

**EFFECTIVENESS OF THE SERVES USED DURING THE
12TH EDITION OF THE AFRICAN VOLLEYBALL CLUBS
CHAMPIONSHIP**

**A THESIS SUBMITTED TO THE DEPARTMENT OF
PHYSICAL EDUCATION, FACULTY OF EDUCATION
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THE REQUIREMENT FOR THE DEGREE OF MASTER OF
EDUCATION**

BY

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1999

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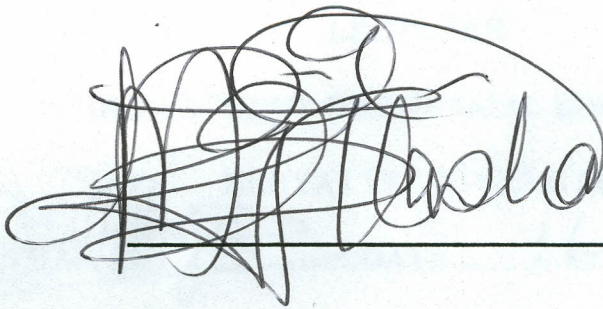


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DECLARATION

No portion of the work referred to in this thesis has been submitted in support of an application for another degree qualification of this or any other University or institute of learning.

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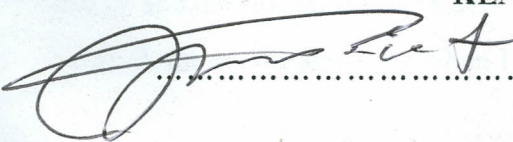
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DEDICATION

To My Loving Dad and Mom, I dedicate this Work.

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ABSTRACT

This study involved the analysis of the serves used by the teams which participated in the 12th edition of African feminine volleyball club championship held in 1997 in Nairobi. A total of 19 matches were pre recorded for this study. A modified Volleyball analysis instrument from the one developed in 1975 by the United States Volleyball Association was used to collect data for this study. Three well trained research assistants were used for collection of data. An inter observer reliability test with a reliability coefficient of 0.81 was conducted to correlate the data from the three research assistants.

The data collected were expressed in terms of frequencies and percentages. Chi-Square at 0.05 level of significance was used to compare the types of the serves used, the one commonly used in this championship and the effectiveness to ineffectiveness of each type of serve by a particular team against her opponents.

From this study it was found that only three types of serves were used in the championship (floater, tennis and jump serve) but Floater serve was used most. It was further found that Floater serve was the most effective while Tennis serve was relatively less effective. Jump serve was used least frequently. Besides, it was used by only three teams in this Championship and by only one particular Player in each of the three teams.

Other findings indicated a significant difference in the effect of Posta's, Pipeline's and Aswab's Tennis serve against their opponents; and Delta Force's, Aswab's and Sonel's floater serve against their opponents. Delta Force, Commercial Bank, Union, Inter, Sonel and Kigali did not have a significant impact on their opponents, same observations were found with respect to floater serves by Pipeline, Posta, Commercial Bank Union, Inter and Kigali.

This study recommends that feminine African volleyball teams should:

- (1) Diversify the type of serves they use.
- (2) Schedule more time for the training of serves in their programmes.
- (3) Learn about their opponent's weaknesses in order to direct serves accordingly.
- (4) Review their serve-receive formations according to the strategy of the opponents serve.
- (5) Training on the serve as a basic and most important aspect in the winning of a volley ball match at the lowest level possible e.g. primary and at the local club levels for proficiency at latter stages.

CHAPTER ONE

INTRODUCTION

1.0 Background to the Problem

Compared to the popular team games like Soccer and Basketball, Volleyball is relatively young. Invented in Holyoke, Massachusetts, in 1895, as a recreational activity for overweight businessmen by William Morgan, (Odeneal, 1979; Scates, 1972), it has developed to be one of the most popular sport competing with soccer and basketball in level and the number of international competitions (FIVB, 1989).

Although at the formation of International Volleyball Federation (FIVB) in 1947 only 14 (fourteen) countries in the world were represented; it was just a matter of time before the game established itself as one of the most popular sport in the world. By 1970, there were 108 affiliated National federations and over 90 million players. At the Moscow Olympic congress of 1980, 134 members were reported with 40 from Asia, 32 from Europe, 31 from Africa, 20 from North, Central America and Caribbean countries (NORCECA) and 12 from South America. By 1988 Seoul Olympic Congress, FIVB membership had reached 175, a figure more than that of the International Olympic Committee members, and had an estimated number of 150 million active players (FIVB, 1989).

Due to the large number of the participating teams, the sport has become very competitive demanding high physical, technical and tactical performance (Dunphy & Wilde, 1991). This, therefore, creates a need for scientific studies on the various aspects of play so as to elevate the standard of the game further.

Changes of the techniques and tactics of volleyball have been a result of long creative development and synthesis of the best elements of international styles (FIVB, 1989). Through research work and more so the development of match analysis technique, researchers have been able to discover tactics and strategies used in international competitions by observing teams in training and or competitions. In the early 1960s Germans and Polish teams dominated international events with long set and out of the net style of attack. Late 1960s to mid 1980s Asian and Japanese male and female teams dominated the event with their style of short and fast centre attacks. From mid 1980s, Cuban and U.S.A. teams dominated, where Cuban teams with their enormous jumping ability brought forth a form of attack from the back court and introduced the jump serve (Dunphy & Wilde, 1991). Some teams have combined styles of the best teams to come up with their own national style. Others have tended to replicate the techniques, tactics and strategies which have lead a team to win in a major tournament (FIVB, 1989). To be able to identify the variables which have led a team to win, it is important to conduct a study on specific techniques and tactics used by that particular team in competition. This will help establish what should be adopted and what requires improvement.

One of the techniques in the game of volleyball which has kept on developing is the serve. It is an integral part of every volleyball match (Nicholls, 1978), as it is the first weapon of attack a team has (Dunphy & Wilde 1991). With time it has developed from the original under arm serve, which was more predictable and easy to control (Armbruster, 1979) to the more offensive overhand serves used by the elite teams (Dunphy & Wilde, 1991). These serves have high velocity, power, low trajectory, narrow angle of contact and unpredictable flight creating hard situation to a receiver to pass accurately to the target (Hippolyte & Bertucci, 1979; Dunphy & Wilde, 1991; Cox, 1994). They include Tennis/top spin, Floater, Windmillhook/Roundhouse and the Jump serve.

Serve as the first weapon of attack can facilitate a victory of a team because it can win a direct score (ace) or reduce the opponents potent attack (Nicholls, 1978). However, few players master more than one type effectively (Dunphy & Wilde, 1991). A comprehensive study can establish the common and identify the most effective serve used in competitions. More so it can determine how each team uses its serve against opponents so that a team can endeavour to polish on her best serve.

Although different African volleyball teams use different serves in competition, review of literature indicates no study has attempted to evaluate them with the purpose of either establishing the common ones used or identifying their effectiveness. It was therefore necessary to assess the effectiveness of the serves used by each team so as to provide this important information to the practitioners and African sport scientists who are constantly seeking the most effective means of improving the performance of teams.

1.2 Statement of the Problem

Kenyan women teams have dominated volleyball competitions at continental level. From 1990 to 1997 the African club championship title changed hands between Nairobi Posta and Kenya Pipeline. At International level Kenya women volleyball team featured in the World championship once and world cup twice representing Kenya and Africa respectively.

Although the standards of Kenyan women teams is comparatively high at continental level the African teams have not made impact at International competitions. Infact the representatives of Africa have not won a single set at international competitions.

Whereas previous studies have focused on the various technical, tactical and even biomechanical aspects in volleyball, none had evaluated the role of the serve. Moreover, no study had focused on volleyball serves in Africa.

This study was therefore set to evaluate the type of serves used by the teams that participated in the 12th edition of feminine African club championships. The study investigated the different types of serves used, their effectiveness and compared how teams used serves against their opponents.

1.3 Purpose of the Study

The purpose of this study was to establish the types of serves used during the 12th edition of the feminine African club championship competitions, how these serves were used and determine how each team used a particular serve against her opponents.

1.4 Research Hypotheses

The study was guided by the following research hypotheses:

- i) There is a significant difference in the types of serves used in this competition -
- ii) There is a significant difference in the effectiveness of the serves used in the championship .
- iii) There is a significant difference in the use of a particular serve in the championship.
- (iv) There is a significant difference in the effectiveness to ineffectiveness of the serves used in the championship.

1.5 Theoretical Framework

Evaluation of techniques and tactics of a game is essential for the improvement of teams' technical and tactical actions (Harre, 1982). Methods of evaluating techniques and form of contest of a volleyball game include: The ranking systems theory and 'Sport tactics' or the "theory of directing contest," (Harre, 1982).

The ranking system theory assists in the determination of the level of techniques acquired, the quality of execution and the partial processes of the coordinative movements. The 'Sports tactics' theory builds its concepts on the form of the contest of the game i.e. individual, dual or team contests and these games actions determined by the intervention by either opponents, interference of the opponents or the influence by the opponents (Harre, 1982).

The principles behind these theories can be used in volleyball to design a training programme according to the level of the players and teams technical acquisition and mastery. This would assist in the selection and placement of the players for the different roles in a team. Tactically, they can assist in the design of the strategies of the team in competition by directing shots and serves according to the strength and weakness of the opponents. It is therefore, important that coaches understand the tenets behind these theories and implement them to evaluate teams' technical acquisition and mastery and develop tactical manouvres for their teams in competitions.

Volleyball which is a team contest depends greatly on the serve as a weapon of attack. For example, Jump serve, although very hard to execute, if well mastered is very fast, powerful, has low trajectory and a narrow angle of contact. Floater serve moves with the existing air current which makes its flight unpredictable. Although Roundhouse and Tennis serves have predictable flights, yet they are offensive if well mastered because they possess great power and can be placed to specific points of weakness on the opponents' court (Armbruster, 1979; Dunphy & Wilde, 1991).

Tactically, serve can win or delay a potent attack by the opponents. Perfection of the serve by the player enhances ball control which increases the effectiveness of the tactical action (Armbruster, 1979). For example, a serve directed to the points of weakness can win a score. These points include; a particular weak receiver in a team, a point where two or three players are in a line to receive a ball, corners of the court, a serve at the far back of the court, a serve on the path of the penetrating setter, a serve on the side of the strongest attacker (Nicholls, 1978). A serve which forces a receiver to move to receive a ball can lead to poor pass. Nicholls, (1978) observes that, receiving a ball when in motion increases the likelihood of making mistakes. Therefore, a serve to uncovered part on the court will lead a player to move thereby increasing the chances of executing a poor pass.

Psychologically a serve can be used to affect the rhythm and coordination of a team. Bertucci (1979) observes that, volleyball requires calmness under pressure and even slight tempers can make a difference between winning or losing a match. With this realization, therefore, a persistent serve to a weakness of an individual player or the team in general can lead to the loss of coordination and consequently quarrels by players of a team amongst themselves which make them not to get back into the rhythm of the game easily (Tuttle, 1979).

In all, this study aimed at using technical and tactical paradigms in volleyball to determine the level at which African feminine volleyball teams have acquired and mastered the required techniques and were able to direct tactical actions during competitions. Additionally, the study pointed out specific technical and tactical aspects which required

emphasis in the training so that teams can internalise them prior to competitions.

1.6 Significance of the Study

The results of this study avails information to the volleyball coaches and sports scientists about serves. This may lead to the development of new serving techniques and tactics and the improvement of the existing ones, an insight into better methods of evaluating teams both in training and competitions, a need for further research into other aspects of volleyball and the general field of sport. The results are specifically beneficial to coaches because they can use them to develop and set practical objectives and evaluate them with the purpose of motivating their teams in training.

1.7 Assumptions of the Study

The study assumed:

- i) the performance of the selected teams reflected accurately the development and level of play of feminine volleyball clubs.
- (ii) the participating teams were physically, psychologically, technically and tactically prepared.

1.8 Delimitations

The study was delimited to:

- (i) Evaluation of serves amongst the offensive techniques in volleyball.
- (ii) Use of only one international competition (12th Edition of the

Feminine African Club Championships).

- (iii) Use of the female teams.
- (iv) Use of chi square as a statistical tool.

1.9 Limitations

Results of this study were realised by analysing the serves used by the teams participating in the 12th edition of the Feminine Africa Club Championship. The results may, therefore, not be generalised globally, to the male and youth teams or to any other championship. Secondly, the study observed technical and tactical effect of the types of serves used, it did not consider the physiological biomechanical and psychological effect of these serves.

1.6 Operational Definition of Terms

- Effective serve:** The serve which won an ace or one directly returned over net on first touch. Also where the designated setter was assisted by a second player to set, ran cross court, bent low or jump for the ball over the net in order to set.
- Elite teams:** The teams participating in the 12th Edition of African feminine volleyball clubs championship in Nairobi, 1997.
- Floater serve:** A spinless overhand serve.
- Hook serve:** A type of serve where the ball is contacted overhead by bringing the arm from the side of the body in a cyclic manner.

Ineffective serve: A situation where a setter does not struggle to set a ball.

Jump serve: A serve where the player tosses the ball in the air, rung jumps and spike it before landing.

Match analysis: A qualitative and quantitative assessment of a team in a playing situation.

'S' Was used to denote effective serve

Serve: A way of putting the ball into play by the right back player of a team.

Tactic: Manipulation of a serve to force a foul on the opponent

Team 'A' Was always the team that started to serve at the beginning of a match.

Technique: The mechanic of executing a serve in the game of volleyball.

'U' Denoted ineffective serve

CHAPTER II

REVIEW OF THE RELATED LITERATURE

2.0 Introduction

This chapter reviewed literature related to the study and it is organised under the following headings.

- (i) Use of match analysis in sport
- (ii) Factors that affect performance in sport.
- (iii) Studies on the factors that affect volleyball team Performance,
 - a) Physical fitness
 - b) Technical and tactical factors

2.1 Use of Match Analysis in Sport

Sport training and competition forms a basis on which coaches and researchers can assess players' physical, psychological, technical and tactical strength and weaknesses (Cox, 1980; Harre, 1982; Lewellyn & Blucker, 1982; Suinn, 1994). Psychological aspects of performance and physical fitness of the athletes are evaluated through assessment of the behaviour in a game situation (Lewellyn & Blucker, 1982; Suinn 1994) and physical fitness test (, Logan & Mickkinney, 1981; Asembo, 1992) respectively.

Techniques and tactics of a team are evaluated using match analysis (Gerisch & Reschelt 1991, Kruger et al 1994; Asembo & Njororai, 1995). This is a qualitative and quantitative form of assessment (Kreighbaum & Barthels, 1982) which can be used objectively to give information on the application of techniques and collective implementation of tactics and strategies in a game (Asembo & Njororai, 1995; Dufour, 1991). The tool has extensively been used to appraise techniques and tactics of the teams in soccer (Gerisch & Reschelt, 1991; Luhatnen, 1991), rugby (Treadwell, 1991), hockey (Asembo & Njororai, 1995), volleyball (Cox, 1978; Calvet, 1981; Lanphear, 1981; Mueller, 1984), and many other sports. Results of these studies have formed a basis for adoption, improvement and development of new techniques, tactics and strategies essential to performance in the respective games (Logan & Mickinney, 1981).

Using volleyball matches one can objectively analyse the techniques, tactics and strategies used by a team in competition. Match analysis was, therefore, used in this study to determine the serves used by female African elite teams in international volleyball competitions with the view of identifying the frequently serves used, one which was most effective and compare how teams used these serves against their opponents.

2.2 Factors that Affect Performance in Sport

In competitions, team performance is affected by three main factors: physical fitness of the athletes (Lindal, 1979; Watson, 1983) psychological preparation of the athletes (Cox, 1980; Llewellyn & Blucker, 1982; Suinn, 1994); and technical and tactical

preparation (Maccurdy, 1979; Harre, 1982). These three factors combined affect the level of performance of the teams. During competition every team endeavours to win. However, only that team which is physically fit, psychologically prepared and possess excellent executions of motor skills would emerge the winner (Colfer, 1979; Lewellyn & Blucker, 1982; Harre, 1982,). The fitness level that affects the executions of techniques in volleyball include: strength, endurance, flexibility and agility, reaction time , speed and coordination (Bertucci, 1979; Simoninan, 1981; Banister and Wenger, 1982). Physically fit athletes are less susceptible to injuries (Scholz & Johnson, 1969) and are able to sustain participation in the game longer. It is, therefore, important that coaches ensure that players posses adequate fitness level related to the games in order to achieve better results in a competition.

Psychological preparation is another factor which affects optimal performance of a team. Psychological state of the athletes which interfere with performance in competitions include: commitment, cooperation, drive, anxiety, fear and mental toughness (Cox, 1980; Suinn, 1994). Fear to get injured or lose a match is very common among experienced players (Suinn, 1994). This condition interferes with the execution of techniques and tactics (Suinn, 1994). Optimal performance would be enhanced if the team is motivated, committed and well developed mentally to meet the pressures of the competition and prepared to direct their aggression positively (Lewellyn & Blucker, 1982).

Technical and tactical variables are other vital aspects of performance (Maccurdy, 1979; Harre, 1982). They constitute the essence of a game (Maccurdy, 1979).

Development and mastery of techniques and tactics of a game optimises performance (Harre, 1982). Without these two aspects, teams cannot create opportunities to win (John & Xanthos, 1984). They facilitate coordination and formation of the team strategies and designs (Nicholls, 1978). Through them, teams' objectives and achievements are determined and realised (Harre, 1982). It is, therefore, important for coaches to understand and have knowledge of the techniques and tactics which are essential in a game so as to improve on them during training to optimise performance. Identification of these techniques and tactics can only be achieved by analysing these variables as used in training and or competition. In volley ball these techniques include movement on the court, spike, blocks, and the serve among others.

2.3 Studies on the Factors that Affect Performance of a Volleyball Team

Scientific studies on performance have established that physical fitness, psychological preparedness, technical and tactical preparedness determine performance of a team.

a) Physical Fitness

Research has shown that physical fitness levels are important in determining performance of teams. An investigation into the factors underlying motor performance by James *et al.*, (1979) indicated that strength and fat content in the body determine success of a team. In this study, anthropometric measures of strength and speed of one hundred and eighty (180) intercollegiate volleyball women players were measured with the aim of

comparing the two factors and team success. Factor analysis of the measured variables found they could be multi dimensional as body size, speed/fat and strength. Multi discriminant analysis found a significant difference in the teams on the factors of speed/fat and strength. Two dimensional discriminant space found the stronger , faster and leaner teams as being most successful.

The results indicated that the basic factor of speed/fat and strength were related to team success. Multi discriminant analysis established that upper body strength and fat weight were the most important factors in differentiating between players of the most successful teams.

Jacqueline *et al* (1982) investigated the physical and physiological characteristics of elite volleyball players. Absolute and relative physiological characteristics of eight (8) male and fourteen (14) female players from United States National team and University World games respectively were examined. Percentage (%) body fat, max vo_2 using treadmill runs, post exercise blood lactic acid, vertical jumping ability and peak isokinetic Torque (cybex II) for Knee flexion and extension, shoulder extension and plantar flexion at 30, 180, 240, 300 degrees/sec were measured. It was found as expected that : men were taller and had higher body density, lean body weight and lower body weight. They achieved greater absolute height for jumping and reach, greater jump distance above the standing reach, had greater max vo_2 expressed in absolute terms (1 min). Maximum exercise heart rate and post exercise blood lactic acid values were similar for both groups.

b) Technical and Tactical Factors

These two are among the three factors which affects performance. They have been expressed as the most important variables in a game without which there would be no success (Harre, 1982; Maccurdy, 1979).

In volleyball Kruger *et al* (1994) investigated whether serve is an attack technique. He conducted a clinical sonographical evaluation of shoulder to compare pain sensation caused by spiking and serving at active intervention above 160° or active abduction above 140° of thirty (30) competitive volleyball players. Fifteen (15) elite players with shoulder pain and fifteen without were used and the results of the attackers compared with those of non -attackers. It was concluded that mechanics of serve and spike were the same.

Cox and Johnson (1982) investigated the relationship between the slide and cross over step in blocking. Three initial step technique and a selected time variable involved in jumping action were used on three female and three male skilled players. A split split plot 3 (step method) x 2 (response direction) x method and direction was used. Results revealed a relationship between step method and the three variables. Cross over, particularly jab cross over was superior to the slide step in terms of getting the body off the ground for blocking position quickly. Jab cross over was found superior in terms of actual jumping and blocking efficiency.

Calvet (1981) investigated the relationship between anthropometric and motor

performance variables to game performance. One hundred and eighty (180) female players were measured on over head volley, fore arm volley, wall spiking, self bump set, agility run, vertical jump, height, weight, flexibility and body composition. Forty eight (48) of these subjects were used. Six (6) qualified coaches were used to rank the forty eight (48) independently under a game situation. Pearson's and multi regression was used to analyse the results. It was found that a battery test consisting of the over head volley, forearm volley, self bump set, wallspiking, and agility run accurately predicts performance.

Phipps (1981) evaluated selected factors predictive of volleyball playing ability. Three general ability tests, three specific volleyball skill tests and a personality trait test were administered to one hundred and twenty (120) high school girls trying out for university teams in six schools. Coaches of each team were used to design a subjective pre and post season score to each of their respective players. Post season score was used as a criterion measure. A general linear model procedure was used to develop prediction equation. It was found that:

- (i) specific model combined equation (general and specific) had the highest relationship of any combined model to criterion score.
- (ii) The specific model was most valid predictor of criterion score followed by combined and specific model.
- (iii) Little relationship exists between volleyball performance and general physical ability, specific skill test or personality traits.
- (iv) Specific skill test Model has the best prediction of volleyball

performance.

- (v) Substantial relationship exists between volleyball performance selected models which are better predictors than the coaches beginning of season judgement.

Mueller (1984) conducted a study on overhead volley using a descriptive analysis of the related literature. Contact time, flexion/extension of the right knee and trunk, ball velocity and displacement of the ball were analysed. Cinematographic technique in semi controlled environment found:

- (i) maximum contact time for effective absorption of force.
- (ii) the action of the legs served to lower total body centre of gravity prior to contact.

The findings supported description from the literature on the action of legs, ball contact and ball velocity. The variables were necessary in the overall performance in the over-head volley.

Allen (1983) did a study to determine a battery of skills techniques and mechanics for option execution of selected volleyball skills and to develop an instrument to qualitatively assess individuals performance for diagnostic purpose. A descriptive analysis from the literature to develop the correct techniques and mechanics of five skills in volleyball (serving, passing, setting, spiking and blocking) and a fifteen member jury to complete a survey instrument for validation were used. The study supported literature on

the mechanics for optimal performance and that the Test battery developed can objectively assess performance.

Hay (1984) compared biomechanical aspect of high side set with the two forehead sets. Three female setters were used to make three trials of each set. Cinematographic technique was used to analyse joint angle of the right and left knee hips and left wrist, distance and angle of the ball to the forehead and angle of the right and left knees at release and angle of the ball projection phase. Wilcoxon signed rank test at $p < 0.01$, produced significant difference on angle of the ball to the forehead, angle of the ball projection and angle of the left wrist.

Acero (1983) conducted study to determine the relationship between ball velocity and the effectiveness of a serve. He performed four pilot studies for objectivity between rates of time distance, vertical difference between ball contact, landing and effectiveness. A coefficient correlation ranging from 0.92 - 0.97 was found. Females from a general studies class of volleyball (n=2) executed sixty four serves in a game situation. Timer Method was used to estimate projection velocity of the ball. Thorpe Acero 7 and 6 point rating scale to determine effectiveness was used. It was found that the placement of the serve, skill of the receiver, score in the game, spin on the ball or other variables may influence the results of the serve.

Findings from the previous studies are essential because through them:

- The importance of physical fitness in volleyball is realised.

- coaches/players are informed of the physiological properties of different sexes in the game of volleyball
- The importance of teaching and learning technique of a particular sport is expressed.
- Methods of evaluating volleyball playing abilities are available.

Although these studies have been able to enlighten volleyball fraternity on the above, the population sample used in most of them was very small. Besides, none of the studies evaluated the effect of the serve as an attack. This study therefore was set to evaluate the effect of the serves in a competition.

CHAPTER III

METHODOLOGY

3.0 Introduction

This chapter focuses on the procedures and methods adopted in carrying out this study. It covers the research design, target population, sampling procedures, research instruments, data collection and analysis techniques.

3.1 Research Design

Match analysis research design was used for this study. Video taped matches made it possible to observe the variables of study as were performed in the actual play.

3.2 Target Population

These were matches played by teams which participated in the 12th edition of the Feminine African Volleyball Clubs Championship held in Nairobi from April 26th - May 2nd 1996. Nine (9) teams took part in this championship with a total of nineteen (19) matches video taped for this study.

3.3 Sampling Method

The teams that participated in this championship were all elite and represented the best from their respective countries. Therefore, all the matches were video taped.

3.4 Research Instruments

Match analysis instrument developed in 1975 by the United States Volleyball Association and used by the United States Coaching staff to spy on other teams in playing situations was used. This was used to study the teams attack, defence, serve receive formations and serve strategies of the opponents in the 1976 Montreal Olympic games. This instrument was able to establish serving strategies of players and the team if any exists (Bertucci, 1979). A test retest consistency of the attack analysis was found to be 0.7, defence analysis was 0.6, serve receive formation 0.6 and that of the serving strategies was found to be 0.8 valid; Reliability co-efficient(r) of the serve analysis chart developed ranged between 0.6- 0.7. This study used the sheet on "analysis of the opponents service techniques", which was modified to reflect the specific variables of the study (See appendix II for the modified analysis sheet). To augment the use of this sheet the matches were video taped.

3.5 Data Collection Procedure

Matches from the teams participating in the 12th edition of the Feminine African Clubs Championship were recorded. To be observed were the types of serve used and their effectiveness.

The analysis required that the type of serve be identified and its success or failure be indicated on the analysis sheet using letters 'S' for effective and 'U' for ineffective.

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To catch the action of all the required variables of the study, four qualified persons each with a video camera were stationed at the four corners of the field of play. For the purpose of accuracy of the analysis, the researcher employed services of three trained assistants who underwent a rigorous training on the use of match analysis sheet. To ensure reliability of the analysed variables, an inter observer reliability test was conducted with a reliability Coefficient of 0.81.

3.6 Data Analysis Techniques

The data collected were tabulated and computed in terms of frequencies and percentages. Frequencies were used to organise the data for ease of description and interpretation (Kerlinger, 1977; Kerkendal *et al*, 1980. Percentages provided a general summary of the data.

Chi-square was computed at 0.05 level of significance to compare the effectiveness to ineffectiveness of serves used against the opponents. It was able to indicate if there was a significant difference in the effectiveness to ineffectiveness of the serves used by a particular team against her opponents.

CHAPTER IV

ANALYSES OF DATA, INTERPRETATION AND DISCUSSION

4.0 INTRODUCTION

This chapter presents the analysis of data, interpretation of results and discussion of findings.

4.1 FINDINGS, INTERPRETATIONS AND DISCUSSION

Table 1: Types of Serves used in the Championship

TYPE	NO	%(OB)	%EXP	$\frac{\%(OB-EXP)^2}{EXP}$
FLOATER	1707	55.22	33.3	14.429
TENNIS	1343	43.45	33.3	3.094
JUMP	41	1.33	33.3	30.693
TOTAL	3091	100	99.9	$x^2 = 48.216$

$P < 0.05; X^2 > 5.99$

In this championship three types of serves were used: floater, tennis and jump serve. All combined gave a total of 3091 serves.

Chi square calculated indicated a significant difference in the percentages. From the observed percentage, floater serve contributed over half of the serves (55.22%)

whereas jump serve contributed (1.33%) which was much lower than the expected (33.3%). Tennis contributed 43.45%, a figure higher than expected.

DISCUSSION

In Table 1, it was found that only three types of serves were used in this tournament, namely floater, tennis and jump serves. It was also found that floater serve was used most followed by tennis and jump serves. These findings support the assertions made earlier that African women teams have not matured to international standards where teams have been known to be efficient in using variety of serves. This is buttressed by the fact that jump serve which is referred presently as the most offensive serve (Dunphy & Wilde, 1991) was rarely used. In fact this serve was used only forty one (41) times in the whole championship. Furthermore, it was used by only three (3) individuals in three (3) teams. A player from Aswab used it twenty three (23) times out of which thirteen (13) were effective and ten (10) were not. A player from Union used it fifteen (15) times, five (5) were effective and ten (10) ineffective. The player from Commercial Bank used it three (3) times; one (1) effective and two (2) were ineffective.

Table 2: Effectiveness of the Serves used in the Championship

TYPE	CATEGORY	NO	%(OB)	%(EXP)	$\frac{(OB-EXP)^2}{EXP}$
FLOATER:	EFFECTIVE	1059	34.3	27.7	1.5726
	INEFFECTIVE	648	21	27.6	1.5783
TENNIS:	EFFECTIVE	470	15.2	21.7	1.9470
	INEFFECTIVE	873	28.2	21.7	0.0143
JUMP:	EFFECTIVE	19	0.6	0.7	0.0167
	INEFFECTIVE	22	0.7	0.6	0.0167
TOTAL		3091	100	100	$X^2 = 7.0759$

$$P < 0.05; X^2 > 5.99$$

Table 2; compares the total effective to ineffective serves of each type. From the table a significant difference $P < 0.05$ in the effective to ineffective of the three types of serves was found. This supports the hypothesis that a particular serve was used effectively than others. From the observed frequencies and percentages of each serve it was found that floater had more effective than the ineffective serves, tennis had more ineffective than effective while jump serve did not show much difference between ineffectiveness and effectiveness of its serve. It can also be seen from the table that the floater serve was more effective than expected, while the opposite was true of its ineffectiveness. Tennis serve was however found to have less or no effect compared to what was expected; much more ineffective than expected. Jump serve showed the same picture as tennis although the difference was very small. The discrepancies in floaters and tennis contributed highest to the chi square calculated.

DISCUSSION

In table 2, it was found that among the three types of serves used, floater serve was the most effective serve compared to the other two. Moreover floater constituted the majority of serves and was more effective. This supports the observation of Armbruster (1979), and Dunphy and Wilde, (1991) that due to the flight characteristics of floater serve it is hard to predict where it lands, thus forcing a receiver to move. Any movement in the act of receiving a ball increases the chance of making fouls (Nicholls, 1978). These could be the reasons which made floater serve more effective during the championship. On the other hand, tennis serve was found to be less effective in this tournament. Although it is effective when power is exerted on it, it is said to have a more predictable flight and the angle of contact is much larger than that of floater or jump serve (Dunphy and Wilde, 1991). This could possibly be the reason why it was less effective than expected. The difference in the effectiveness to ineffectiveness of the jump serve was relatively small. This serve is said to be hard to execute (Dunphy and Wilde, 1991). This may be why over 80% of this serve landed out of court in this championship. However if this serve is mastered it can be very effective. This is indicated by the fact that, of the serves which landed within the court over 50% won aces.

The inability of the teams to use this most offensive technique (jump serve) more frequently than others is an indication that Feminine African teams have not realised the importance of the serve in the game of volleyball. It also supports the earlier observation that Africa teams needs to isolate each aspect of performance on its own merit other than

incorporating all the aspects of play as one system in the training. This would assist in the perfection of the techniques which are difficult to effect in a real playing situation.

Tables 3 a, b and c compare how each team used the three types of serves. It was aimed at establishing if there was a team which could be said to have used any of the type of the serves more effectively than the others. Chi square computed indicated no evidence to suggest any team in the championship used any of the type better than others.

USE OF THE SERVES BY INDIVIDUAL TEAMS

Table 3(a): Floater Serve

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	176	183	0.26775
	INEFFECTIVE	119	112	0.43750
PIPELINE:	EFFECTIVE	177	183	0.19672
	INEFFECTIVE	183	112	0.32142
COMMERCIAL BANK:				
	EFFECTIVE	117	127.8	0.91267
	INEFFECTIVE	89	78.2	1.49156
DELTA FORCE:	EFFECTIVE	150	143.9	0.25858
	INEFFECTIVE	82	88.1	0.42236
ASWAB;	EFFECTIVE	147	135.9	0.90662
	INEFFECTIVE	72	83.1	1.48267
UNION:	EFFECTIVE	128	119.1	0.66507
	INEFFECTIVE	64	72.90	1.08655
SONEL:	EFFECTIVE	112	110.4	0.02318
	INEFFECTIVE	66	67.6	0.03786
INTER:	EFFECTIVE	36	38.5	0.16233
	INEFFECTIVE	26	23.5	0.26595
KIGALI:	EFFECTIVE	16	17.4	0.11264
	INEFFECTIVE	12	10.6	0.18490
TOTAL		1707	1707	$X^2 = 9.23633$

$P < 0.05; X^2 < 15.51$

Table 3b: Tennis Serve

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA	EFFECTIVE	61	60.5	0.0041
	INEFFECTIVE	112	112.4	0.0014
PIPELINE	EFFECTIVE	64	63.7	0.0014
	INNEFFECTIVE	118	118.3	0.0008
COMMERCIAL BANK				
	EFFECTIVE	69	72.1	0.1333
	INEFFECTIVE	137	134	0.0672
DELTA-FORCE				
	EFFECTIVE	80	73.8	0.5209
	INEFFECTIVE	131	137.2	0.2714
ASWAB	EFFECTIVE	54	56.3	0.0940
	INEFFECTIVE	107	104.6	0.551
UNION	EFFECTIVE	52	46.2	0.7281
	INNEFFECTIVE	80	85.8	0.3930
SONEL	EFFECTIVE	24	30.1	1.2362
	INEFFECTIVE	62	56	0.6657
INTER	EFFECTIVE	44	47	0.1915
	INEFFECTIVE	90	87	0.1034
KIGALI	EFFECTIVE	22	20.3	0.1423
	INNEFFECTIVE	36	37.7	0.0767
TOTAL		1343	1343	$X^2 = 4.6865$

$P < 0.05$; $X^2 < 15.51$

Table 3c: Jump Serve

TEAM	CATEGORY	O	E	$\frac{(\text{OB}-\text{EXP})^2}{\text{EXP}}$
ASWAB:	EFFECTIVE	13	10.9	0.4046
	INEFFECTIVE	10	12.1	0.3645
UNION:	EFFECTIVE	5	7.1	0.6211
	INEFFECTIVE	10	7.9	0.6211
TOTAL		38	38	$X^2 = 1.9484$

$$P < 0.05; X^2 < 3.84$$

DISCUSSION

Tables 3a, b and c established that no team in the championship could be said to have used any of the three types of serves better than others. This supports Mose, 1979 assertion that "one of the most off-quoted cliches through the years is a good serve". Infact the observation made from this championship indicated that the teams use serves as if they were playing just for leisure (Fivb, 1989) or just putting the ball into play and not an attack in itself (Nicholls, 1978). This was demonstrated by the inability of the players to be consistent in their serve even when they had a chance of continuously serving. It was observed that most players could hardly serve more than three serves continuously without

either playing into the net or sending the ball out of court.

To compare how each team used its serves against her opponents, effective to ineffective of floater and tennis serve for all the teams was computed. Jump serve was not compared because it was used by only three teams and even then the number required per cell to enable the use of chi square test could not be achieved.

Table 4a: Posta of Kenya's tennis serve against pipeline of Kenya, commercial Bank of Kenya, Delta Force of Nigeria, Sonel of Cameroon and Kigali of Rwanda.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
KPC	EFFECTIVE	18	15	0.516
	INEFFECTIVE	25	28	0.321
KCB	EFFECTIVE	17	18	0.056
	INEFFECTIVE	34	33	0.030
DELTA-FORCE:	EFFECTIVE	5	14	6.136
	INEFFECTIVE	36	27	3.000
SONEL:	EFFECTIVE	10	8	0.621
	INEFFECTIVE	12	14	0.286
KIGALI:	EFFECTIVE	11	6	5.207
	INEFFECTIVE	5	10	2.500
TOTAL		173	173	$X^2=18.673$

$$P < 0.05; X^2 > 9.49$$

Table 4a, indicates a significant difference in the outcome of Posta's tennis against all her opponents $P < 0.05$. This supports the hypothesis that a particular team used a

specific serve more effectively than another. Generally, Posta's tennis was less effective given the values of the observed frequencies. However, from the calculated chi-square, significant difference in the distribution could be located in the encounter of Posta versus Delta-Force and Posta versus Kigali. The two matches actually contributed the highest value to the total Chi-square observed. For example, Posta's tennis serve was much less effective against Delta-Force of Nigeria as could be expected theoretically. Moreover the number of the ineffective tennis serves against Delta-force was higher than expected. By contrast significant proportion of effective tennis serve was found in the match between Posta and Kigali. In this match effective serves were more than the expected while the ineffective ones were less.

Table 4b: Kenya Posta's Floater serves against pipeline of Kenya, Commercial Bank of Kenya, Delta-Force of Nigeria, Sonel of Cameroon and Kigali of Rwanda.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
KPC	EFFECTIVE	38	42	0.328
	INEFFECTIVE	32	28	0.512
KCB	EFFECTIVE	34	41	1.258
	INEFFECTIVE	35	28	1.865
DELTA-FORCE:	EFFECTIVE	46	43	0.209
	INEFFECTIVE	26	29	0.310
SONEL:	EFFECTIVE	34	29	1.020
	INEFFECTIVE	14	19	1.503
KIGALI:	EFFECTIVE	24	21	0.291
	INEFFECTIVE	12	15	0.431
TOTAL		295	295	$X^2 = 7.729$

$P < 0.05$; $X^2 < 9.49$

In table 4b, no significant relationship was found in the effect of Posta's floater serves and the composition of her opponents.

DISCUSSION

On the use of each type of serve, Posta's tennis serve was found to be significantly effective ($P < 0.05$) against her opponents (Pipeline, Commercial Bank, Delta Force, Sonel and Kigali). This also is in agreement with the hypothesis that a team used a particular serve more effectively than another. However, her tennis was much less effective against Delta-Force of Nigeria. To achieve better results against Delta-Force, Posta needs to vary her serves. Also, Posta's floater serves were not any better to guarantee its massive use against the Delta Force. The possible conclusion in this case could be that Delta-Force was able to master the types of the serves used by Posta as well as her strategy of serving. It is therefore important that Posta's coach devices new strategies of serving when playing Delta-Force of Nigeria. He should also objectively assess serve-receive formation of Delta-Force whenever they meet with the aim of directing and redirecting the serves used according to Delta-Force's weaknesses. Further, Posta's coach should diversify the types of serves used by his team so that they have a variety to choose from when playing such teams as Delta-Force. The same can be said of Posta's tennis serve against Commercial Bank of Kenya although it was not as ineffective as it was against Delta-Force.

Posta's tennis serves produced much better results than the floater serve against Commercial Bank, Pipeline, Sonel and Kigali. It is important that coaches of these teams

study Posta's strategy of using her tennis against them. Ostensibly, Posta capitalised on one or combination of the following factors to gain advantage over these teams. A serve to a poor receiver in a team, serve to the far corners of the court or far deep in the court depending on the serve receive formation of the opponent, empty spaces left by the team in the court, two players in the same lines, or on a path of a penetrating setter (Nicholls, 1978; Bertucci, 1979). Therefore anytime these teams are playing against Posta, they should ensure that their serve - receive formation takes care of the possible loopholes mentioned above so that they do not suffer undue advantage.

Table 5a: Pipeline of Kenya's tennis serves against Inter of Congo, Union of Mauritius, Commercial Bank of Kenya, Posta of Kenya and Aswab of Algeria.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
INTER:	EFFECTIVE	11	14	0.643
	INEFFECTIVE	29	26	0.946
UNION:	EFFECTIVE	13	9	2.005
	INEFFECTIVE	12	16	1.000
COMMERCIAL BANK:				
	EFFECTIVE	19	17	0.261
	INEFFECTIVE	29	31	0.129
POSTA:	EFFECTIVE	8	19	3.124
	INEFFECTIVE	34	27	1.815
ASWAB:	EFFECTIVE	13	9	1.289
	INEFFECTIVE	14	18	$X^2 = 11.501$

$P < 0.05; X^2 > 9.49$

Table 5a, indicates a significant difference in the out come of pipeline's tennis serve against her opponents $P < 0.05$. Therefore, hypothesis 1.4 (iii) which states that there is a significant difference in the use of a particular serve by the teams is accepted. Given the

values of the observed frequencies, Pipeline's tennis was generally less effective. However, from the calculated chi-square, significant difference in the distribution was found in the matches between Pipeline versus Posta, Union, versus Pipeline and Pipeline versus Aswab. From the three matches the discrepancies from the expected frequencies were relatively higher than in others. For example, as could be expected theoretically, that effective serves against Posta were much less. Moreover ineffective serves against Posta were higher than expected. On the other hand a significant proportion of Pipeline's effective serves was found in the out-come of the matches between Pipeline versus Union and Pipeline versus Aswab. In the two matches effective serves of Pipeline were much higher against both teams. By contrast, ineffective serves of Pipeline against the same teams were much less than expected.

Table 5b: Pipeline of Kenya's floater serves against Inter of Congo, Union of Mauritius, Commercial Bank of Kenya, Posta of Kenya and Aswab of Algeria.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
INTER:	EFFECTIVE	19	16.2	0.484
	INEFFECTIVE	8	10.8	0.726
UNION:	EFFECTIVE	44	42	0.095
	INEFFECTIVE	26	28	0.143
KCB	EFFECTIVE	45	46.2	0.031
	INEFFECTIVE	32	30.8	0.047
POSTA:	EFFECTIVE	35	37.2	0.195
ASWAB:	EFFECTIVE	34	35.4	0.083
	INEFFECTIVE	25	23.6	0.083
TOTAL		295	295	$X^2 = 1.989$

$P < 0.05; X^2 < 9.49$

As indicated in Table 5b, no significant relationship was observed in the effect of pipelines floater serve against her opponents.

DISCUSSION

Pipeline tennis serve was found to have a significant ($P < 0.05$) effect against her opponents (Inter, Union, Commercial Bank, Posta and Aswab). This accepts the hypothesis - that there is a significant difference in the use of a particular serve by a team. Her tennis were particularly effective against Inter of Congo, Aswab of Algeria and to a lesser extent Commercial Bank of Kenya. In this case Pipeline could possibly have used the factors highlighted earlier to gain advantage over her opponents. Coaches of these teams are therefore advised to seal all these loopholes which may render their teams prone to the manipulations of Pipeline through the use of tennis type of serve. They can easily do this by changing their serve - receive formation according to the demand or by perfecting their individual reception ability.

Against Posta of Kenya and Union of Mauritius, Pipelines tennis serve was found to be less effective. Possible reasons could be that these teams have mastered Pipeline's serving strategy, the teams had perfected their receiving techniques, Pipeline players themselves could not be able to direct the serves as per the planned strategy, or they could not notice and determine the weakness of their opponents.

The coach of Pipeline is therefore advised in future to; diversify the serves against

The coach of Pipeline is therefore advised in future to; diversify the serves against these teams, study and identify the many weaknesses of the opponents and advise his players accordingly so as to change to the most appropriate serve for each occasion.

Table 6a: Commercial Bank of Kenya's Tennis serve against Pipeline of Kenya, Posta of Kenya, Delta-Force of Nigeria, and Sonel of Cameroon.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
PIPELINE:	EFFECTIVE	20	19	0.077
	INEFFECTIVE	36	37	0.039
POSTA:	EFFECTIVE	14	19	1.503
	INEFFECTIVE	44	39	0.755
DEALTA FORCE:	EFFECTIVE	19	17	0.211
	INEFFECTIVE	32	34	0.106
SONEL:	EFFECTIVE	16	14	0.386
	INEFFECTIVE	25	27	0.194
TOTAL		206	206	$X^2 = 3.271$

$P < 0.05$; $X^2 < 7.82$.

From Table 6a no evidence could be found to suggest that any relationship existed in the effect of tennis serve of Commercial Bank of Kenya against her opponents during the championship.

Table 6b: Commercial Bank of Kenya floater serves against Pipeline of Kenya, Posta of Kenya, Delta-Force of Nigeria and Sonel of Cameroon.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
PIPELINE:	EFFECTIVE	28	29	0.034
	INEFFECTIVE	23	22	0.045
POSTA:	EFFECTIVE	29	28	0.036
	INEFFECTIVE	20	21	0.048
DELTA-FORCE:	EFFECTIVE	38	41	0.22
	INEFFECTIVE	35	32	0.281
SONEL:	EFFECTIVE	22	19	0.474
	INEFFECTIVE	11	14	0.643
TOTAL		206	206	$X^2 = 1.781$

$P < 0.05; X^2 < 7.82$

As indicated in Table 6b, no significant difference existed in the effect of floater serve of Commercial Bank of Kenya against her opponents.

DISCUSSION

The hypothesis that there is no significant difference in the use of a particular serve by teams is rejected. Although Commercial Bank of Kenya's tennis and floater serves did not score against the opponents, it was observed from the raw data that her tennis serves were much less effective against Posta of Kenya compared to all her other opponents. Her floater serve were also much less effective against Delta-force of Nigeria. Clearly, Kenya Commercial Bank did not use her tennis serve as planned or Posta had mastered the reception of this serve. It could also be that Posta realised the strategy of the Commercial in using this serve and adjusted accordingly. To overcome Posta, Commercial Bank must study the serve-receive formation of Posta so as to disorient it.

Also, since Commercial's floater was ineffective against Delta-force of Nigeria, it would be in order if she adopts different types of serve in future.

Table 7a Delta-Force of Nigeria's tennis serve against Posta of Kenya, Commercial Bank of Kenya, Union of Mauritius, Aswab of Algeria and Inter of Congo.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	8	13.3	2.112
	INEFFECTIVE	27	21.7	1.294
KCB:	EFFECTIVE	23	18.6	1.041
	INEFFECTIVE	26	30.4	0.637
UNION:	EFFECTIVE	21	21.6	0.017
	INEFFECTIVE	36	35.4	0.01
ASWAB:	EFFECTIVE	21	21.6	0.017
	INEFFECTIVE	13	21.1	0.209
INTER:	EFFECTIVE	13	13.6	0.026
	INEFFECTIVE	23	22.4	0.016
TOTAL		211	211	$X^2 = 5.704$

$P < 0.05; X^2 < 9.49$

Similarly as indicated in Table 7a, no significant difference was detected in the effect of Delta-Force of Nigeria tennis serves against her opponents.

Table 7b: Delta-Force of Nigeria's floater serve against Posta of Kenya, Union of Mauritius, Aswab of Algeria, Inter of Congo and Commercial Bank of Kenya.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	47	39	1.641
	INEFFECTIVE	13	21	3.048
UNION:	EFFECTIVE	17	21	0.762
	INEFFECTIVE	16	12	1.333
ASWAB:	EFFECTIVE	29	30	0.033
	INEFFECTIVE	17	16	0.063
INTER:	EFFECTIVE	25	21	0.762
	INEFFECTIVE	8	12	1.333
	EFFECTIVE	32	39	1.256
	INEFFECTIVE	28	21	2.333
TOTAL		232	232	$X^2 = 12.564$

$P < 0.05; X^2 > 9.49$

Table 7b, indicates a significant difference in the Delta-Force Floater serve against her opponent. Given the values of observed frequencies her floater serves were generally effective against her opponents, $P < 0.05$. This proves the hypothesis that there is a

significant difference in the use of a particular serve by a team. From the calculated chi-square a significant relationship in the distribution could be found in the out-come of the matches between Delta-Force against Posta and Commercial Bank both of Kenya. Delta-Force's serves against these two teams indicated higher discrepancies from the chi-square calculated than in her matches against her other opponents. For example from the out-come of the match between Delta-Force and Posta, it was observed that effective serves were more than expected while the ineffective were less than expected. It therefore implies that Delta-Force floater serve against Posta -was most effective.

In the match between Delta-Force and Commercial Bank, Delta-Force effective floater serve was less than expected, while her ineffective serve was more than expected. It is evident that Delta-Force floater serves against commercial bank was not effective.

DISCUSSION

The encounter between Delta-Force of Nigeria and her opponents indicated that her tennis serve did not have any significant effect. However, observation of the raw data available indicated her tennis was much less effective against Posta of Kenya as compared to other opponents. It could be that Posta had mastered the reception of this type of serve or the Delta-Force players could not execute it to weaken the serve-receive formation of Posta. It is therefore important that whenever these two teams meet, they adjust their strategy accordingly.

Delta-Force floater serve was found to have a significant ($P < 0.05$) effect against her opponents in this championship. Her floater serves were found to be most effective against Posta of Kenya. Furthermore, it was found to be generally effective against all her opponents except Commercial Bank of Kenya. The reasons for this could be that her mastery of this serve was better than that of the opponents or players of her opponents were poor receivers.

Since this serve was much effective against Posta of Kenya, whereas tennis failed, it is important that Delta-Force capitalises on it to gain advantage over Posta in future. She can also use it against other opponents because it produced some positive results except in her encounter with Commercial Bank of Kenya. Against Commercial Bank, Delta-Force had better change to another serve if she hopes to make any impact.

The opponents of Delta-Force are on the other hand advised to be cautious when playing her in future. They need to devise a method to counter the effect of floater serve by the Nigerian team. They can do this by, perfecting their individual skill in reception and designing a serve-receive formation to avoid much movement while receiving her floater serve. This will curb the problem of receiving the serve while in motion which indeed increases chances of making a poor pass (Nicholls, 1978).

Table 8a: Aswab of Algeria's tennis serve against Pipeline of Kenya, Delta-Force of Nigeria, Union of Mauritius, Sonel of Cameroon and Inter of Congo.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
K.P.C.	EFFECTIVE	14	10	1.6
	INEFFECTIVE	15	19	0.842
DELTA FORCE	EFFECTIVE	6	7	0.143
	INEFFECTIVE	16	15	0.067
UNION;	EFFECTIVE	8	11	0.818
	INEFFECTIVE	24	21	0.429
SONEL:	EFFECTIVE	8	14	2.571
	INEFFECTIVE	34	28	1.286
INTER:	EFFECTIVE	18	12	3
	INEFFECTIVE	18	24	1.5
TOTAL		161	161	$X^2 = 12.256$

$P < 0.05$; $X^2 > 9.49$.

As presented in Table 8a: a significant difference was noted in the outcome of Aswab tennis serve against the opponents. Generally Aswab's tennis serves were less

effective given the values of the frequencies observed. However, from the calculated chi-square, the difference in the distribution could be located in the encounters within Aswab versus pipeline, Aswab versus Sonel and Aswab versus Inter. The three matches contributed most to the total chi-square calculated.

From the Table, it was evident that Aswab's tennis serves were more effective against Pipeline of Kenya and Inter of Congo. In the two encounters the observed effective serves were more than the expected although the ineffective serves were less than expected. On the other hand, Aswab's tennis serves were found to be less effective against Sonel of Cameroon and Union of Mauritius. This is evident from the distribution of effective to ineffective serves of Aswab against Sonel and Union. In these encounters the composition of Aswab's effective serves against the two teams were found to be less than expected while the ineffective were more.

Table 8b: Aswab of Algeria's floater serves against Pipeline of Kenya, Delta-Force of Nigeria, Union of Mauritius Sonel of Cameroon and Inter of Congo.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
K.P.C.	EFFECTIVE	19	26	1.885
	INEFFECTIVE	20	13	3.769
DELTA-FORCE:	EFFECTIVE	28	26	0.154
	INEFFECTIVE	10	12	0.333
UNION;	EFFECTIVE	35	38	0.237
	INEFFECTIVE	22	19	0.474
SONEL:	EFFECTIVE	47	4	1.225
	INEFFECTIVE	12	19	2.579
INTER:	EFFECTIVE	18	17	0.059
	INEFFECTIVE	8	9	0.111
TOTAL		219	219	$X^2 = 10.826$

$P < 0.05; X^2 > 9.49$

Table 8b, indicates a significant difference in the efficiency of floater serves of Aswab against her opponents, $P < 0.05$. This tends to acceptance of the hypothesis that some teams use a specific serve more effectively than others. Generally, Aswab's floater serves were more effective against her opponents. However, calculated chi-square indicated much discrepancies in her encounter against Pipeline and Sonel. For example in Aswab's encounter against Pipeline, her floater serves were less effective as indicated by the number of the observed frequencies. Here, Aswab's effective serves were less than expected. By contrast ineffective serves were more than expected.

In her encounter against Sonel, Aswab's floater serves were found to be more effective. In this match, Aswab's effective serves were more than expected, while her ineffective ones were less.

DISCUSSION

On Aswab's encounter with her opponents both her tennis and floater serves indicate a significant ($P < 0.05$) effect. Her tennis serve was found to be much effective against Inter of Congo and Pipeline of Kenya. However, it was much less effective against Union of Mauritius and Sonel of Cameroon. Earlier it was indicated that Pipeline's tennis serve against Aswab was less effective. The implication here is that whereas the Aswab players had possibly mastered Pipeline's use of tennis serves, Pipeline players were not able to counter her (Aswab) tennis. Aswab therefore is advised to capitalise on this weakness in order to gain more advantage over Pipeline. Equally they can use the same serve against

Inter of Congo to gain more advantage. Pipeline and Inter are advised that in order to counter the effect of this serve against Aswab, they ought to assess the possible weakness which may have led to their failure to contain this type of serve. The weakness could have been, empty spaces left due to either stationing the players far much deep into the court or far back of the court, or having players who were poor receivers. These teams should therefore design their serve-receive formation to cover the whole court. In case of poor receivers they should design a method of shielding her when in back court. She can alternatively be substituted when she gets to the back. Else, they should train and ensure each individual player can receive accurately any type of serve.

Against Sonel and Union, Aswab is advised to change her serve to another one if she is to gain any advantage over these teams in future.

Aswabs floater serve was found to be more effective against Sonel of Cameroon and less effective against Pipeline of Kenya and Union of Mauritius. Since Aswab's tennis serve was found to be less effective against Sonel of Cameroon, it is advised in future to use floater serve more frequently against her because it appeared to be more effective. In any encounter with Pipeline, Aswab can instead of using floater serve, use tennis which was found to confer advantage over Pipeline. Against Union, Aswab has no alternative but to change to any other type of serve other than tennis and floater. In fact Aswab can go a head and encourage more of her players to try jump serve which was used very effectively by one of her players. If this could be used by most of her players and well perfected, it may give them a reasonable advantage over her opponents like it did the few times it was used.

Table 9a: Union of Mauritius' tennis serves against Pipeline of Kenya, Delta-Force of Nigeria, Aswab of Algeria and Inter of Congo.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
KPC:	EFFECTIVE	16	12	1.333
	INEFFECTIVE	14	18	0.889
DELTA-FORCE:	EFFECTIVE	7	10	0.9
	INEFFECTIVE	19	16	0.563
ASWAB:	EFFECTIVE	6	8	0.5
	INEFFECTIVE	15	13	0.308
INTER:	EFFECTIVE	23	22	0.045
	INEFFECTIVE	32	33	0.03
TOTAL		132	132	$X^2 = 4.568$

$P < 0.05; X^2 < 7.82$

Table 9a, indicates no significant relationship between the effect of Union's tennis serves and her opponents.

Table 9b: Union of Mauritius' floater serves against Pipeline of Kenya, Delta-Force of Nigeria, Aswab of Algeria and Inter of Congo.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
KPC:	EFFECTIVE	28	31	0.29
	INEFFECTIVE	19	16	0.563
DELTA-FORCE:	EFFECTIVE	25	26	0.038
	INEFFECTIVE	14	13	0.077
ASWAB:	EFFECTIVE	38	37	0.027
	INEFFECTIVE	17	18	0.056
INTER:	EFFECTIVE	37	34	0.265
	INEFFECTIVE	14	17	0.529
TOTAL		192	192	$X^2 = 1.845$

$P < 0.05$ $X^2 < 9.49$

Also the results in Table 9b, indicate no significant relationship between the effect of Union's floater serves and the composition of her opponents.

Table 10a: Sonel of Cameroon's tennis serve against Posta of Kenya, Commercial Bank of Kenya, Aswab of Algeria and Kigali of Rwanda.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	6	4	1.000
	INEFFECTIVE	9	4	0.364
K.C.B.	EFFECTIVE	5	6	0.167
	INEFFECTIVE	15	14	0.071
ASWAB:	EFFECTIVE	7	9	0.444
	INEFFECTIVE	15	14	0.154
KIGALI:	EFFECTIVE	6	5	0.200
	INEFFECTIVE	12	13	0.077
TOTAL		86	86	$X^2 = 2.477$

$P < 0.05; X^2 < 7.82$

From Table 10a; data analysis indicates no significant evidence to support the expectation that Sonel's tennis serve had any significant effect on her opponents.

Table 10b: Sonel of Cameroon's floater serves against Posta of Kenya, Commercial Bank of Kenya, Aswab of Algeria and Kigali of Rwanda.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	17	19	0.21
	INEFFECTIVE	13	11	0.363
K.C.B.	EFFECTIVE	14	21	2.333
	INEFFECTIVE	19	12	4.083
ASWAB:	EFFECTIVE	40	40	0.000
	INEFFECTIVE	24	24	0.000
KIGALI:	EFFECTIVE	41	32	2.531
	INEFFECTIVE	10	19	4.263
TOTAL		178	178	$X^2 = 13.783$

$$P < 0.05; X^2 > 7.82$$

Generally, Sonel's floater serve was more effective as is evident from the observed values of effective to ineffective serves. From the values of the calculated chi-square, a significant difference was found in Sonel's encounter with Commercial Bank and Kigali. From the distribution of the observed frequencies, it was found Sonel's floater was less

effective against Commercial Bank of Kenya. Within this encounter it was found that observed values of effective serves were less than expected while those of ineffective were more than expected. In the encounter with Kigali of Rwanda, Sonel's floater serve was found to be more effective. In this match, the observed values of effective serves were found to be more than expected while the ineffective were less.

DISCUSSION

The encounter between Sonel of Cameroon against her opponents namely the Posta, Commercial Bank, Aswab and Kigali indicated that her floater serve was significantly effective ($P < 0.05$). Her floater serve was found to be more effective against Kigali of Rwanda. It was however, much less effective against Commercial Bank of Kenya.

Sonel is advised that in future she should use the floater serve more frequently against Kigali. However, she should realise that it would be futile to use this same serve against Commercial Bank of Kenya. She is therefore advised to try other types of serves against this Kenyan team. Kigali can stop Sonel advances when using this serve if she ensures her serve - receive formation covers the whole court so that the movement in the process of receiving of a serve is limited. She can also train each individual player to be efficient in reception.

Table 11a: Inter of Congo's tennis serve against Pipeline of Kenya, Delta-Force of Nigeria, Aswab of Algeria and Union of Mauritius.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
KPC:	EFFECTIVE	5	9	1.778
	INEFFECTIVE	23	19	0.842
DELTA-FORCE:	EFFECTIVE	8	7	0.143
	INEFFECTIVE	13	14	0.071
ASWAB:	EFFECTIVE	13	9	1.778
	INEFFECTIVE	14	18	0.889
UNION:	EFFECTIVE	18	19	0.053
	INEFFECTIVE	40	39	0.026
TOTAL		134	134	$X^2 = 5.58$

$P < 0.05, X^2 < 7.82$

From Table 11a, there was no evidence to suggest that Inter's tennis serves had any significant effect against her opponents.

Table 11b: Inter of Congo's floater serves against Delta Force of Nigeria, Aswab of Algeria and Union of Mauritius.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
DELTA-FORCE:	EFFECTIVE	9	9.3	0.009
	INEFFECTIVE	7	6	0.167
ASWAB:	EFFECTIVE	5	6.4	0.306
	INEFFECTIVE	6	5	0.2
UNION:	EFFECTIVE	22	20.3	0.142
	INEFFECTIVE	13	15	0.267
TOTAL		62	62	$X^2 = 1.091$

$P < 0.05; X^2 < 5.99$

The results presented in Table 11b, indicate no evidence to suggest that Inter's floater serves had any significant effect on her opponents.

Table 12a: Kigali of Rwanda tennis serves against Posta of Kenya and Sonel of Cameroon.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	14	11	0.818
	INEFFECTIVE	16	19	0.474
SONEL:	EFFECTIVE	8	11	0.818
	INEFFECTIVE	20	17	0.529
TOTAL		58	58	$X^2 = 2.639$

$$P < 0.05 \quad X^2 < 3.84$$

The chi-square computations in Table 12a, indicate no significant difference in the effect of Kigali's tennis serves against her opponents.

CHAPTER V

Table 12b: Kigali of Rwanda floater serves against Posta of Kenya and Sonel of Cameroon.

TEAM	CATEGORY	OB	EXP	$\frac{(OB-EXP)^2}{EXP}$
POSTA:	EFFECTIVE	5	7	0.571
	INEFFECTIVE	7	5	0.8
SONEL:	EFFECTIVE	11	9	0.444
	INEFFECTIVE	5	7	0.571
TOTAL		28	28	$X^2 = 2.386$

$$P < 0.05; X^2 < 3.84$$

Also there was no significant relationship between the effects of Kigali's floater serves and the teams she played against.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter deals with the summary, conclusion and recommendations of the study. The study was designed to establish the types of serves, one which was most effective and how teams used each of the type against the opponent during 12th Edition of the African Feminine Volleyball Clubs Championship held in Kenya. For this study (19) nineteen matches were pre-recorded and the data analysed using chi square.

5.1 SUMMARY OF THE FINDINGS

The following were the summary of the findings of the study:

- a) Only three types of serves were used by the teams which participated in the 12th Edition of the African Club Championship. Floater serve was used most followed by tennis and jump serve respectively.
- b) Floater serve accounted for majority of effective serves while tennis accounted for majority of the ineffective ones in this championship.
- c) No team in the championship was found to use any of the types of serve more effectively than the other.

On the performance of each team against her opponents it was found:

- i) Posta's tennis serve had significant effect against most of her opponents although it was found to be ineffective against Delta-Force of Nigeria while it was much effective

against Kigali of Rwanda.

- ii) Pipeline's tennis serve was less effective against Posta of Kenya and Inter of Congo. It was much effective against Union of Mauritius and Aswab of Algeria.
- iii) Delta-Force's floater serve was found to be effective against Posta of Kenya, but was ineffective against Commercial Bank of Kenya.
- iv) Aswab's tennis serve was found to be effective against Pipeline of Kenya, while it was ineffective against Sonel of Cameroon and Union of Mauritius.
- v) Aswab's floater serves were found to be effective against Sonel of Cameroon but was ineffective against Pipeline of Kenya.
- vi) Sonel's floater serves were found to be effective against Kigali of Rwanda but less effective against Commercial Bank of Kenya.
- vii) The serves that had no significant effect against the opponents include Posta's floater, Pipeline's floater, Commercial Bank of Kenya tennis and floater, Delta-Force tennis, Union's tennis and floater, Sonel's tennis, Inter's tennis and floater and Kigali tennis and floater serves.
- viii) Only three teams were found to use jump serve in the whole championship. In fact the use of this serve faded as the championship progressed.

5.2 CONCLUSIONS

Conclusions that can be drawn from the findings of this study are as follows:

- i) African feminine teams use only three types of serves namely floater, tennis and jump serve.

- ii) Floater serve was most effective compared to the other two.
- iii) No team in Africa uses a specific type of serve more effectively than others. Posta, Pipeline and Aswab's tennis serves were effective against Kigali, Inter and Sonel teams respectively.
- iv) Delta-Force, Aswab and Sonel's floater serves were effective against Posta, Sonel and Kigali teams respectively.
- v) Only three teams used jump serve in this championship.

5.3 RECOMMENDATIONS

Based on the conclusions of this study the following recommendations are made:-

1. There is a need for the Feminine African Volleyball teams to diversify the use of serve in competitions. These teams need to be aware of other types of serves used at international levels such as roundhouse serve and jump serve so as to add the number of choice a team can make when playing.
2. Coaches are advised to schedule more time for practice of serve in the training programme and encourage practice of jump serve which was rarely used in this championship.
3. Every team is advised to be aware of the characteristics of the type of serve used by her opponent so that she can adjust her serve-receive formations accordingly.

5.4 PROPOSAL FOR FURTHER RESEARCH

- (i) There is need for research to identify the court position where each type of serve lands most frequently.
- (ii) There is a need to conduct studies of this kind on men's team.
- (iii) A study on various other attack techniques like spike should be conducted.
- (iv) There is a need for a study on the serve-receive formation of the teams to avail information on how to counter variety of serves.
- (v) There is a need for a study on the serve using other tournaments like National leagues and international competitions like worldcup and world championships.

REFERENCES

- Acero, J. (1983): Relationship Between Ball Velocity and Effectiveness of the Serve in Volleyball. AAPHERED Completed Research 26:152.
- Allen, D.W. (1983): Volleyball Skill Guide and Diagnostic Instrument for Coaches and Players: In: Completed Research 26:46.
- Armbruster, D.A. (1979): Sport and Recreational Activities for Men and Women. Toronto; C. Mosby.
- Asembo J.M. (1992): An Investigation into the Specificity of Giessener Soccer Fitness Test. Unpublished M.Ed. Thesis, Kenyatta University.
- Asembo, J.M. and Njororai W.W.S. (1995): An Evaluation of the Effectiveness of the Offensive Penalty Corner at the 4th African Cup of Nations Hockey Championships. A paper presented at the All Africa Games Science Congress, 9th-13th September, Harare, Zimbabwe.
- Banister, J.W. and Wenger H.A. (1982): Monitoring Training. In: Macdougall, J.D., H.A. Wenger and H.H.J. Greens (ed) Physiological Testing of Elite Athletes New York: Canadian Cataloguing publication data (pp. 163-171).

Bertucci, B (1979): Overhead Serve - "Floater" in: Bertucci, B. (ed) Championship Volleyball, By Experts West Point Sports/Fitness Series. New York: Leisure 12:45-49.

Borg, W.R. and Gall, M.D. (1983): Educational Research New York Longman.

Bryant, C.A. (1973): Hockey for Schools. London: Pelhans Books Limited.

Calvet, B.M. (1981). The Relationship of Anthropometric and Motor Performance Variables to Game Performance in High School Female Volleyball Players. AAPHERED Completed Research, 25:67.

Cox R.H. (1980) Response Times of Slide and Cross-over Steps as used by Volleyball Players: Research Quarterly for Exercise and Sport, 51:3, 562-567.

Cox R.H. (1994) Teaching Volleyball. Minnsotta: Burgess Publishing Company.

Cox R.H. (1980 B): Sports Psychology: Concepts and Applications. Iowa W.M.C. Brown Publishers.

Cox R.H. Noble L. and Johnson R.E. (1982) Effectiveness of the Slide and Cross-Over Steps in Volleyball Blocking - A temporal Analysis. Research Quarterly for Exercise and Sport. 53: 2: 101-107.

Colfer R.G. (1979). Interval Training through Use of the Set System: In: Bertucci, B. (ed) Championship Volleyball by experts. West point Sport/Fitness Series: New York: Leisure press. 12:198-204.

Dufour, W. (1991) Observation Technique of Motor Behaviour. A paper Presented at the Second World Congress on Science and Football, May 22-25 Veldhoven, The Netherlands.

Dunphy, M. and Wilde, R. (1991) Volleyball Today New York: West Publishing Company.

FIVB (1989): Coaches Manual One. Loussane: Federation of International Volleyball Association.

Gerisch, G. and Reischelt, M. (1991): Computer and Video-aided Analysis of Football Games. A paper Presented at the Second World Congress on Science and Football, May 22-25, Veldhoven. The Netherlands.

Hay, R.J. (1984). A Comparison of the High Outside Set with the Two-set. Research. 26:172.

Harre, D. (1982): Methods of Evaluation in Training Technique and Fundamentals of Sport Tactics and Tactical Training, In Harre D (ed): Principles of Sport Training. Berlin Sport Verlag (pp. 176-178).

Hippolyte, R and Bertucci B. (1979): Serving. In: Bertucci, B. (ed) Championship Volleyball by Experts. West Point Sport/Fitness Series. New York: Leisure press 12:41-45.

Jacqueline, P. Case, S. Fleck S. and Peter, H. (1982): Physical and Physiologica Characteristics of Elite Volleyball Players. Research Quarterly for Exercise and Sport 53: 3, pp. 257-262.

James, R.M. Jackson, A.S. Hosler W.W. and Kachurik J.K.(1978): The Importance Strength, Speed and Body Size for Team Success in Women's Intercollegiat Volleyball. Research Quarterly for Exercise and Sport. 50:3:429-437.

John, J. and Xanthos, P. (1984). Tennis. Iowa: Brown Publishers Company.

Kirkendal, D.R. Gruber, J.J. and Johnson, R.E. (1980) Measurement and Evaluation for Physical Educators. Iowa: WM.C. Brown Company Publishers.

Kerlinger, F.N. (1977): Foundations of Behavioral Research London, Holt, Rinehart and Winston.

- Kreighbaum, E. and Barthels, K.M. (1982): Biomechanics: A qualitative Approach for Studying Human Movement. Minnesota. Burgess Publishing Company.
- Kruger, M.F., Kugler, A. Reinger, S. Rosemeyer, B. (1994): Clinical and Sonographical Evaluation of the Shoulder in Volleyball. International Journal of 15:6:279-381.
- Lanphear, A.K. (1981): The Effectiveness of Components of Sub-skill Practice on the Performance of Overhead Floater Serve in Volleyball. AAPHERED Completed Research 25:28.
- Lewellyn, H.J. and Blucker, A.J. (1982): Psychology of Coaching: Theory and Application. Minnesota, Burgess publishing Company.
- Lindal, V. (1979): Team Offense and Attack Tactics: In: Bertucci, B. (ed) Championship Volleyball by Experts. West Point Sport/Fitness Series. New York. Leisure Press. 12:104-106.
- Logan, G.A. and Mickinney, W.C. (1982): Anatomic Kinesiology. Iowa: W.M.C. Brown Publishing Company.
- Luhatnen, P. (1991): Statistical Evaluation of Offensive Actions in Soccer at World Cup level in Science and Football, A paper Presented at the Second World Congress on Science and Football. May 22-25 Velhoven, The Netherlands.

Maccurdy, D. (1979). Tennis Intermediate, Tennis Instructor. Journal of Physical Education and Recreation. 50:40-41.

Mueller, C.L. (1984): An Analysis of the Overhead Volley in Volleyball Completed Research AAPHERED. 27:252.

Mose, S. (1979): The serve - An attack Weapon. Bertucci, B. (ed) Championship Volleyball by Experts. West point Sport/Fitness Series. New York: Leisure Press. 12:39-41.

Nicholls, K. (1978): Modern Volleyball: For Teacher, Coach and Player. London. Lepus Books.

Odeneal, W.T. (1979): The History of Volleyball. Bertucci, B. (ed). Volleyball by Experts. West point Sport/Fitness Series. New York: Leisure Press. 12:11-19.

Phipps, F.J. (1981): A Comparison of Selected Factors Predictive of Volleyball Playing Ability. AAPHERED Completed Research 25:89.

Scates, A.E. (1972): Winning Volleyball, Fundamentals, Tactics and Strategies. New York: Boston Allyn & Bacon.

Scholz, A.E. and Johnson R.E. (1969): Body Conditioning for College Men. Philadelphia, W.B Sanders.

Simonian, C. (1981): Fundamentals of Sport Biomechanics. New Jersey. Prentice-Hall.

Suinn, R.M. (1994): Psychology in Sport - Methods and Application. Delhi Surjet Publications.

Treadwell, P. (1991): The Predictive Potential of Match Analysis System for Rugby Union Football. A Paper Presented at the Second World Congress on Science and Football. May 22-25 Veldhoven, The Netherlands.

Tuckman, B.W. (1978): Conducting Educational Research. New York: Harcourt Brace Jonanovich Inc.

Tuttle, S.C. (1979): Motivating the Athlete: Bertucci, B. (ed). Championship Volleyball by Experts. West Point Sport/Fitness Series. New York Leisure Press. 12:238-241.

Watson, A.W.S. (1983). Physical Fitness and Athletic Performance: A guide for Students, Athletes and Coaches. London: Longman Group Limited.

APPENDIX I

Matches to be Played

TEAMS	A	B	C	D	E	F	G	H	J	K	L	M		
A	X	1	1	1	1	1	1	1	1	1	1	1	11	
B	0	X	1	1	1	1	1	1	1	1	1	1	10	
C	0	0	X	1	1	1	1	1	1	1	1	1	9	
D	0	0	0	X	1	1	1	1	1	1	1	1	8	
E	0	0	0	0	X	1	1	1	1	1	1	1	7	
F	0	0	0	0	0	X	1	1	1	1	1	1	6	
G	0	0	0	0	0	0	X	1	1	1	1	1	5	
H	0	0	0	0	0	0	0	X	1	1	1	1	4	
J	0	0	0	0	0	0	0	0	X	1	1	1	3	
K	0	0	0	0	0	0	0	0	0	X	1	1	2	
L	0	0	0	0	0	0	0	0	0	0	X	1	1	
M	0	0	0	0	0	0	0	0	0	0	0	X		
		1	2	3	4	5	6	7	8	9	10	11	66	

APPENDIX II

Serve Analysis Chart

Tournament _____ Venue _____
 Teams A _____ B _____
 Dates _____ Score _____

	GAME	TEAM A	TOTAL	GAME	TEAM B	TOTAL
	1			1		
	2			2		
	3			3		
	4			4		
	5			5		
FLOATER SERVE	1			1		
	2			2		
	3			3		
	4			4		
	5			5		
	1			1		
	2			2		
	3			3		
	4			4		
	5			5		
	1			1		
	2			2		
	3			3		
	4			4		
	5			5		
TEAM TOTAL SERVE			TEAM TOTAL SERVE			

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