific method based on scientific instruments and modern techniques(Ihsan, 2006), and familiarity of trainers with ways and methods of analysis helps them discover their sports completely and make them more confident in their profession.And also their possession of some background can connect to their knowledge beyond the techniques involved and used in sporting activities that includes the certain movement in a certain way (Bareeq and Al-Sokkari, 2002). And in this regard (Mahjoub and Taleb 1982)described mechanical analysis as the forefront of scientific facts that aids workers in the sports field to select the appropriate movements of the scenario surrounding the accomplishment of sportsand that, is an essential aspect in the scientific diagnosis of the employment performance in the competition sort via mechanical rules and laws that govern the application of human performance(Roys, 2001).

Scientific analysis which is the second part of the mechanical analysis sections, has the responsibility of analyzing and examining the causes of the movement occurs, taking into consideration the internal and external forces around the movement(al-Hashimi, 1991) based on the fact that, the movement that occurs in the sports field or in the normal life has a mutual effect between internal forces (muscle force) and external forces (gravity and friction) and other related forces that directly affect the performance(Mahmoud & Hussein, 1998).

Based on the above, we deduce that, the application of mechanical analysis has become today's necessities of education training in all type of sports because it helps the teacher and coach a lot in the evaluation process objectively (Farfel, 1983: Geese,1992).The mechanical analysis is divided into two, that`s kinematic and kinetic analysis.

2.1.1.1 Quantitative analysis

This type of analysis is interested in describing the human body movement in whole or in part, either manually or digitally description. It contribute a lot in analyzing the movement performance to scaling values in order to reflect meanings with its implications on the principles and laws that they deploy from other sciences. And of course, these measurements is possible with different devices for that purpose, for example simple instrument with faster indications about the body status, or sophisticated devices that delves into the measurement whenever study required more details, and normally this kind of analysis is non-economic and requires a high level of expertise, hence the use of it limits to sports with high levels in most instances.Although knowing the results by the coach for this type of analysis without giving details, helps him in the formation of a general picture of the possible values for any studied phenomenon, thus attaining a greater understanding of the movement performance details(Hossam El Din, 1993).

2.1.1.2 Qualitative analysis

Thistypeof movement investigation is restricted to the aspect of qualitative side of performance, which is the external distinctive shape in terms of overall track without being able to investigate the movement parts and the factors influencing them (Al-Hashimi, 1999).but the perception one can get while using this type of analysis may be consistent to a large extent with digital data. However, despite the ease of use to some large extent in comparison with a quantitative method, there are many conditions in which scientific researchers are obtained in the area of movement performance which is the basis of qualitative analysis in describing performance, and that the logical conclusions resulting from its use could be re-investigated and therefore be accepted or rejected by the quantitative method(Hossam El Din, 1993).

2.1.2 The Main goals of mechanical analysis

2.1.2.1 Mechanical analysis in order to identify the technical characteristics

This particular type of analysis is simple, where by its study the movement paths of different parts of the body based on a set of mechanical characteristics distinction by skill. Thoughthis method can be determine by the laws of linear movement or rotational movement to calculate the characteristic values of the variables, and expose the most vital of these characteristics by dealing with each point of the particular points on the body(Jabber, 2008).

2.1.2.2 Mechanical analysis in order to detect defects of performance

This type of analysis is identified by prior knowledge of the most important mechanical properties of special studied skills and values of the variables, and these properties on the basis of that analysis is to hold a comparison between what should be and what is the object to identify shortcomings that follow the movement requirements of its causes and recommend the right solutions(Jabber, 2008).

2.1.2.3 Mechanical analysis in order tocompare the performance to thetheoretical curves

The problem of this method of analysis is in the conclusion of theoretical curves of similar properties to compare players performing with the real values that are obtained already. And also the possibility of redefying these variables to obtain higher dynamic income that can be obtained both in the immediate adjustment and through the physical preparation of the players program specifically on these Value (Jabber, 2008).

2.1.3 Kinetic analysis

The kinetics science has to do with body movements and the forces that act on them to produce the motion. However, the kinetic variables can be used to portray the state of rest or motion of a body, and these variables includes; Position, velocity and acceleration of the body under investigation (Payton, 2008).The two areas that's kinetic and kinematic together they contain in them biomechanical principles and of course form the basis of musculoskeletal function (Bisseling, 2008).

2.1.4. Kinematic Analysis

Kinematics is the branch of science of motion that deals with relationships between displacement, velocities and accelerations (Bisseling, 2008).Kinematic analysis is one of mechanical analysis types that deals with the movement of objects regardless of the causes of occurrence (Ali, 2007), and the motion explanation is the first step of analysis in quantification measurement that many studies dealt with. It`s a phenomenon through movement fragmentation into different parts which describe each of these parts differently, and begins the way for quantum study research, and that means determining the amount of the contents of the movement parts which is subjected to the measurement and calculation such as (distance-speed-acceleration-corner) and other kinematic variables (Hussein and Mahmoud ,1998). However, kinematic analysis is divided into two, which are quantitative and qualitative analysis explained as follows.

2.1.5 Kinematic andKinetic Variables

Kinematic explain the motion of a body by not referencing to a variables that is responsible for the change in motion of the body(Payton, 2008). While thevariables of these biomechanics can be used to portray the state of rest or motion of a body and these variables includes; Position, velocity and acceleration of the body under investigation(Payton, 2008)

2.1.5.1 Position

In order for the body to be in motion, it must be changing its position within an appropriate reference frame. This position variable use linear displacement to allow for a change in the player's linear position. We can now record the athlete's change in position to provide a variable known as the linear displacement of the athlete during the time of analysis(Payton, 2008).

2.1.5.2 Velocity

While the change of position of a system within the reference frame provides information about the state of rest or motion of the system, it is the velocity of the system which is defined as the rate of change of position at a particular time interval (Δt) which provides a more formal explanation of linear motion(Payton, 2008).

2.1.5.3 Acceleration

The rate at which a linear velocity change is known as acceleration, with the average acceleration calculated as follows; $a = \Delta v/\Delta t$

Where "a" is the average linear acceleration of the body during the time of analysis, "Δv" "is the change in linear velocity over the time of analysis", and "Δt" "is the time taken to undergo the change in linear velocity" (Payton, 2008).

2.1.5.4Relationships between kinematic variables

The definitions of displacement, velocity, and acceleration allow the relationships between these kinematic variables to be explained in a series of equations, known as the equations of motion as follows;

$V_f = V_i + at$-------------------------- (1)

$S = V_i t + ½+at^2$ --------------------- (2)

$V^2_f = v_i^2 + as$ ------------------------ (3)

where "V_f""is the linear velocity of the body at the end of the period of analysis", "Vi" is the "linear velocity of the body at the beginning of the period of analysis", "a" is the "linear acceleration experienced by the body", "t" is the "period of time over which the analysis occurs", and "S" is the "linear displacement that the body undergoes during the period of analysis". These equations become very essential in determining the outcome of human movements given in account the knowledge of certain kinematic variables related with the movement (Payton, 2008).

However, symmetry of gait, which is the perfect similarity between right and left measures,may not stands in healthy populations. Statistically significant distinctions in kinematic and kinetic measures between limbs must be observed, which may also contradict the assumption of gait symmetry. Previous investigation indicates that separate limbs are used by individuals more heavily for “stabilization, propulsion, or braking during walking”. While distinctions could be attributed to limb dominance, as is established within the upper extremity, lower extremity (LE) differences which have been reported despite controlling for dominance (Radzak et al, 2017).

2.1.6 The importance of analysis in bio-mechanic

Bio-mechanic is interested in the field of Physical Education studying force and its effects on the body leading to the athletic movements, as well as the mechanical application of the principles and rules on the conduct of sports movements under certain biological conditions, then (bio-mechanic is the science of the machine or nepotism and means studying bio mechanics) (Susan J., Hall, 1995).The use of bio-mechanic sports analysis in different movements, especially volleyball skills is one of the necessities of learning and training for the various events of the game, which in turn helps the teacher and the coach and the academic strengthen in the process objectively through rigorous kinetic analysis (Farfel, 1983; Cease, 1992).The bio-mechanic science in its modern conception has become a science of freestanding, which has its theories and multiple methods and the basic method of analysis, as well as it has its rules applicable basis on its own that is used in a wide range in the study of movements of various terrestrial, whether the individual movements or group as well as that bio-mechanic is of sections, some of which is interested in the study physical description of the movement without addressing the force and so it's called bio-kinematic (Susan J. Hall, 1995).Science that deals with the description and external phenomena and assess achievement and diagnose mechanical and anatomical factors and surrounding factors clarifying the rules of bio-mechanic and motor learning (John, 1926).

2.1.7 Bio-Mechanical analysis in Volleyball

Is sorting and classification of data for key elements and then processing logically with outcome of scalable digital limited when interpreting compared with the proper and specific standard for switching to useful formula meanings and to solve the problem the researcher (Moor, 1979).The bio-kinematic variables are the most important points that should be focused by the athlete before the serve is completed, such as the selection of the proper angle for all sections of the body, especially the launch of the player to obtain a higher elevation angle (the highest - in front) so that the vertical vehicle is more valuable in angle than the horizontal closely with technique movement where the best angle to deliver the projectile to the fullest extent is the angle (45), where the horizontal speed is equal with the vertical (Blazerich, 2007).An excellent understanding of biomechanics of volleyball is a significant factor in the evaluation and treatment of a volleyball playerin the game, the athlete has to perform repeated maximal vertical jumps, direction changing sprints, many dives all in an attempt to save the ball, and of course the repeated overhead movements of upper extremities while spiking, serving or blocking (Seminati, &Minetti, 2013).A serve sets each rally, the player normally strikes the ball with the hand overhead, while standing or jumping high in the air, hand speed is calculated to be approximately 13.1 m/s while it accelerates the ball to velocities up to 120 km/h as established by Kugler et al., (1996). The stresses endured as a result of repeated spiking and Jump serving, subject's low back and shoulder to a high risk of injuries. Both actions are been identified by simultaneous forceful hyperextension and rotation of the low back, as well as higher shoulder external rotation (150 deg in spike/serve) (Seminati, &Minetti, 2013).The biomechanical model of an overhead/throwing sports is considered to be open kinetic chain of segments that performs in a manner of proximal-todistal sequence. Each part of the body accelerates sequentially, transmitting force and energy to the next segments, and subsequently imparting maximum velocity to the ball (Seminati, &Minetti, 2013).The spiking kinematic in volleyball has a distinction, based on the fact that, the athlete needs to accelerate a ball while in mid-air and without a closed chain backing according to Jacobson & Benson, (2001).

Reeser et al. (2013), suggested that volleyball specific skills required maximum shoulder abduction and maximum horizontal adduction when compared to other overhead sports. Wagner et al. (2012) affirmed that, biomechanically, spike and serve are very similar with regards to the act of pitching, tennis serve and handball throwing.All these overhead sports are grouped by a phase of wing up and cocking, before a rapid acceleration, with the humerus "140-170 deg, abducted at the ball contact and the trunk backward rotated to be (-64 ± 16 deg) and in hyperextension (27± 7 deg" (Wagner et al., 2012).There were much emphasis not only on the shoulder and trunk but also on the elbow and legs which are highest in the cocking and acceleration phase, making these movements the most sensitive with respect to risk of injury. We can be compare upper limb body segments with a two-segment hinged ruler, as the first segment moves forward (arm), the other (forearm) lags behind, then moves forward and past below at an even higher speed. The hand velocity was calculated to be around 19.2 ms- (Coleman, Benham, &Northcott, 1993). However, the investigation of Wagner et al (2012) found upper limb biomechanics among the three overhead sports placed volleyball-specific kinematics and kinetics of the athlete to greater risk of developing infraspinatus syndrome.

However, biomechanics of different movements involved in the game of volleyball (particularly spiking and serving) is subject to some risk factors of overuse injuries of the shoulder, which is always exposed to higher values of torque and range of motion in a very short time (Seminati, &Minetti, 2013).

2.1.8 Bio-Mechanical analysis of the jump serve movement

It highlights the importance of kinetic analysis to identify mistakes and correct and that the study of the mechanical aspects of the motor performance based on the objective measurement method using the mechanical analysis, which plays a major role in the development of performance (Carr, 1997). As well as the attention to aggregates muscle working on the arms and developing since the appropriate strengthening to the hands, wrists and shoulders form the structural side when we need physical preparation program (Red Holman & Leonard Lewis, 1989). The Modern volleyball game invented by William Morgan in 1995 is a game needs a higher degree of accuracy, safety and technical and tactical skills andfitness (Volleyball. best sport, 1998).

2.1.9 Technology to Record Kinematic Variables

There are various technologies available to the choice of practitioner to assess the kinematic variables related with the performance of his or her athletes while running, jumping, and resistance training exercises. Some of these technologies include timing gates, contact mats, position transducers, accelerometers, Global Position System devices (GPS), and motion-analysis systems. Kinematic data associated with the motion of an athlete's center of mass (CM) can also be gathered from force data collected from a force plate, a technology with same ability function(Payton, 2008). However, mask tracker also is a device that has the ability to follow the motion of an object while in a game. Normally, you can use the tracker to make masks in order to hide clips from the final output, select a part of the image /video to apply the require effects, or merge clips from different sequences(After Effects, 2016). It is very important in tracking the positions and contact time points of the players and the ball in volleyball videos(Gomez, et al., 2014). More so, it is also part of its features, selectionsof many masks before the starts of tracking operation and keyframes are then merge to the Mask

Path property for the each selected mask.The trackedlayer has to be a track matte, an adjustment layer, or a layer with a source that can contain motion.The mask tracking analysis searches for content inside the mask, then use the mask enlarging property to enlarged or contract the area of the mask(After Effects, 2016).

2.1.10 Analyzing by computers and software used in analysis

The distinctive features of the present era and what is discovered from the modern technological developments in the computer world and electronics and entering into all the details of life gave those who are interested in the field of education the possibility of exploiting the many facilities provided by the computer and the analysis using computer which is the analysis done by the mechanism cells of automated computer memory (Al smaidae, 2011). As is known, the latest program, which began to rely on is the program (Max TRAQ), which is used for the purpose of measuring all the different mechanical variables as we give the subject center of gravity this property that Max TRAQ is unique.

2.1.11 Force measurement Platform

Is an electrical electronic sensitive balance that has the ability to measure strength in both vertical and horizontal type as well as the sum, and responds to changes in the amounts of accelerating the movement of center of gravity, relying on the module (force=m*a), as well as to know the direction of the site and the impact force (Meivin, 1973). We mean by force from the mechanical aspect in general concept is the push or pull affecting in an object (Susan J. Hall, 1995). And the platform is used in the sports field to determine the level of technical performance and mistakes from the driving force of an athlete (Payne, 1986). And the study of the amount of this force and how it affects gives valuable information about the achievement, the scientific advantage of using this platform and graphical forms are represented by two dimensions (vertical: Strength Index recorded while the horizontal represents: the time it takes to perform Index), Moreover the time of the occurrence of any value to the force can be calculated at any moment of the movement and through the calculation of both strength and time we know the value of the push (www.iraqaced.org, 2009).

That, and there are procedures that must be implemented to obtain accurate information about the case to be measured when using the platform of force which is characterized as having a flat surface leveled to the surface of the earth ensures the player to pivot and stand on its surface steadily and distinctively which can be seen from a distance, and the platform has to be fixed to the ground sensitivity which gives us amounts of the driving force and the time of impact through the force-time curve (Payne, 1986), which lets us to:

1. Comparing the recorded strength for athletes with a difference of their way of technical performance.
2. Comparing the recorded strength for variant athletes with one technical performance.
3. The use of the recorded force in developing the components of situation required to be studied.
4. Provides us with the level of athlete's development from null.

2.1.11.1 The importance of studying the force-time curve

The force-time curve shows the causes of the movement which is the strength caused from muscle work, and through the curved the following can be studied:

1. Get the rate of recorded force from the beginning of the movement to the end.
2. Get the strengthen of the movement of the body on platform impact when landing, and the rapid movement from steering the force to the ground to responds the latter by opposite reaction on the push.
3. It provides us with the values of the force focused on the ground by collision, absorption, push and elapsed time and measure the vertical distance of foot's performance and speed.
4. Provide us with curves among various attempts of the players and reaches us to the best performance for each player through the shape of the curve.
5. Assists in developing the training programs and provides us with objective values and level of player's development in the training season by giving us numerical values more accurate than other methods as well as the force-time curve gives an indication of the maximum strength and explosive force in every moment of time (Payne, 1986).

2.2 Literature Review

The researcher in this chapter made every effort to locate and collect the literature relevant to the study, through studies and research Previous that have been focal to him by a researcher there are no similar studies of analyzingjump serve on force platform, and with the spectrum there are a lot of studies and scientific research Take all jump serve, but not bio-mechanical of jump serve on force platform. Take these studies and do the research on clubs, teams and coaches. there are many studies and researches have been carried in different languages on the subject of jump serve, the subject of kinematic of jump serve and the subject of linear and angular kinematics for jump serve, the researcher mentions below the various sources that review the related literature available in the Near East university library and few from other sources are presented in abstract in this chapter to provide the variable background material for this study, can address these topics and studies as follows:

2.2.1 Study of Hirunrat, (2014)

The objectives of the study were to define the kinematics and total mechanics of the energy differences among the jumping serve skills of women volleyball players. Kinematics data included linear and angular velocity and the linear and angular acceleration of the upper and lower extremity and the center of gravity, as well as the kinetics and potential energy during ball contact. The statistics were measured in mean and SD. the results show that the maximum of linear velocity of finger, wrist, elbow, hip, and knee were 16.32, 13.25, 6.12, 1.95, and 4.22 m/s, respectively. The maximum of linear velocity of shoulder and ankle were 3.57, and 4.95 m/s respectively. The maximum of linear acceleration of wrist, elbow, and hip were 271.85, 110.03, and 25.09 m/s^2, respectively. The maximum of linear acceleration of the finger and shoulder were 271.74 and 53.88 m/s^2, respectively. The maximum of the linear acceleration of the knee was 18.69 m/s^2. The maximum of the linear acceleration of the ankle and toe were 40.4 and 50.95 m/s^2, respectively. The maximum of the angular velocity of the wrist, hip, and ankle were 397.35, 536.66, and 286.5 deg/s, respectively. The maximum of the angular velocity of the elbow and knee were 1186.7 and 304.73 deg/s, respectively. The maximum of the angular velocity of the shoulder was 493.61 deg/s. The average velocity of the center of gravity was 2.07 ± 0.65 m/s, and the maximum was 3.15 m/s. The maximum relative of the height of C.G. and body height was 86.8%, and the average total mechanical energy was 1039.5 ± 219.4. They conclude that the appearance of the upper body joints of elite volleyball players during ball contact could be used as a criterion of jumping serve skill and as a measure of basic-performance.

2.2.2 Study of Singh (2012)

The purpose of the study was to determine the relationship of selected linear and angular kinematics variable with the performance of jump serve in volleyball. The subject for this study five female national volleyball players of Chhattisgarh, the age varied from 19-23 year old. The performance of jump serve was measured by Russellunge volleyball serve test. Each subject was given ten service and whole movement in sagittal plane filming and recorded by video-graphy technique. The high speed camera (Sony Model 3CCD, HDDR

FX1) was used in video-graphy. Segmentation method was employed to determined height of center of gravity. The data was used by using Pearson's product movement correlation to ascertain the relationship between the selected angular and linear kinematics variable with jump serve performance in volleyball. The level of significance was set at 0.05 levels. There was positive relationship between wrist joint and elbow joints angle during hitting the ball. Another selected angular and linear kinematics variables does not show the significant relationship with the performance of jump serve in volleyball. This does not mean that these variables might have not influence the performance in jump serve.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This section will look at the research design, population, research instruments, and data collection and presentation procedures. The main aim of this study is to obtain adequate data that will be used to answer the research questions and therefore making good recommendations**.**The study was conducted in the following steps:

Table 1: Steps used in the experiment

s/n	Steps
1	Research design
2	Research approach
3	The questionnaire and validity test
4	Selection of the research area and unit
5	Study population and sample size
6	Materials and methods
7	Procedure of the study
8	Pilot study and main experiment
9	Data collection instrument and data analysis
10	Reliability test

3.2 Research design

This section will give details on the research approach and how the data is collected and analyzed.

3.3 Research Approach

This study utilizes quantitative approach in finding the relation between some kinematic variables and strength function-time of jump serve in volleyball. Also, the study will use descriptive statistics such as mean and Standard deviations to determine the responsiveness of the variables to a change in either a situation or strategy. Correlation analysis was carried out to know the degree of association and relationship between kinematic variables and the strengths function-time variables. In statistics, correlation r measures the strength and direction of a linear relationship between two variables and SPSS will be used for this. The approach is selected to bring potential benefits in terms of data quality and depth of understanding. The quantitative data is used to gather the level of relationship between kinematic and strength function-time of jump serve.

3.3.1 The Questionnaire

The aim of the questionnaire in this study is to provide an insight about variables and tests required to be relied upon to accomplish the research. Three different questionnaires that answer questions on the appropriate and performance of volleyball serve; second questionnaire is about the appropriate bio kinematic variables to be used in the study and the third questionnaire is about the variables for strength function-time.

Skill test for jump serve skill in Volleyball was done by drafting questionnaire with two different tests as shown in appendix 1. 10 experts in the field of volleyball were administered the questionnaire and all the 10 respondents choose the first test. Thus, first test (test of accuracy of jump serve ‘diagonally or straight’ performance) received 100 percent approval, the nature and procedure of the test is presented in the appendix page of this study.

Identify bio-kinematic variables in Volleyball was validated by administering questionnaires to 8 different experts in the field of volleyball, 52 variables that relate to bio-kinematics were presented and the responded selected some variables that fit the current study and also categorize these variables into jumping stage (collision, absorption, pushing), flying stage (before hitting and instant hitting) and landing stage. The questionnaire can be found in the appendix page.

To identify strength function – time variables in Volleyball, questionnaire was design and sent to experts for validity test. 8 experts were requested to identify the variables that fit best for the current study and also categories each variable into collision, absorption and pushing stages. Since the group of experts (academicians) has good knowledge of the game, they were given the questionnaire for validation (validity test)

3.4 Selection of the Research Area and Unit

In the following sub-section, the research area and the participants in the survey will be presented.

3.4.1 Study Population

Study population in quantitative research is the number of people, object, place or event that is usually selected randomly for a specific research or investigation (Abdulmajid, 2014). The population in any research study must be explicitly defined in line with particular characteristics such as sex, age, geographical. Thus, the research problem and study objectives defined the study population in any research.

The research area is selected for this research based on the information, facility and availability of the subject. The study population included 18 volleyball players from Erbil club and the time period is 2015-2016 season.

3.4.2 Description and Selection of the Research Units

The subjects that take part in this study were selected based on some given criteria. These include players that are right-handed, male players and age of between 18 to 32 years.

3.4.3 Sample Size

Planning in any research requires a number of sampling size needed in the research. This sample size will depends on the aims, scope and nature of the research and on the expected result (Lwanha et. al, 1991). However, the sample size of this study was chosen to be 10 right handed male volleyball players.

3.5 Materials and Methods

10 male volleyball players of Erbil club who had average to excellent level of jump serve participated in the study. All of them were healthy and had no history of serious injuries at least 3 months prior to data collection. All the subjects were informed about the purposes, procedure and important of the study. The anthropometric data were measured as shown in table 1. All subjects were asked to warm-up and perform jump serve before testing. A video

camera (Sony camera), the first camera is located at 7.65m left and 1.5m height of the force platform, the second camera is located right side of the platform at a distance of 7.65m and 1.5m height, the third camera was placed at the front of the platform at a distance of 8.34m and 1.5m height to capture the motion of the players. Three dimensional motions were obtained from approach to landing. Five successful trials were recorded for each player and the results are as shown in table 2. Kinematic and kinetic data were examined and analyzed using skill Spector V.1.3 the selected kinematic variables were collision variables, absorption variable, pushing variables, maximal arch, hitting, landing and the variables between stages. The selected kinematic variables were potential and kinetic energy during ball contact. The statistical analysis was conducted with SPSS version 20.

3.6 Procedure of the study

The researcher personally met the players of Arbil Club at the College of Physical Education Hall, University of Dohuk, and they were informed about the necessity and importance of this study. The players have been granted time to warm up, and then the volleyball player performed the jump serve by giving him five trials; each trial was recorded as shown in the table 2. Also, at the same time performs the serve by jumping on the platform of force-time function for the purpose of obtaining the value of the explosive force for push on the podium (pivot), and by this, we filmed the serve movement for the purpose of obtaining kinematic variables and at the same time to get the explosive force on the platform of force-time function, and by using the three cameras with speed of 480 images in a second, after that we got a video of the jump serve movement for each player, in which the best attempt has been analyzed for each player for the total sample. The players perform the jump serve by waiting for the researcher's instruction and after that they step on the force platform before making the jump serve. Thus, instructions from the researcher, stepping of the force platform and making the jump serve only at the center of the court (location of the force platform) were restrictions during the jump serve. However, it is assume that the subjects perform the jump serve in similar way as it is in the game situation.

3.7 Data Collection Instrument

Three different questionnaires that answer questions on the appropriate and performance of volleyball serve; second questionnaire is about the appropriate bio kinematic variables to be used in the study and the third questionnaire is about the variables for strength function-time.

Test for jump serve skill in Volleyball was done by drafting questionnaire with two different tests as shown in appendix 1. 10 expertsin the field of volleyball were administered the questionnaire and all the 10 respondents choose the first test. Thus, first test received 100 percent approval, the nature and procedure of the test is presented in the appendix page of this studyidentify bio-kinematic variables in Volleyball was validated by administering questionnaires to 8 different experts in the field of volleyball, 52 variables that relate to bio-kinematics were presented and the responded selected some variables that fit the current study and also categorize these variables into jumping stage (collision, absorption, pushing), flying stage (before hitting and instant hitting) and landing stage.

3.7.1 Data Analysis Procedure

Statistical package for social science (SPSS statistics for windows version 20.0 IBM corp. Armonk New York USA) was used for the data analysis. Means, standard deviation and Pearson correlation analysis were computed. Also, Microsoft excel was used to demonstrate some graphical information in the study. Through the field test of jump serve we got a video recording for each player and at the same time we got the explosive force values and time through the use of the force-time function platform, and we have entered the obtained video that we got to the analytical program called (Max TRAQ), to get kinematic variables of distance, times, angles, and elevations of the stages of multiple serve movement which is the collision and absorption, pushing, maximum arc and hitting, and at the same time explosive force values were obtained and time and entered into the program (Excel) and then we get kinematic values and explosive force we have entered into the statistical software to identify the degree of the relationship between these two regular variables (kinematic variables and explosive force variables) of the stages of the jump serve movement. The logger pro was used for data collection analysis.

3.7.2 Validity Tests

Validity test focuses on the meaningfulness of research components (Drost, 2011). The notion of validity test is to determine if the respondents will be able to easily understand the purpose and requirements of the research instrument (Pickard, 2013). They are the four major types of validity test (internal validity, external validity, statistical validity and construct validity). In research there are four types of validity test that include internal validity, conclusion validity, construct validity and external validity. In this thesis, the validity used is construct (content) validity. Content validity is a qualitative type of validity that the domain of the concept is made clear and the analyst judges whether the measures fully represent the domain (Drost, 2011). The content validity is this study was done by asking expert (expert in the field of volleyball) for their opinion on the variables that related kinetic and kinematic.

3.7.3 Reliability Test

In measuring some behavior or attribute when using psychological test, reliability need to be considered (Drost, 2011). The reliability is the level to which measurement are repeated especially when several individuals take part in the measurement on different period under different condition with supposedly different instruments that measure same thing. However, reliability means consistency in measurement or the stability of measurement over different conditions that could provide same results (Nunnally, 1978). Data gotten from behavioral research studies are affected by random errors of measurement. These errors can be in form of systematic error or random error. Reliability test can either be alternative form, test-retest reliability, split-halve, internal consistency and inter-rater. In this study, test-retest reliability was used to measure some of the tools. Test-retest reliability is a temporal stability of a test from one measurement session to another. This is done by administering the same test to same set of respondent at a later date. Thus, the correlation between the scores on the identical test given at different times operationally defines its test-retest reliability (Drost, 2011). The reliability of the stadiometer was measured by measuring the height of two persons three different times and the results obtained shows very close measurement. Also, the medical weight reliability was tested by measuring the weight of another set of two people for three consecutive times. The difference in the measurement was not much.

3.8 Tools used in the study

Stadiometer is an instrument used to measure the length (height) of people. This piece of tool that has construction like that of a ruler with a sliding horizontal headpiece used for the adjustment was used to measure the height of players, the unit of this instrument is meters. Also, medical weight scale that calculates mass or measure weight was used to measure the weight of the players prior to the experiment. The stair wall was done so as to measure the vertical jump of the players.

Table.2: Anthropometric data of the subjects (volleyball players)

s/n	Height cm	Mass Kg	Age Years
1	197	86	20
2	180	63	19
3	187	80	22
4	190	90	25
5	192	92	25
6	190	70	19
7	180	72	26
8	198	73	21
9	185	80	32
10	182	74	32
$\overline{X}$	188.1	78	24.1
SD	6.48	9.297	4.863
Coefficient of Variance	3.4	11.91	20.1

As shown in table 2 above, the anthropometric data of the players, the mean score of their ages was found to be 24 years; the mean weight is 78kg and the mean height is 188cm. Thus, the above 10 subjects volunteered to participate in the experiment.

3.9 Research test

Test the accuracy of jump serve for research's sample, and the purpose is to measure the accurate of the test and the tools used are

- Volleyball court
- Volleyball balls (10)
- Volleyball net as well as columns
- Stick tape to determine squares on playground

The test environment different slightly from the actual game environment as a result of certain factor such as adhesive marks on the participant's body, restricted path of walking, and restricted zone jump. In addition to the absence of complete team-mates and opponents players, this may impose restrictions of the subjects when they were asked to jump on the force platform to perform the movement.

Table 3: Accuracy test of the jump serve

Name	Attempts					True	False
	1	2	3	4	5		
Dilovan	⁄	⁄	X	⁄	⁄	4	1
Ahmed	X	⁄	⁄	⁄	X	3	2
Muhammed	X	X	X	⁄	⁄	2	3
Nawzad	⁄	⁄	⁄	⁄	⁄	5	0
Saleem	⁄	⁄	⁄	X	⁄	4	1
Bleen	X	X	⁄	⁄	X	2	3
Gailan	X	⁄	⁄	⁄	⁄	4	1
Bawar	⁄	X	⁄	⁄	X	3	2
Waleed	⁄	X	⁄	X	⁄	3	2
Araz	X	⁄	⁄	⁄	⁄	4	1
Succeed serve						34	
Percentage						%68	
False serve							16
Percentage							%32

As shown in table 3 above, tests for jump serve was performed by all the players that partake in the study, each player was given five trials and the result for each jump serve was recorded as presented in the table. A player is score right whenever the ball falls within the marked area as shown in the appendix. However, there are some restrictions when the players were asked to perform the jump serve, this include the restriction due to the force platform (the players serve on the plat form as they did in the game as shown in the figures), restriction due to instructions that the get before performing the jump serve.

3.9.2. Force measurement platform

A measurement platform of earth reaction force has been built (0.8m X 1.2m) which reflects the hanging force on the device provided with a computer, works with (AC – DC) force (220 Volt) and on battery for (1.5 to 2) hours, the platform transmits the electric indicators to the computer throw number of (Strain gauges), the gauges start to work at the moment the center foot touches the external board. And it stops reading data the moment of athlete’s launching at the end of throwing. As for platforms ingredients, it is as shown in figure (1), and also it has been calibrated in a study (Al-Obaidi, 2010,p 63-66).

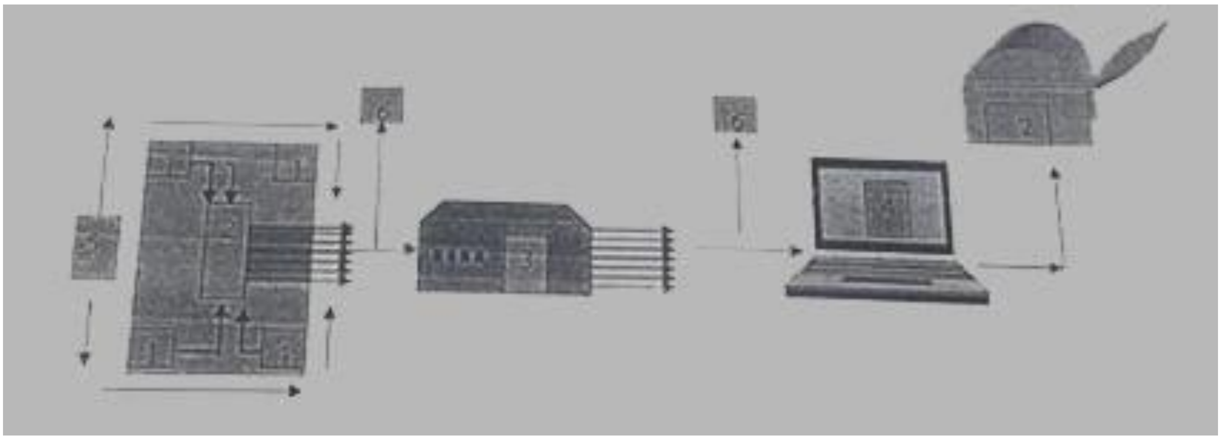


Figure 1: Parts of measuring platform of earth's reaction and its accessories.

1. Strain gauges. 2. Collector signals. 3. Signals reader and processed. 4. the computer

5. Platform power. 6. Wires to connect to the data. 7. Laser printer

Forceplateofgallileoperformancetester®wasused**.** Gallileoperformancetester®hasleft-right& front-rear measurement in addition to a software analysis of squat, SJ, CMJ, DJ, repeated jumps, reaction time, and balance. This force plate has specifications of the following which confirm the reliability and validity the tool**:**

•size: 116 x 85 x 7,5 cm

• 2 platform sizes: 101 x 34 cm

• separate left-right measurement

• measurement frequency 250 Hz

• accuracy 1,2 N

• power: 100 - 240 volt

To identify the values of figured shapes, click on (View chart) at the bottom of programs window which is prepared for that purpose, the shape will come out with two dimensions (X) represents the time and (Y) represents the amount of recorded earth's reaction force. As shown in figure (2)

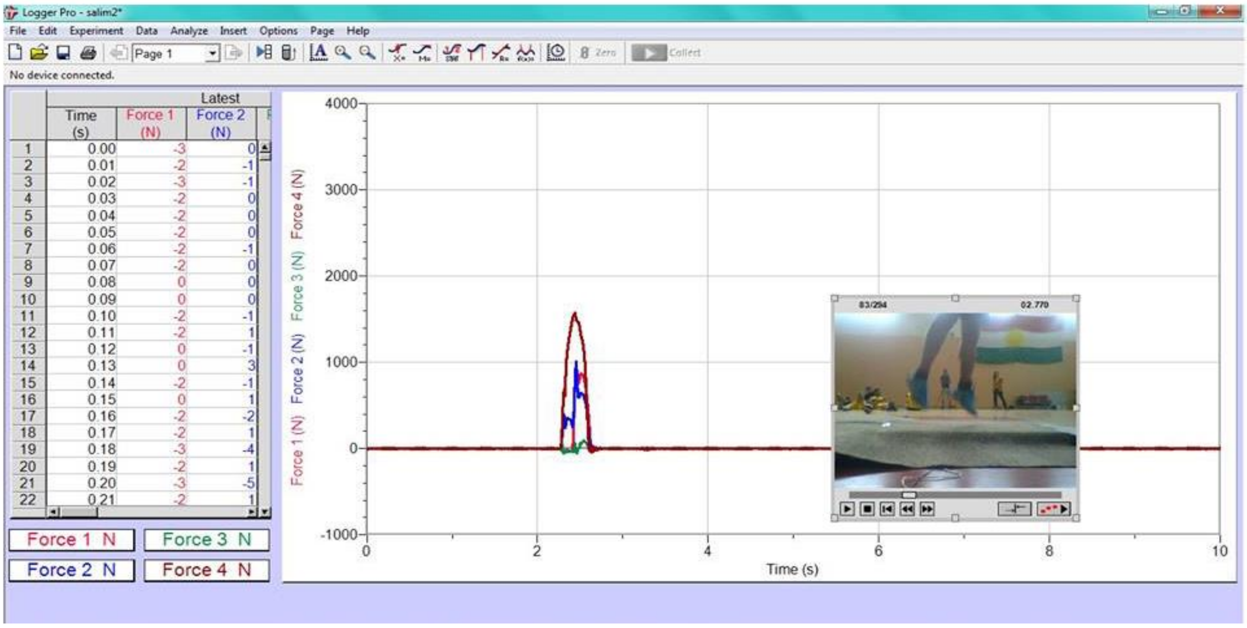


Figure 2: X coordination (Time) and Y coordination (the amount of recorded earth's reaction) as shown in computer.

This is for the way of knowing the amount of the variables of measuring platform of earth's reaction which are recorded on (Excel), page (Sheet 1). And for the of getting and knowing the shape of the curve chart, just click on (chart 1) at the bottom of the Excel, the curve chart will come out and for any recorded movement on the platform. See figure (3)

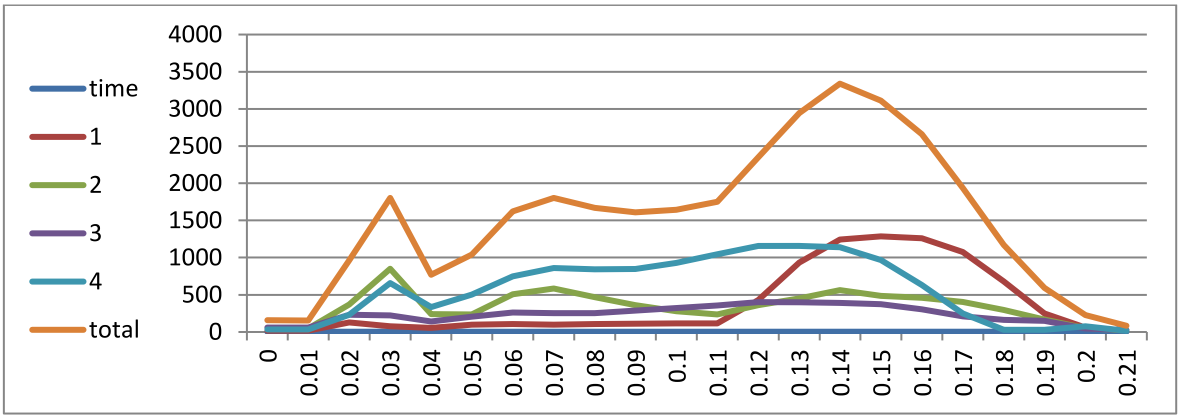


Figure 3: Shows the chart curve of force-time module, and the system of weighing for one member from the sample as shown in (Excel 2007).

3.10 Scientific technique observation

To achieve the scientific observation, the researcher has used the following: Three video recorders have been used, type (Sony) with (480) frames per second, and the results were:

1. First camera: the distance from the force platform on the left 7.65m and 1,5m height.
2. Second camera: from right side of platform the distance was 7.65m and 1.5m height.
3. Third camera: 8.34m to the front of the platform and 1.5m height.

The figure (4) shows the location of distance and height of the video recorder during the main experiment of the research.

Figure 4: Location of the video recorders and height during the main experiment of the research

The video record has been done for explosive strength on the force platform at the same time to measure the power of reaction at once to all the five attempts for each player the best attempt was chosen.

Figure 5: shows the player during the jumping on force platform.

3.11 Pilot study

The first exploratory experiment was done in May 23th 2016 at exactly 10am in Duhok University's stadium, on two players from the university's team, and the aim of the experiment was:

1. Insure of the validation of the platform of ground reaction force to work in its position inside throwing circle.
2. Clarity of diagrams that are obtained from the recording platform of ground reaction force.
3. Identify and reset the time of the platform action in proportion to the time of performance.
4. Make sure of the platform inside the throwing circle.
5. Making sure of validation of tools and the light degree.

3.12 Main Experiment

The researcher has made the main experiment in an internal basement of college of physical education/DUH, on May 25th 2016 at 12.00 pm. The work plan has been divided according to an agreed plan to save time, and do the experiments organically and accurately. Three recording cameras have been prepared, as shown in figure (6).

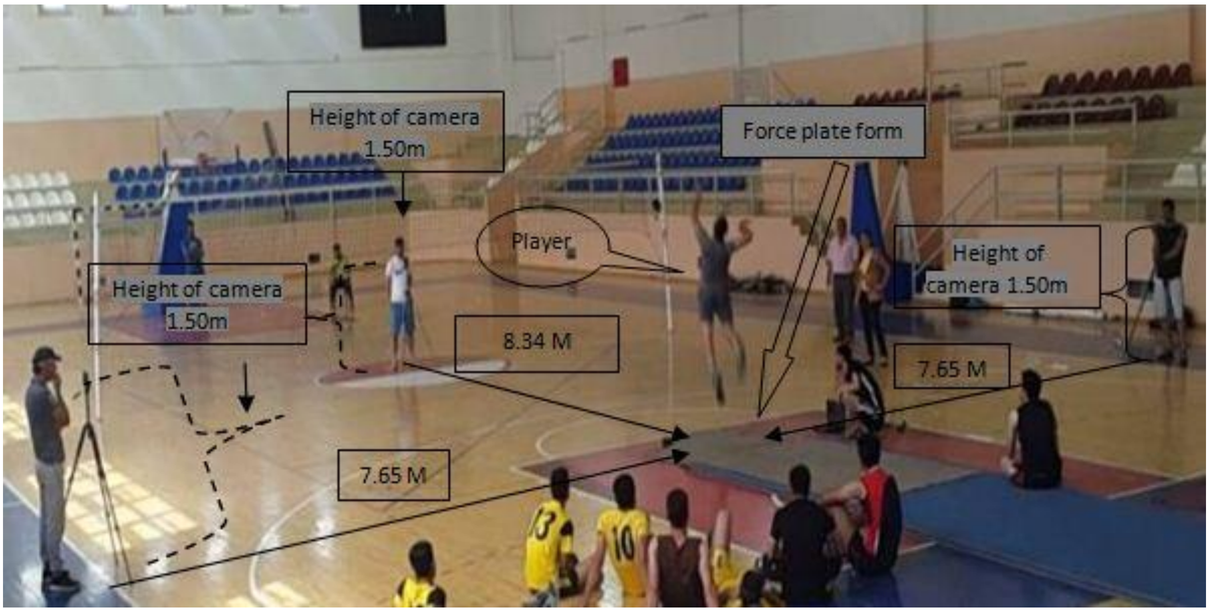


Figure 6: Field position of research main experiment.

3.13 The stage of jump serves in Volleyball

1. Collision
2. Absorption

3. Pushing

4. The flight and the Maximal Back arch were measured.

5. The hitting stage of the ball

6. The landing outside the force platform

And the video has been recorded with saving the amount of explosive force on the force of center reacting measurement platform in the same time, as shown in figure (7) and the picture represent the stage of jump serve in volleyball.

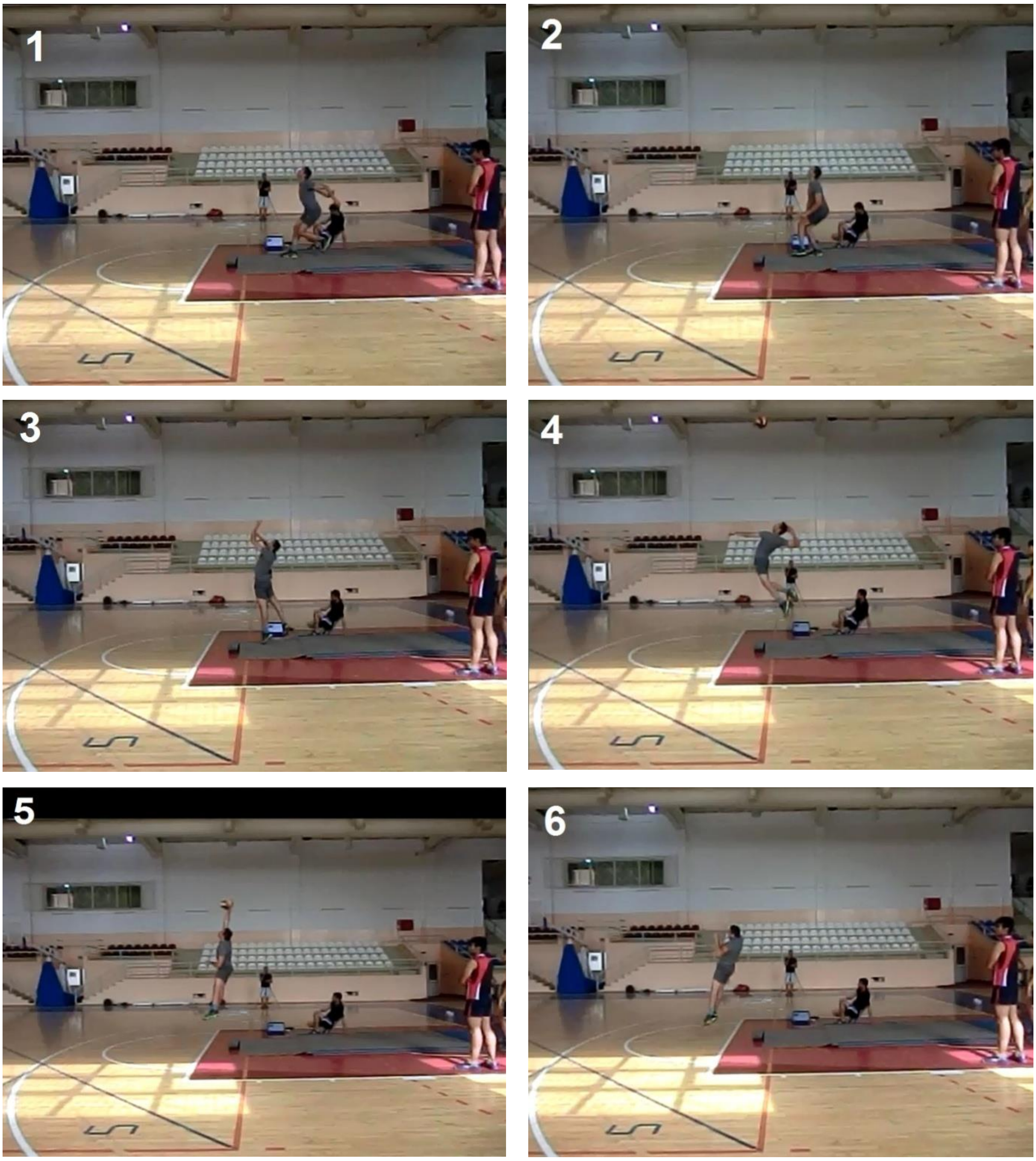


Figure 7: The sequence of player jump serve on the platform from left side.

3.14 Method of extraction of kinematic variables

The researcher extracted the variables of kinematic depending on program (MAX TRAQ) to find out the levels and values of the following variables:

Collision phase

Angle of right knee: is the limited angle between the thigh and the right leg, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

Angle of right shoulder: is the limited angle between the arm and forearm of the right arm, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

Angle of right hip: is the limited angle between the right thigh and the right trunk, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

Distance between feet: it is the measured distance between the end of the right foot and the beginning of the left foot, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

The height of C.G.: it is measured height between centre of gravity and ground in vertical way, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

Angle of right ankle: it is the measured angle between the right foot and the leg of the right leg, when the player takes a second step of jump serve, and where the right leg is in the front and the left leg in the back where the right foot hits the platform.

Absorption phase

Angle of right knee: it is the limited angle between thigh and leg of the right leg, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Angle of right shoulder: it is the limited angle between upper arm and hand of the right arm, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Angle of right hip: it is the limited angle between right leg and right trunk, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

The height of C.G.: it is the measured height between playercenter of gravity and ground in vertical way, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Angle of right ankle: it is the measured angle between right foot and leg of the right leg, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Angle of left hip: it is the limited angle between left leg and trunk, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Distance between feet: it is the measured distance between the end of right foot and the beginning of left foot, when the player is in second step and the middle part of it, in which the player tilts his body down to save potential energy to get ready to jump.

Pushing phase

Angle of tendency: It is the limited angle between vertical lines of middle of the trunk with vertical line from center of gravity in a straight way, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Angle of tendency for trunk C.G. with horizon: it is the limited angle between center lines of trunk horizontal line stretched from center of gravity in parallel with the ground, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Angle of right shoulder from forward: it is the limited angle between arm and hand of the right arm, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Angle of right shoulder: it is the limited angle between arm and hand of right arm, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Angle of right knee: it is the limited angle between thigh and leg of right leg, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Angle of right hip: it is the limited angle between right thigh and right trunk, when the player is in the last part of the stage of the second step when all the joints are stretched up.

The height of C.G.: it is the measured height between playercenter of gravity and ground in vertical way, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Time: it the consumed timing from absorption phase to push phase.

Distance between feet: it is the measured distance between the end of right foot and the beginning of left foot, when the player is in the last part of the stage of the second step when all the joints are stretched up.

Maximum arc (Before hitting)

Angle of tendency: it is the limited angle between vertical line of middle of trunk and vertical line in which climbs up from center of gravity in vertical way, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of right shoulder from forward: it is the limited angle between arm and hand of right arm, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of Tendency for trunk C.G with Horizon: it is the limited angle between center line of trunk with horizon stretched to C.G. in parallel with ground, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of right knee: it is the limited angle between thigh and leg of right leg, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of right shoulder: it is the limited angle between arm and hand of right arm, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of right hip to backward: it is the limited angle between right thigh and right trunk, when the player is flying in the highest point in the air and body inclination is max backward.

The height of C.G.: it is the measured height between player C.G. and ground in vertical way to the right, when the player is flying in the highest point in the air and body inclination is max backward.

The length of stretched back arch: it is the down line between right shoulder and right knee from backward, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of left hip from backward: it is the limited angle between left thigh and trunk, when the player is flying in the highest point in the air and body inclination is max backward.

Angle of left shoulder: it is the limited angle between arm and hand of right arm, when the player is flying in the highest point in the air and body inclination is max backward.

Hitting phase

Angle of tendency: it is the limited angle between vertical lines of middle trunk with vertical line climbs up from C.G. in vertical way, when the player hits the ball and he is flying.

Angle of right shoulder from forward: it is the limited angle between arm and hand of right arm, when the player hits the ball and he is flying.

Angle of tendency for trunk C.G. with horizon: it is the limited angle between middle line for trunk with horizontal line stretched from C.G. in parallel with ground, when the player hits the ball and he is flying.

Angle of right shoulder: it is the limited angle between arm and hand of right arm, when the player hits the ball and he is flying.

Angle of right knee: it is the limited angle between thigh and leg of right leg, when the player hits the ball and he is flying.

Angle of right hip: it is the limited angle between right thigh and right trunk, when the player hits the ball and he is flying.

The height of C.G. at the moment of hitting: it is the measured height between players C.G. and ground in vertical way to the right, when the player hits the ball and he is flying.

Time: it is the consumed time from the moment of pushing to the moment of hitting.

Landing phase

Angle of tendency: it is the limited angle vertical line of middle trunk with vertical line climbs up from C.G. in a straight way, when the player lands and touches the ground at first moment.

Angle of tendency for trunk C.G. with horizon: it is the limited angle between middle line of trunk with horizon line stretched from body C.G. in parallel with ground, when the player lands and touches the ground at first moment.

The height of C.G.: it is the measured height between players C.G. and ground in vertical way to the right, when the player lands and touches the ground at first moment.

Variables between phases

Vertical distance of C.G during pushing to hit: it is the vertical distance that measures for C.G. between moment of pushing and to the moment of hitting the ball, in which measures by the rib of triangle drawn between both C.G.s in both moments.

Horizontal distance of C.G during pushing to hit: it is the horizontal distance that measures to C.G. between pushing moment to hit the ball moment, in which measures by the rib of triangle drawn between both C.G.s in both moments.

Result ant distance of C.G during pushing to hit: it is the resultant distance measures to C.G. between pushing moment to hit the ball moment, in which measures by the rib of triangle drawn between both C.G.s in both moments.

The angle of shoulder from preparedness during hitting to instant hit:

This angle is measured by four points: 1. Shoulder in preparedness during hitting. 2. Palm in preparedness during hitting. 3. Shoulder in hitting the ball. 4. Palm in hitting the ball, And after checking the four points in Max TRAQ program to figure out this quad angle.

Angle of flying for ball: it is the limited angle between passing line through the core of the ball during hit moment and to fleet from the hand and horizontal line parallel to ground.

Angle of flying for player: it is the limited angle between the passing line of players C.G. and horizontal line parallel to ground between two moments, the moment of pushing before leaving the ground, and the moment that follows after flying.

3.15 Method of extraction of strength function – time variables

The researcher extracted the variables of force platform depending on program (logger pro) the converted to program (Excel) to find out the levels and values of the following variables:

Collision force: it is the value of the strength of the first moment of hitting the platform by right foot, and it measures by newton.

Collision force time: Is the time period in which the player reaches to the moment of the collision.

Less force: it is the minimum force value appeared in absorption phase and it measures in newton.

Less force time: it is the period the absorption moment takes.

Pushing force: it is the value of the strength when the body pushes up and all joints are stretched, and it measured in newton.

Pushing force time: it is the period that the pushing moment takes.

Total time on platform: It is complete time of the player on the platform.

3.16 Synchronization between force platform device and recording cameras

Synchronization between three cameras and force measurement platform has been done, beginning from the moment of touching, as the platform shows the moment of touching for the first height of force-time function curve, also a videotaping device specified to force measurement platform device was connected to a computer by universal serial bus, as it shows on the programs screen the moment of touching by video and the curve of force-time function in addition to digital values that climb every time touching happens on the left side of the screen of the program (logger pro), in sort of data tables shows contents of force and time.

3.17 Scaling tool

Scaling tool utilizes Scale bars providing a visual indication of the size of features, and distance between features, on an image. Scale bar in general is a line or bar divided into parts. It is labeled with its ground length, usually in multiples of image units. When capturing an image, it appears less than its actual size. So, it should be modified by using the following formula (Omer, 2013) (Mushin, 2008)

:

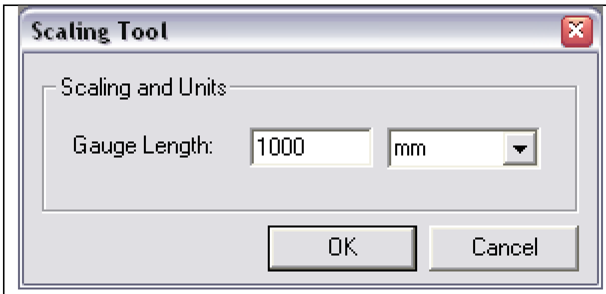
$$actual\ distance = \frac{distance\ witin\ image \times actual\ scale\ bar}{scale\ bar\ witin\ image}$$

3.17.1 MAXTRAQ scaling tool

Analyzing motion does not need to be expensive or hard to use. MaxTRAQ 3D is a flexible solution for your budget. MaxTRAQ 3D does not discriminate which camera you choose to use (standard camcorder to high speed). After you have scaled the coordinate system, the point coordinates are displayed in the units that you choose.

To scale the coordinate system, follow these steps:

1. Activate the Scaling Tool from the Tools menu or click the Scaling tool on the toolbar.
2. The following dialog will be displayed.



3. Enter the length of the scaling gauge.
4. Enter the units used.

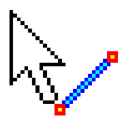
5. Click OK.
6. The mouse cursor will change to
7. Click on the first landmark.
8. Click on the second landmark.
9. A scaling gauge will be displayed between the 2 selected landmarks.

To cancel the scaling tool, simply select the scale command again or press ESC. If you need to delete the scaling tool, right-click on the gauge and then select Delete Scale. You can also change the units or gauge length by double-clicking or right-clicking/properties on the gauge. (MaxTRAQ manual).

3.17.2 Stick Tooling

The movement of every participant is tracked by fixing markers on predetermined points at limb joints, shoulder, hip, knee, and ankle (see appendix 4). These markers or sticker could be utilized after inside Maxtraq program as a sticking tool.

The stick tool in Maxtraq allows you to draw a line between 2 points creating a "stick figure". Note that if you want to create a stick figure with more than 2 points you need to activate the stick tool for each line. Once you have activated the stick figure tool, the mouse cursor will change to the following:



Then click on the 2 points that you want to draw a line between. The stick will be drawn after you have selected the second point.

To cancel the stick tool, simply select the stick command again or press ESC. If you need to delete a stick, right-click on the line and then select Delete Stick (MaxTRAQ manual).

3.18 The researcher has used the statistical program (SPSS), which depends the following role:

1. Mean
2. Standard Division
3. Simple correlation (person).

3.19 Statistical procedure employed

After data collection, they have been developed by a series of columns of data in a statistical program (SPSS) and the arithmetic mean extracted, and standard deviation of kinematic variables and strength function – time variables , also the simple correlation has been figured out (r) between the variables depending on the alternative hypothesis and with significance level less or equal to 0.05%, and the researcher depended on the alternative hypothesis that the jump serve performance is consensus in bio-mechanical transmissions from one part to another according kinematic variables and function of force-time, and for this reason the movement cannot be done without the relation between variables that contributes to the jump serve.

CHAPTER 4

RESULTS

In this chapter, the required information that answers the research questions is discussed. Mean, standard deviation, Pearson correlation measures that is a linear correlation between two variables x and y was used to measure the correlation between kinematic variables for jump serve stages with collision force variable on platform for volleyball players, The relationship of selected kinematic variables with strength function-time of jump serve in volleyball was calculated by using Pearson's product moment correlation and for testing the hypothesis level of significance at $p \leq 0.05$.

- **Mean and standard deviation analysis**

Standard deviation is defined as a measure of the dispersion of a set of data from its mean. If the data points are further from the mean, there is higher deviation within the data set. Thus, the standard deviation for the kinematic variables and strength function time is presented.

Table 4: Mean and standard deviation of kinematic variables

Stages	n	Variables	$\bar{X}$	Sd
Collision	1	Angle of Right Knee (deg)	174.79	9.88
	2	Angle of Right Shoulder (deg)	77.43	21.25
	3	Angle of Right Hip (deg)	135.19	12.6
	4	Distance between the feet (cm)	87.85	17.04
	5	The height of C. G (cm)	103.92	11.63
	6	Angle of Right ankle(deg)	110.95	35.10
Absorption	7	Angle of Right Knee (deg)	125.34	11.33
	8	Angle of Right Shoulder (deg)	27.09	2.78
	9	Angle of Right Hip (deg)	119.25	11.31
	10	The height of C. G (cm)	95.58	8.54
	11	Angle of Right ankle (deg)	107.13	19.46
	12	Angle of Left Hip (deg)	130.74	16.48
	13	Distance between the feet (cm)	40.44	12.53

Stages	n	Variables	$\bar{X}$	Sd
Pushing	14	Angle of Tendency (deg)	2.45	.99
	15	Angle of Tendency for hip C.G with Horizon (deg)	89.420	1.86
	16	Right Shoulder with Horizon (deg)	130.48	12.52
	17	Angle of Right Knee (degree)	141.02	10.11
	18	Angle of Right Shoulder (deg)	172.91	8.09
	19	Angle of Right Hip (deg)	194.98	12.69
	20	The height of C. G (cm)	141.98	17.87
	21	Time (sec)	.28	.03
	22	Distance between the feet (cm)	50.33	10.33
Maximal arch	23	Angle of Tendency (deg)	5.65	3.98
	24	Right Shoulder with Horizon (deg)	135.57	6.98
	25	Angle of Tendency for hip C.G with Horizon (deg)	84.71	3.35
	26	The angle of right knee (deg)	115.56	15.91
	27	The angle of right Shoulder (deg)	158.62	30.54
	28	The angle of right hip to backward (deg)	189.16	32.64
	29	The height of C. G (cm)	189.96	30.65
	30	The length of Stretched back arch (cm)	101.02	13.81
	31	The angle of left hip from backward (deg)	155.60	15.17
	32	The angle of left Shoulder (deg)	97.30	13.79
Hitting	33	Angle of Tendency (deg)	8.30	2.57
	34	The angle of right Shoulder to forward (deg)	166.95	10.01
	35	Angle of Tendency for hip C.G with Horizon (deg)	81.580	2.73
	36	The angle of right Shoulder (deg)	168.63	14.63
	37	The angle of right knee (deg)	157.41	8.31
	38	The angle of right hip (deg)	182.98	8.37
	39	The height of C. G in the moment of hitting (cm)	193.26	31.89
	40	Time (sec)	.56	.044
Landing	41	Angle of Tendency (deg)	6.88	4.84
	42	Angle of Tendency for hip C.G with Horizon (deg)	84.62	4.52
	43	The height of C. G (cm)	119.74	19.54

Stages	n	Variables	$\bar{X}$	Sd
The variables between stages	44	Vertical distance of C.G during pushing to hit (cm)	51.82	15.22
	45	Horizontal distance of C.G during pushing to hit (cm)	92.59	27.59
	46	Result ant distance of C.G during pushing to hit(cm)	109.06	26.82
	47	The angle of shoulder from prepared nessduring hitting to hit(deg)	69.48	9.57
	48	The angle of flight for ball (deg)	5.83	2.59
	49	The angle of flight for player (deg)	19.72	5.44

As shown in table 4, the mean and standard deviation of some kinematic variables are presented. Mean and standard deviation for right knee joint for variables are 174.79±9.88,125.34±11.3,172.91±8.09,115.56±15.91,157.41±8.31 for collision, absorption, push, max curve and touch respectively. The mean and standard deviation for right shoulder joint for variables are 77.43±21.25, 27.09±2.78,141.02±10.11,158.62±30.50,168.63±14.63 for collision, absorption, push, max curve and touch respectively. The mean and standard deviation for right hip joint for variables the values are 135.19±12.56, 119.25±11.31, 194.98±12.69, 189.16±32.64, 182.98±8.37for collision, absorption, push, max curve and touch respectively. The mean values are 12.56, 11.31, 12.69, 32.64, and 8.36for collision, absorption, push, max curve and touch respectively.

For distance between feet joint for variables the mean values are 87.55±17.04, 40.44±12.53 and 50.33±10.33.

However, the mean and standard deviation for center of gravity joint for variables are103.92 ±11.63,95.58±8.54,141.98±17.87,189.96±,30.65and 119.74±19.54 for collision, absorption, push, max curve and touch respectively.

Right ankle joint mean and standard deviation for variables values are110.95± 35.10107.13±19.46for collision and absorption respectively.

For tilt angular joint for variables the mean and standard deviation values are 2.45±0.99,5.65±4.84,8.30±3.98for push, max curve, touch and landing respectively.

For center of gravity tilt angular with horizon for variables the mean and standard deviation are 89.42±1.86,81.50±3.35,84.71±2.73, 84.62±4.52 for push, max curve, touch and landing respectively.

The mean and standard deviation for the rest variables are 51.82±15.22, , 92.590±27.592,109.06±26.82,69.48±9.57, 25.830 ,±2.592,19.72±5.44 for vertical center of gravity from push to touch, horizontal center of gravity from push to touch and the result of center of gravity from push to touch respectively.

Table 5: Mean and standard deviation of strength function-time

n	Variables	$\bar{X}$	Sd
1.	The strength of Collision (N)	1216.08	317.49
2.	The time of strength of Collision (sec)	0.03	0.01
3.	Minimum strength(N)	804.60	176.76
4.	The time of Minimum strength (second)	0.07	0.03
5.	Strength of pushing (N)	2780.18	338.22
6.	The time Strength of pushing (sec)	0.20	0.03
7.	The time of total touching (sec)	0.33	0.05

N=newton

Table 5 present the mean and standard deviation of strength force time. The mean and standard deviation for collision was found to be 1216.08± 317.49 and for collision timing variable the mean is 0.03± 0.01, for less force variable the mean and standard deviation are 804.60±176.76 and for less force timing the mean and standard deviation 0.07±0.03, for push variable the mean is 2780.18±338.22 and for push timing variable the mean and standard deviation are 0.20±0.03, for full touch timing variable the mean and standard deviation are 0.33±0.048.

- **Pearson correlation analysis**

Correlation analysis was carried out to know the degree of association and relationship between kinematic variables and the strengths function-time variables. In statistics, correlation r measures the strength and direction of a linear relationship between two variables. Pearson's Product moment correlation was used to find out the relationship of selected kinematics variables and strength function-time of jump serve in volleyball. The level of significance in order to check the relationship was set at $p \leq 0.05$.

The score of each kinematic variable were correlated strength function-time of jump serve in volleyball. In order to ascertain the relationship of selected biomechanical variables namely angle of right knee, angle of right shoulder, distance between the feet, height of center of gravity etc. with the strength function-time of jump serve in volleyball, the Pearson’s correlation was calculated. The values of co-efficient of correlations are presented in table 5 to 11.

Table 6: Correlation between Kinematic variables for jump serves stages with collision force variable

Stages	n	Variables	r	p
Collision	1	Angle of Right Knee	-.21	.56
	2	Angle of Right Shoulder	-.38	.28
	3	Angle of Right Hips	.04	.92
	4	Distance between the feet	.08	.81
	5	The height of C. G	-.36	.30
	6	Angle of Right ankle	.23	.53
Absorption	7	Angle of Right Knee	-.04	.92
	8	Angle of Right Shoulder	-.19	.59
	9	Angle of Right Hip	-.07	.84
	10	The height of C. G	-.29	.41
	11	Angle of Right ankle	.30	.39
	12	Angle of Left Hip	.29	.42
	13	Distance between the feet	-.11	.76
Pushing	14	Angle of Tendency	.12	.75
	15	Angle of Tendency for hip C.G with Horizon	.27	.45
	16	Right Shoulder with Horizon	.19	.58
	17	Angle of Right Knee	-.45	.19
	18	Angle of Right Shoulder	-.25	.48
	19	Angle of Right Hip	-.20	.57
	20	The height of C. G	-.19	.59
	21	Time	-.25	.49
	22	Distance between the feet	.58	.09
Maximal arch	23	Angle of Tendency	.28	.42
	24	Right Shoulder with Horizon	-.07	.840
	25	Angle of Tendency for hip C.G with Horizon	-.15	.68
	26	The angle of right knee	.10	.77
	27	The angle of right Shoulder	-.14	.65
	28	The angle of right hip to backward	.49	.14
	29	The height of C. G	-.11	.75
	30	The length of Stretched back arch	-.35	.31
	31	The angle of left hip from backward	.01	.98
	32	The angle of Shoulder for left hand	-.16	.65

Stages	n	Variables	r	p
Hitting	33	Angle of Tendency	.57	.08
	34	The angle of right Shoulder to forward	-.26	.46
	35	Angle of Tendency for hip C.G with Horizon	-.46	.18
	36	The angle of right Shoulder	.45	.19
	37	The angle of right knee	.26	.45
	38	The angle of right hip	-.03	.92
	39	The height of C. G in the moment of hitting	-.26	.45
	40	Time	-.14	.70
Landing	41	Angle of Tendency	.36	.29
	42	Angle of Tendency for hip C.G with Horizon	-.21	.55
	43	The height of C. G	-.31	.38
The variables between stages	44	Vertical distance of C.G during pushing to hit	-.23	.51
	45	Horizontal distance of C.G during pushing to hit	.32	.36
	46	Result ant distance of C.G during pushing to hit	.18	.60
	47	The angle of shoulder from prepared nessduring hitting to hit	-.41	.24
	48	The angle of flight for ball	-.19	.58
	49	The angle of flight for player	-.05	.89

$p \leq 0.05$

From table 6 above, the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with collision force variable on platform for Volleyball players. Thus, the research hypothesis, H1 was rejected.

Table 7: Correlation between Kinematic variables for jump serves stages with collision force time variable on platform of volleyball players.

stages	n	Variables	r	p
Collision	1	Angle of Right Knee	.02	.94
	2	Angle of Right Shoulder	-.05	.87
	3	Angle of Right Hip	.25	.47
	4	Distance between the feet	-.04	.91
	5	The height of C. G	-.09	.79
	6	Angle of Right ankle	.13	.70
Absorption	7	Angle of Right Knee	-.51	.13
	8	Angle of Right Shoulder	-.57	.08
	9	Angle of Right Hip	-.05	.88
	10	The height of C. G	-.00	.99
	11	Angle of Right ankle	.25	.47
	12	Angle of Left Hip	.12	.73
	13	Distance between the feet	.24	.50

stages	n	Variables	r	p
Pushing	14	Angle of Tendency	-.62	.05
	15	Angle of Tendency for hip C.G with Horizon	.05	.87
	16	Right Shoulder with Horizon	.28	.42
	17	Angle of Right Knee	.41	.23
	18	Angle of Right Shoulder	-.43	.20
	19	Angle of Right Hip	-.09	.79
	20	The height of C. G	.00	.99
	21	Time	.24	.42
	22	Distance between the feet	.08	.81
Maximal arch	23	Angle of Tendency	-.03	.92
	24	Right Shoulder with Horizon	.27	.43
	25	Angle of Tendency for hip C.G with Horizon	.26	.46
	26	The angle of right knee	.46	.18
	27	The angle of right Shoulder	-.43	.20
	28	The angle of right hip to backward	-.41	.23
	29	The height of C. G	-.04	.91
	30	The length of Stretched back arch	-.02	.93
Hitting	31	The angle of left hip from backward	-.50	.13
	32	The angle of Shoulder for left hand	-.53	.11
	33	Angle of Tendency	.11	.75
	34	The angle of right Shoulder to forward	.33	.35
	35	Angle of Tendency for hip C.G with Horizon	-.24	.50
	36	The angle of right Shoulder	.00	.98
	37	The angle of right knee	-.10	.77
	38	The angle of right hip	-.26	.45
	39	The height of C. G in the moment of hitting	-.14	.69
	40	Time	.40	.24
Landing	41	Angle of Tendency	-.14	.69
	42	Angle of Tendency for hip C.G with Horizon	.06	.86
	43	The height of C. G	.10	.77
The variables between stages	44	Vertical distance of C.G during pushing to hit	-.25	.47
	45	Horizontal distance of C.G during pushing to hit	.07	.84
	46	Result ant distance of C.G during pushing to hit	.02	.94
	47	The angle of shoulder from prepared nessduring hitting to hit	-.33	.34
	48	The angle of flight for ball	-.41	.23
	49	The angle of flight for player	.06	.86

$p \leq 0.05$

Table 7 reveals the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with collision force time variable on platform for Volleyball players. However, the research hypothesis, H1 was rejected.

Table 8: Correlation between Kinematic variables for jump serves stage with minimum force variable on platform of volleyball players.

Stages	n	Variables	r	p
Collision	1	Angle of Right Knee	.41	.24
	2	Angle of Right Shoulder	.29	.40
	3	Angle of Right Hip	.37	.28
	4	Distance between the feet	.39	.26
	5	The height of C. G	.14	.69
	6	Angle of Right ankle	.60	.06
Absorption	7	Angle of Right Knee	-.61	.06
	8	Angle of Right Shoulder	-.39	.26
	9	Angle of Right Hip	-.55	.09
	10	The height of C. G	.22	.52
	11	Angle of Right ankle	.51	.13
	12	Angle of Left Hip	-.17	.63
	13	Distance between the feet	-.21	.55
Pushing	14	Angle of Tendency	.09	.79
	15	Angle of Tendency for hip C.G with Horizon	.10	.76
	16	Right Shoulder with Horizon	-.34	.32
	17	Angle of Right Knee	.10	.78
	18	Angle of Right Shoulder	.16	.65
	19	Angle of Right Hip	-.69	.02*
	20	The height of C. G	.47	.16
	21	Time	-.15	.66
	22	Distance between the feet	-.11	..76
Maximal arch	23	Angle of Tendency	-.28	.42
	24	Right Shoulder with Horizon	.27	.43
	25	Angle of Tendency for hip C.G with Horizon	.54	.10
	26	The angle of right knee	-.28	.43
	27	The angle of right Shoulder	-.02	.93
	28	The angle of right hip to backward	.21	.55
	29	The height of C. G	.49	.14
	30	The length of Stretched back arch	.15	.66
	31	The angle of left hip from backward	-.19	.58
	32	The angle of Shoulder for left hand	.14	.68
Hitting	33	Angle of Tendency	-.09	.78
	34	The angle of right Shoulder to forward	.38	.27
	35	Angle of Tendency for hip C.G with Horizon	.28	.43
	36	The angle of right Shoulder	.03	.91
	37	The angle of right knee	.24	.49
	38	The angle of right hip	.39	.25
	39	The height of C. G in the moment of hitting	.33	.35
	40	Time	.34	.32
Landing	41	Angle of Tendency	-.16	.65
	42	Angle of Tendency for hip C.G with Horizon	.61	.06
	43	The height of C. G	.54	.10

stages	n	Variables	r	p
The variables between stages	44	Vertical distance of C.G during pushing to hit	.11	.74
	45	Horizontal distance of C.G during pushing to hit	.26	.45
	46	Result ant distance of C.G during pushing to hit	.29	.40
	47	The angle of shoulder from prepared nessduring hitting to hit	-.32	.37
	48	The angle of flight for ball	-.51	.12
	49	The angle of flight for player	-.27	.44

*significant at p≤0.05 level

In table 8 above, the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with minimum force variable on platform for Volleyball players, except for angle of right hip with significant relation at $r = -0.69 (p < 0.026)$. However, the research hypothesis was accepted for one variable and rejected for the remaining variables.

Table 9: Correlation between Kinematic variables for jump serves stages with time of Minimum force variable on platform of volleyball players.

Stages	n	Variables	r	p
Collision	1	Angle of Right Knee	.55	.09
	2	Angle of Right Shoulder	.40	.24
	3	Angle of Right Hip	.45	.18
	4	Distance between the feet	-.08	.82
	5	The height of C. G	.15	.67
	6	Angle of Right ankle	.45	.18
Absorption	7	Angle of Right Knee	-.48	.15
	8	Angle of Right Shoulder	-.28	.42
	9	Angle of Right Hip	-.21	.54
	10	The height of C. G	.12	.73
	11	Angle of Right ankle	.47	.16
	12	Angle of Left Hip	.12	.73
	13	Distance between the feet	.01	.96
Pushing	14	Angle of Tendency	-.16	.64
	15	Angle of Tendency for hip C.G with Horizon	.25	.47
	16	Right Shoulder with Horizon	-.12	.72
	17	Angle of Right Knee	.16	.65
	18	Angle of Right Shoulder	-.03	.93
	19	Angle of Right Hip	-.53	.11
	20	The height of C. G	.25	.47
	21	Time	-.39	.26
	22	Distance between the feet	-.20	.54

stages	n	Variables	r	p
Maximal arch	23	Angle of Tendency	-.37	.28
	24	Right Shoulder with Horizon	.37	.28
	25	Angle of Tendency for hip C.G with Horizon	.58	.07
	26	The angle of right knee	-.17	.63
	27	The angle of right Shoulder	-.16	.65
	28	The angle of right hip to backward	-.04	.91
	29	The height of C. G	.38	.26
	30	The length of Stretched back arch	-.13	.70
	31	The angle of left hip from backward	-.22	.52
	32	The angle of Shoulder for left hand	.09	.79
Hitting	33	Angle of Tendency	-.32	.35
	34	The angle of right Shoulder to forward	.72	.01*
	35	Angle of Tendency for hip C.G with Horizon	.37	.28
	36	The angle of right Shoulder	.25	.47
	37	The angle of right knee	.41	.23
	38	The angle of right hip	.15	.67
	39	The height of C. G in the moment of hitting	.28	.42
	40	Time	.04	.89
Landing	41	Angle of Tendency	-.23	.51
	42	Angle of Tendency for hip C.G with Horizon	.66	.03*
	43	The height of C. G	.34	.33
The variables between stages	44	Vertical distance of C.G during pushing to hit	.27	.44
	45	Horizontal distance of C.G during pushing to hit	.19	.59
	46	Result ant distance of C.G during pushing to hit	.24	.49
	47	The angle of shoulder from prepared nessduring hitting to hit	-.04	.89
	48	The angle of flight for ball	-.24	.49
	49	The angle of flight for player	-.46	.17

*significant at p≤0.05 level

In table 9 above, the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with time of minimum force variable on platform for Volleyball players, except for the angle shoulder to forward, angle of tendency for hip C.G with horizon with significant relation r at 0.72(p <0.019)and 0.66(p <0.034)respectively. Thus, the results revealed that some correlation exist between kinematic variables for jump serves stages with time of minimum force variable on platform for Volleyball players only in two variables. However, two variables accepted the research hypothesis while the remaining reject.

Table 10: Correlation between Kinematic variables for jump serves stages with pushing force on platform of volleyball players.

stages	n	Variables	r	p
Collision	1	Angle of Right Knee	-.11	.76
	2	Angle of Right Shoulder	.07	.84
	3	Angle of Right Hip	-.14	.69
	4	Distance between the feet	.15	.66
	5	The height of C. G	.20	.57
	6	Angle of Right ankle	.46	.17
Absorption	7	Angle of Right Knee	-.15	.66
	8	Angle of Right Shoulder	-.03	.93
	9	Angle of Right Hip	-.34	.33
	10	The height of C. G	.21	.54
	11	Angle of Right ankle	.21	.55
	12	Angle of Left Hip	.03	.92
	13	Distance between the feet	.01	.97
Pushing	14	Angle of Tendency	-.11	.76
	15	Angle of Tendency for hip C.G with Horizon	.15	.67
	16	Right Shoulder with Horizon	.16	.64
	17	Angle of Right Knee	-.47	.16
	18	Angle of Right Shoulder	-.13	.72
	19	Angle of Right Hip	-.24	.49
	20	The height of C. G	.23	.51
	21	Time	-.25	.47
	22	Distance between the feet	.55	.09
Maximal arch	23	Angle of Tendency	.02	.93
	24	Right Shoulder with Horizon	.22	.52
	25	Angle of Tendency for hip C.G with Horizon	.19	.58
	26	The angle of right knee	-.14	.68
	27	The angle of right Shoulder	-.25	.47
	28	The angle of right hip to backward	.40	.25
	29	The height of C. G	.31	.37
	30	The length of Stretched back arch	-.15	.67
	31	The angle of left hip from backward	-.18	.61
	32	The angle of Shoulder for left hand	.07	.84
Hitting	33	Angle of Tendency	.26	.45
	34	The angle of right Shoulder to forward	-.08	.81
	35	Angle of Tendency for hip C.G with Horizon	-.13	.70
	36	The angle of right Shoulder	.28	.42
	37	The angle of right knee	.49	.14
	38	The angle of right hip	-.07	.82
	39	The height of C. G in the moment of hitting	.22	.54
	40	Time	.23	.51
Landing	41	Angle of Tendency	.26	.45
	42	Angle of Tendency for hip C.G with Horizon	-.24	.49
	43	The height of C. G	.12	.73

stages	n	Variables	r	p
The variables between stages	44	Vertical distance of C.G during pushing to hit	.21	.54
	45	Horizontal distance of C.G during pushing to hit	.44	.20
	46	Result ant distance of C.G during pushing to hit	.45	.19
	47	The angle of shoulder from prepared nessduring hitting to hit	-.14	.69
	48	The angle of flight for ball	-.33	.34
	49	The angle of flight for player	-.26	.45

$p \leq 0.05$

Table 10 reveals the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with pushing force on platform for Volleyball players. However, the research hypothesis was rejected.

Table 11: Correlation between Kinematic variables for jump serve stages with push force time on platform of volleyball players

Stages	n	Variables	r	p
Collision	1	Angle of Right Knee	.40	.24
	2	Angle of Right Shoulder	.05	.87
	3	Angle of Right Hip	.48	.15
	4	Distance between the feet	.01	.97
	5	The height of C. G	-.02	.95
	6	Angle of Right ankle	.11	.75
Absorption	7	Angle of Right Knee	-.46	.18
	8	Angle of Right Shoulder	-.46	.17
	9	Angle of Right Hip	.07	.83
	10	The height of C. G	-.03	.93
	11	Angle of Right ankle	.19	.59
	12	Angle of Left Hip	-.12	.74
	13	Distance between the feet	.10	.76
Pushing	14	Angle of Tendency	-.30	.38
	15	Angle of Tendency for hip C.G with Horizon	.11	.77
	16	Right Shoulder with Horizon	-.30	.39
	17	Angle of Right Knee	.53	.11
	18	Angle of Right Shoulder	-.03	.91
	19	Angle of Right Hip	-.24	.49
	20	The height of C. G	.19	.59
	21	Time	.25	.48
	22	Distance between the feet	-.45	.18

stages	n	Variables	r	p
Maximal arch	23	Angle of Tendency	-.41	.22
	24	Right Shoulder with Horizon	.20	.56
	25	Angle of Tendency for hip C.G with Horizon	.34	.32
	26	The angle of right knee	.08	.82
	27	The angle of right Shoulder	.08	.82
	28	The angle of right hip to backward	-.32	.35
	29	The height of C. G	.04	.89
	30	The length of Stretched back arch	.27	.44
	31	The angle of left hip from backward	-.10	.77
	32	The angle of Shoulder for left hand	-.15	.66
Hitting	33	Angle of Tendency	-.27	.44
	34	The angle of right Shoulder to forward	.48	.15
	35	Angle of Tendency for hip C.G with Horizon	.23	.51
	36	The angle of right Shoulder	-.10	.76
	37	The angle of right knee	-.28	.42
	38	The angle of right hip	.18	.60
	39	The height of C. G in the moment of hitting	.02	.94
	40	Time	.14	.68
Landing	41	Angle of Tendency	-.64	.04*
	42	Angle of Tendency for hip C.G with Horizon	.59	.07
	43	The height of C. G	.28	.43
The variables between stages	44	Vertical distance of C.G during pushing to hit	-.16	.65
	45	Horizontal distance of C.G during pushing to hit	.01	.96
	46	Result ant distance of C.G during pushing to hit	-.01	.98
	47	The angle of shoulder from prepared nessduring hitting to hit	-.19	.58
	48	The angle of flight for ball	-.08	.82
	49	The angle of flight for player	.05	.89

*significant at $p \leq 0.05$ level

In table 11 above, the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with push force time on platform for Volleyball players, except for angle of tendency with significant relation at r = -0.64 (p=0.04) significance. Thus, only one variable accept the hypothesis and other variables reject the hypothesis.

Table 12: Correlation between Kinematic variables for jump serves stages with full touch time

Stages	n	Variables	r	p
Collision	1	Angle of Right Knee	.64	.04*
	2	Angle of Right Shoulder	.36	.29
	3	Angle of Right Hip	.52	.11
	4	Distance between the feet	-.12	.72
	5	The height of C. G	.23	.51
	6	Angle of Right ankle	.26	.46
Absorption	7	Angle of Right Knee	-.49	.14
	8	Angle of Right Shoulder	-.30	.38
	9	Angle of Right Hip	.06	.86
	10	The height of C. G	.16	.65
	11	Angle of Right ankle	.20	.56
	12	Angle of Left Hip	-.15	.67
	13	Distance between the feet	.22	.53
Pushing	14	Angle of Tendency	-.18	.61
	15	Angle of Tendency for hip C.G with Horizon	.23	.51
	16	Right Shoulder with Horizon	-.38	.27
	17	Angle of Right Knee	.49	.14
	18	Angle of Right Shoulder	.03	.91
	19	Angle of Right Hip	-.34	.33
	20	The height of C. G	.37	.28
	21	Time	-.03	.92
	22	Distance between the feet	-.58	.07
Maximal arch	23	Angle of Tendency	-.67	.03
	24	Right Shoulder with Horizon	.23	.54
	25	Angle of Tendency for hip C.G with Horizon	.38	.26
	26	The angle of right knee	-.11	.75
	27	The angle of right Shoulder	.06	.87
	28	The angle of right hip to backward	-.39	.25
	29	The height of C. G	.29	.40
	30	The length of Stretched back arch	.23	.52
	31	The angle of left hip from backward	-.16	.65
	32	The angle of Shoulder for left hand	.03	.91
Hitting	33	Angle of Tendency	-.64	.04*
	34	The angle of right Shoulder to forward	.60	.06
	35	Angle of Tendency for hip C.G with Horizon	.61	.05*
	36	The angle of right Shoulder	-.02	.93
	37	The angle of right knee	-.05	.87
	38	The angle of right hip	.17	.63
	39	The height of C. G in the moment of hitting	.29	.40
	40	Time	.07	.84

Stages	n	Variables	r	p
Landing	41	Angle of Tendency	-.64	.04*
	42	Angle of Tendency for hip C.G with Horizon	.66	.03*
	43	The height of C. G	.47	.16
The variables between stages	44	Vertical distance of C.G during pushing to hit	.16	.65
	45	Horizontal distance of C.G during pushing to hit	.10	.78
	46	Result ant distance of C.G during pushing to hit	.15	.67
	47	The angle of shoulder from prepared nessduring hitting to hit	.02	.94
	48	The angle of flight for ball	-.06	.86
	49	The angle of flight for player	-.33	.34

*significant at $p \leq 0.05$ level

In table 12 above, the correlation between the kinematic variables for jump serve stages with collision force variable on the platform for volleyball is presented. The results shows insignificant relationship between kinematic variables for jump serves stages with full touch time on platform for Volleyball players, except for the angle of right knee, angle of tendency (maximal arch), angle of tendency C.G with horizon, angle of tendency (landing) and height of center of gravity with significant relation r at 0.64($p < 0.04$), -0.64($p < 0.04$), 0.61($p < 0.05$), -0.64($p < 0.04$)and 0.66($p < 0.03$), respectively. Thus, the results revealed that some correlation exist between kinematic variables for jump serves stages with time of minimum force variable on platform for Volleyball players only in five variables. Thus, the five of the variables accept the research hypothesis and other variables reject it.

CHAPTER 5

DISCUSSTION

The study investigated and compared the relationship between the kinematic variables and strength function-time during jump serve of Erbil club male volleyball players. As shown in table 6, there is no significant relation between bio-kinematic variables with collision force on platform. The researcher attributes that the athletes are not proficient in the process of dealing with the pivot, which is one of the fundamentals of volleyball, in which the body gets the opposite force to the direction of his strength issued for the purpose of raising up and implementing interconnected stages of jump serve, closely with the dynamics third law states that in every action there is an equal and opposite reaction (Al-Khaledi, 2010), as well as not to give importance to the study sample to the stage of the collision to the fact that there is a shortening in the closing run correlation process with the jump and the collision with the platform process, but that these values are all recorded different variables the most accurate one was between the variable (inclination angle of the trunk) where the arithmetic average of the sample 8.300 degree, and this is obvious because the player confirms the speed in the performance of the blow as a result of the presence of two obstacles, the net and the opponent repel wall, and the value of the correlation coefficient was 0.57 which is the highest value recorded of the variables for this stage.

From table 7, it appeared that the lack of connectivity relation between Kinematic variables with collision time variable on platform, This researcher attributes that the athletes in the study sample do not affirm the long-time but want to accomplish the movement a short time and raise up to that matches with the game tactic in which the athlete confirms to get a large explosive force to the height that matches with momentum law which states that multiplying force with time (Al-Hashemi, 1999). Thus, it was noticed through variables that the highest value was between the angle of the right shoulder at the absorption stage and the time of the collision force on the platform was -0.57 because the athlete at the moment of collision with the platform emphasizes the short time which appeared an inverse relationship.

Table 8shows there is a negative significant relationship between angle of right hip at the moment of push with minimum force on platform The researcher attributes that volleyball players of the study sample affirm to extend the body's front joints up for the purpose of getting the center of gravity to the height and extending the arm to its highest point to get a good push to the ball through the reliance on athlete's mass and correlate with the momentum of platform at the moment of absorption (for the purpose of benefiting from physics concept that confirms the dealing body mass with the speed) (Al-Khaledi, 2010), as well as showing that there is no significant correlation between other kinematic variables and less module force on the platform, but some values recorded a greater value but did not rise to the level of significance, and confirmed the relationship between the variable of right ankle at the moment collision with less force on the jump platform and the foot was 0.60, and this we attribute that the athlete (volleyball player) trying to raise up to the top to get rid of the absorption process and prepare to hit, as well as a value of correlation between the right knee at the moment of absorption was recorded to us -0.61, and this we attribute that athletes increase the value of the knee angle at this moment and the lack of emphasis on absorption of down force.

Their correlation t between the two variables of less force with the tilt angle of the trunk with the horizontal line through landing and the value of r value of 0.61, which is high value but it did not raise to the significance, and this we may attribute that athlete when his body tilts to the side that means the athlete will move away parts of his body from the virtual vertical line of gravity and thus will increase the resistance at the expense of force because the athlete when a lot of mass that interact with the focal is been taking out with final outcome will decrease the value of the force generated that matches with the third law of dynamics.

Tables9 shows that there is positive significant relation between hitting shoulder the moment of hitting the ball with minimum force and Positive relation between leaning trunk angle variable at landing stage with less force time on platform.The researcher attributes that when the athlete tilts his body on landing will be done from the main movement which is touching the ball, and continues his body path movement to maintain balance, as (Hall) mentioned that distance of performance will drag the push, so the athlete after completing the touch will try to increase landing time for the purpose of collision's absorption (Hall, 1995).

In the table 10 the researcher attributes the lack of significant connectivity kinematic variables of jump serve and push force on platform to some of player's joints angles didn't get to the required extend at push stage, as some volleyball sources confirm that players body joints should be at maximum extension just before raising.

The researcher also attributes the cause of the non-existence of correlation link between push force on platform with the measured bio-kinematic variables, but players of the study sample did not get to the required power at push moment on the platform, and this is because of inability of the study sample players to store the full energy for the moment of absorption very well and convert it to kinetic energy when pushing up.

Also in table 11 the researcher attributes the significant relation between angle of tendency with a vertical line to the athlete during the landing will try to decrease timing to get to balance procedure and body settle after the touch and push from the platform, because when the athlete interacts with the serve he has to produce big angular momentum equals, as the relation between angular speed and angular difference positive relationship, like the following formula (John, 1979).

In the table 12

- The researcher attributes the cause to the increase in left knee's tilt stage of collision, and will led to increase the timing of touching the platform and then will take more time in collision and stay, which will affect negatively on raising up and produce the explosive force.
- The researcher attributes that time has a significant correlation with the production of power, and that beating phase needs a large collision force with the ball by striking hand, touching must be very short for the purpose of producing considerable momentum as the momentum before the collision is equal to the momentum after the collision.
- The more tilt angle is the more distance will be, and then the athlete will get good torque which will be invested in increasing time for the purpose of huge collision with the ball at this stage, and then will remain on platform for more time.
- The researcher attributes that body joints tilt angle will lead to increase full touching, and this results get us to it when staying time on platform is longer than usual for the purpose of producing explosive force for raising the body.
- The researcher attributes the cause that the nearly vertical trunk position accelerates the players approach for flying stage, and then staying on platform will help somehow to increase correlation with touching time.

Finally, a volleyball player demands generally to face the net and perform his jump serve by tilting his body at the phase of jumping. He demands also muscular strength at jumping since it correlates to the higher CG during his jump serve. In addition, accuracy and speed during his jump serve are very critical demand components.

However, the results of the study have shown that only in case of relation between kinematic variables for jump serve with minimum force variable on the platform of volleyball players, only one variable for pushing (angle of right hip), for relation between kinematic variables for jump serve with time of minimum force variable on the platform of volleyball players, hitting (angle of right shoulder to forward) and landing (angle of tendency for hip

C.G with horizon), for relation between kinematic variables for jump serve with push force variable on the platform of volleyball players, only hitting (angle of tendency), for relation between kinematic variables for jump serve with touch time on the platform of volleyball players with collision (angle of right knee), hitting (angle of tendency, angle of tendency for hip center of gravity with horizon), landing (angle of tendency and angle of tendency for hip center of gravity with horizon) show significant relation. Therefore these variables accept the hypothesis. Thus, other variables in the study reject the hypothesis at $p \leq 0.05$ level of significance.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The analysis of the results revealed that only nine variables the include relation between kinematic variables for jump serve with minimum force variable on the platform of volleyball players, only one variable for pushing (angle of right hip), for relation between kinematic variables for jump serve with time of minimum force variable on the platform of volleyball players, hitting (angle of right shoulder to forward) and landing (angle of tendency for hip C.G with horizon), for relation between kinematic variables for jump serve with push force variable on the platform of volleyball players, only hitting (angle of tendency), for relation between kinematic variables for jump serve with touch time on the platform of volleyball players with collision (angle of right knee), hitting (angle of tendency, angle of tendency for hip center of gravity with horizon), landing (angle of tendency and angle of tendency for hip center of gravity with horizon) show significant relation. Therefore these variables accept the hypothesis. Thus, other variables in the study reject the hypothesis at $p \leq 0.05$ level of significance as stated below.

- For jump serve stages with collision force variable on platform, there are no significant differences ($p \leq 0.05$) between the bio-kinematic variables with collision force on platform.
- For jump serve stages with collision force time variable on platform, there are no significantdifferences ($p \leq 0.05$)between Kinematic variables with collision time variable on platform.
- For jump serve stages with minimum force variable on platform, there is one significant negative difference ($r=-0.69$, $p \leq 0.02$) between angle of right hip at the moment of push with less force on platform.
- For jump serve stages with time of Minimum force variable on platform, there are two significant positive differences. The first one ($r= 0.72$, $p \leq 0.02$) was between the angle of right shoulder variable (hitting shoulder) the moment of hitting the ball with less force. The second one ($r= 0.66$, $p \leq 0.03$) was between angle of tendency for hip C.G with horizon variable at landing stage with less force time on platform.
- For jump serve stages with pushing force on platform, there are no significant differences ($p \leq 0.05$) between Kinematic variables with collision time variable on platform.

- For jump serve stages with push force time on platform, there is one significant negative difference ($r=-0.65$, $p \leq 0.03$) between angle of tendency with a vertical line.
- For jump serve stages with full touch time on platform, there are five significant differences. The first one ($r= 0.64$) was positive between the angle of right of knee in the collision stage with foul touch time on platform. The second one ($r= -0.64$, $p \leq 0.04$) was negative between the angle of tendency of the vertical line in hitting moment with foul touch time on platform. The third one ($r= 0. 61$, $p \leq 0.05$) was positive between the angle of tendency of the vertical line in hitting moment with foul touch time on platform. The fourth one ($r= -0.64$, $p \leq 0.04$) was negative between the angle of tendency of the vertical line in the landing stage with foul touch time on platform. The fifth one ($r= 0. 66$, $p \leq 0.034$) was positive between the angle tendency of hip of the horizontal line in the landing stage with foul touch time on platform.

6.2 Recommendations

- This study of bio kinematic variables and strength function-time of jump serve in volleyball should be repeated with collecting additional qualitative data. It is prefer to collect similar data and within the same methodology from various levels of young, high school, college, amateur, semi-expert, and expert samples.
- It would be valuable to consider the effects bio kinematic variables and strength function-time on change of jump serve in volleyball.
- The significant relationship between certain bio kinematic variables in function of strength-time jump serve in volleyball should be of concern to coaches, sport biomechanics and other experts working closely with volleyball sport.
- The bio kinematic variables in function of strength-time jump serve should be concerned and listed in the criteria of selecting a volleyball player.
- The development of the jump serve for volleyball players should be developed by psychological and counseling programs.
- The bio kinematic variables in function of strength-time jump serve should be concerned and emphasized in training programs in order to reach higher levels.

REFERENCES

AdilBasir, (1998). Biomechanics, *Al KitabCenter for Publishing and Distribution, Cairo, Egypt.*

https://helpx.adobe.com/after-effects/using/rigid-mask-tracking.html

Al-Gailani, H. A., (2003).Courses in Kinetic Analysis, *Jordan University, Amman, Jordan*.

Al-Gailani, Hisham, (2007). Competition Approaching and some Kinematic Variables as an Indicator of DigitalAchievement for the Distance Jump to the Emerging Long Jump, *the Scientific Journal, Jordan University, Amman, Jordan.*

Al-Hashemi, S. M., (1999). Physical Biomechanics, *School of Physical Education, Baghdad University, Iraq.*

Ali, AdilAbdulbaseer,(2007). Biomechanical, Appraisal and Analytical Measurement in PhysicalPerformance, *1st Edition, Egyptian Library, Alexandria, Egypt.*

Al-Jumaili, Sa'ad Hamad (1997) Volleyball – Teach – Train – Coach, *Manshorat al Sabe' min April, Libya.*

Al-Jumaili, S. H,.(1997). Volleyball – Learn – Train – Coach, *1st Edition, Libya*.

Al-Khalidi, M. J. & Al-Ameri, H., (2010).Biomechanical Basics, *Al-Kofa University, Iraq.*

Al-Khalidi, M. J. & Al-Ameri, H. H., (2010) BiomechanicalBasics, *1st Edition, Dar ulKutubwalWathaeq, Baghdad, Iraq.*

Al-Khaqani, Qasim Muhammed Hassan (2001) Training Methods of Quick Force and its Impact on some Mechanical Variables as an Indicator of the Digital to Accomplish for a Distance Jump to the Emerging Long Jump, *the Scientific Journal, Jordan University Press, Amman, Jordan*.

Allyn,&Bacon, (1977).Inc winning volleyball.*2nd edition, London*.

Al-Smaedae, L. G..and others, (2011).Physics & Biomechanics in Sports, *Salahaddin University Press.*

Andrzej wit, and others, (1998). A Three-Dimensional Kinematic analysis of handball, *Throws. Http://www.isbs98.uni-kon stan8.de.*

Arie, S., Joan A., (2000). volleyball serve, *Human kinetics, U.S.A.*

Berthold.F. & Bernd, (1996). Selected aspects of the developing of men's volleyball: (*the Coach).*

Beutesthl, (1979).BLV rerlagcgeseneschaftMunchen Bern Wien, *volleyball fur spieler und trainer*.

Blazerich, A., (2007). sports Biomechanics, *first publishes, ABC Black Publishers, Ltd 38 soho square, London.*

Carr,Gerry, (1997).*"Mechanics of sport"*, A .practitioners Guide,Huma Kinetics.

Cease, R., (1992). TechnischapparatiremoglichzkeitenzurLeistungsdiagnostik and steurung mittelsopjektirerschnellineeormationleistungs sport.Nr.2.S.

Challoumas, D., Stavrou, A. and Dimitrakakis, G., (2017) The Volleyball Athlete’s Shoulder: Biomechanical Adaptations and Injury Associations. Sports Biomechanics, 16(2), pp.220-237.

Charlton, P.C., Kenneally-Dabrowski, C., Sheppard, J. and Spratford, W., (2017) A simple method for quantifying jump loads in volleyball athletes.Journal of science and medicine in sport, 20(3), pp.241-245.

Charlton, P.C., Kenneally-Dabrowski, C., Sheppard, J. and Spratford, W., (2017) A Simple Method for Quantifying Jump Loads in Volleyball Athletes.Journal of science and medicine in sport, 20(3), pp.241-245.

Cortina, J. M. (1993)What is coefficient alpha? An examination of theory and applications. Journal of applied psychology, 78(1), 98.

Colema Simon, (2001). kinematic analysis of the volleyball jump serve, *university of Edinbourgh, Scotland.*

Coleman, S.G.S., Benham, A.S. and Northcott, S.R., (1993).A three-dimensional cinematographically analysis of the volleyball spike. *Journal of sports sciences, 11(4), pp.295-302.*

DcbraAllyn, (1995).The biomechanics of landing after the quick attack, *coaching volleyball, U.S.A VCA.*

Deborah W.Crisfield, (1995).Winning volleyball for girls, *A mountain lion book, Facts on file aninfobaseb holding company.*

Depra,P. & R.Brenzikofer, (2005). Fluid Mechanics in VolleyballServicefrom

http://www.coachesinfo.com/index.php?option=com_content&view=article&id=377:fluidmechanicsarticle&catid=103:volleyballgeneralarticles&Itemid=197.

Donskoy, D.D., (1975). BiomechanicMoscow.

Dr.Vishan Singh Rathore, (2012). Relationship between Linear and Anguler kinama Tics with Jump Serve In Volleyball. *Vo.1, Issue.Xii.Vol.*

Drost, E. A., (2011). Validity and reliability in social science research. *Education Research and Perspectives, 38(1), 105.*

Farfel, V. S., (1983). Bewe Gungs Steurung in sport,Berlin.

FIVP, (2000). Magazine for volleyball coaches, *the coaches. No.2*

Gomez, G., López, P.H., Link, D. and Eskofier, B., (2014). Tracking of ball and players in beach volleyball videos. *PloS one, 9(11), p.e111730*.

Hall,Susan(1995). Basic of biomechanics,*2nd,Editionboston*.

Hirunrat,et.al., (2014). Kinematics Analysis In Jumping Serve Of Thai Women volleyball National Team.*Journal Of Sports Science And Technology volume 14, No. 2.*

Http:www.iraqacid.Arg./Lib/ahmed.htm(2009).

Huang, C., G. C. Liu, et al., (2005). "Kinematic analysis of the volleyball back row jump spike." From:

http://www.coachesinfo.com/index.php?option=com_content&view=article&id=378:inematic-article&catid=103:volleyball-generalarticles&Itemid=197.

Hughes, C., (1980). Tactics and Skills.*British broadcasting corporation and Queen anne press*.

Husamaddin, Talha Hussain (1994).Biomechanics, Dar ulFikr al Arabi, Cairo, Egypt.

Hussain, Qasim Hassan & Mahmood, Iman Shakir, (1998). Mechanical Basics Principles for Physical Kinetics,

Jacek J, Robert M. & Krzysztof C, (2017).Mathematical Modelling as a Tool to Assessment of Loads in Volleyball Player’s Shoulder Joint during Spike.*Journal of Sports Sciences, 35:12, 1179-1186, DOI: 10.1080/02640414.2016.1214284*

De Loes, M., (1995).Epidemiology of sports injuries in the Swiss organization.International *journal of sports medicine, 16(02), pp.134-138.*

Jawad, Ali Salim, (1997). Mechanical Analysis of some Variables in Low Rectum Serve Skill, *Unpublished Ph. D., Physical Education School, Basrah University, Iraq.*

Jenson, j., (2000). For young jumpers, differences_are in movement's control, not it's coordination, *research quarterly for exercise and sports.*

John W.Northrip and other, (1979)."Biomechanic analysis of sport W.M.C.".*Brown company Publishers, U.S.A.*

Khalid Najim Abdullah, (1997). The relationship between some of the variables calculated vote of three points in basketball, *Unpublished Ph. D., Baghdad University, Iraq.*

Khatayba, (1996).Encyclopaedia of Modern Volleyball*, Dar ulFikrlilTiba'awalNashir, Amman, Jordan.*

Knapp.(1983). Skill in sport.The Attainment of proficiency, Routledge and Kegen Paul.

Kugler, A., Krüger-Franke, M., Reininger, S., Trouillier, H.H. and Rosemeyer, B., (1996). Muscular imbalance and shoulder pain in volleyball attackers.*British journal of sports medicine, 30(3), pp.256-259.*

Laysan, Yourkin and others, (1978).Basic Theoretical in Gymnastic, *1st Edition, Baghdad University Press.*

Mahjoob, Wajeeh, (1987). Kinetic Analysis, *Baghdad University, Iraq.*

Márquez, G., Alegre, L.M., Jaén, D., Martin-Casado, L. and Aguado, X., (2017).Sex differences in kinetic and neuromuscular control during jumping and landing. *Journal of Musculoskeletal & Neuronal Interactions, 17(1), p.409.*

Marwan Abdulhamdi, (2001). Scientific Encyclopedia of Volleyball, *1st Edition, Al-Waraq Foundation for Printing & Distribution, Amman.*

Meirin R, Ramey, (1973). Use of force plates for long jump studies.*Medicine8sport,Vol1 8,Biomechanics 111,California.*

Moor, (1979). How To do research. *London, the Library Association.*

Moor, N.,(1979). How to research London; *the Library Association*

Payne A,n,(1986). Use of force platform for the study of physical activity, *Biomechanics medicine and sport.Vol1 2, New York.*

Payton C, J. (2008). Motion Analysis Using Video.In C.J Payton & R.M Bartlett (Eds), Biomechanical evaluation of Movement in Sport and Exercise.*The British Association of Sport and Exercise Sciences Guidelines (pp.8-32). New York, NY. Routledge*

Pickard, A. J., (2013). Research methods in information.Facet publishing.

Qotob, Sa'ad Muhammed, (1985). Volleyball between theory and practice, *Mosul Printing House, Iraq.*

Radzak, K.N., Putnam, A.M., Tamura, K., Hetzler, R.K. and Stickley, C.D., (2017).Asymmetry between lower limbs during rested and fatigued state running gait in healthy individuals. *Gait & Posture, 51, pp.268-274.*

Red Holman& Leonard Lewis,(1989). winning strategy and tactics. *New York, The Macmillan Company, P78.*

Reeser, J.C., Fleisig, G.S., Bolt, B. and Ruan, M., (2010).Upper Limb Biomechanics during the Volleyball Serve and Spike. *Sports health, 2(5), pp.368-374.*

Reeser, J.C., Fleisig, G.S., Cools, A.M., Yount, D. and Magnes, S.A., (2013)..Biomechanical Insights into the Aetiology of Infraspinatus Syndrome. *Br J Sports Med, 47(4), pp.239-244.*

Rennie Lidor, (1995). Developing mental skills searing coaching volleyball, feb-march, p16.

Sandor Fic, (1997).“Hiting”, volleyball, *vol.7,number6,Colorado:A cam publishing.*

Seminati, E. and Minetti, A.E., (2013). Overuse In Volleyball Training/Practice: A Review On Shoulder And Spine-Related Injuries. European journal of sport science, 13(6), pp.732-743.

Susan, J., (1995). Basic Biomechanics, *second, U.S.A, New York Megaw*.

Tant, C. L., B. Greene, et al., (1993).A comparison of the volleyball jump serve and the volleyball spike.Biomechanics in SPorts XI, *University of Massachussetts, International Society of Biomechanics in Sports.*

Wagner, H., Pfusterschmied, J., Tilp, M., Landlinger, J., Von Duvillard, S.P. and Müller, E., (2014). Upper-Body Kinematics in Team-Handball Throw, Tennis Serve, and Volleyball Spike. *Scandinavian journal of medicine & science in sports, 24(2), pp.345-354.*

Wilson, Tom, (2006). Basic Approach foot work, *Twilson @binah.cc.brandis,edu*

http://www.xnet.com/schneid/docs/basic-footwork

Kassem Hassan Hussein &Eman Shaker Mahmoud, (1998).Principles of Mechanical Bases for Sport Movements,*1st Edition, Amman, Dar Al Fikr Press.*

Bisseling, R.W., (2008). Biomechanical determinants of the *jumper's knee involleyball. University of Groningen.*

Omer HM., (2013). Mmotor analysis according to movement phases, time, *displacement, velocity and acceleration, an article at website:*

http://www.husseinmardan.com/in28.htm

Mushin AT., (2008). Biomechanical analysis by video filming, *an article on Iraq sport’s academy at website:*

http://www.iraqacad.org/Lib/ahmed/ahmed.htm

MaxTRAQ online manual, Scale tool at website:
http://www.innovision-systems.com/Help/MaxTRAQ/index.html?scaling_tool.htm
MaxTRAQ online manual, stick tool at website:
http://www.innovision-systems.com/Help/MaxTRAQ/index.html?scaling_tool.htm

APPENDIX 1

Questionnaire for experts about jump serve in volleyball

Dear expert:

The researcher wants to conduct a research about (The relationship between some of the bio kinematic variables and strength function of jump serve in volleyball), so you as an expert in this field needed to be helpful to choose the most suitable test of jump serve in volleyball between those mentioned in the next page and add any suitable recommendation

Best Regards . . .

Signature:

Date:

Scientific surnames:

Specialist:

University:

Email**:**

List of experts for jump serve in volleyball

f	Name	Discipline	Job title
	Dr. .laith Mohammed Daoud Al-Banna	Bio-mechanic Volleyball	Professor
	Dr. Mohamed Hassan	Bio-mechanic Volleyball	Assistant Professor
	Dr. Ahmed Hamed Al-Suwaidi	Bio-mechanic Volleyball	Assistant Professor
	Dr. Khalid Abdul Majeed Al-Khatib	Bio-mechanic Volleyball	Assistant Professor
	Dr. Khalid Mohammed Dawood	Bio-mechanic Volleyball	Assistant Professor
	Dr. Khalid Mohammed Dawood	Bio-mechanic Volleyball	Assistant Lecturer
	Dr. Waleed Al-Tai	Bio-mechanic Volleyball	Associated Professor
	Dr. Khalil Mohamed Al-Hadithi	Bio-mechanic Volleyball	Assistant Lecturer
	Dr. Ibrahim Saleh Al-Suwaidi	Bio-mechanic Volleyball	Assistant Lecturer
	Dr. Dr. BassimIssa	Bio-mechanic Volleyball	Associated Professor

First test

Test of Accuracy of jump serve (Diagonally or straight) Performance:

The purpose of the test: Measuring the accuracy of jump serve during performing it diagonally and straightly.

The test performance:

The player stands behind the end line on one of the three selected areas on the line.

The player will choose whether he will perform straight or diagonal serve to one of the three areas on the opposite side of the court.

The player will be given ten attempts divided (five of the diagonal) and (for five straight).

Register:

player records (5) points when he hits the small square (0.5 × 0.5 m)

player records (4) points when he hit the other square(1 × 1 m)

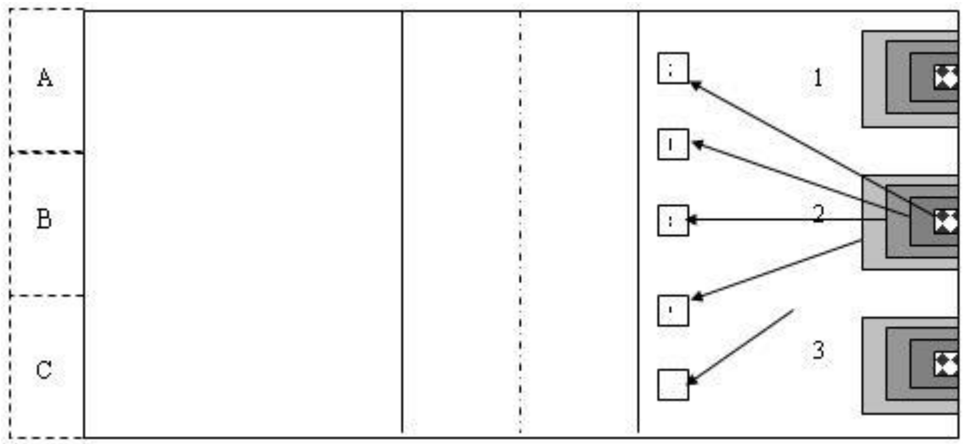
player records (3) points when he hit the other square(1.5 × 1.5 m)

player records (2) points when he hit the other square(2 × 2 m)

when the ball hits the line separating two areas he will be given the highest score

Do not touch the ball on any of the squares are given (1)

The highest score of the test is (50), as it shown in the figure bellow



Second test

The purpose of test: Evaluating the accuracy of jump serve performance.

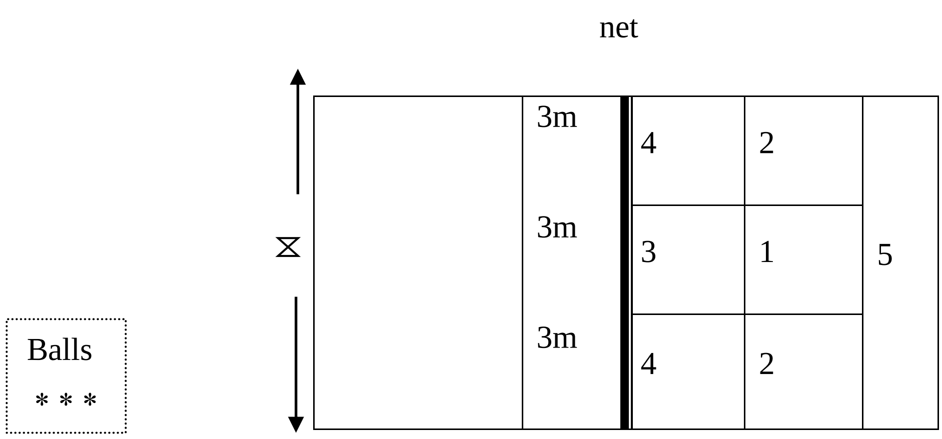
Tools used**:**standard volleyball court, 5 volleyball balls, colorful tape to divide the areas of the court.

Performance: the participant will stand in the middle behind the base line to perform the jump serve and ball has to cross the net to the other side of the court.

Conditions: in the case of crossing the ball to the other half of the court or outside the court will be counted of five attempts.

Registration:

The players get the mark of the place where the ball hits it for each correct jump serve, every players has 5 attempt, the highest mark going to be 25, note, in the case if the ball fall the line separating the two areas, the highest for the degree will be accounted, as shown in figure below.



APPENDIX 2

Questionnaire for experts about some kinematic variables

Dear expert:

The researcher wants to conduct a research about (The relationship between some bio kinematic variables and strength function of jump serve in volleyball), so you as an expert in this field needed to be helpful to choose the most important bio kinematic variables that mentioned in the next page by ticking the variable and add any suitable recommendation

Best Regards

Signature:

Date:

Scientific surnames:

Specialist:

Email:

University:

variables / Stages		Jumping Stage			Flying Stage		Landing stage
		Collision	Absorption	Pushing	Before hitting	instant hitting	
the Angles of body joints	Angle of the right Wrist						
	Angle of the left Wrist						
	Angle of the right Elbow						
	Angle of the leftElbow						
	Angle of right Shoulder						
	Angle of leftShoulder						
	Angle of the right Hip						
	Angle of the leftHip						
	Angle of the right Ankle						
	Angle of the leftAnkle						

Angles of the body parts	Angle of the right Palm						
	Angle of the left Palm						
	Angle of rightForearm						
	Angle of leftForearm						
	Angle of right Humerus						
	Angle of left Humerus						
	Angle of the rightThigh						
	Angle of the leftThigh						
	Angle of the rightleg						
	Angle of the leftleg						
	Angle of the rightFoot						
	Angle of the leftFoot						
	The Angle ofTorso Tendency						
	The angle of body Tendency						
	The Angle of Flying						
	The Angle of Head						
Displacements, Distances and Elevations	Elevation of Center of Body Mass						
	The Distance between the Feet						
	Overall distance of movement						
	Obtained Distance ofCenter of Body Mass						
	Vertical distance ofCenter of Body Mass						
	Horizontal Distance ofCenter of Body Mass						
	The Tendon of back bow stretched						
	Elevation ofCenter of Palm Mass						
Time							
Extracted variables	Overall Speed of Center of Body Mass						
	Horizontal Speed of Center of Body Mass						
	Vertical Speed of Center of Body Mass						

	AngularSpeed of Arm						
	Angular Speed of Palm						
	AngularSpeed of Elbow						
	Horizontal Accelerate of Center of Body Mass						
	VerticalAccelerate of Center of Body Mass						
	Overall Accelerate of Center of Body Mass						
	AngularAccelerate of Arm						
	AngularAccelerate of Palm						
	AngularAccelerate of Elbow						

List of experts for the bio kinematic variables

f	Name	Discipline	Job title
	Dr. LouayGhanem Al-Sumaidaie	Biomechanics	Professor
	Dr. Hussein Al-Bayati, Merdan	Biomechanics	Professor
	Dr. Ahmed Tawfik al-Janabi	Biomechanics	Professor
	Dr. Mohamed Khalil Aqidi	Biomechanics	Professor
	Dr. Ammar Ali Ihsan	Biomechanics	Professor
	Dr. Saadallah Abbas Rachid	Biomechanics	Assistant professor
	Dr. Abu Ramez al-Bakri	Biomechanics	Assistant professor
	Dr. Nawaf al-ObeidiOwaied	Biomechanics	Assistant professor

APPENDIX 3

Questionnaire for experts about some variables for strength function – time

Dear expert:

The researcher wants to conduct a research about (The relationship between some of the bio kinematic variables and strength function of jump serve in volleyball), so you as an expert in this field needed to be helpful to choose the most suitablevariables of Power Function - time in volleyball following below in the next page by ticking the variable and add any suitable recommendation

Best Regards . . .

Signature:

Date:

Scientific surnames:

Specialist:

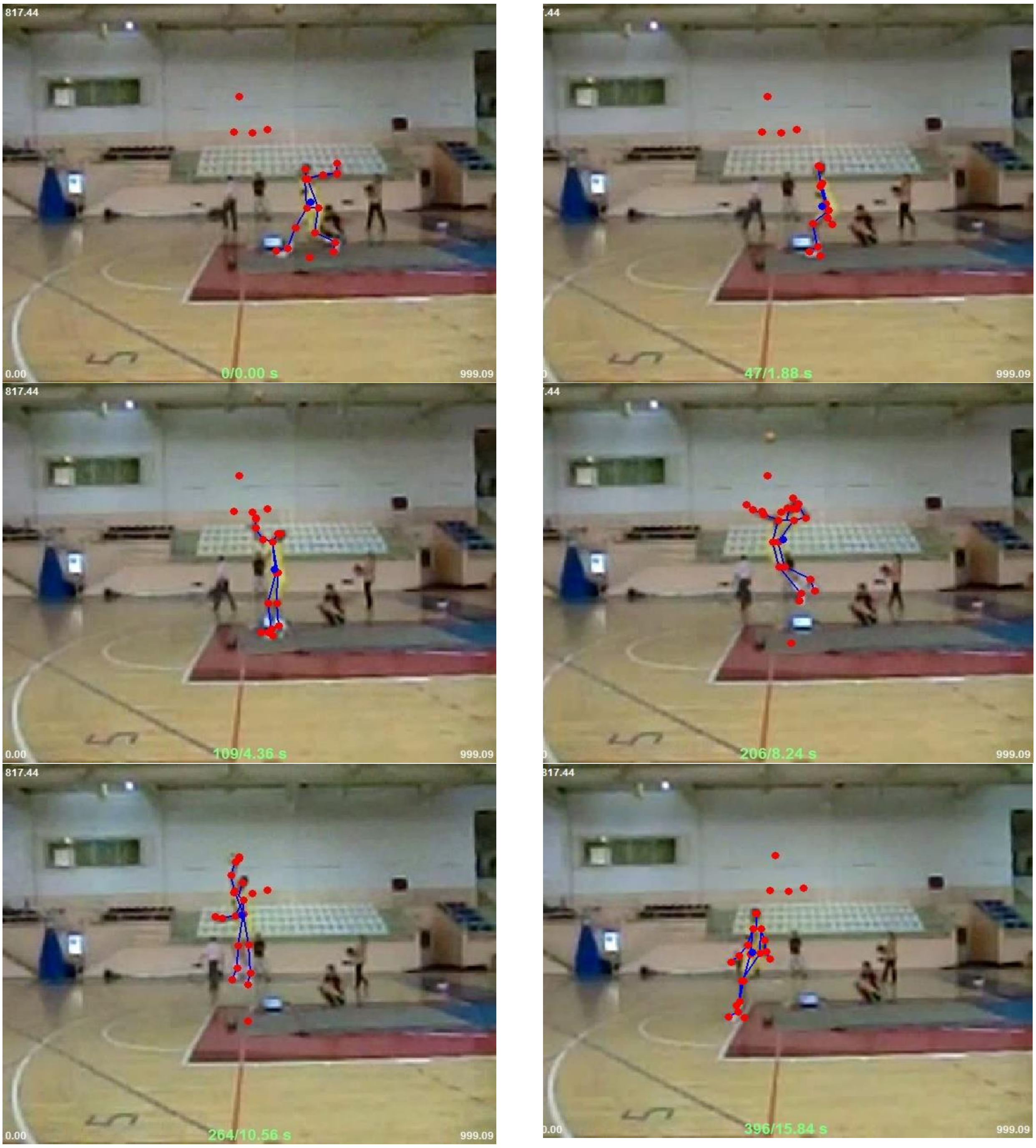
University:

Email**:**

Variables Stages	Jumping Stages		
Variables	Collision	Absorption	Pushing
The strength of collision			
The time of strengths of collision			
Minimum Strength			
The time of Minimum strength			
Strength of pushing			
The Time Strength of pushing			
Average of strength reaction of the ground			
An area under the curve / CM^2			
An area under the curve / time			
Wadih Samir's index $= \dfrac{\text{System weight / Newton}}{\text{Area under the curve/time } CM^2 \text{. Sec}}$			

APPENDIX 4

Cut images of the movement one of the players

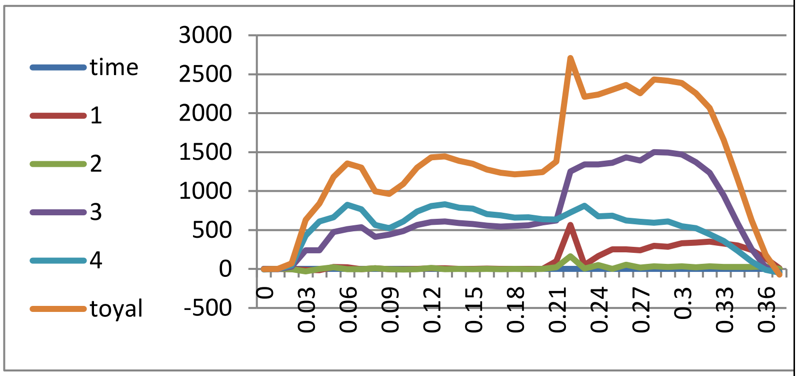


APPENDIX 5

Knowing the shape of the curve chart of the players

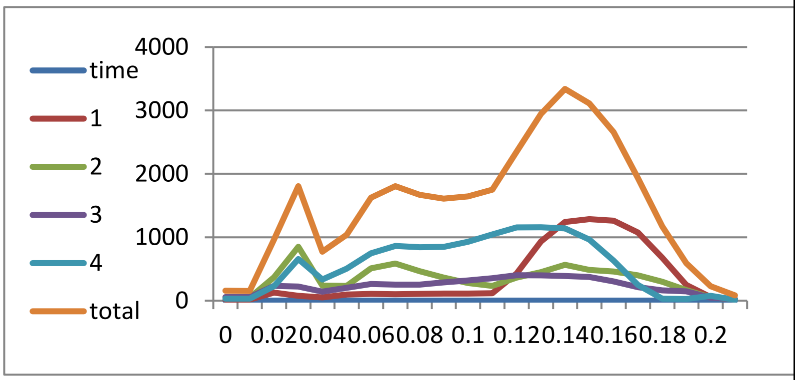
Bewar

838.9936	collision force
0.04	Time
963.5357	Less force
0.09	Time
2708.346	Pushing
0.22	Time
0.37	Full touchtime



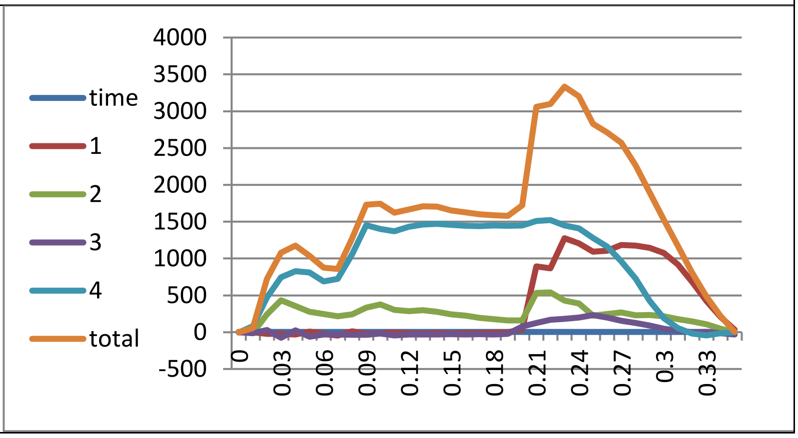
Waleed

1803.419	collision force
0.03	Time
770.4511	Less force
0.04	Time
3339.444	Pushing
0.14	Time
0.21	Full touchtime



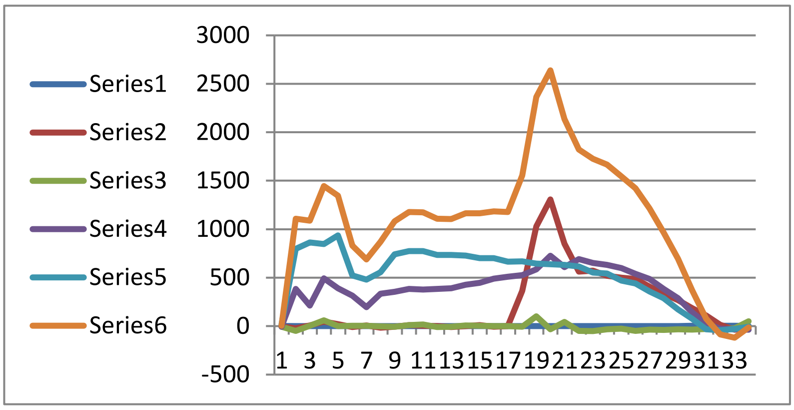
Nawzad

1174.769	collision force
0.05	Time
859.7506	Less force
0.08	Time
3333.499	Pushing
0.24	Time
0.36	Full touchtime



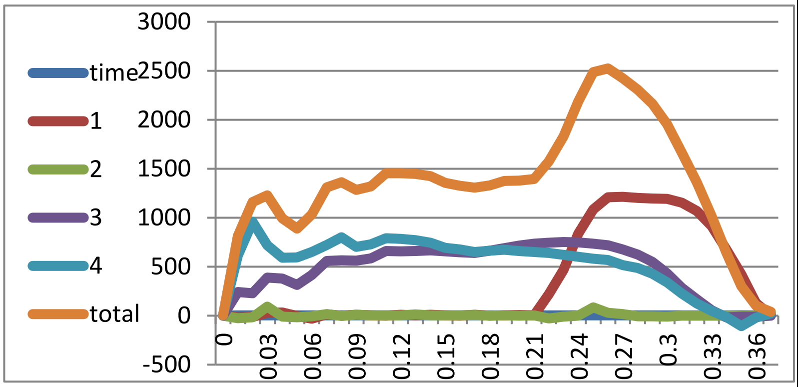
Ahmad

1446.237192	collision force
0.03	Time
686.7744322	Less force
0.06	Time
2639.155385	Pushing
0.19	Time
0.3	Full touchtime



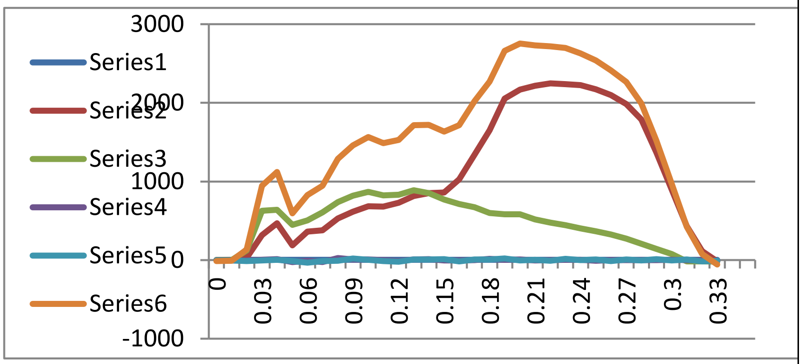
Dilovan

994.5473	collision force
0.04	Time
888.3202	Less force
0.05	Time
2486.608	Pushing
0.25	Time
0.37	Full touchtime



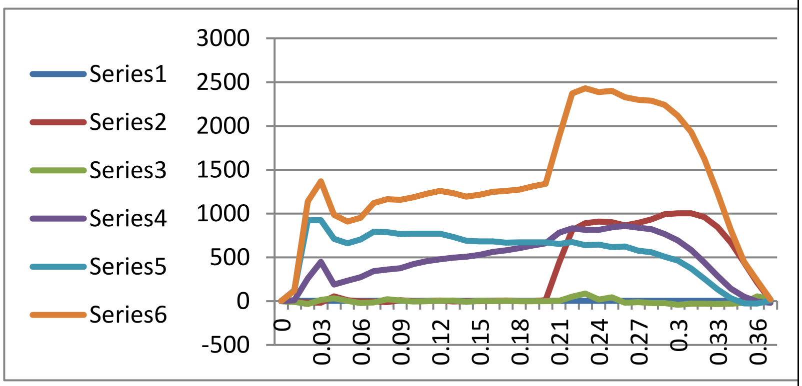
Mohamed

1120.229	collision force
0.04	Time
596.4201	Less force
0.05	Time
2753.924	Pushing
0.2	Time
0.33	Full touchtime



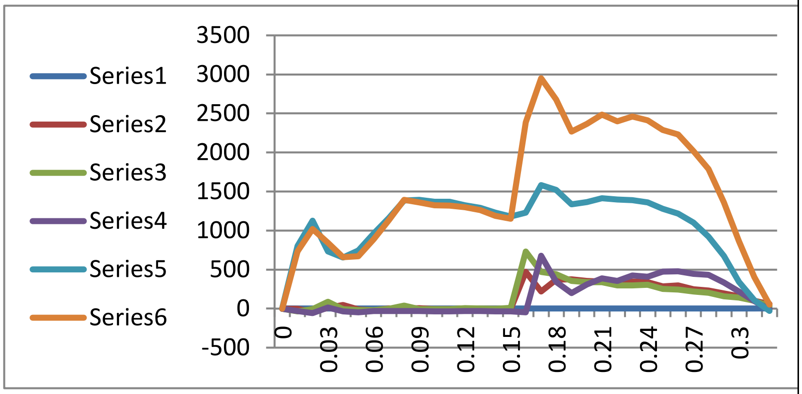
BLLEEN

1366.953	collision force
0.03	Time
1191.128	Less force
0.14	Time
2429.224	Pushing
0.23	Time
0.37	Full touchtime



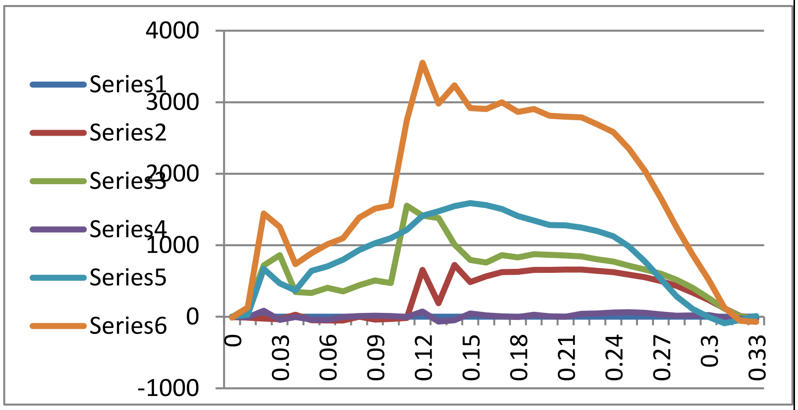
GAELAN

734.3936	collision force
0.01	Time
658.6917	Less force
0.04	Time
2678.227	Pushing
0.18	Time
0.32	Full touchtime



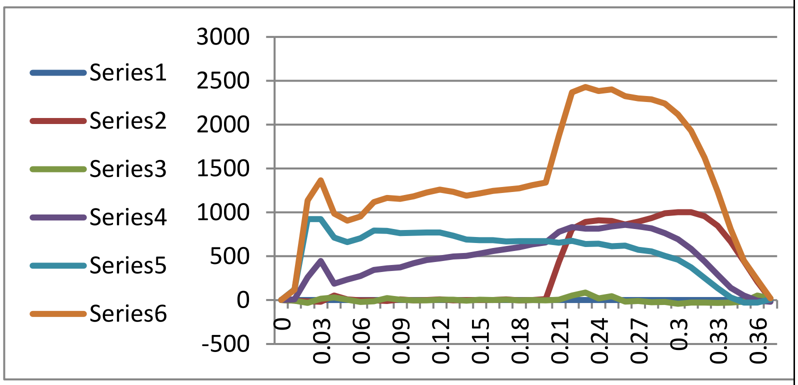
SALEM

1443.795	collision force
0.02	Time
736.8355	Less force
0.04	Time
2996.909	Pushing
0.17	Time
0.33	Full touchtime



ARAS

1237.445983	collision force
0.04	Time
694.1004396	Less force
0.06	Time
2436.469182	Pushing
0.22	Time
0.33	Full touchtime



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http://www.amrswira.com/downloads/books/design/after_effects_reference.pdf

5. < 1% match (student papers from 31-Oct-2016)
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6. < 1% match (publications)
Zhang, Nan. "Analysis of External Prestressing Effect on Flexural Performance of Composite Steel Box-concrete Continuous Girder Bridge", Journal of Highway and Transportation Research and Development (English Edition), 2008.