

THE TENNIS SERVE AND ITS RELATIONSHIP  
TO PERFORMANCE IN COMPETITION:  
A STUDY OF SELECTED MATCHES  
DURING THE 1997 KENYA NATIONAL TENNIS  
CHAMPIONSHIPS

BY

DOROTHY WAITHIRA GATHEGE

REGISTRATION NUMBER - E55/7987/93

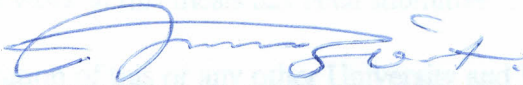
A THESIS SUBMITTED  
TO THE DEPARTMENT OF PHYSICAL  
EDUCATION, KENYATTA UNIVERSITY, IN  
PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE DEGREE  
OF MASTER OF EDUCATION

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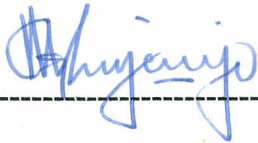
DR MICHAEL BOIT

SENIOR LECTURER

DEPARTMENT OF PHYSICAL EDUCATION

FACULTY OF EDUCATION

KENYATTA UNIVERSITY



---

MR GEORGE KIGANJO

LECTURER

DEPARTMENT OF PHYSICAL EDUCATION

FACULTY OF EDUCATION

KENYATTA UNIVERSITY

DECLARATION

No portion of the work in this thesis has been submitted in support of an application for another degree or qualification of this or any other University and Institution of Learning

*Dorothy Waithira*

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Dorothy Waithira Gathege

## DEDICATION

This thesis is dedicated to my parents who supported and encouraged me through my course work, financially and morally. Special dedication also goes to my husband who came in at the latter stage of this work to give me the final energy to complete it. I can't forget my brothers and sisters who inspired me to complete this work

## ACKNOWLEDGEMENT

I wish to express my appreciation to my Supervisors Dr. Michael Boit and Mr. George Kiganjo for their invaluable help and guidance.

I am deeply indebted to Mrs. Joyce Njuki who helped in typing of this work and Julius Rugha who drew the diagrams.

Lots of appreciation also go to members of physical education staff for their professional guidance and encouragement. Special thanks go to Mr. E. Wahome, Mr. P. Wanderi, Dr. Jimoh Shehu and Mr. Muniu.

Finally I, strongly acknowledge all the help I received from scores of many other people who are not mentioned here by names. I am indeed grateful than words can adequately express to them all for the help they accorded me in the course of this study.

## TABLE OF CONTENTS

Title page	(i)
Supervisors approval	(ii)
Declaration	(iii)
Dedication	(iv)
Acknowledgement	(v)
Table of contents	(vi)
List of tables	(x)
List of figures	(xi)
Abstract	(xii)

### CHAPTER ONE

#### INTRODUCTION

1.0. Background to the Problem	1
1.1 Statement of the problem	3
1.2 Theoretical framework	4
1.3 Five playing situations	6
1.4 Percentage Play	8
1.5 Theoretical framework model	9
1.6 Purpose of the Study	10
1.7 Hypothesis	10
1.8 Assumptions of the Study	10

1.9	Significance of the Study ✓	11
1.9.1	Delimitation ✓	11
1.9.2	Limitation ✓	12
1.9.3	Definition of terms	12

## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

2.0	Introduction	15
2.1	Physical fitness component in tennis	15
2.2	Psychological Factors in tennis	16
2.3	Technical studies in tennis	17
2.4	Tactical studies in tennis	21
2.5	Tennis serve	22

## CHAPTER THREE

### RESEARCH METHODOLOGY

3.0	Introduction	29
3.1	Target and Sampled Population	29
3.2	Research Instrument	31
3.3	Data collection Procedure	32
3.4	Statistical Analysis	34

**CHAPTER FOUR****DATA ANALYSIS AND DISCUSSION**

4.0	Introduction	36
4.1.0	Good-in serves	36
4.2	Ace Serves	42
4.3	Net Errors	48
4.4	Out Errors	53
4.4.1	Mishits	59

**CHAPTER FIVE****SUMMARY, DISCUSSION AND RECOMMENDATIONS**

5.0	Introduction	62
5.1	Good-in serves	62
5.2	Ace serves	62
5.3.0	Faults	62
5.3.1	Net Errors	62
5.3.2	Out Errors	63
5.3.3	Mishits	63
5.4	First Serve and Second Serve	63
5.4.1	Good/in Serves	64
5.4.2	Ace Serves	64
5.4.3	Net Errors	64
5.4.4	Out Errors	65

Table of Contents

5.5	Gender Difference in Execution of good/in serves	65	Page
5.6	Conclusion	65	31
5.7	Recommendation	66	33
	References	68	37
	Appendices	73	
	Frequency, percentage, T-test, analysis of good-in serves by male and female winners and losers		34
	Proportion of net errors executed by male winners and losers and female winners and losers		37
	Frequency, percentage, T-test, analysis of good-in serves by male and female winners and losers in the first and second serves		40
	Proportion of net errors executed by male winners and losers and female winners and losers in the first and second serves		43
	Frequency, percentage and T-test analysis of net errors for male and female winners and losers		47
	Proportion of net errors executed by male and female players		49
	Frequency, percentage and T-test analysis of net errors for male winners and losers and female winners and losers		49
	Proportion of net errors executed by male and female winners and losers		53
	Proportion of net errors executed by male and female winners and losers		57
	Proportion of net errors executed by male and female players in the first and second serves		59
	Frequency, percentage and T-test analysis of net error for male and female winners and losers		67
	A summary table of total net errors (successful) and errors (unsuccessful) for male and female winners and losers		70
	Frequency, percentage and mean of net errors for male and female winners		74

X  
**List of Tables**

<b>Table</b>		<b>Page</b>
1	Sampling of men and ladies matches in tournament stages	31
2	Records of match actions by research assistants	33
3	Proportion of good-in executed by male and female winners and losers	37
4	A comparison of good-in serves in the first and second serve for both female and male players	38
5	Frequency, percentage, T-test, analysis of good-in serves for male and female winners and losers	42
6	Proportion of ace serves executed by male winners and losers and female winners and losers	43
7	Proportion of ace serves executed by male winners and losers and female winners and losers in the first and second serve	44
8	Frequency, percentage and T-test analysis of ace serves of male and female winners and losers	47
9	Proportion of net errors executed by male and female players	49
10	A comparison of net errors executed by male winners and losers and female winners and losers	49
11	Frequency, percentage and T-test analysis of net errors for male and female winners and losers	53
12	A proportion of out errors executed by male and female winners and losers	53
13	Proportion of out errors among male and female players in the first and second serves	54
14	Frequency, percentage and T-test analysis of the out error for male and female winners and losers	57
15	A summary table of total service wins (successful) and errors (unsuccessful) for male and female winners and losers	58
16	Frequency, percentage and means of mishits among male and female players	59

List of Figures

<b>Figure</b>		<b>Page</b>
1	A comparison of good-in serves executed by male winners and losers and female winners and losers	37
2	A comparison of good-in means for male winners and losers in the first and second serve	39
3	A comparison of good-in serves means for female winners and losers in 1st and 2nd serve	40
4	A comparison of means in execution of aces for male winners and losers and female winners and losers	43
5	A comparison of means in the ace serves executed by male winners and losers in first and second serve	45
6	A comparison of ace serves executed by female winners and losers in first and second serves	46
7	A comparison of means in net errors executed by male winners and losers and female winners and losers	49
8	A comparison of means in net errors in the first and second serve in male players	51
9	A comparison of means in net errors in the first and second serve in female players	52
10	A proportion of means executed in the out errors for male and female winners and losers	54
11	A comparison of means of out errors in the first and second serve for male winners and losers	56
12	A comparison of means in the out error between the female winners and losers in first and second serve	56
13	A comparison of means among male players on successful and unsuccessful serves executed	59
14	A comparison of means among female players on successful and unsuccessful serves	59
15	A comparison of means of mishits among men and women players	59

### Abstract

The tennis serve is probably the most important stroke in tennis as it is a stroke used to put the ball into play and the means by which all points are started. The purpose of this study was to find out the relationship of the serve to performance by focussing on male and female players during the Kenya National Tennis Championships held from 25th September to 5th October, 1997 at Parklands Sports Club in Nairobi. The Championships attracted players from main urban towns in Kenya. The matches were played on murrum courts and was organised on qualifying rounds and a main draw. Subjects of this study were drawn from the qualifying draws and main draw using stratified random sampling. All matches for the semi-final and final were used for the study. A total of 41 matches, 26 male and 15 female matches were observed. This included winners and losers in both gender groups. A manual charting system was used to collect the data by the researcher and her assistants who watched the matches and recorded the frequencies of the wins (good/in, aces) and errors (nets, outs, mishits) committed in the first serve and second serve for the two opposing players. Descriptive statistical analysis using mean scores and percentage tabulations showed that male and female winners executed more good/in serves and also ace serves. The winners were also observed to have executed more net errors and less out errors as opposed to the losers. More wins (good/in, ace) and faults (net, out, mishit errors) were recorded in the first serve than in the second serve. Inferential Statistics indicated that there was a significant difference at  $p < .05$  between the male winners and losers in the execution of aces using the 't' test and hence the hypothesis that there was no significant difference between the two groups was rejected. The outcome of this study confirmed the works of Brabenec (1994a), Elliot & Kilderry (1983), Moore & Chaffin (1982) and of Kiganjo & Njororai (1997) which found that players who make few errors emerge as winners of tennis match.

## CHAPTER ONE

### INTRODUCTION

#### Background to the Problem

Tennis is a racquet game that can be played by singles, doubles and mixed players (Pearce & Pearce 1971, Moore & Chaffin 1981). It is one of the fastest, intricate and challenging games that can be modified to cater for a wide range of abilities, needs and interests (Litz 1978). The object of the game is to hit the ball over the net into the opponents court using a racquet (Hale 1974, Moore & Chaffin 1981).

Tennis owes its historical background to the Greek and Roman Empire where a similar game was played two thousand years ago (Gensemer 1969). In 1967 British Lawn Tennis Association abolished the distinction between amateurs and professionals in Great Britain. In 1968 open tennis was approved for the first time and today all of the worlds greatest tournaments are available to amateur and professional players alike (Pelton 1969).

Tennis has grown to be a popular game played in most countries by people of varied backgrounds and cultures (Litz 1978). According to the secretary general of Confederation Africa Tennis, tennis potential in Africa has not been exploited (Obera 1997). This has been attributed to lack of finances and the attitude of some people in the villages that tennis is a game of the rich and a racquet, a sacred tool. To raise the standards of tennis in Africa, mini tennis has been introduced on regional basis to offer a chance to beginning tennis players. In competitive tennis, inauguration of prize money and ranking of players has contributed to raising tennis standards in Africa. Ranking of players has assisted Africa tennis players to gain recognition in Association of Tennis Professionals and Women Tennis Association

tournaments, where they are awarded points in order to know their ranking professionally (Obera 1997).

In Kenya tennis was introduced by early British immigrants in the late nineteenth century (Davies 1996). Tennis in Kenya is co-ordinated by the Kenya Lawn Tennis Association an affiliate of the International Tennis Federation (Smith 1977). The Association organizes several tournaments for different age groups and levels. These tournaments are sub-divided into official championships, Nairobi and District League, Gilbey Cup, Junior Championships and Inter-School competition. Some of the official tournaments include Kenya National Championships , Kenya Open, Parklands Open, and Diamond Trust (Obera 1977). The Kenya National Championship is a unique tournament that attracts veteran players between 35 and 45 years for men and over 35 for women from the main urban towns in Kenya. Other categories of matches in this tournament include singles matches for men and women from the age of 12 years and above. Mixed doubles and doubles men and women are matches played in this tournament (Warambo 1997).

Although Kenya has participated in international matches, that include the All - Africa Tennis Championship, Davis Cup Competition and Africa Tennis Championships, her performance in tennis has not been very encouraging. In her first participation in the Davis Cup in 1975, Kenya lost to Nigeria. For four consecutive years that followed no participation was recorded (Smith 1977). In 1995 Kenya was placed within the Africa Zone Group III in the Davis Cup but that was the furthest she could go. In 1996, they again lost in Davis Cup held in Bulgaria. Kenya continued to lose during the preliminary of the third Africa Tennis Championships held in 1997 (Obera 1997). In order to improve the situation, the Kenya Lawn Tennis Association has organized clinics on coaching and umpiring mini tennis for young

players as well as sponsorship, prize money and tournaments that run throughout the year. (Davis 1996, Obera 1997).

Tournaments provide the competitive atmosphere that can assist players in refining their strokes and tactical strategies. Competition is a key foundation in enhancing performance because the coach is able to evaluate stroke production, court movement and functional fitness in order to identify factors that limit a player's performance and those that enhance it (Elliot & Kilderry 1983). Competition also offers an opportunity for a player to analyse the most successful teams in a particular sport and relate the tactical factors determining their performance (Harre 1982). The coach can evaluate performance scientifically by use of notational analysis (Elliot & Kilderry 1983). Using the notation analysis the coach can therefore evaluate performance in competition on important technical aspects and strategies associated with winning and losing in order to provide quantitative and qualitative information to a player (Elliot & Kilderry 1983). Times have passed when coaches would roar and push players through the barriers of mental and physical exhaustion. These days the coach is a sharp suited individual quietly taking notes and analysing every move a player makes (Moore 1993). Research has shown that even top class coaches cannot remember more than 30% of match actions correctly. Consequently there is need for an accurate way of recording the important events in a given performance be it individual or teamsport (Moore 1993). This study sought to use competition to evaluate the service skill and how it relates to performance in tennis.

### 1.1 Statement of the Problem

The International Tennis Federation collaborates with the affiliate, Kenya Lawn Tennis Association, the coaches, trainers and physical educators have introduced clinics, seminars, mini tennis all in view of raising the standard of tennis performance in Kenya. However this is not

all that the upcoming Kenyan tennis players need to succeed. The factors that affect performance namely physical fitness, psychological factors and technical and tactical aspects should be addressed empirically. The skillful use of strokes and employment of strategies during competition has become an important factor in determining victory and defeat. A player needs to technically and tactfully approach a contest situation and to analyse it in order to understand the technical and tactical problem it poses and solve it both mentally and physically in the shortest time possible (Harre 1982). Therefore there is the need to develop the skills and strategy application in competition since they have become superior aspects in determining performance. The Kenyan tennis players lack in technical and tactical abilities due to poor financial support. Hence they cannot afford the expensive equipment, professional coaching and exposure to the outside world of tennis. This study hence investigated the serve from its skillful use, application and the extent to which it affected performance of winning and losing players in singles men and women matches during the Kenya National Tennis Championship, held from 25th September to 5th October, 1997 at Parklands Sports Club in Nairobi. The placement and accuracy of the serve as an important component and its skillful use were empirically addressed.

## 2. Theoretical Framework

The major factors that affect performance in training and competition can be categorized as :-

- (a) Technical and tactical proficiency (Brabenec 1994, Elliot & Kilderry 1983, Kiganjo & Njororai 1997, Skorodumova 1994).
- (b) Physical fitness (Baker & Putnam 1979, Ray 1993, Szczeniak et.al.1994)
- (c) Psychological preparation (Isaac et.al.1983, Taylor et.al.1993, Terry & Coakley 1993).

These factors are discussed in details as follows:-

### 1.2.1 Physical Fitness Factor

The goal of any player is to produce the best performance at the time of competition (Wood 1979). Physical conditioning and psychological preparation all help determine one's level of performance. Specifically, preparation for competition in tennis not only entails playing but demands a specific and regular training program focussing on overall body strength, flexibility, long and short term endurance and footwork as well as stroke fundamentals (Wood 1979). General cardio-vascular development allows quick and vigorous movement in court coverage while upper body developments helps endurance in swinging of the racket. Lower body fitness enables swift and efficient movement and prevents leg fatigue and muscle cramps.

The serve technique requires fitness in speed, force and co-ordination of the toss and the swing in order to ace a receiver, draw him past the sideline and out of position and force for a weak return (Hale 1974). Physical condition is also a major factor in psychological preparation because fatigue development in a prolonged match results in skill deterioration and player frustration (Elliot & Kilderry 1983).

### 1.2.2 Psychological Factor

One of the greatest obstacles to success in sports lies in the mind (psychological component). Tennis is an individual game that requires a player to be dealt with as a unique person. Personality tests are essential to assess traits that are important for successful performance in sport (Wood 1979). Such traits include concentration, anticipation and prediction (Lewllyn & Blucker 1982). A tennis player has only a split of a second to hit a fast moving ball. Later than this the ball is irretrievable (Maccrone 1993). Top tennis players are

therefore seen to possess intellectual capabilities that help them predict the placement of the ball and enable them retrieve balls hit at a speed of about 200 Kph (Lewlyn & Blucker 1982).

### 1.2.3 Technical Factors

While physical and psychological endowment may be important in enhancing performance, the prowess of a player in implementing techniques and tactics during a match has been an overriding factor in determining victory and defeat (Harre 1982). Inadequate use of skills and employment of strategies to a situation at hand may result to loss of available opportunities in which shots for a win can be effected, thus affecting performance greatly (Mal 1982). Various playing situations are encountered in a match and their logical solutions are employment of tactics to exploit the opponents deficiencies and protect a player's inadequacies (Winter bottom 1964). In tennis the basic strokes (forehand and backhand) are important for maintaining rallies (Litz 1978). But the serve acts as a vital edge to successfully challenge an opponent (Stanley et.al. 1978). To be a successful tournament performer, a powerful serve with a spin, control of direction and accurate placement is indispensable (Pelton 1969). The auxiliary strokes which are the more advanced strokes also contribute to net play strategy and to a player's artillery (Moore & Chaffin 1981). Therefore application of both basic and auxiliary strokes are used in the possible occurring situations during a match.

### 1.3 Five Playing Situations

There are five possible playing situations in tennis, namely:-

- (i) Serving - 100% of all points in a match start with service.
- (ii) Receiving and returning - only 70-85% of all points continue with a return.
- (iii) Rallying from the backcourt.
- (iv) Attacking using passing shots, volleys and smashes.

## (v) Defending (Brabenec 1994a).

The serve is the most repeated situation in the game of tennis followed by the service return (Brabenec 1994). The serve is the only stroke that the player has control of (Pearce & Pearce 1971). Proper delivery of a high speed serve coupled with force enables the player who is serving to acquire many outright points. Three essentials of a good serve have been identified as deep placement of the ball, fast speed to keep the opponent off-balance and ball spin to make the ball difficult to retrieve accurately (Stanley et.al.1973). Other characteristics identified with effective service include accuracy, consistency, variation, balance and pace (Elliot & Kilderry 1983).

Hale (1974) has elaborated on factors that make the serve an effective weapon. This is when:-

- (a) a large percentage of first serve are hit in the right court. A player should hit 70% of all the serves in the proper court.
- (b) A player serves to an opponent's backhand, although an occasional forehand serve should be delivered.
- (c) A player serves and proceeds to the net to finish the return with a cross-court shot.
- (d) The serve is hit with increased speed to elicit a weak return from the opponent offering an opportunity for a put-away-shot.
- (e) The server recognizes which serves (speed, direction and spin) have the best chance of drawing errors from the oponent and winning points. In the process of executing the serves, players will exhibit good serves and make errors which may be forced errors or unforced errors (hitting into the net, hitting out and mishits). The percentage theory of play has enabled us to understand the interplay of errors and wins in tennis and how they affect performance.

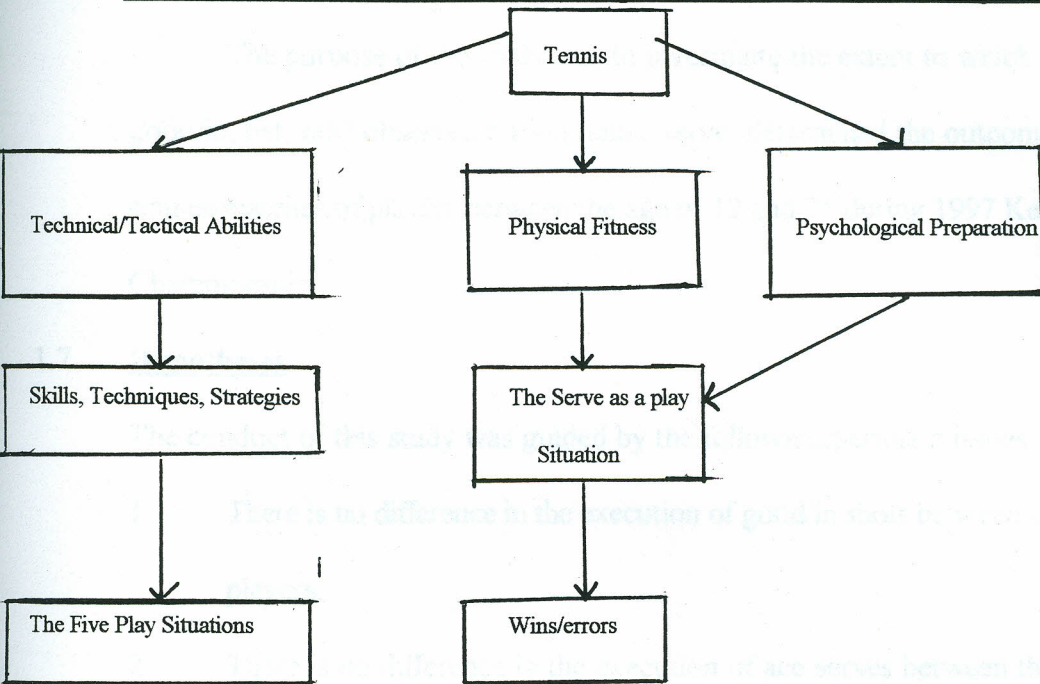
#### 1.4 Percentage Play

Percentage play emphasizes the ability to hit the shot or pattern of shots that provide the greatest chance of winning the point. Not every hit results to winning but instead every hit should keep the ball safely in play, position a player better strategically and enhance a put away shot or point winner (Pearce & Pearce 1971). Therefore when selecting a shot, for example, the serve, the player should analyse the probability of making errors to that of wins. In fact errors and wins are what the game of tennis entails. Errors can be forced or unforced (Douglas 1982). Advanced players win points by outright winners or forcing opponents to err since the ratio of errors to wins is always high (Brabenec 1997). It is evident that most matches in tennis are won on errors since the player making fewest errors in critical situations in a match, wins the match (Brabenec 1994, Moore & Chaffin 1981). It has been recognized that 75 percent of all points are lost because of unnecessary errors while 25 percent are lost on placement (Elliot & Kilderry 1983). Therefore a player should use the strategy of forcing an opponent to error and reduce his errors in order to win, instead of trying to win using placement spectacular shots (Brabenec 1994a).

The serve can be used as a strategy to win. Professional players like Pete Sampras, Philoppoussis, Krajicek, Goran Ivanisevic, Poncho Gonzales, Roscoe Tanner and Ellsworth have been recognized for their spectacular serves (Brabenec 1994, Moore & Chaffin 1981). Maurice Mc Loughlin won the United States Championship in 1912 using the serve technique (Moore & Chaffin 1981).

The model by Elliot & Kilderry below can be used to summarize the theoretical framework of this study by considering the technical and tactical factor as a factor which affects performance from which the study of serve skill is derived and developed.

### 1.5 Theoretical Framework Model (Adapted from Elliot & Kilderry 1983)



Various researchers have conducted studies to show the importance of techniques and tactics in performance. Such studies have been on pedagogical instructions (Emmen et.al.1985, Van Wieriengen et.al 1985), morphological variations (Ferrario et.al.1994), biomechanical analysis of the serve (Elliot et.al.1983, Piller 1994), psychological preparation (Isaac et.al.1983, Terry & Coakley 1994), and on physical component (Baker & Putnam 1979, Szczeniak et.al.1994). Further still, other studies have focused on the serve and other techniques from a match play situation (Brabenec 1994a, 1994b, Elliot & Kilderry 1983, Kiganjo & Njororai 1997, Skodrodumova 1994). The latter studies have used match analysis but have focused on the six strokes of a match (Brabenec 1994a, ), female players only (Kiganjo & Njororai 1997), other skills apart from the serve (Brabenec 1994b) and on two sets of a match (Elliot & Kilderry 1983). This empirical study therefore set out to focus on the serve technique and the extent to which it affected performance in an entire match, involving men and women singles.

## 1.6 Purpose of the Study

The purpose of the study was to investigate the extent to which match variables (ace, good/in, net, out) observed during tennis serve, determined the outcome of male and female singles matches of players between the age of 12 and 25 during 1997 Kenyan National Tennis Championship.

## 1.7 Hypotheses

The conduct of this study was guided by the following pertinent issues:-

- 1 There is no difference in the execution of good/in shots between the winning and losing players.
- 2 There is no difference in the execution of ace serves between the winning and losing players.
- 3 There is no difference in the patterns of faults (net error, out error, mishits) between the winning and losing players?.
- 4 The first and the second serve do not determine performance.
- 5 There is no significant gender difference in execution of good/in in the serve.
- 6 There is no significant difference in patterns of faults by the players when serving.

## 1.8 Assumptions of the Study

The study assumed that the effects that the tennis serve had on the performance of a player could not be determined a priori. An elaborate and vivid study of the variables in the serve that are known to affect performance (good/in, ace, net, outball, mishits) needed to be done empirically and practically to ascertain the facts.

## 1.9 Significance of the Study

A comprehensive, objective and precise diagnosis of a player's and teams' performance in match play is a prerequisite for planning and implementation of training . The results of the study will be useful in achieving the following:-

- 1 Help the Kenyan Lawn Tennis Association as well as the Kenya Association of Lawn Tennis Umpires and coaches to adopt appropriate serving techniques during training and competition.
- 2 Assist the coaches, trainers and physical educators to emphasize the factors identified to determine winning, when serving.
- 3 Assist coaches and trainers of players participating in the Kenya National Tennis Championship to adopt feedback skills on players' performance. This will provide motivation for improvements and maintenance of correct technical and tactical skills.
- 4 Assist the Kenya Lawn Tennis Association, coaches trainers and physical educators in analyzing the performance of their players both in training and competition using the match analysis method of collecting data.

## 1.9.1 Delimitation

1. The study focused on only one tournament, the Kenya National Tennis Championship because it entailed a good representation of players in the urban areas. At the time of collecting data the researcher could not wait for the next tournament which was to be held in January. The time span for completing the research was running out.
2. Only one variable, the serve, was studied, more research can be done on other variables. The serve was a wide area sufficient enough to cover this study.

### 1.9.2 Limitation

- 1 One of the limitation of the study was the low registration of ladies matches which affected the hypothetical number of matches to be observed. The other limitation was that some matches did not take place either because players were late and there was a walk over or the players proceeded to another round through 'bye'. This affected the number of matches under investigation and also the findings. One of the ladies matches in the semi final was not observed. These could have affected the reflected effect of variables of the serve at a high level of competition, in the final findings for example the number of wins and faults could have been altered. Another limitation is that the research findings can only be generalized to players in urban areas.
2. Due to lapse of time the research findings may have changed.

### 1.9.3 Definition of Terms

#### Ace

An exceptionally good ball served in the correct court and not touched by the receiver. It is a hard ball that diminishes in the ground. (Elliot & Kilderry 1983, Johnson & Xanthos 1981).

#### Competition

Refers to singles contests that is best of 3 sets that result to performance in the entire match. (Charez & Nieder 1982).

#### Errors

Errors are mistakes made on the serve for example hitting the ball out of bound, in the wrong court, on the net, ball not reaching the net, or winning and losing through forced and unforced errors (Brayant 1986).

**Fault**

Refers to a mistake made while serving for example net error, out error or a landing in the wrong court.

**Good/in Serves**

Is a ball that lands within the right service court after being served.

**Kenya National Tennis Championship**

It is an official tournament that takes place every year in September and attracts players from all over the country (especially from the main urban areas) between the age of 12 years and 45 years (Warambo 1997).

**Match**

Is a term used to refer to a complete official tennis contest of singles play that consist of best of three sets for male and female matches. For this study the age bracket was between 12 and 25 years (Charez & Nieder 1982, Moore & Chaffin 1981).

**Net Error**

Any error caused by a ball served but does not cross the net but instead hits any part of the net and does not go over but remains on the server's court.

**Out Ball**

Any ball landing wide or long out of the singles' service court.

**Performance**

Refers to the outcome of an entire match of best of 3 sets in singles matches in a competitive situation (competition)

**Serve**

It is the skill that starts the game of tennis (Hale 1974, Johnson & Xanthos 1981, Moore & Chaffin 1981).

**Statistical Match Analysis**

It is qualitative and a quantitative analysis which enables collection of data for a players strength and weaknesses by tallying the variables of interest by watching a match 'live'. (Elliot & Kilderry 1983, Singh 1982).

**Technical**

Refers to the skillful use of the skills, techniques and strokes used in tennis, such as the use of serve, lob, volley, smash, half-volley and dropshot (Moore & Chaffin 1981).

**Tennis**

Tennis is a competitive individual and team racket sport played by people of all ages, sex and abilities. In this study it is a racket sport played by female and male players between the age of 12 to 25 (Hale 1974).

**Tactical**

Is the modification or adaptation of a players system of play (Winterbotton 1964), or means employed to implement the strategy during a match play (Brayant 1986).

**Wins**

Refer to points won when the balls that land correctly in the service court are poorly retrieved by the receiver or playing a hard perfect service that is untouchable (ace). (Johnson & Xanthos 1981).

## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

#### 2.0 Introduction

The literature review in this chapter was organised around the components Physical fitness, Psychological factor, Technical and Tactical factor that affect performance in any sport with special reference to tennis. Advanced competitive play has become the goal of every player hence more consideration has been given to evaluation of the stroke production under pressure, court movement and psychological make-up. Efficient stroke mechanics, appropriate psychological capacities and psychological make-up has become the primary component in determining success in tennis, adds Elliot & Kilderry (1983).

#### 2.1 Physical Fitness Components in Tennis

Today the physical demands of tennis are recognized to be quite high to the fact that the game has developed from a leisure sport to a physically demanding sport (Frank 1979). Execution of techniques and more so the serve requires co-ordination in the tossing and swing for proper results. Poor co-ordination will result in the ball hitting the net or landing in the wrong court (Hensley et.al.1979 Jaeger 1963) In order to serve an ace a tennis player needs physical power (Pelton 1969).

Studies showing the importance of physical component in tennis have been conducted by Szecniak et.al (1994) on degradation of insulin among tennis players using the power test and exercise test. A decline was observed in the insulin after the power test. However no significant difference was revealed in degradation of insulin between the two tests. It can be noted that as players decrease their anxiety (insulin level), they increase their concentration

level and reaction time which is a requirement for successful serves (Mac Crone 1993). A Cinematographic analysis was used on one ball racket impact, under clamped and also on free-standing conditions. The study revealed the magnitude of impulse applied by the racket to the ball to remain the same for stationary clamped and free standing rackets. It was concluded that firmness of grip contributed to acquisition of high ball velocity. When serving players require a firm grip to acquire high ball velocity for high contact point between the ball and racket to execute a successful and powerful serve (Hale 1974)

## 2.2 Psychological Factor in Tennis

Players may have similar physical abilities and yet perform at different levels in competition (Lewellyn & Blucker 1982). This can be attributed to different levels of psychological make-up. Tennis is an individual game put into a team organisation (Frank 1979). Therefore each player must be dealt with individually and a game plan for the season planned with the player in mind. The game of tennis also involves the outer game played against external opponents and inner game played against internal, mental and emotional obstacles (Gallwey 1974). These factors interact to enhance performance. Successful players have been observed to have certain psychological traits. These players are aggressive, demonstrate high levels of concentration and depict intellectual aspiration and self assurance. More specifically a tennis player requires confidence, maturity, emotional and temperament control, good reaction time and superior ability to read the game. More precisely a player when serving requires the above qualities to hit a powerful shot especially an ace. These variables also enable a player to respond within five milliseconds to an oncoming ball (Mac Crone 1993). Studies on psychological aspect has been conducted by Taylor et.al. (1993) who investigated the effects of perceptual cues on acquisition of speed and accuracy in badminton

players. Improvement in placement of smashes, dropshots and drives were noted after perceptual coaching. High level of perceptual skills will enable a tennis player serve the ball in the right court hence increase his chances of successful shots (Hale 1974) Terry and Coakley (1993) in their study between the winning and losing players on anxiety upheavals, noted no pre-performance anxiety difference between the two groups. Though no difference was noted in pre-performance anxiety, in the two groups, a steady mind concentration and stress free environment is very crucial in serving (Gallwey 1974). Isaac et.al. (1983) used 34 beginner and 16 intermediate tennis players to investigate their anticipatory timing of the tennis ball as it landed on the opponents court. The players viewed a small part of the service motion using film clips. It was noted that intermediate players predicted the ball placement more correctly than beginner players. The study also revealed increased correct predictions with increased number of viewing times. More emphasis should be placed on watching the server before ball contact, as this will help assist the player prepare to retrieve the ball and also execute the right service into the right court.

### 2.3 Technical Studies in Tennis (Skill Achievement)

Mastery of skill especially the serve will place a player at a superior level than another of the same skill endowment (Barnaby 1969). A skill like the serve should be established conscious automated action used to produce an action that is successful. Therefore technical knowledge (training) whose objective is to enable a player plan tactical contests in such a way that winning can result, gives a player a superior level than another of equal skill endowment (Harre 1982). The player must be well equipped especially in serving and in all other strokes. The serve skill need to be well internalized and almost an automatic response for a player in tennis (Litz 1978). This enables a player to respond fast enough in order to execute

appropriate skill according to the situation at hand. The limitation of the playing court in tennis demands skillful play (Litz 1978). Each situation demands an appropriate skill to be executed in the shortest time possible. Therefore a player who is technically trained is able to plan tactical contest and handle them in a way that he can win or at least produce a good personal performance. A tennis player must be well equipped in serving and in all other strokes (Harre 1982).

Strokes in tennis are categorized into basic and auxiliary (Moore & Chaffin 1981). Auxiliary strokes refer to the volley, lob, dropshot, half-volley and smash skills (Johnson & Xanthos 1981, Pearce & Pearce 1971, Moore & Chaffin 1981). The basic strokes include forehand, backhand and the serve. A forehand drive for example can be used as an offensive stroke. Good execution of the forehand enables a player to sustain a rally (Pearce & Pearce 1971). The forehand stroke is important because over seventy percent of all the strokes are made from the forehand side. Backhand stroke on the other hand enables a player to return balls coming on the left hand side and is a vital weapon in placing a ball deep in the opponents court (Johnson & Xanthos 1981). As much as the drives are important in tennis it is important to note that a tennis player will serve 100% of the game therefore the serve is regarded as the most important stroke, not to imply that a strong serve excludes the necessity for developing other strokes. The serve is one essential stroke among others that has become a principle weapon of attack that can result to an ace, an outright win or enforce a weak return from an opponent (Gensemer 1969, Johnson & Xanthos 1981). Since it is the most frequent stroke (100%) as it puts the ball into play at the beginning of each point, many professional players have used it win (Pearce & Pearce 1971). Various studies have been conducted on the serve and on other techniques in various disciplines.

Ferrario et.al. (1994) conducted a morphological variation analysis to quantify shape differences in arrangement of body segments in the execution of the tennis service. Two professional and one skilled tennis players were used to analyze the within subject and between subject morphological variability of body patterns when serving. The professional players showed a high repeatability in arrangement of their body segments compared to the skilled player. All players showed a higher within player repeatability in exact service than in unsuccessful ones. Hence tennis players need to show consistency in their serves. A cinematographic camera was used to find out the body arrangement. Another study on biomechanical analysis was by Elliot et.al (1983). The study used a three dimensional high speed photography to record the service action of eight tennis players. The study revealed that a mean of vertical shoulder velocity of 1.7m/s during the leg drive produced a force at the shoulder that was eccentric to the racket-limb causing a downward rotation of the limb. The leg drive was also discovered to increase the angular displacement of the loop. This provided a greater distance over which the racket would be accelerated for impact. A forceful and effective service calls for a high ball velocity and proper footwork for effective impact in order to get the ball in the right service court (Elliot et.al.1983).

A study conducted in Crewe and Alsager College used 7 nationally ranked and 7 county right handed male players to investigate biomechanical aspect of the tennis service, using the high speed cinematography cameras. A significant finding was noted in the timing of the movement of the backfoot forward during preparation phase. A player's foot movement affects the height one is able to generate upwards and also the weight transfer forward so as to make contact with the ball at an optimum height in the service, for effective results (Piller 1994). An

effective serve will result from proper backfoot movement during preparation phase. (Piller 1994)

Another study done on the techniques in tennis focused on the skill achievement test to find out accuracy of the forehand and backhand drives and the service in a games situation as compared to the test achievement performance. A correlation of 0.78 for backhand, 0.66 for service and 0.40 for the forehand drive was revealed between the achievement test and the stroke performance during actual play. The student used circular targets varying in distance and diameter to provide an objective method of measuring accuracy (Digennaro 1969). This study can be used to improve accuracy especially in the serve. Other studies in the serve have focused on pedagogical instructions in tennis claiming that players learn by listening to instructions and by visual experiences (Heitmann 1976). Emmen et.al 1985, proved otherwise when he used tennis novices to find out the effectiveness of video mediated instruction on learning tennis. Three experimental groups were used, a video model, a video feedback and a combination of video modeling and video feedback. After subjects taking part in the five successive training sessions, no clear advantage of using video mediated instruction methods in teaching novices was noticed. A similar study on video instructional method was conducted also by Van - Wieringen et.al.1989. The researcher used subjects with two years experience to find out the effect of video feedback on improvement of the tennis serve. The subjects were put in to three groups, the control, the video feedback training and the traditional training group. The two groups apart from the control, received training and also spent time in watching recording and discussing video recordings. The study revealed a greater improvement of service skill in the two groups that received training than in the control group.

A tennis player needs to use video feedback in order to correct his serve flaws for a more successful performance (Elliot & Kilderry 1983)

#### 2.4 Tactical studies in Tennis (Match Play Situation)

Executing a skillful serve is not the only requirement of winning in tennis (Johnson & Xanthos 1981). Players must apply their knowledge of serve to the situation at hand. Further still a player must possess knowledge on planning contests so as to be able to take decisions in accordance with contest conditions for example which type of serve to use. Therefore tactical skills and attitude are acquired at a higher level after achieving a correspondingly high level of technical skills, mental and physical abilities. The tactical aspect of a player has become a performance determining factor (Harre 1982). Currently high level of performance is being executed in many sports and the factor which seems to dominate as a determinant of victory and defeat is the tactical attitude of a player (Harre 1982).

The tactical goal in competitive play is to think and find an ideal solution for the task ahead in the shortest time possible. This is done on the basis of perfection and analysis of the contest situation. Therefore it is important to note the most frequent situation in a match, for example the serve analyse and practice it (Brabenec 1994a, Harre 1982). There are five common playing situations in tennis; serving, service return, backcourt rallying, net play and playing against an opponent (Brabence 1994, Johnson & Xanthos 1981). Serving of all the playing situations can be referred to as the most important single stroke as it is the means by which all points are started (Brabenec 1994, Elliot & Kilderry 1983, Gensemer 1969, Johnson & Xanthos 1981, Pearce & Pearce 1971, Pelton 1969). However enhancement of other playing situations should not be overlooked but the serve should be emphasized (Gensemer 1969).

## The Tennis Serve

The serve has become a principle weapon of attack that can be used to place the opponent on the defensive if placed deep into the opponents' court especially when accompanied with speed and spin (Johnson & Xanthos 1981, Stanley et.al.1973). The serve is the only stroke controlled by a player hence it can be made consistently effective if much time is devoted to it. Additionally, it is the only single stroke that can win many points outright (Pearce & Pearce 1971). More than half of all match points are won or lost as a result of the serve. Therefore tennis players must hold "service" as a prerequisite to victory in any match in a tournament ( Pelton 1969). The objective of the serve is to get the first serve into the court with both power and placement and with 70 - 80% accuracy. But the second serve should be executed with more spin to allow greater margin of success of near 100 percent reliability to avoid double faults (Pearce & Pearce 1971). Early players considered the serve as nothing more than a method of getting the ball into play. But Maurice Mc Loughlin upset this attitude when he used blistering serves to win the 1912 U.S. championship. Bob Falkenburg won the 1949 Wimbledon using the serve technique. Additionally Jack Kramer and Poncho Gonzales owned serves that traveled at 110 M.P.H and 113 M.P.H respectively (Gensemer 1969). More than 50 percent of points in a match are scored as a direct or indirect result of the serve and at least 75 percent of the game will be won in a game that a player serves. Pete Sampras won 88%of his games using service in the 1995 Association of Tennis professionals (ATP) tour. Additionally, Goran Ivanisevic won 83% of all points made using the first serve. Further still, 54% of points won by Michael Chang were through his second serve during the 1995 ATP tour. Therefore a strong serve builds the server's confidence (Gensemer 1969, Johnson & Xanthos 1981). The player with a rythmical serve and one who can vary service type and direction will execute a service hard to break (Elliot & Kilderry 1983). The variations of serves

occur by changing speed, spin and direction (Pearce & Pearce 1971). The choice of the serve depends upon the power, margin of safety and control. For instance a flat serve can be hit with tremendous speed of over 200 Kph. This serve is used on the first serve to terrify an opponent, though many faults are made as the ball has to travel close to the top of the net in order to drop in the service court (Elliot & Kilderry 1983, Pearce & Pearce 1971). Many players use the American twist (kicker, tospin) or the slice serve in the second serve because of their great safety and success and in order to avoid double faults (Elliot & Kilderry 1983, Pearce & Pearce 1971). The slice serve spins on the opponents body while the kicker serve dispositions a player. Despite its margin of success the kicker serve stays long in the air to the advantage of a net rusher (Pearce & Pearce 1971).

Various studies have been conducted on different aspects of the serve. Van - der Meer et.al. (1986) focused on the execution of the serve of fifteen elite players, at different velocity conditions. The subjects completed ten serves at a velocity of 50, 60, 70, 80 and 90m/s. The study revealed an improvement in performance as the ball velocity increased from 70 to 90m/s. In another study forty tennis players were used to show the effect of physical factors of upper extremity on the tennis serve velocity. Significant relationships between the serve velocity and several flexibility measurements was noted. Hence it was concluded that tennis serve velocity can be increased through specific directed muscle strengthening or stretching (Cohen et.al.1994). Using expert and novice players in another study, Goulet et.al.1989, found out that expert players selected valuable information during preparatory phase and the first part of the execution phase , to identify the types of serves presented (flat, topspin, slice). Novices on the other hand had to see the ritual phase (ball/racquet impact) to be accurate. Other studies in tennis have focussed on the effectiveness of the service and its placement (Kiganjo & Njororai

1997), the influence of the service on the outcome of a set (Elliot & Kilderry 1983), the frequency and efficiency of individual strokes in hard and clay courts (Brabenec 1994a) and the efficiency of the serve and the ratio of errors to wins in a match (Brabenec 1994b).

The other playing situations supplement the serve to make play successful. For instance a player returns about 70 - 85% of all points in a match, hence the return is a frequent game situation. Rallies develop in the game of tennis on court surface and 50 - 80% of all points are finished after two opposing players hit the ball twice. At least 25 percent of all points are lost through placement errors so attacking is very important for any tennis player if outright wins have to be achieved. A player will defend himself using passing shots or lobs. (Brabenec 1994). Hence these playing situations should also be practiced for successful play. Various studies have been conducted on the five possible playing situations to show the usage of tactics in a game situation portrayed by tennis players against their opponent giving special emphasis to the serve. In their study done during the International Tennis Federation women circuit championship held in Nairobi Kiganjo and Njororai (1997) investigated the:-

- (a) Serve effectiveness
- (b) Serve return

The study used a combination of manual analysis and video camera to collect data on the wins and faults committed by women players in their service. Match analysis, whether manual or video, is an effective method used in collection of data, when assessing performance (Singh 1982). Infact forms of match analysis (notation) have existed for a long time but its only in this century that notation of dance was first formalised. The concept of recording observations in sports by match analysis method gathered momentum in mid seventies. A combination of hand notation techniques and video recording have been used in pieces of work

done in soccer by Njororai (1995). In a broad context, match analysis has been used to investigate match actions in netball (Palmer et.al. 1993), soccer (Hughes & Sykes 1993), Rugby (Clarke Hughes 1993), Basketball (Miller & Barlette 1993) and in tennis (Brabenec 1994 a, b., Elliot & Kilderry 1983, Skorodumova 1994). Evaluation of performance when done, enables the data collected to be used to quantify aspects of performance in order to correct flaws made on the strokes of the game. Modern technology has provided the coach with video systems that help in analysis of stroke production (Elliot & Kilderry 1983). Manual match analysis, which involves observing the matches with the naked eyes and recording the information has not lost fame because it is a less expensive method which is readily achievable.

Kiganjo and Njororai (1997) also focussed their study on placement of good serves as they landed in the court . The study found out the following:-

- (i) More errors were made on the first serve than on the second serve.
- (ii) More serves landed in the middle of the service court than in the left and right service courts.
- (iii) Service errors decreased with progressive tournament stages.
- (iv) The winning player made least errors and this occurred on the backhand stroke than on the forehand stroke.
- (v) Cross court shots were more than down the line shots and the middle shots, in the service return.
- (vi) The errors in the service return decreased with successive tournament stages.

Brabenec (1994a) conducted a study on tactics on how professional players use various strokes in tennis, and how effective they are. Matches were charted from French

Open, US Open and Australian Open Championships held in the years 1992, 1993 and 1994.

A match in Amelia Island was also charted. This study used match analysis to gather information on the frequency of errors as compared to the wins. The frequency of the rallies and termination of points was also scrutinized in this study. The study revealed the following:-

- i) The most repeated situation in any match was serving and returning.
- ii) 50 - 80% of all the points in a match were finished after both players hit the ball twice.
- iii) 70% of all the points on hard court ended after each player hit the ball twice. However, 55 - 60% of all points ended similarly on clay court.

Top tennis players were seen to commit 1.5 to 2.5 errors for one win. The study concluded that such information was essential especially when training on different court surfaces. The serve and return were recommended to be given more practice time since they are the most repeated situations in tennis. Forcing an opponent to error was also seen as a winning tactic compared to execution of spectacular shots (Brabenec 1994b).

Statistics taken from a match between Bjorn Borg and Roscoe Tanner is another study that focused on the serve as one of the selected variables influencing the outcome of a set (Elliot & Kilderry 1983). The study focused on two sets of a match in Wimbledon. The results were as follows:-

- (i) The two players had a similar service return (Tanner 66%, Borg 70%) in the first set.
- (ii) Tanner reduced his first service return to 35% while Borg increased to 82% in the second set.

- (iii) Tanners' service and volley style of play was affected in the second set where 12 out of 20 volleys executed were effective, while in the first set 28 out of 39 volleys executed, were effective.
- (iv) Borgs' volley percentage increased from 7 volleys in 13 games to 6 volleys in 7 games in the second set. The study used match analysis to collect the information.

The study concluded that a decrease in the percentage of first service led to an effective "serve and volley" style of play (Elliot & Kilderry 1982).

Skorodumova (1994) also investigated the serve among the variety of techniques under this particular study. The study used match analysis to find out the strokes efficiency of top players against their opponents. The study revealed the serve as the stroke with the highest efficiency.

Additionally Emilio Sanchez acquired 32.4% of effective service against the opponent John McEnroe. In another match in the same study Michael Chang's stability and efficiency of strokes against Andrei Chesnokov was highest in the serve and in backhand volley hit cross-court. The study offered important information on improvement of weakness and maintenance of strengths in play. This information can therefore be used by the coach to devise a tactical plan against the opponent and practice it prior to the match. Brabenec (1994a) also used match analysis to investigate individual strokes in a match and compared this to successful (efficient) individual strokes. This study focused on the rallies and defensive game situations. The study focused on six shots of the game. Each player was observed to have 21% of undecided points and 79% decided points after three shots. Additionally 38% of points were undecided and 62% decided after three shots in the clay court. The study serves in assisting coaches to select appropriate drills for players using hard court and clay court surfaces.

### Summary of the Literature Review

Studies using Cinematography camera (Ferrario et.al 1994) video clips (Van Wieringen et.al 1989, Emmen et.al 1985) skill achievement tests, focused on technical aspect of the serve but not from a match play situation but from a drill practice situation. Therefore there is need to focus on the serve from a competitive or game situation aspect.

Some of the studies cited focused on a small part of the game (Brabenec 1994 a, Elliot & Kildery 1983) while others focused on the winning players only. (Skorodumova 1994). One study which focused on tactical aspect of performance in Canada also focused on other tactics with no isolation of the serve as a single tactic. The study by Kiganjo and Njororai (1997) focused on female players only. Therefore the above mentioned studies either focused on other skills with no isolation of the serve, winning teams female players, matches in a training situation but none of the above matches focussed on the relationship of the serve to performance in both men and women competitions in an entire match.

**CHAPTER THREE****RESEARCH METHODOLOGY****3.0 Introduction**

This chapter covered the methodology used in this study. It entailed the target population, selected sample, research instrument, the procedure involved in data collection and the statistical method of analysing the data .

**3.1 Target and Sampled Population**

The population in this study consisted of men and ladies singles matches, of players between the age of 12 and 25 years who played in the Kenya National Tennis Championship held in 1997. The method of sampling was stratified since it was based on gender, age, stages and also single matches. Players participating in this tournament were mostly from urban towns for example, Nakuru and Eldoret. The tournament which was organized by Kenya Lawn Tennis Association and sponsored by Co-operative Merchants bank provides a training and competitive environment for Kenyan players especially those selected to play in the Davis Cup which takes place 3 to 4 months after. The tournament takes place in September every year. It provides a training and competitive opportunity for players from most urban towns to refine their physical fitness, psychological and technical and tactical abilities. The tournament allows, especially the male players selected to play in the Davis Cup, a favorable competitive situation for them to upgrade their techniques and tactics before proceeding for Davis Cup tournament.

The Kenya National Tennis Championship was organized on qualifying rounds and a main draw for men and ladies players. The matches were played on knock-out basis in the qualifying rounds. For the main draw, the top players were seeded to avoid playing each other early in the tournament, but still on the knock-out system. The players who won their

preliminary rounds proceeded to the quarter final, to play other winners, then to the semi-final and final to determine the winner. The losers were eliminated in the tournament. Depending on the number of entries the total number of players for the main draw varies. A main draw of 32 competitors was held for this particular competition. The total number of men matches were 24 in the qualifying round. In the main draw 16 matches were held in the preliminary, 8 in the second round, 4 in the quarter finals, 2 in the semi-final and 1 match in the final. The total number of men matches was therefore 55 (See Appendix 'D').

The matches were selected through stratified random sampling. The researcher numbered the matches in the qualifying round put the pieces of papers written the court numbers in a hat and picked the papers at random. After the preliminary round, the researcher and his assistants observed all the matches at quarter finals, semi-finals and finals. Hence the latter matches were selected on stratified sampling.

From the past record of matches, it has been noted that women matches are always fewer than those of men because of low registration of lady players. But hypothetically 24 ladies matches were scheduled in the qualifying round. Only five matches took place in the qualifying rounds. The rest of the players proceeded to the next stage of the tournament on 'Byes' or walk overs. In the main draw the total number of ladies matches scheduled were to be 16 in the preliminary and only 7 matches took place. The rest of the players proceeded to the second round on 'Bye'. In the second round there were four matches played. Only one match was played in the semi-final as one of the players in the second semi-final match fainted. The match was not completed due to default. Only one match took place in the final. The total sum of ladies matches, hypothetically was supposed to be 55 but only 26 matches were played. The sum total of matches for both men and ladies can be summarized as follows:-

**Table 1. Sampling of men and ladies matches in tournament stages**

Stages of tournament	Men			Ladies		
	Hypothetical Population	Matches Played	Sample	Hypothetical Population	Matches Played	Sample
Preliminary rounds	24	24	15	24	5	4
Preliminary main draw	24	24	8	24	15	5
Quarter-finals	4	4	0	4	4	4
Semi-final	2	2	2	2	1	1
Finals	1	1	1	1	1	1
Totals	55	55	26	55	26	15

From table 1 it can be observed that the hypothetical matches for both men and women were 55. The researcher sampled 26 male matches and 25 female matches.

Stratified random sampling was done on the preliminary rounds, main draw preliminaries and quarter final matches for both male and female matches. The number of matches observed were three per day and the research assistants were paired up to watch a match at a go for validity and consistency. The total number of men matches observed were 26 and those of ladies 15 representing 51.2% of the total matches played. The sample of 41 matches (15 + 26) was taken as large enough to make inferences about the 1997 Kenya National Tennis Championship.

### 3.2 Research Instrument

A match analysis protocol sheet was used in the collection of data. The protocol sheet was a modified version of an instrument that has been successfully applied in the game of tennis

by the works of Kiganjo and Njororai (1997) and Elliot and Kilderry (1983). This instrument was further tested using Physical Education Student during their interclass competition to ensure validity and reliability. The instrument was further tested using video tennis matches played internationally in Wimbledon, Australia open between the 1982 and 1997. The information gathered was valid.

The people who assisted in modifying the instrument are tennis coaches who have a detailed knowledge and experience of the game. The instrument was modified to only include the researchers levels of interest in the serve (Good-in, Ace, Net, Out ball, Mishit)

The protocol sheet consisted of technical and tactical match actions under investigation (good/in, ace, net, out). It also showed two columns indicating the two opposing players (A and B), and enough space to record the faults and wins of players respectively. Player A on the sheet was the player taking the first serve while player B was one who received the first ball (See appendix 'A').

### **Data Collection Procedure**

The data were collected by watching the matches live as they were played, while seated in unobstructive site. The research assistants who were conversant with the game of tennis and had received prior training on how to collect the data helped in recording ace serves, good/in, out errors net errors and mishits for winning players and losing players in both male and female matches. The protocol sheet was designed to clearly show where variables (match actions) could be tallied. Every time the variables under investigation appeared in the game, the researcher, with her assistants tallied them down appropriately in the protocol sheet. The recording of the variables was done from the start of a point in the match to the end of the match for both opposing players in both male and female matches. Rigorous training of the

research assistants was done using the tennis matches played by Kenyatta University Physical Education students during their inter-class competition to test and re-design if need be, the match charting technique and protocol sheet and assess its objectivity. The charting technique and the protocol sheet were again tested using matches in the Kenya National Championship to further rectify on its objectivity and determine inter observer reliability. Table 2 below shows the findings of two male and one female matches selected at random, which were recorded by a pair of researchers, to indicate the consistency and variability of the scores.

**Table 2: Records of Match Actions by Research Assistants**

M a t c h   A c t i o n s							
Research Assistants		Good/in	Aces	Net	Out	Mishit	
Pair 1	Researcher A	82	1	23	27	0	
	Researcher B	82	1	23	27	0	
Pair 2	Researcher C	77	1	28	17	0	
	Researcher D	77	1	28	17	0	
Pair 3	Researcher E	75	1	23	41	0	
	Researcher F	75	1	22	41	0	

From the above table it is evident that two research assistants watching the same match recorded similar scores. For the scores that varied for instance in net errors (as shown above) by pair 3, a mean was tabulated and the resulting figure taken to be the true score, the results were found to

be valid and reliable. A further prove for reliability was with use of video, which was replayed in case of a controversial tally.

### 3.4 Statistical Analysis

The data obtained from the research was summarized and presented using tables, charts, means, standard deviation and percentages tabulation. The study compared the performance of the male winners and losers and that of female winners and losers on ace serves, good/ins, net errors, out errors, and mishits. Therefore the means of good/ins, ace serves, net errors and out errors were calculated separately for male and female players because the two groups did not at one time play against each other.

Inferential statistics were applied in this study to test the existence of any significant difference in winners and losers in the variables under investigation for men and women players independently and also for the two groups together. The 't' test analysis which deals with a small number of less than 29 subjects was appropriate in comparing the sample means between the winners and losers in male and female players independently.

A significance level of  $P < .05$  was used to determine the rejection of the null hypothesis.

The data was categorized into:-

- (A) Factor
- (B) Dependent variables
  - 1. Male winners
  - 2. Male losers
  - 3. Female winners
  - 4. Female losers

(C) Independent variables

- 1. Ace serves
- 2. Good-in serve
- 3. Net errors.
- 4. Out errors
- 5. Mishits

## DATA ANALYSIS AND DISCUSSION

4.0 **Introduction**

This chapter entails data pertaining to the performance of the winning and losing groups in men and women players, its presentation, analysis and discussion. The chapter is organised around the match actions (good/ins, ace serves, net serves ,out errors and mishits) under investigation to establish the existence of any difference in their execution among male and female players. The findings of this study and its discussion have been done under the five levels (good/ins, ace serves, net serves, out errors , mishits) and also analysed in terms of the first serve and second serve. The study compared the performance of winning and losing groups among male and female players in best of three sets through stratified randoming. Twenty five male and fifteen female matches were investigated. Players were declared winners when ahead of their opponents by two sets to one. For a player to be declared the winner of a game, such a player had to be ahead by at least two games at six games. Where the player ahead had six games to five games, a seventh game had to be played to separate the two players by two games. If the player behind won, a tie break occurred and more games had to be played to separate the players with two games. There were three male and two female matches of this kind.

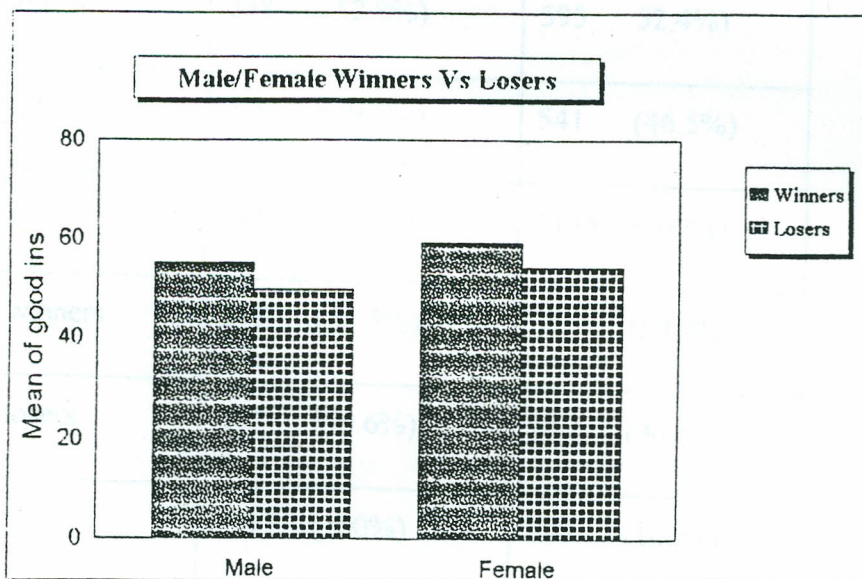
4.1.0 **Good-in serves**

Table 3 shows a higher percentage of good/in balls executed by male winners compared to the male losers. The female winners also showed a better performance in their execution of good/in balls compared to the female losers.

**Table 3: Proportion of good/ins executed by male and female winners and losers.**

Groups	Frequency	Total
Male winners	1433 (52.6%)	2723 (100%)
Male losers	1290 (47.4%)	
Female winners	888 (52.2%)	1700 (100%)
Female losers	812 (47.8%)	

A comparison of the means reveals that the male winners and female winners had a better performance than the losers. The male winners had a mean of  $55.1 \pm 21.12$  good/in as compared to the losers ( $49.6 \pm 18.4$ ). Female winners had  $59.2 \pm 20.39$  mean of good/in balls while the losers obtained a mean of  $54.1 \pm 20.06$ .

**Fig:1 A comparison of good/in means executed by male winners and losers and female winners and losers.**

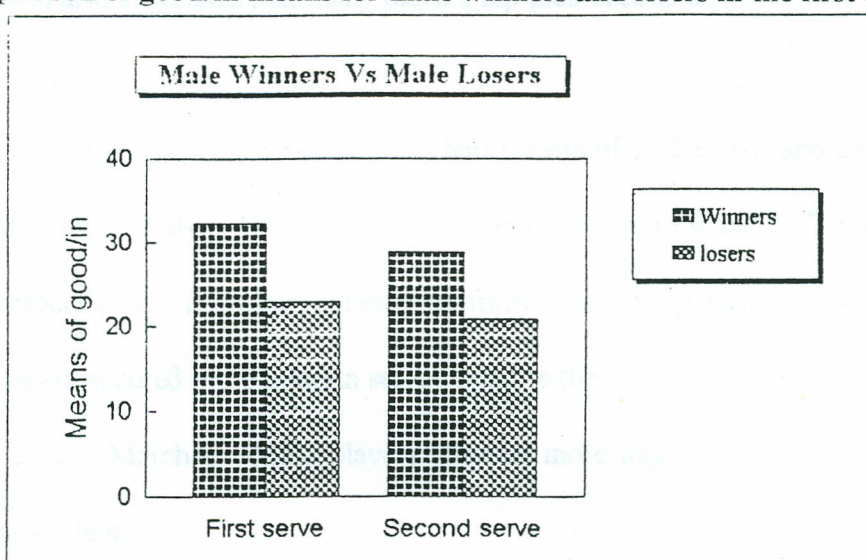
It is evident from table 3 that the male winners had a higher proportion of more balls in (good/in) 52.6% compared to the losers (47.4%). Figure 1 also supports this fact. The female winners also showed a higher performance of balls served in the appropriate court (52.2%) compared to the losers (47.8%). This agrees with Kiganjo & Njororai (1997) who observed more good/in serves for the winning players than the losing players. This could imply that probably the winners had more consistent rhythmical and accurate serves as compared to their counterparts. The winning male and female players could have employed a percentage theory system of play, by avoiding errors which provides a greater margin of safety, compared to the losers. The winning players would have kept the ball more safely in the court compared to their opponents. This also agrees with Elliot & Kilderry (1983) that more points are won from opponents errors than hitting winning placements.

**Table 4: A comparison of good/in serves from the first and second serve for both female and male players.**

Groups	Frequency	
	1st Serve	2nd Serve
Male winners	838 (52.8%)	595 (52.4%)
Male losers	749 (49.6%)	541 (46.5%)
Total	1587 (100%)	1136 (100%)
Female winners	543 (53.5%)	345 (50.4%)
Female losers	472 (49.6%)	340 (46.5%)
Total	1015 (100%)	685 (100%)

From table 4 it is evident that all groups of players had more good/in in the first serve than in the second. Male winners however had a higher percentage of good/in in the first serve and second serve compared to the male losers. Similarly, the female winners executed more good/in in the first and second serve compared to the female losers. From figure 2 it can be noted that male winners had means of  $32.2 \pm 14.7$  and  $22.9 \pm 10.7$  in the first and second serves respectively while the male losers had  $28.8 \pm 12.95$  and  $20.81 \pm 9.2$  in the first and second serves respectively (see figure 2).

**Fig 2 A comparison of good/in means for male winners and losers in the first and second serve.**



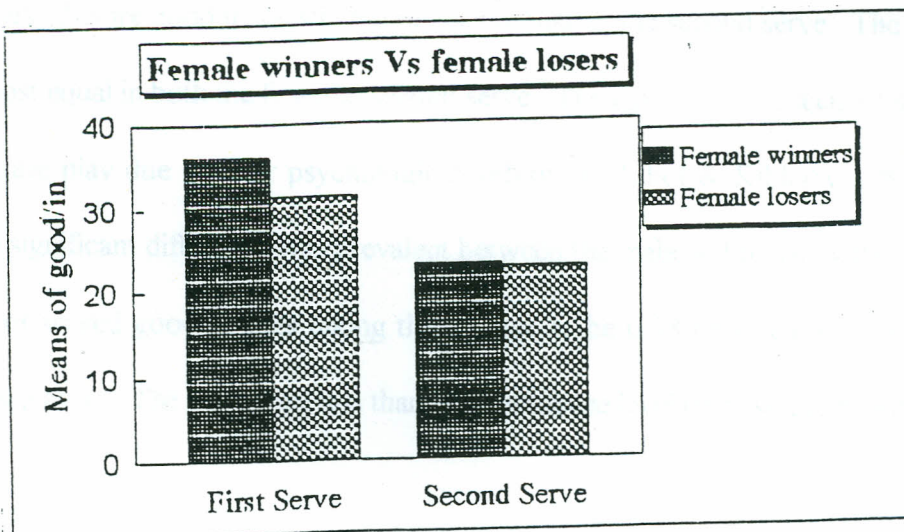
As shown in figure 2 male winners and losers hit more good/in balls in the first serve than in the second serve. ( $W = 32.2 \pm 14.7$ ) Executing more serves in the first serve than in the second serve gave the players with a higher proportion of good/in serves a better chance of winning because a second serve may not open a chance of offensive play but instead defensive play may be applicable.

This confirms Gould's (1978) that two thirds of serves in the first serve should be placed in the appropriate court for a better performance. Additionally Gould indicates that a much higher percentage of first serve must be good even if served less aggressively than the second serves. Pearce & Pearce (1971) supports the fact that a higher proportion of good/ins in the first serve is the server's objective and that the serves should be executed with power, placement and accuracy of 70 to 80%.

The male winners also executed a higher percentage of good/ins in the second serve ( $22.9 \pm 10.7$ ) compared to the losers ( $20.8 \pm 10.7$ ). This implies that probably the male winners observed a greater margin of safety in the second serve than the losers to avoid needless double faults. The second serve provides the last chance of service for any point. This tends to make players more careful with their second serve. This can be supported by Elliot & Kilderry (1983) who states that the second serves should be hit similar to the first serve but should have less power and spin to avoid double faults. Gensemer (1969) also ascertains that many players tap their second serve to have a higher chance of placement.

As shown in figure 3, the female winners had a mean of  $36.2 \pm 16.2$  and  $23 \pm 15.8$  in the first and second serve respectively. The losers had a mean of  $31.5 \pm 15.9$  and  $22.7 \pm 7.5$  in the first and second serve respectively. Therefore a better performance by female winners was reflected. Male winners could have executed more good/in serves because their matches were more and took a longer duration than female Matches. Male players showed more aggressive play due to their natural physiological advantage.

Fig 3 A comparison of good/in means for female winners and losers in 1st and 2nd serve.



From figure 3 it is evident that female winners executed more good/in in the first serve ( $36.2 \pm 16.2$ ) compared to the losers ( $31.5 \pm 15.9$ ). The female winners had ( $23 \pm 15.8$ ) of good/in in second serve while the losers made a ( $22.7 \pm 7.5$ ) of the good/in. Therefore the female winners had a lower proportion of good/in in the second serve than in the first serve since they had more good/in balls served in the first serve and they did not need to do a second serve. The female losers executed more good/in in the second serve than in the first serve because they lost many of their first serves through hitting the ball out or onto the net and they had to serve a second time. As indicated above the female winners had more good/in in the first serve which can be supported by Gensemer's (1969) observation that first serves need to be successful three-fourth of the times and that a serve made consistently successful will boost any server. According to Brabenec (1994) a high percentage of forcing first serves will reward the server with considerable tactical benefits because of constant pressure put on the receiver. Additionally Elliot & Kilderry (1983) states that service placement wins points while power may be secondary. Higher proportion of good/in in the first serve leads to winning. This is also evident in Elliot and Kilderry's (1983) study which revealed that as the winning player increased his first service percentage, the losing player decreased his. According to the aforementioned study an increase in first-service percentage influenced the effectiveness of serve for the winning player. The male players served more good/in balls in the first serve than in the second serve. The female good/in balls were almost equal in both the first and second serve. The male players executed more aggressive play and accurate play due to their psychological difference (Elliot & Kilderry 1983). However, statistically no significant difference was prevalent between the male and female winners and losers in the execution of served good/in balls taking the p value to be 0.98 between male players and 0.67 between female players. The values are less than the confidence level 0.05, so the hypothesis that there

was a difference between male winners and losers and female winners and losers in execution of good/in serve was rejected.

**Table 5: Frequency, percentage, 't'-test analysis of good/in for male and female winners and losers.**

Groups	Frequency	Total	't'-test	Comment
Male winners	1433 (52.6%)	2723	0.98	Not significant
Male losers	1290 (47.4%)	(100%)		
Female winners	888 (52.2%)	1700	0.67	Not significant
Female losers	812 (47.8%)	(100%)		

$p < .05$

From table 5 it is evident that there was no significant difference between men winners and losers in their execution of good/in. Also, women winners and losers showed no significant difference in their execution of the good/in balls. Additionally more good/in balls were evident in male players than in women players. This could be attributed to the fact that female matches were fewer and their matches were shorter. For instance only two female matches were played to three sets while for male only three matches were played to 3 sets.

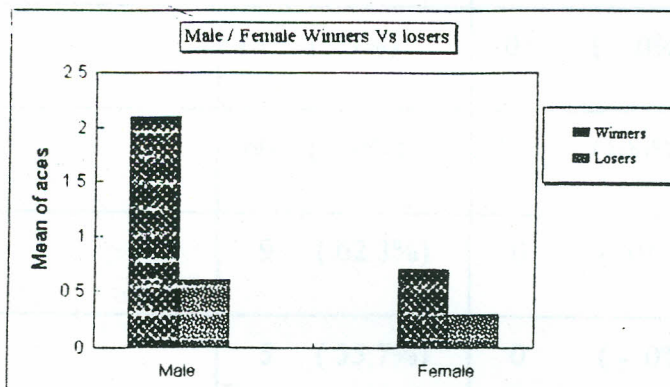
#### 4.2 Ace Serves

Male winners executed more aces compared to male losers. Female winners also performed better than the female losers as they showed a higher percentage of execution of ace serves as shown in the table 6 below.

**Table 6: Proportion of aces executed by male winners and losers and female winners and losers.**

Group	Frequency	Total
Male winners	56 (78.9%)	71 (100%)
Male losers	15 (21.1%)	
Female winners	9 (64.3%)	14 (100%)
Female losers	5 (35.7%)	

The means also revealed a better performance for male and female winners as compared to the losers. The male winners had a mean of  $2.1 \pm 2.34$  in aces compared to the losers  $0.6 \pm 0.85$ . The female winners' mean in aces was  $0.7 \pm 0.79$  compared to the losers  $0.3 \pm 0.60$ .

**Fig 4: A comparison of means in execution of ace serves for male winners and losers and female winners and losers.**

Men winners executed more aces (78.9%) of the total aces compared to the losers (21.1%).

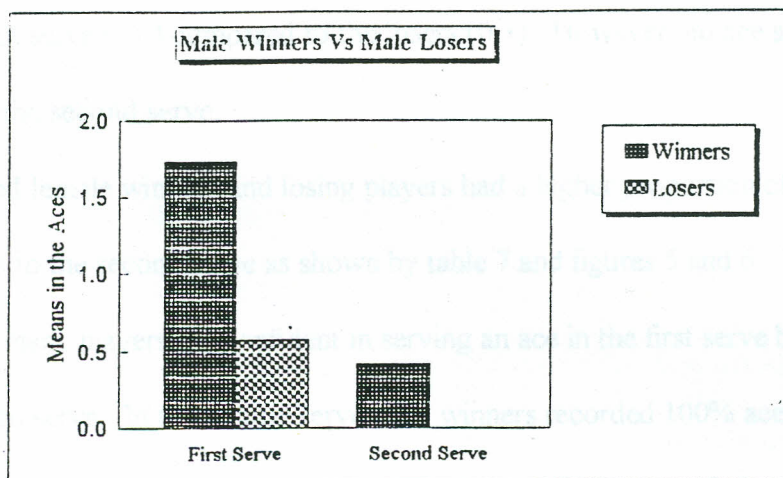
The female winners also executed a higher proportion of aces (64.3%) compared to the losers (37.7%). This is supported by Kiganjo and Njororai (1997) who concluded in their study that winning players made more aces than the losing players except on final and qualifying stages of matches focussed on. Gensemer (1969) supports that a higher proportion of ace served may lead to better performance. The author ascertains that the serve can win outright points and that 50% of points in a match are scored as a direct or indirect result of the serve. Maurice Mc Loughlin, Jack Kramer, Poncho Gonzales who are popular tennis champions had very powerful serves with speeds of upto 113 m.p.h. These players probably used ace serves to win outright points or used the serve to force weak returns from the opponent in order to execute a put away shot (Gensemer 1969).

**Table 7: Proportion of ace serves executed by male winners and losers and female winners and losers in the first and second serve.**

Groups	Frequency	
	1st serve	2nd serve
Male winners	45 (75%)	11 (100%)
Male losers	15 (25%)	0 (0%)
Total	60 (100%)	11 (100%)
Female winners	9 (62.3%)	0 (0%)
Female losers	5 (35.7%)	0 (-0%)
Total	14 (100%)	0 (-0%)

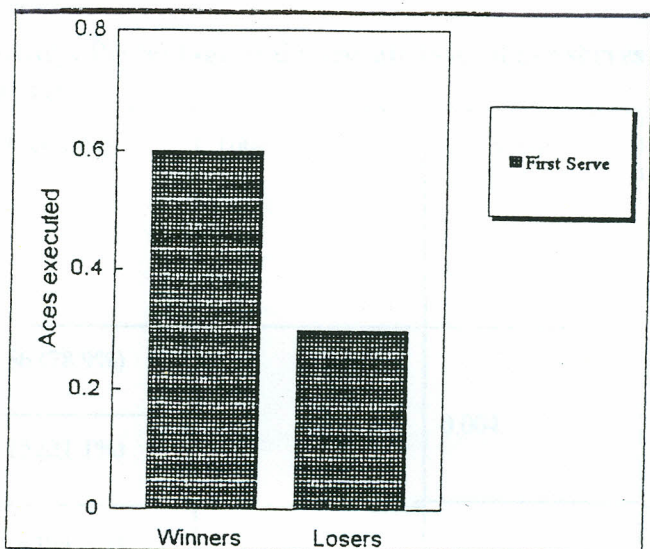
From table 7, it is clear that male winners had the highest percentage of ace serves executed in the first serve, compared to the losing team. In the second serve the male winners executed 100% of the total ace serves in the second serve among male players, while the losers had no aces at all in the second serve. Female winners executed more aces in the first serve compared to the female losers. Female players did not execute any ace serves in the second serve. Probably after loosing the first serve the losers tended to tap their second serve. They feared to make aggressive shots and commit a double fault (Gensemer 1969).

**Fig 5: A comparison of means in the ace serves executed by male winners and losers in first and second serves.**



The means revealed more ace serves for the male winners in the first serve (1.73) and in the second serve (0.42). However, the men losers had a mean of 0.58 in the execution of ace serves in the first serve, but no ace serves were executed in the second serve. Probably after loosing the first serve the losers tended to tap their second serve. They feared to make aggressive shots and commit a double fault (Gensemer 1969).

Fig 6: A comparison of ace serves executed by female winners and losers in first and second serves.



The female winners, from the figure above showed a better performance in execution of ace serves in the first serve (0.6) compared to the losers (0.3). However, no ace serves were executed by both groups in the second serve.

Male and female winning and losing players had a higher proportion of ace serves in their first serve compared to the second serve as shown by table 7 and figures 5 and 6. This could be attributed to the fact that many players are confident in serving an ace in the first serve because they still have a second chance to serve. In the second serve male winners recorded 100% aces of the total number of aces executed by male winners and losers. This can be attributed to the fact that many novices players have a tendency of hitting forceful, hard and flat first serves which have a little margin of safety, and then tap the second serve. Lack of ace serves in the second serve could indicate fear of losing the second chance and encountering double faults. This agrees with Gensemer (1969) who indicates that tennis players assume that they should bash away their first serve and having failed, pat the second one. Gensemer (1969) adds that first serves need to be slowed down but second serves made aggressive

with a high margin of safety. Statistically there was a significant difference in the execution of ace serves between the male winners and losers ( $p = 0.004$ ) given the confidence level of  $p < .05$ .

**Table 8: Frequency, Percentage and t-test analysis of ace serves of male and female winners and losers.**

Groups	Frequency	Total	'P' - value	Comment
Male winners	56 (78.9%)	71 (100%)	0.004	Significant
Male losers	15 (21.1%)			
Female winners	9 (64.3%)	14 (100%)	1.52	Not significant
Female losers	5 (35.7%)			

$p < .05$

There was no significant difference between female winners and losers in the execution of aces as shown from the above table using  $p < .05$ .

From table 8 it is evident that there was a significant difference in the execution of ace serves of the male winners compared to that of the male losers and also between male and female players ( $F = 0.006$ ). This can be attributed to the fact that male players executed more aggressive play compared to the female players. This is supported by the fact that there are physiological, psychological, socio-cultural and anatomical differences between men and women which influence performance (Elliot & Kilderry 1983). Female players may have an attitude for instance if they increase their muscle strength, they may look masculine, yet strength is indispensable when executing hard serves. The difference in execution of aces between men and female winners could also be attributed to the high number of male

matches (26) compared to the female (15) and the fact that the duration of men matches was longer than that of female matches.

#### 4.3 Net errors

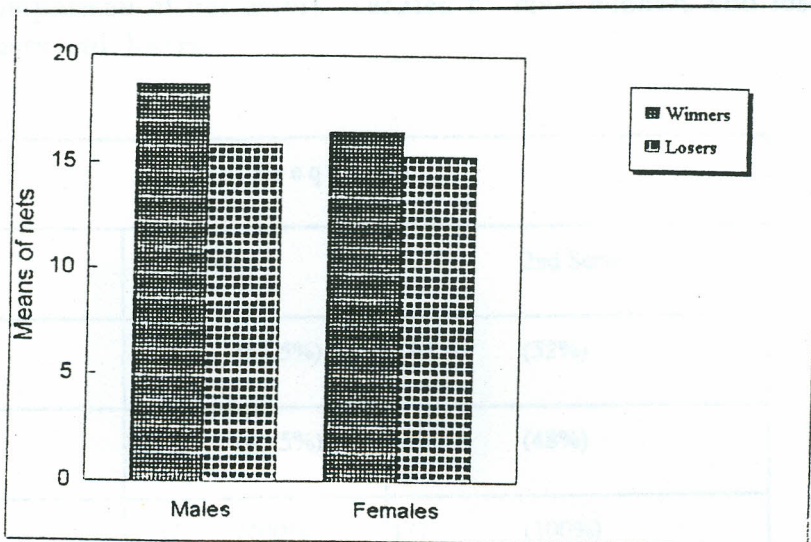
Male winners and female winners executed more net errors than the losers as seen from the table that follows.

**Table 9: Proportion of net errors executed by male and female players.**

Groups	Frequency	Total
Male winners	486 (53.2%)	914 (100%)
Male losers	428 (46.8%)	
Female winners	239 (51.0%)	469 (100%)
Female losers	230 (49%)	

From table 9 it can be noted that the male and female winners made more mistakes of hitting the ball against the net compared to their counterparts. A comparison of the means shows that the losers both male and female players made less mistakes of hitting the net while serving. The male losers had a mean of  $16.5 \pm 7.4$  in net errors compared to the male winners whose mean was  $18.7 \pm 9.11$ . The female losers mean was  $15.3 \pm 6.17$  of compared to female winners'  $15.9 \pm 96.2$ .

Fig 7: A comparison of net error means executed by male winners and losers and female winners and losers.



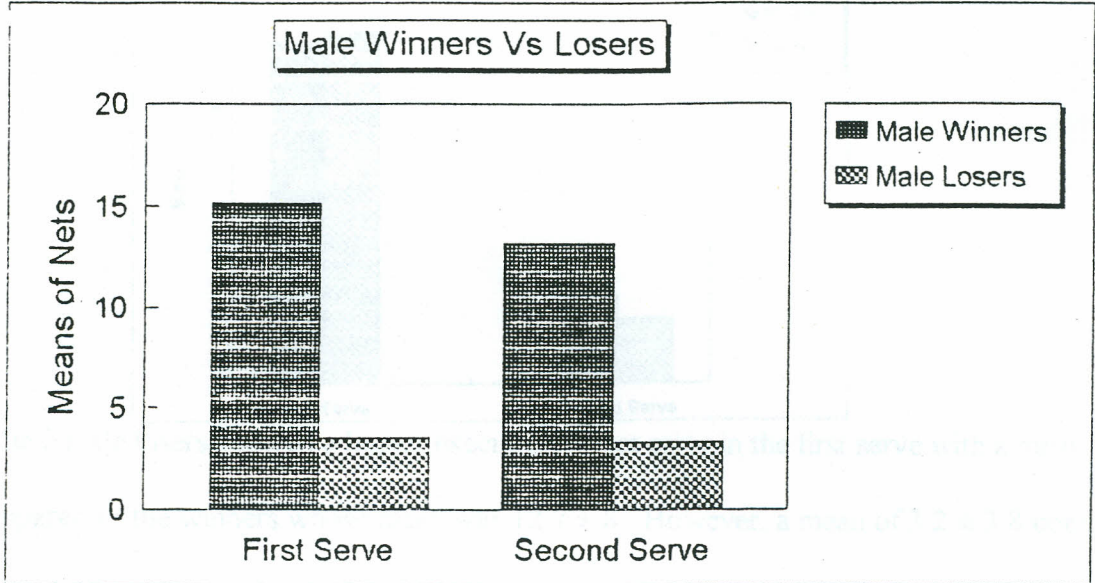
Male winners had a higher proportion of net error (53.2%) compared to the male losers (46.8%). The female winners also had a higher percentage of net error (51.0%) compared to the female losers (49%) as shown in table 9. This can be attributed to the fact that the winners probably used a serve with greater a speed but one whose chances of error was higher. Therefore this resulted to many net balls for the winners. According to Pearce & Pearce (1971) most professional players prefer to use the hard flat serve for their first serve which may terrify the opponent, but produces the greatest percentage of service errors. Additionally the male and female winners in Kenya National Tennis Championship would have been aggressive players who get most enjoyment by hitting winners. Therefore in their attempt to hit many ace serves, they lost their balls to the net.

**Table 10: A comparison of net errors executed by male winners and losers and female winners and losers.**

Groups	Frequency			
	1st Serve		2nd Serve	
Male winner	394	(53.5%)	92	(52%)
Male loser	343	(46.5%)	85	(48%)
Total	737	(100%)	177	(100%)
Female winner	191	(49.5%)	48	(57.8%)
Female loser	195	(50.5%)	35	(42.2%)
Total	386	(100%)	83	(100%)

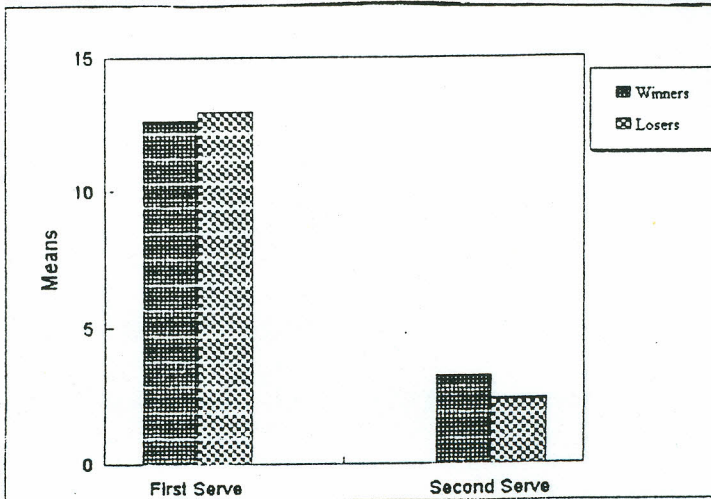
From the above table the male winners executed more nets in the first serve as compared to the second serve. Additionally, the male winners frequency of net error was higher than the losers. Both groups showed a higher frequency of net error in the first serve. The female winners showed a lower frequency of net error compared to the losers in the first serve, but a higher frequency of net error was observed for them (winners) in the second serve.

Fig 8: A comparison of means in net errors in the first and second serve for male players.



The male winners showed a higher execution of net error in the first serve with a mean of  $15.15 \pm 7.4$  compared to the losers  $13.19 \pm 6.8$  and a mean of  $3.5 \pm 2.7$  compared to  $3.3 \pm 2.7$  for losers in the second serve. More nets errors for male players were in the first serve where the male winners acquired 43.1% nets of the total nets executed by male winners and losers in both first and second serve. The losers committed 37.5% of the total nets. Both the male winners (10.1%) and losers (9.3%) acquired a lower percentage of net error in the second serve. This can be attributed to the fact that more safety was observed in the second serve in order to avoid double faults. As stated by Gensemer (1969), many players tend to tap their second serve to have a higher chance of placement.

**Fig 9: A comparison of means in net errors in the first and second serve for female players.**



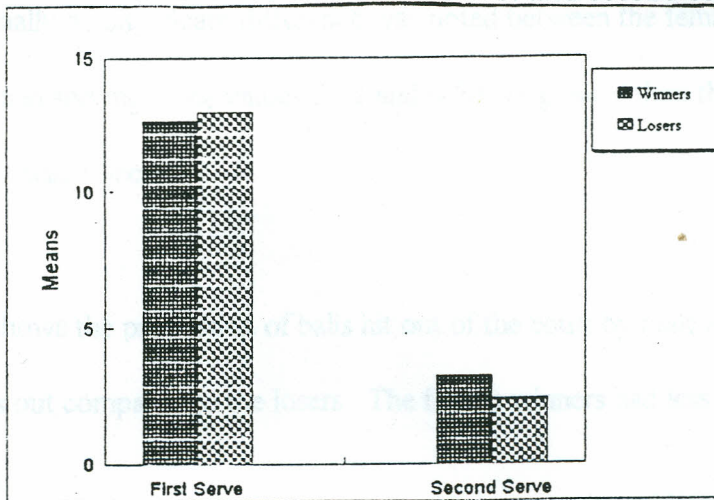
The female losers showed a higher execution of net error in the first serve with a mean of  $13.6 \pm 6.1$  compared to the winners whose mean was  $12.7 \pm 8$ . However, a mean of  $3.2 \pm 3.8$  compared to the losers  $2.33 \pm 1.8$  was observed for the second serve. Female winners and losers had 40.7% and 41.6% of net error in the first serve, respectively and 10.2% and 7.5% in the second serve. It can be noted that both male and female winners made more net error than the losers. This can be attributed to the fact that the winning players in their attempt to make outright winners through their serves lost the balls to the net.

**Table 11: Frequency, Percentage and t-test analysis of net errors for male and female winners and losers.**

Groups	Frequency	Total	'P' - value	Comment
Male winner	486 (53.2%)	914 (100%)	0.92	Not significant
Male losers	428 (46.8%)			
Female winner	239 (51.0%)	469 (100%)	0.20	Not significant
Female losers	230 (49%)			

P < .05

Fig 9: A comparison of means in net errors in the first and second serve for female players.



The female losers showed a higher execution of net error in the first serve with a mean of  $13 \pm 6.1$  compared to the winners whose mean was  $12.7 \pm 8$ . However, a mean of  $3.2 \pm 3.8$  compared to the losers  $2.33 \pm 1.8$  was observed for the second serve. Female winners and losers had 40.7% and 41.6% of net error in the first serve, respectively and 10.2% and 7.5% in the second serve. It can be noted that both male and female winners made more net error than the losers. This can be attributed to the fact that the winning players in their attempt to make outright winners through their serves lost the balls to the net.

Table 11: Frequency, Percentage and  $\chi^2$  test analysis of net errors for male and female winners and losers.

Groups	Frequency	Total	'P' - value	Comment
Male winner	486 (53.2%)	914 (100%)	0.92	Not significant
Male losers	428 (46.8%)			
Female winner	239 (51.0%)	469 (100%)	0.20	Not significant
Female losers	230 (49%)			

$P < .05$

The table shows no significant difference in execution of net errors between the male winners and losers. Additionally no significant difference was noted between the female winners and losers in execution of nets when serving. The values 0.92 and 0.20 are greater than the confidence level 0.05, hence the hypothesis was rejected.

#### 4.4 Outs error

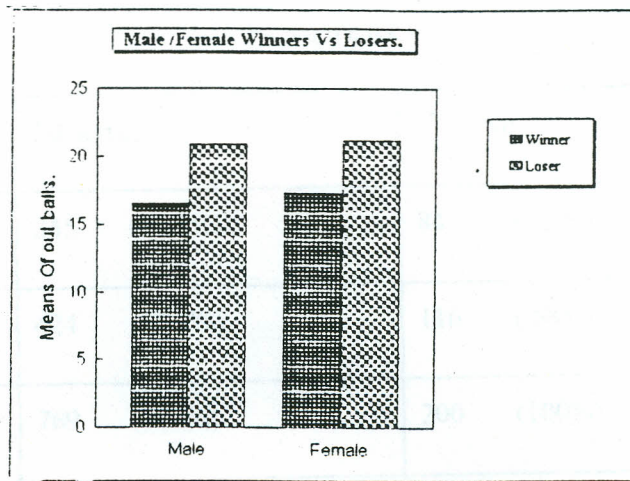
Table (12) shows the proportion of balls hit out of the court by male and female players. Men winners hit less balls out compared to the losers. The female winners had less balls out also, compared to the female losers.

**Table 12: Proportions of out errors executed by male and female winners and losers.**

Groups	Frequency	Total
Male winners	429 (44.3%)	969 (100%)
Male losers	540 (55.7%)	
Female winners	260 (45.1%)	576 (100%)
Female losers	316 (54.9%)	

Comparison of the means between male winners and losers supports the fact that the winners performed better as they had a mean of  $16.5 \pm 8.41$  while the losers mean was  $20.8 \pm 10.25$  of balls hit out of court. The female winners showed a mean of  $17.3 \pm 14.64$  while the losers  $21.17 \pm 7.38$  of the balls were hit out. This reveals that the female winners had less mistakes of serving the ball out as compared to the losers.

Fig 10: A proportion of means executed in the out error balls for male and female winners and losers.



From table 12 and figure 10 it is evident that male winners showed less proportion of balls hit out of the court while serving (44.3%) compared to the male losers (55.7%). Female winners also showed a better performance with only 45.1% of balls hit out compared to 54.9% for the losers. Therefore the winners showed a better performance by not committing many errors of hitting the ball out of court than the losers. This agrees with Elliot & Kilderry (1983) whose explanation indicates that more points are won from opponent's errors than hitting winning placement. Additionally 75% of all points scored in tennis are due to players errors. In fact a quarter of the errors are because the ball landed out of bounds (Elliot & Kilderry 1983). This is also supported by Brabenec (1994) that tennis matches are won on errors than placement. Additionally Brabenec in his study found out that top players commit 1.5 to 2.5 errors for one win. The author therefore recommended that players should try to force their opponents to make errors instead of trying to win each point with a spectacular shot. The winning players in this case both male and female showed less errors of hitting the ball out than their counterparts.

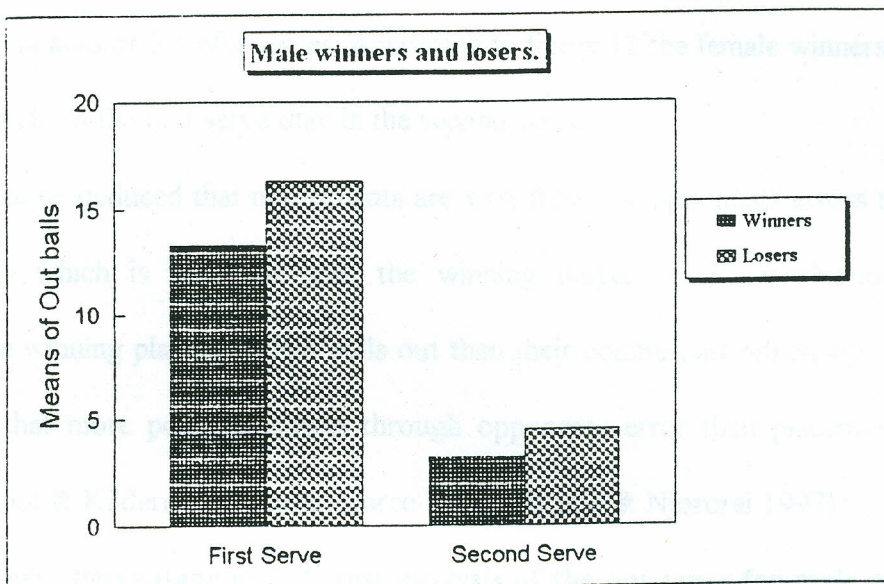
**Table 13: Proportion of out errors among male and female players in first and second serves.**

Groups	Frequency	
	1st serve	2 <sup>nd</sup> serve
Male winners	345 (44.8%)	84 (42%)
Male losers	424 (55.2%)	116 (58%)
Total	769 (100%)	200 (100%)
Female winners	208 (45.1%)	52 (45.2%)
Female losers	253 (54.9%)	63 (54.8%)
Total	461 (100%)	115 (100%)

From the table, it is evident that more balls were hit out in the first serve than in the second serve by both male and female players. However, more balls were hit out by male and female losers compared to their counterparts.

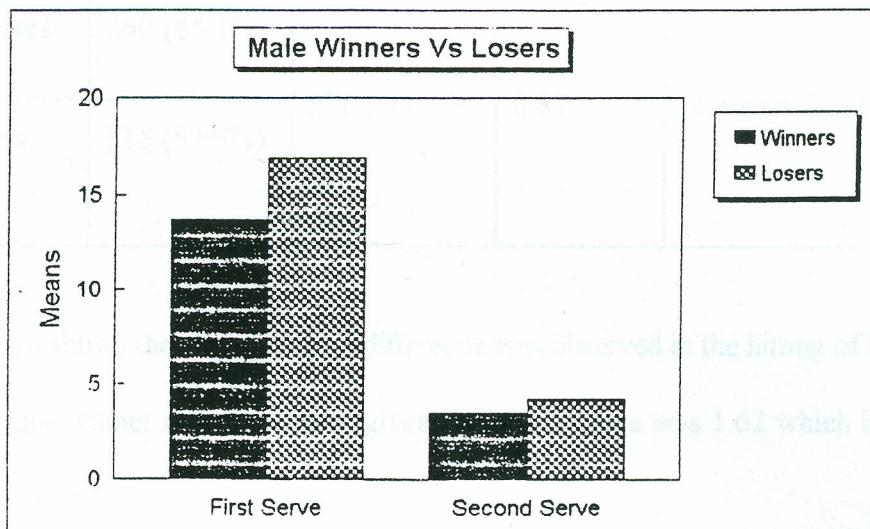
A comparison of the means in balls out shows a better performance for the male winners who had means of  $13.3 \pm 7.4$  and  $3.2 \pm 5.5$  in the first and second serve respectively compared to the means of  $16.3 \pm 8.2$  and  $4.46 \pm 3.2$  for the losers in the first and second serve respectively.

**Fig 11:** A comparison of means of out error in the first and second serve for male winners and losers.



A comparison of means between female winners and losers in the outs executed showed a better performance for winners. Their means were  $13.9 \pm 11.9$  and  $3.47 \pm 5.5$  in the first and second serve respectively. The losers had means of  $16.9 \pm 6.4$  and  $4.2 \pm 2.0$  in the first and second serve respectively.

**Fig 12 :** A comparison of means in the out error between the female winners and losers in first and second serves.



As shown in figure 11 the male winners and losers hit less balls out in the second serve than in the first serve. This is probably because the players served hard and inaccurately in their first serve in the aim of obtaining aces or forceful serves. According to figure 12 the female winners and losers executed more out balls in the first serve than in the second serve.

Hence it can be deduced that more points are won from the opponents errors than hitting winning placements which is the case with the winning players in Kenya National Tennis Championship. The winning players hit less balls out than their counterpart which agrees with the percentage theory that more points are won through opponents error than placement of shots (Brabenec 1994, Elliot & Kilderry, Pearce & Pearce 1971, Kiganjo & Njororai 1997).

**Table 14: Frequency, Percentage and 't'- test analysis of the out error for male and female winners and losers.**

Groups	Frequency	Total	p-value	Comment
Male winners	429 (44.3%)	969 (100%)	1.62	Not significant
Male losers	540 (55.7%)			
Female winners	260 (45.1%)	576 (100%)	0.87	Not significant
Female losers	316 (54.9%)			

< .05

Table 14 shows that no significant difference was observed in the hitting of balls out of bounds between the male winner and male loser, given that the p value was 1.62 which is greater than .05.

Women players also showed no significant difference between themselves in hitting balls out of bounds since the p value was 0.87 which was greater than .05, hence the hypothesis that there was no difference in the execution of female winners and losers was rejected.

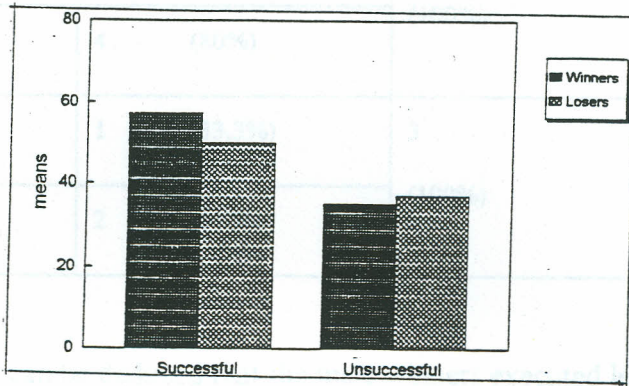
**Table 15: A summary table of total service wins (successful) and errors (unsuccessful) for male and female winners and losers.**

Groups	Successful serves			Unsuccessful serves		
	Good/in	Aces	Total	Nets	Outs	Total
Male winner	1433 (52.6%)	56 (78.9%)	1489 (53.6%)	486 (53.2%)	429 (44.3%)	915 (48.6)
Male losers	1290 (47.4%)	15 (21.1%)	1305 (46.7%)	428 (46.8%)	540 (55.7%)	968 (51.4)
Totals	2723 (100%)	71 (100%)	2794 (100%)	914 (100%)	969 (100%)	1883 (100%)
Female winner	888 (52.2%)	9 (64.2%)	897 (52.3%)	239 (51.0%)	260 (45.13%)	499 (47.75%)
Female losers	812 (47.8%)	5 (35.7%)	817 (47.7%)	230 (49%)	316 (54.86%)	546 (52.25%)
Total	1700 (100%)	14 (100%)	1714 (100%)	469 (100%)	576 (100%)	1045 (100%)

From the above table it can be deduced that male winners had more successful serves (53.6%) compared to the male losers (46.7%). Hence the winner's performance was obviously better. For the unsuccessful shots the loser had more (51.4%) compared to the winners (48.6%). Female winners had

more successful shots (52.3%) compared to the losers (47.7%). For unsuccessful shots, the female losers had a higher frequency of 52.3% compared to the women winners, (47.7%) hence showing more errors committed by losers than the winners.

**Fig 13: A comparison of means among male players on the successful and unsuccessful serves executed.**



From the figure above it is evident that male winners had a better performance in their serving because they had a mean of 57.2 successful serves and 35.2 unsuccessful ones, compared to men losers 50.2 successful and 37.2 unsuccessful serves.

**Fig 14: A comparison of means among female players on successful and unsuccessful serves.**

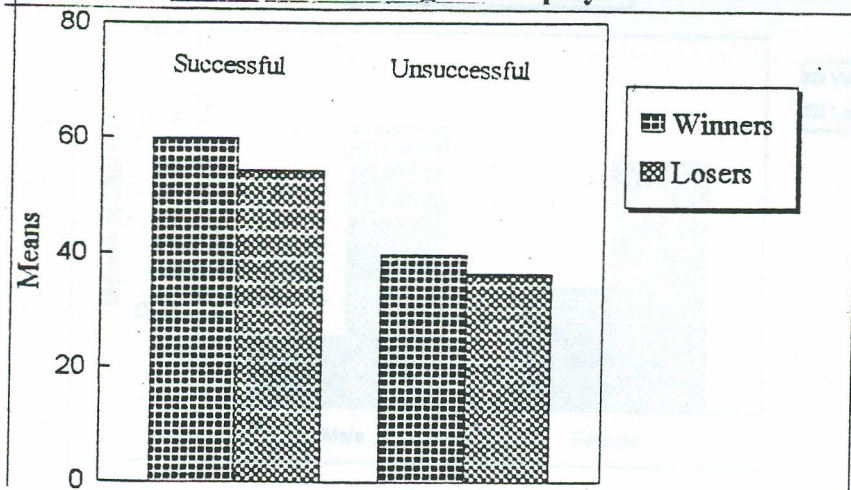
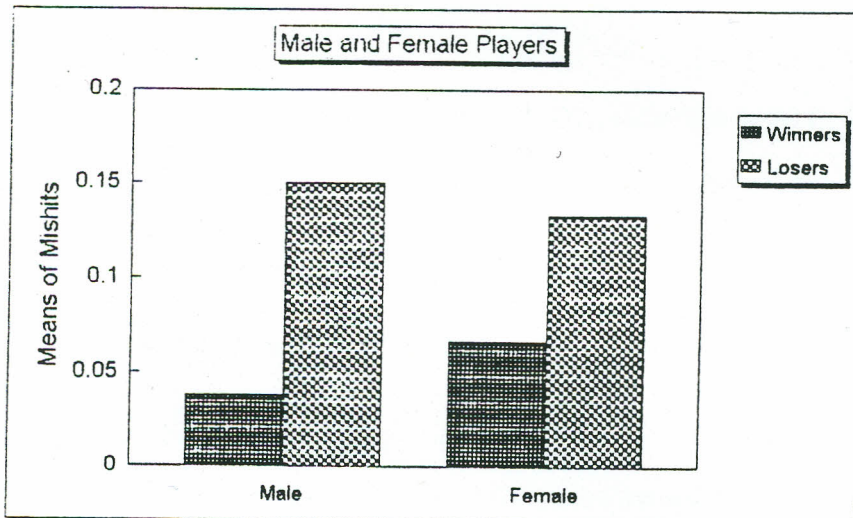


Figure 14 shows a better serving performance for female winners, with a mean of 59.8 successful serves compared to the female losers (54.5). Female winners had a higher mean of unsuccessful serves (39.9) than the losers with a mean of 36.4.

4.4.1 **Mishits****Table 16: Frequency, Percentage and means of mishits among male and female players.**

Groups	Frequency	Total	Mean
Male winners	1 (20%)	5 (100%)	0.038
Male losers	4 (80%)		0.15
Female winners	1 (33.3%)	3 (100%)	0.066
Female losers	2 (66.7%)		0.133

From table 16 it can be deduced that the male winners executed less mishits (20%) compared to the losers (80%). Female winners also made less mistakes of mishits (33.3%) compared to the losers (66.7%)

**Fig 15: A comparison of means of mishits among men and women players.**

It is evident from figure 6 that the performance of men winners (10.038) was better than the losers (0.15). Likewise the female winners mean was 0.066 compared to the losers 0.133, hence depicting a likewise better performance for female winners.

This could be an implication that the ball toss of the losers may have been short and possibly they lacked some co-ordination between the service toss and the height of the ball at impact. Piller (1994) ascertains that players should fit the ball toss to the serve, and that the ball should be rushed to the height of the top of the racket to ensure a fully extended body position at impact in order to avoid poor service and injury.

### Winding serve

The research hypothesis in this was stated no difference in execution of the toss of the ball between the winning and losing players. The findings relating to this question showed that -

- 1) Male winners returned more good balls (52.6%) compared to the losers (47.4%)
- 2) Female winners also showed a higher proportion of good balls (52.2%) compared to the losers (47.8%).

### Net error

The research hypothesis in this was stated no difference between the winning and losing players in the number of net errors. The findings revealed that -

- 1) Male winners made more net errors (27.1%) compared to the losers (25.1%)
- 2) Female winners made more net errors (27.4%) compared to the losers (25.9%)

### Faults

The research hypothesis stated no difference between the winning and losing players in respect to the faults (nets, out, mishits).

### Net errors

The following findings were obtained in net errors -

**CHAPTER FIVE****SUMMARY, CONCLUSION AND RECOMMENDATIONS****Introduction**

This chapter is organised around the hypothesis formulated for this study in relation to the findings obtained. This revolves around the match action under investigation (aces, good/ins outs, nets, mishits). Subsequent to the analysis of the findings, suggestive recommendations have been advanced.

**Good/in serves**

The research hypothesis on this, stated no difference in execution of the good/in balls between the winning and losing players. The findings pertaining to this question showed that

- (i) Male winners executed more good/in balls (52.6%) compared to the losers (47.4%)
- (ii) Female winners also showed a higher proportion of balls in the right court (52.2%) compared to the losers (47.8%).

**Ace serves**

The research hypothesis in this area stated no difference between the winning and losing players in the execution of the aces. The findings revealed that:-

- (i) Male winners executed more aces (78.9%) compared to the losers (21.1%).
- (ii) Female winners made more aces (64.3%) compared to the female losers (35.7%).

**Faults**

The research hypothesis stated no difference between the winning and losing players in execution the faults (nets, outs, mishits).

**Net errors**

The following findings were observed on net errors :-

- (1) Male winners were seen to execute more net balls (53.2%) compared to the male losers (46.8%).
- (2) Female winners were observed to execute more net balls (51.0%) compared to the losers 49%. Therefore the winners seemed to have made more mistakes of hitting the ball to the net than the losers.

### Out errors

The research question here sought to find out whether there existed a difference between the winning and losing players in execution of balls hit out of bounds when serving.

The study revealed that:-

- (1) Male winners had less out errors (44.3%) compared to the losers (55.7%).
- (2) Female winners showed less mistakes of hitting the ball out of bound (45.1%) compared to the losers (54.9%).

### Mishits

The research question on mishits sought to find out the mishit pattern between the winning and losing players. The following was found out:-

- (1) Male winners committed 20% of total mishits made among the male players compared to the male loser (80%).
- (2) Female winners made less mishits (33.3%) compared to the losers (66.7%).

### First Serve and Second Serve

The research question was geared find out to what extent the first serve and second serve determined performance. The study found that:-

#### 4.1 Good/in serves

- (i) Male winners executed more good/in balls in the first serve (58.5%) than in the second serve (41.5%). The male losers were also observed to execute more good/in balls in the first serve (58.1%) than in the second serve (41.9%). The male winners had a higher percentage of total number of good/in balls among male players in the first serve (52.8%) compared to the losers (47.2%) and also in the second serve (52.4%) compared to the losers (47.6%).
- (ii) Female winners executed more good/in balls in the first serve (53.5%) compared to the losers (46.5%). In the second serve the female winners were still observed to execute more good/in balls (50.4%) compared to the losers (49.6%).

#### 4.2 Ace serves

- (i) Male winners executed more aces in the first serve (75%) compared to the losers (25%). In the second serve male winners has 100% of the total aces executed by both groups, while the losers executed no aces at all.
- (ii) Female winners executed (62.3%) of the total aces among the female players while the losers had (35.9%). Both groups of players did not execute any aces in the second serve.

#### 4.3 Net errors

- (i) Male winners executed more net errors in the first serve (53.5%) than the losers (46.5%). In the second serve the male winners were still observed to execute more net errors (52%) than the losers.

- (ii) Female winners showed a lower frequency of net error in the first serve (49.5%) compared with the losers (50.5%). In the second serve the winners showed a higher frequency of net error (57.8%) compared to the losers (42.2%).

#### 5.4.4 Out Errors

- (i) Male winners had a lower percentage of balls hit out in the first serve (44.8%) and (42%) in the second serve as compared to the losers who had 55.1% and 58% in the first and second serve respectively.
- (ii) Female winners hit less balls out in the first serve 45.1% and second serve 45.2% compared to the losers who had 54.9% and 54.8% in the first and second serve respectively.

#### 5.5 Gender Difference in Execution of Aces and Good/in Serves

The research hypothesis stated no significant gender difference in execution of aces and good/ins. The study revealed that there was no significant difference between men and women players in execution of good/in serves.

#### 5.6 Conclusion

- (i) Winners were observed to have a higher proportion of good/in balls compared to the losers
- (ii) Winners, both male and female, hit fewer balls out of bound of the appropriate court compared to the losers.
- (iii) Both the female and male winners executed more aces in the first serve compared to the losers.
- (iv) The winners were observed to have more balls hit the net compared to the female losers.
- (v) Male winners were observed to have fewer mishits compared to their counterparts and so were the female winners as opposed to losers.

- (vii) The winners, both female and male, showed a higher proportion of successful serves in the first serve than in the second serve compared to the losers.

This study only focussed on the wins or successful balls (good/in, aces) and faults or unsuccessful balls (net error, out error, mishit) committed in the serve by male and female players during the Kenya National Tennis Championship held in September 25 to October 10th 1997 in Nairobi. The study did not focus on the type of serve, speed, spin and direction but concentrated on the placement during service. Further investigations need to be carried out on the effectiveness of different types of serves, serve speed, direction of serve and how they affect the technical and tactical aspects of other skills and general performance in tennis.

#### 5.7 **Recommendations**

The players in the Kenya National Tennis Championship can be advised to serve balls in the appropriate court mostly in the first serve as this gives them a chance to play offensively either by making outright wins using the aces or forcing a player to return the shot defensively.

The player who makes fewer errors and especially at critical times are likely to win (Brabenec 1994, Elliot & Kilderry 1983, Gould 1978, Pearce & Pearce 1971, Kiganjo & Njororai 1997).

The players should adopt the percentage theory technique which indicates that more points are won on opponents errors than hitting spectacular placements. The tennis players hoping to participate in the Kenya National Tennis Championship should also observe the fact that players should select the serve that yields the highest percentage of success instead of trying a difficult serve which will increase chances of errors. This is supported by Moore & Chaffin (1981) who states that 80% of points are won through common errors and 20% through placements. Tennis players in the tournament should ensure that they serve more aces both in their first serve and also second serve as these will give them chances of making outright

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67

winners. Tennis players in the Kenya National Tennis Championship should reduce any errors of either hitting the balls out of bound or onto the net, if their performance has to be enhanced.

The Kenya players should also avoid double faults and instead should vary their serves in form of speed, direction and spin in order to obtain a high margin of safety and have the ball with a high percentage of placement and accuracy and avoid errors.

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74  
Appendix 'B'

Part 1

Raw data showing the results of male winners in wins (good/in ace) and faults (net, out, mishits)

Matches	Scores	Good/in	Aces	Net	Out	Mishits
1	(6-3) (6-1)	37	0	23	12	0
2	(6-1) (6-2)	46	2	14	18	0
3	(6-3) (6-1)	42	1	17	11	0
4	(7-6) (7-6)	100	5	23	30	0
5	(6-3) (6-2)	42	2	32	21	0
6	(7-6) (6-4)	63	7	19	26	0
7	(6-3) (6-1)	38	1	16	14	0
8	(6-2) (6-2)	47	1	21	20	0
9	(6-1) (7-5)	55	1	32	19	0
10	(6-1) (3-6) (8-6)	88	1	20	23	0
11	(6-3) (6-1)	87	0	8	10	0
12	(6-1) (6-0)	31	0	15	4	0
13	(6-2) (6-1)	37	3	8	15	0
14	(6-0) (6-3)	39	2	17	13	0
15	(6-3) (6-1)	51	4	14	15	0
16	(6-2) (6-3)	51	0	12	8	0
17	(6-2) (6-3)	37	3	12	7	0
18	(7-5) (6-3) (3-6)	102	2	23	39	0
19	(6-0) (6-4)	95	0	27	24	1
20	(6-4) (6-4)	42	6	19	11	0
21	(6-0) (6-0)	43	0	10	14	0
22	(6-3) (4-6) (6-4)	63	9	46	28	0
23	(6-0) (6-0)	33	0	3	1	0
24	(6-3) (6-1)	47	0	4	4	0
25	(6-4) (4-3)	55	3	18	21	0
26	(6-3) (6-4)	62	2	23	21	0

## Part 2

Raw data showing male losers results in match actions under investigation wins (ace, good/in) and faults (net, out, mishits)

Matches	Scores	Good - in	Aces	Net	Out	Mishits
1	(6-3)(6-1)	43	2	23	9	0
2	(6-1)(6-2)	40	2	10	28	0
3	(6-3)(6-1)	41	0	10	12	0
4	(7-6)(7-6)	77	1	12	41	0
5	(6-3)(6-2)	48	0	14	18	1
6	(7-6)(6-4)	67	1	11	21	0
7	(6-3)(6-1)	32	0	25	21	0
8	(6-2)(6-2)	35	2	27	21	0
9	(6-1)(7-5)	44	1	25	30	0
10	(6-1)(3-6)(8-6)	87	0	12	20	0
11	(6-3)(6-1)	44	2	16	13	0
12	(6-1)(6-0)	31	0	15	4	0
13	(6-2)(6-1)	43	0	8	15	0
14	(6-0)(6-3)	36	0	14	21	0
15	(6-3)(6-1)	34	0	18	9	0
16	(6-2)(6-3)	46	0	11	15	0
17	(6-2)(6-3)	29	0	8	17	0
18	(7-5)(6-3)(3-6)	91	0	43	24	0
19	(6-0)(6-4)	57	0	18	31	3
20	(6-4)(6-4)	56	2	11	18	0
21	(6-0)(6-0)	34	0	14	30	0
22	(6-3)(4-6)(6-4)	86	0	21	45	0
23	(6-0)(6-0)	32	0	6	5	0
24	(6-3)(6-1)	44	2	13	13	0
25	(6-4)(4-3)	64	0	22	38	0
26	(6-3)(6-4)	59	0	11	21	0

## Part 3

Raw Data Showing Female Winners Results in Wins (ace, good/in) and Faults (net, out mishits)

Matches	Scores	Good-in	Aces	Net	Out	Mishits
1	(6-1) (6-2)	56	1	20	20	0
2	(6-1) (6-0)	32	3	3	5	0
3	(6-3) (6-4)	55	0	20	16	0
4	(6,4) (6,3)	56	0	5	7	0
5	(2-6) (6-3) (6-2)	74	0	19	24	1
7	(5-7) (6-3) (6-0)	80	1	21	11	0
6	(6-1) (6-1)	90	1	24	48	0
8	(6-0) (6-3)	45	1	16	16	0
9	(6,0) (6,0)	31	1	1	5	0
10	(6-1) (6-4)	43	1	15	15	0
11	(6-1) (6-2)	43	1	22	11	0
12	(6-0) (6-0)	36	0	2	4	0
13	(6-3) (6-3)	93	0	38	55	0
14	(7-5) (6-4)	74	0	13	6	0
15	(6-1) (6-2)	80	0	20	17	0

77  
Part 4

Raw data showing female losers results in good-in wins (ace, good/in) and faults (nets, out mishits)

Match	Scores	Good/in	Ace	Net	Out	Mishits
1	(6-1)(6-2)	60	0	18	23	0
2	(6-1)(6-0)	36	0	16	13	0
3	(6-3)(6-4)	52	0	15	20	0
4	(6-4)(6-3)	54	2	3	16	0
5	(2-6)6-3(6-2)	81	0	24	21	0
6	(6-1)(6-1)	81	0	16	32	0
7	(5-7)(6-3)6-0	82	1	23	34	0
8	(6-0)(6-3)	43	1	16	24	2
9	(6-0)(6-0)	17	0	10	16	0
10	(6-1)(6-4)	49	0	17	16	0
11	(6-1)(6-2)	37	0	13	29	0
12	(6-0)(6-0)	28	0	12	11	0
13	(6-3)(6-3)	84	1	4	32	0
14	(7-5)(6-4)	59	0	25	16	0
15	(6-1)(6-2)	49	0	18	13	0

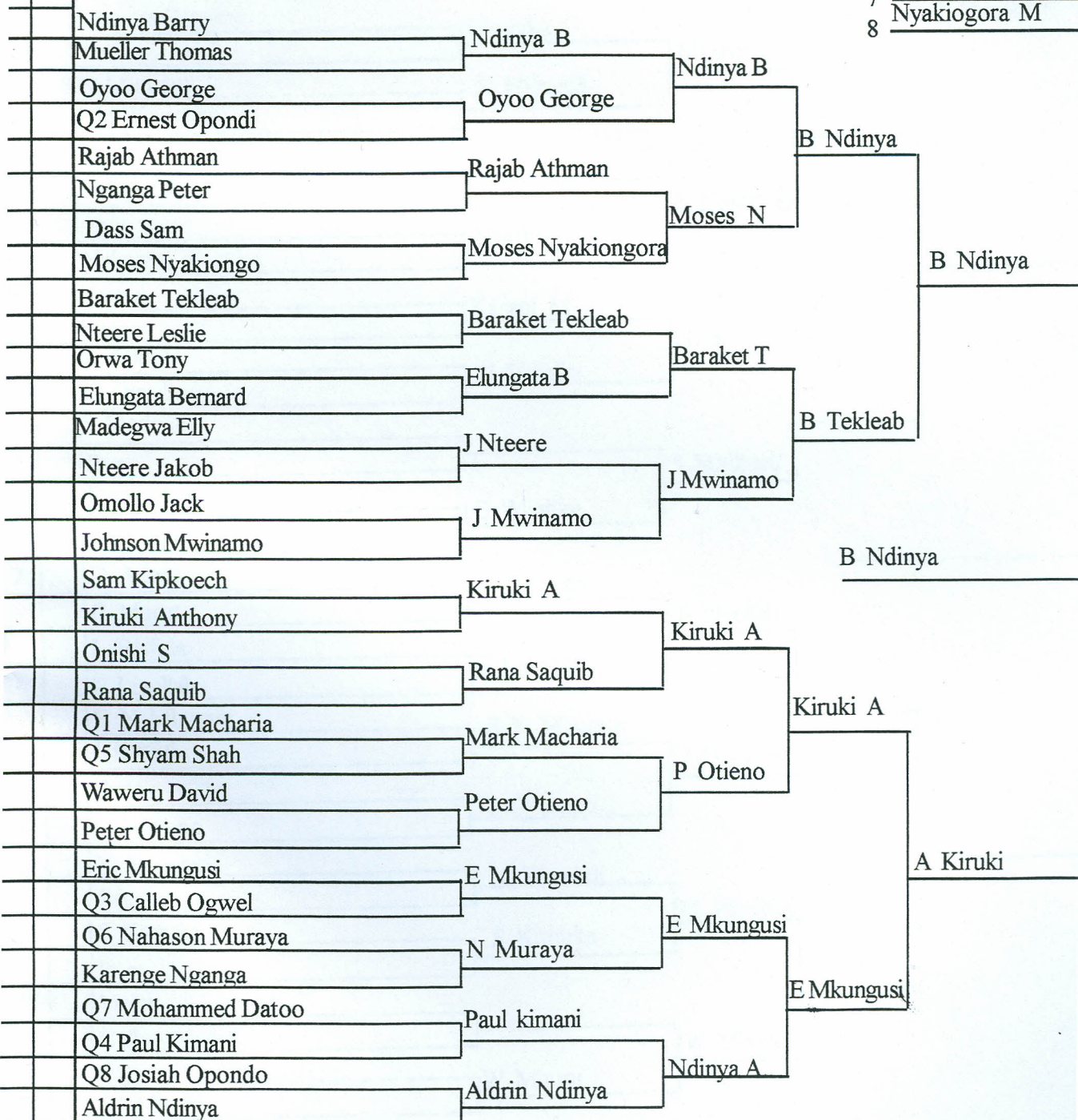
### Appendix 'D'

#### Part 1

**CO-OP MERCHANTS KENYA NATIONAL CHAMPION SEEDS**

Tournament	<u>PARKLANDS SPORTS CLUB</u>
Site	<u>NAIROBI</u>
City	<u>MENS SINGLES MAIN DRAW</u>
Event	<u>25 - 5 - OCTOBER, 1997</u>
Date	<u>150,000/-</u>
Prize Money	<u>MURRAM /Outdoor</u>
Surface	

- 1 Ndinya B
- 2 Ndinya A
- 3 Otieno P
- 4 Takleab B
- 5 Kipkoech S
- 6 Mwinamo J
- 7 Mkungusi E
- 8 Nyakiogora M



Part 2

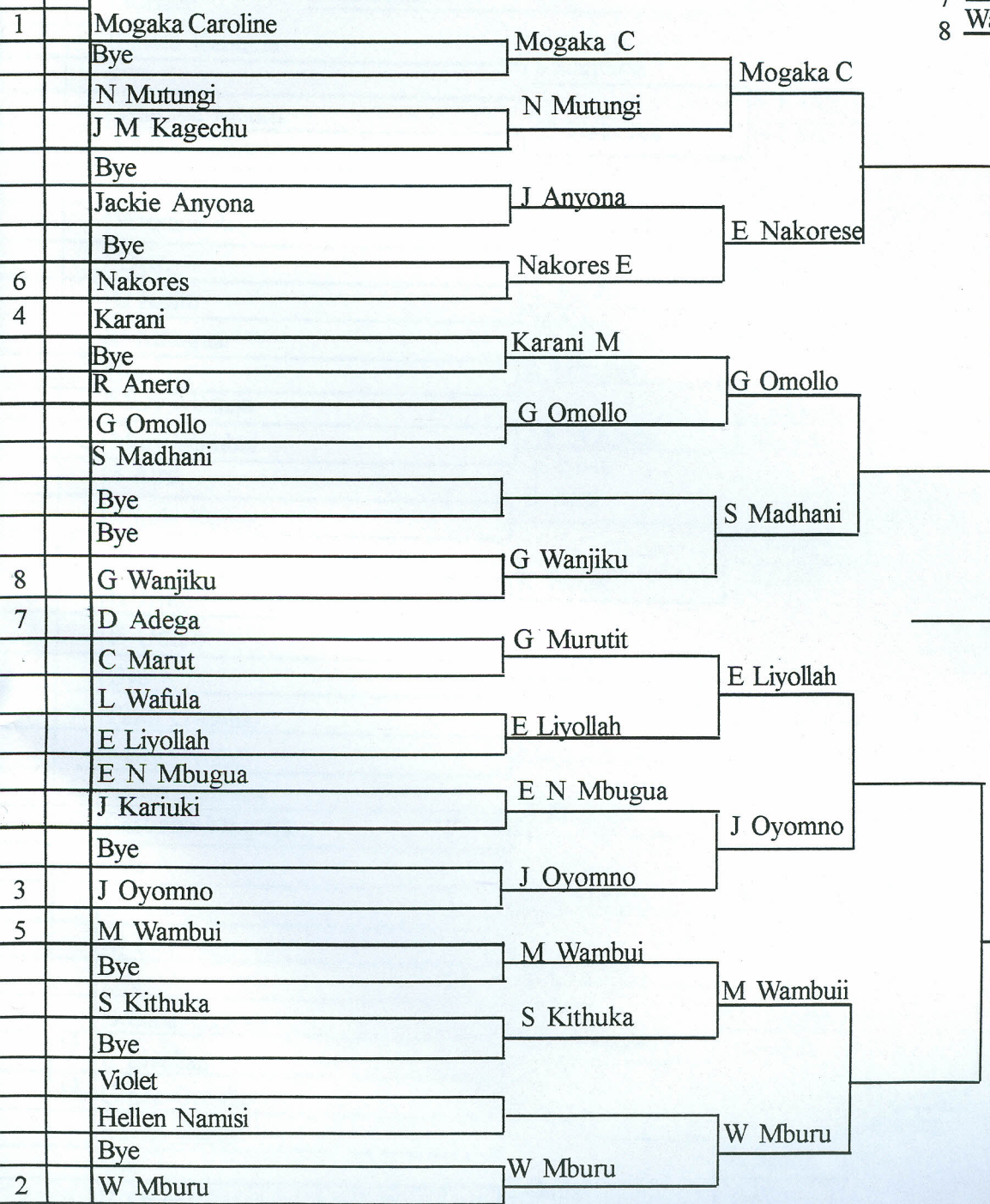
OFFICIAL DRAW SHEET

Tournament	CO-OP MERCHANTS KENYA NATIONAL CHAMPION	SEEDS
Site	PARKLANDS SPORTS CLUB	
City	NAIROBI	
Event	QUALIFYING LADIES SINGLES	
Date	25 - 5 - OCTOBER, 1997	
Prize Money	150,000/-	
Surface	MURRAM /Outdoor	

- 1 Mugoka C
- 2 Mburu W
- 3 Oyomno J
- 4 Karani M
- 5 Wambui M
- 6 Nakores E
- 7 Adega D
- 8 Wanjiku G

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Part 3

KENYATTA UNIVERSITY LIBRARY

OFFICIAL DRAW SHEET

Tournament CO-OP MERCHANTS KENYA NATIONAL CHAMPION SEEDS  
 Site PARKLANDS SPORTS CLUB  
 City NAIROBI  
 Event LADIES SINGLES  
 Date 25 - 5 - OCTOBER, 1997  
 Prize Money 150,000/-  
 Surface MURRAM /Outdoor

- 1 S Kantaria
- 2 E Otula
- 3 S Onanga
- 4 E Mbugua
- 5 M Oyomno
- 6 L Kiritu
- 7 E Odero
- 8 K Iwami

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	Bye		
	Q Wairimu Mburu	E Nakores	S Kantaria (6-1, 6-0)
	Q Eddah Nakores	(6-2, 6-1)	
	Q Jill Oyomno	Jill Oyomno	S Kantaria (W/O)
	Veronica Ruguru		
	Bye	L Kiritu	(6-1, 6-3)
6	L Kiritu	(6-3, 6-1)	
4	E Mbugua	E Mbugua	S Kantaria (5-7, 6-3, 6-0)
	Bye		
	Mary Wilunda	M Wilunda	E Mbugua (6-3, 6-4)
	Q Mary Wambui	(6-2, 6-0)	
	S Aird	S Aird	E Mbugua (6-1, 6-3)
	Rhoda Kuusa		
	Bye	K Iwami	(6-3, 6-3)
8	K Iwami		
7	E Odero	E Odero	S Kantaria (6-0, 6-2)
	Bye		
	Faith Oyomno	Faith Oyomno	F Oyomno (6-4, 6-1)
	Mary Mwikali		
	Q Safina Madhani	S Onanga	S Onanga (6-1, 6-4)
	Q Caroline Mogaka		
	Bye	S Onanga	(6-1, 6-3)
3	S Onanga	M Oyomno	
5	M Oyomno	B Okanga	M Oyomno (+3) Sunday
	Bye	(6-0, 6-0)	
	Brenda Okanga	Karen Rapp	M Oyomno (6-1, 6-1)
	Q E Livollah	(6-1, 6-0)	
	Q Grace Omollo	K Rapp	M Oyomno Saturday
	Karen Rapp		
	Bye	K Rapp	
2	E Otula	E Otula	(W/O) Thursday
			Tuesday