University of the Free State

Department of Mathematical Statistics and Actuarial Science

And the

Department of Sports at UFS: Kovsie Sport

A survey on participation and attitude to sports among undergraduate students in junior residences at the University of the Free State

By

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DECLARATION

I hereby declare that this work, submitted to the University of the Free State, for the degree Magister Scientiae: Dissertation is my own original work and has not previously been submitted for degree purposes at any other institution of higher learning. I further declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references. Copyright hereby cedes to the University of the Free State.

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SIGNATURE DATE

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I would like to thank the Almighty for His presence in my life.

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DEDICATION

This study is dedicated to the people I most honour as friends and colleagues, who supported and encouraged me to keep reaching for success, Mokete Jack Mokoena, Nonthuthuzelo Matha and Augustine Pheto Miya, I could not have done it without you. You are the best.

ABSTRACT

The main objective of this study is to assess and quantify participation in sporting activities by students and to determine the factors influencing students' intentions to participate or not to participate in sports at the University of the Free State. The data are obtained from interviewing students participating or not participating in various sporting codes available at the University of the Free State (main campus in Bloemfontein, South Africa). A systematic random sampling technique was used as the interviewing team knocked on every fifth door in a given residence to ensure that all corners of each residence were reached. The students found at the residence at that particular time, were asked to fill in the questionnaire. Tables and charts are used for illustration of results. T-tests, F-tests, Principal component analysis, Cluster comparison analysis and Item analysis are also performed for further analysis.

Three hundred and eight students (308) (61% females and 39% males) living in junior residences were interviewed for this research. The majority of participants (75%) were non-whites (blacks, coloured, and Asians); this was in line with the University of the Free State enrolment structure of the year 2011 (75% non-whites and 25% whites).

The reasons provided by the participants for their participation in sporting activities were indicated as keeping fit (91%), releasing of stress (89.35%), gaining a feeling of wellbeing (83%), increasing in physical abilities (81%) and previous school sports involvement (67%). Students from second academic year upwards mostly raised the positive response that they relied on regular exercise to achieve academic success.

The researcher concludes that certain variables, namely gender, age group, race, marital status preferred language of study, faculty of study, academic year of study, previous school sport participation, current sport participation, participated sporting codes, reasons for sport participation and reasons for non-sport participation for students, are the most important variables that the Kovsie Sport and management of sports, should focus on in order to encourage students to participate in sporting activities.

Through sports, students are also able to interact with one another and participate in different sporting codes offered by the university.

ACRONYMS

CUCSA	Confederation of University and College Sports Associations
DF	Degrees of freedom
EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
FASU	Africa University Sports Federation
FISU	International University Sports Federation
KMO	Kaiser-Meyer-Olkin
KOVSIE SPORT	UFS Sports Department
NP	Non participants
PAF	Principal axis factoring
OP	Occasional participants
PCA	Principal components analysis
RP	Regular participants
SAQA	South African Qualification Authority
SASCOC	South African Sport Confederation and Olympic Committee
SASQAF	South African Statistical Quality Assurance Framework
SPSS	Statistical Package for Social Sciences
SQC	Statistical quality control
SRSA	Sport and Recreation South Africa
UFS	University of the Free State
USSA	University Sports South Africa
WCSS	Within – cluster sum of squares

CHAPTER 1: INTRODUCTION AND BACKGROUND

1. Introduction

The purpose of this chapter is to provide the background of participation and attitudes to sports among students studying at the University of the Free State (UFS), the description of the study area, the statement of the research problem, and objectives of the study. The study briefly outlines ethical issues in undertaking the study and the project as well**.**

1.1 Background

South Africans have more than made their mark in the international sport arena. Sport and Recreation South Africa (SRSA) aims to improve the quality of life of all South Africans by promoting participation in sport and recreational activities. Participating in sport is encouraged at both the local and the international levels. Sport has the potential to build social cohesion and national unity. South Africa was bound together when the country won the Rugby World Cup in 1995, and again in 2007, the African Cup of Nations in 1996, as well as when it won the right to host the 2010 World Cup in 2004. Sport in South Africa is a multibillion-rand industry and contributes more than 2 percent to the country's gross domestic product. The country has successfully hosted major international sporting events, including the rugby, cricket, women's golf world cup and world soccer cup. (www.supersport.com accessed on 25 December 2012).

This study focuses on effective monitoring and evaluation of sports participation amongst university students, which largely has been overlooked. The University of Oxford undertook a review of existing qualitative research evidence around understanding participation in sport (Sport England, 2005). Generic challenges and barriers to increasing sports participation amongst higher education students have been identified as follows:

- Work pressure and competing activities, not all students are based on campuses, many live at home and many study part time. Sport has to compete against students' increased work pressure, balancing studies and earning money as well as having a variety of other recreational activities from which to choose.

- Students do want to play competitive sports, but not always through formal competitive routes. This suggests that it is not all about competition and rankings that can enhance students desire to participate.

- Most students have enthusiasm to join new sporting codes but they do not have the capacity and knowledge to fit into flourishing codes at the university as novices.

1.2 What makes university students participate in sport?

Team sports provide students with opportunities to grow physically and socially, mentally as well as emotionally. Moreover, physical activities with other students allow them to learn and build social skills through peer interaction.

Two theories: intrinsic and extrinsic motives are associated with sport participation (Deci and Ryan, 1985a). Intrinsic motivation is defined as doing something for its own sake and not for external

rewards or status recognition. Extrinsic motivation is defined as doing something as a means to an end such as for monetary rewards or status recognition (McNeill and Wang, 2004).

According to Weiss and Chaumenton (1992), the intrinsic- or mastery-orientated person takes on challenges which are optimal for learning and improving skills based on a system of self-reward and a standard of goal mystery. Intrinsically motivated behaviours are engaged in for their own sake, for pleasure and satisfaction derived from the process of engaging in the activity (Deci and Ryan, 1985b; Ryan and Deci, 2000). Athletes do not need external rewards to participate and are often described as self-motivated (Li and Harmer, 1996).

Extrinsic or outcome orientated person selects challenges which are less than optimal and judges personal capability on successful performance outcome, usually winning. Extrinsic motivation refers to when the goals of action for the individual include factors such as rewards, social expectations, or norms. Behaviourist and certain sociological views claim that people are enticed or conditioned into participation through: reinforcement modelling, social learning, socialisation in sport, all make people subject to external factors that push them into sport or to continue participating (Lindner and Kerr, 2001).

1.2.1 Rewards

According to Lindner and Kerr (2001), either rewards in the form of cash or in kind will motivate sports persons to participate in sport, as this is one of the extrinsic factors. Some sports persons believe that rewards in the form of money or assets are a good motivation in sports.

However, the first skill that team sports are useful in teaching youth is competition. In today's world, we are driven largely by cooperation. People in sport sometimes misuse the terms competitive or driven, which in fact can become wrongly interchangeable over time. A competitive person measures her/his success against others, and it is enough to beat a champion and have a name on the trophy. The score or level of performance does not matter to her/him, while a driven person sets himself or herself process-based targets and goals to achieve, and against which to define their self-esteem. For example, a driven athlete would say that performance matters more than the results. A driven person sets their own agenda and may focus all their attention on achieving something that is not actually critical or even important to the ultimate outcome of their endeavor, while a competitive person picks somebody, a tournament or a position in a national ranking and they go out to do enough to achieve that (Ryan *et al.*, 2009).

1.2.2 Famous sports persons as role models

Famous players of the world, as role models, also play a part in sport motivation, as much as the sport itself may be one of factors influencing individuals to love the game. Activity trait had a significant effect on both exercise intention and exercise behaviour (Rhodes *et al*., 2004). The study found that the game itself can create an interesting environment for participants and act as a motivational factor in sport. The popularity of the sport, which is heavily linked to famous sporting individuals, can act as one of the motivational factors since it offers opportunities to meet and socialise with many people.

1.2.3 Social support network

Social interaction in team sports at school enhances relationships with other students, develops effective communication skills, ability to solve conflicts, and improves cooperativeness. Social support network is made up of friends, family, significant others, coaches, therapists and other people one interacts with on regular basis. One of the benefits of social support is that one can gain support from individuals in variety of ways for which they might not be seeking emotional comfort from their orthopaedic surgeon, but s/he could still provide invaluable education about sport injuries and rehabilitation process. Conversely, a parent might not understand the details of losing a game in sports but can provide unconditional love and support. Social support can come in a variety of forms, *inter alia* emotional, educational and tangible (Hedstrom, 2009). Emotional social support goes with some sort of rehabilitation where individuals such as friends, family and significant others provide emotional support such as listening and advising. They help one to cope with frustrations and negative emotions of the situation (Lussier and Kimball, 2009).

Educational social support comes from those who help one recover from the situation, for example injury, such as psychologists, doctors, therapists and athletics trainers. These individuals can help the sport person to cope with one situation by providing education about specific downfalls and rehabilitation processes. Coaches and team mates can also assist with emotional support by keeping one up to date on important team matters.

Tangible social support provides day-to-day assistance for effectively dealing with one's situation. This could be in a form of rides to rehabilitation sessions, assistance with getting to classes on campus or shopping. Tangible social support can be invaluable during the rehabilitation process (Taylor, 2011). Social support can be measured as the perception that one has assistance available, the actual received assistance, or the degree to which a person is integrated in a social network. Support can come from many sources, such as family, friends, pets, neighbours, co-workers, organisations, etc. Government-provided social support is referred to often as public aid.

1.2.4 Environmental influences

Environmental factors play a role in sport motivation. Most students agree that they became actively involved in competitive sport when they were in school. Recent research has also suggested the possibility that the social environment created by an exercise leader may impact on physical activity participation and adherence indirectly through factors such as enjoyment and intention (Bray *et al.* 2005). There is some evidence that participation in sports may be motivated by the need to develop one's talents and a potentially nurturing environment is critical to the identification and subsequent development of talent and individual potential. Depending on the environment and upbringing, prior studies suggest that young people have a variety of motives such as fun, fitness, competence and skill improvement (Lindner and Kerr, 2001).

1.2.5 What is sport supposed to teach?

According to Fullinwider (2006), most sport participants purportedly learn or can learn to do the following:

- Cooperate with team mates
- Display courage
- Develop self-discipline and practice self-control
- Respect rules of the game and the environment
- Express compassion and become competitive
- Foster peace and a spirit of perseverance
- Develop and maintain integrity
- Subordinate self to group
- Develop leadership skills and feel a sense of empathy.

1.2.6 Benefits of sports and physical activities (physical health)

The Centre for Physical Educational and Sports Research reached international consensus that physical activities can offer a great deal to individuals, communities and nations. The physical health benefits of regular activity are well established. Regular participation in sporting activities is associated with a longer and better quality of life, reduced risks of a variety of diseases and many psychological and emotional benefits. Sport and physical activity can make a substantial contribution to the well-being of people in developing countries. Exercise, physical activity and sport have long been used in the treatment and rehabilitation of communicable and non-communicable diseases. Physical activity for individuals is a strong means for the prevention of diseases. Thus for nations it is a cost-effective method to improve public health across populations. The report from the United Nations Inter-Agency Task Force on Sport for Development and Peace (2003) states that young people can benefit from physical activity as it contributes to developing healthy bones, efficient heart and lung function as well as improved motor skills and cognitive function. Physical activity can help to prevent hip fractures among women and reduce the effects of osteoporosis. Remaining physically active can enhance functional capacity among older people, and can help to maintain quality of life and independence.

A number of studies have shown that exercise may play a therapeutic role in addressing a number of psychological disorders**.** Studies also show that exercise has a positive influence on depression. Physical self-worth and physical self-perception, including body image, have been linked to improved self-esteem. The evidence relating to health benefits of physical activity predominantly focuses on intra-personal factors such as physiological, cognitive and affective benefits, however, that does not exclude the social and inter-personal benefits of sport and physical activity, which can also produce positive health effects in individuals and communities. Regular physical activity, active play and sports can be practical means to achieving numerous health gains, either directly or through positive impact on other major risks, in particular high blood pressure, high cholesterol, obesity, tobacco use and stress (World Health Report, 2002).

Physical activities reduce the risk of cardiovascular disease, some cancers and type 2 diabetes. These benefits are mediated through a number of mechanisms: In general, they improve glucose

metabolism, reduce body fat and lower blood pressure. Physical activities may reduce the risk of colon cancer by effects of prostaglandins, reduced intestinal transit time, and higher antioxidant levels. Physical activities are also associated with lower risk of breast cancer, which may be result of effects on hormonal metabolism.

1.2.7 Risks of non-involvement in sporting activities

There is also a large body of literature showing that inactivity is one of the most significant causes of death, disability and reduced quality of life in the developed world, and increasingly in the developing world.

1.2.8 Sports and recreation in South Africa

From 11 June to 11 July 2010, South Africa successfully hosted the 2010 FIFA World Cup, which included 32 teams and an estimated 450 000 international fans. The success of the tournament showed the power of sport and recreation in nation building as well as economic and social development. Sports and Recreation South Africa (SRSA) intends carrying this forward by contributing towards transforming South Africa into a country that truly reflects diversity.

However, it has been realised that South African sports are still divided by race. In South Africa, most white South Africans support rugby and cricket but not many support local soccer. Their allegiance to football often ends in the United Kingdom. It appears that the pride that came with 2010 World Cup, when young white men could be seen wearing Bafana Bafana jerseys, has long been forgotten. Most black Africans, it appears support local soccer, even though they might not necessarily support Bafana Bafana (hence participation at varsity and local authority levels).

Blacks and African support for rugby and cricket is not substantial, partly because the national and provincial rugby and cricket teams have not yet grasped the concept that attracts the new demographic supporters when it comes to unpopular sporting codes like rugby and cricket amongst blacks and mainly Africans. This attitude has grown in such a way that popular teams like the top British soccer team (Manchester United) realised that in order to develop a fan base in the East, it needed to include players from the eastern countries.

1.3 Description of the study area

The study was done at the Bloemfontein campus of the University of the Free State in South Africa. The University of the Free State is ideal because there is ethnic, racial and gender demographic diversity in the student population. Further, there are seven academic faculties, 23 on-campus residences, over 60 student-led and run societies and over 24 396 students affiliated to its main campus. These dynamics make the UFS a viable university to study student's participation, attitudes and motivations in sport.

The University of the Free State (UFS) with its main campus in Bloemfontein, the judicial capital of South Africa and in the heart of the country, is one of the oldest South African institutions of higher learning. The other two campuses are the vibrant QwaQwa campus in the Eastern Free State and the smaller South Campus in Bloemfontein (formerly known as Vista University).

The university has a parallel medium of instruction: English and Afrikaans. The university offers undergraduate and postgraduate degrees and diplomas in seven faculties to more than 30 000 students of these 26 000 students are studying on the main campus, 1 100 students on the South campus (Vista University), and 3 800 on the QwaQwa campus.

For this study, the main focus is participation and attitudes to sports among students studying at the University of the Free State. The Department of Sports, known as Kovsie Sports, within the University of the Free State raised a concern about the relatively low level of frequency of sports participation and lack of positive attitudes to sport among students. Sports in Kovsie play a very important role in the processes of shaping and developing the students on campus. Achievements of Kovsie sportsmen and sportswomen are known provincially, nationally, and internationally. The university provides the best coaches, best facilities and offers competition at the highest level.

Kovsie Sport also offers excellent recreational opportunities, including facilities for fitness and wellness. It also encourages students within the university to participate, get involved and experience the fun of being a student by practicing in their favourite sport. To anyone who wishes to participate in sports, the university has the following to offer:

- Best coaching
  - The best facilities
- Opportunities for competition at the highest level
- Recreational opportunities including a gymnasium

  Kovsie Sport staff is divided into four categories:
  - Directorate – A director of sports and a secretary,
  - Managers – eight managers, each specialising in different sporting codes,
  - Coaches – four coaches, each specialising in sporting codes and
  - Officials – two officials responsible for different tasks within the entire area.

Kovsie Sports offers 22 different sporting codes, each assigned to different managers and coaches. The following are on offer:

Table 1: Different sporting codes at UFS

Athletics	Netball	Squash	Taekwondo	Judo
Cross Country	Swimming	Badminton	Volleyball	Fencing
Road Run	Cycling	Table Tennis	Chess	Hockey (field/ indoor)
Triathlon	Soccer	Cricket	Rugby	Tennis
Basketball	Karate			

Facilities are also at places within the university premises for different location of venues:

- Pelliespark – Athletics club with Morden clubhouse,
- Three cross country tracks,
- Shimla park – rugby,
- Five soccer pitches,
- A tennis complex comprising 18 courts, two fitted floodlights and club house,
- Cricket house with five fields and 20 nets,
- Netball facilities with eight courts and clubhouse,
- A standard swimming pool,
- Badminton hall, which caters for table tennis, indoor hockey, and volleyball,
- Five squash courts,
- Two artificial hockey fields, clubhouse with change room and four grass fields,
- Two basketball courts,
- Fencing.

1.4 Statement of the research problem

UFS Sports Department (Kovsie Sport) organises a large number of sporting activities for students and staff. To address the current concern of non-participation in sport, this research seeks to find reasons for participation and non-participation in sports among students residing at junior residences of the University of the Free State. It aims to identify satisfaction level from participants.

1.5 Objectives of the study

- Objectives of the survey

The main objective is to assess and quantify participation in sporting activities by students, and to determine factors influencing students' intentions to participate or not to participate in sports.

1.6 Specific objectives

- To assess the interest and participation levels among different age groups, gender, racial groups, and faculty of studies.
- To assess factors influencing participation in sports.
- To assess the level of satisfaction among sporting students.

The main purpose of the research is to help the Department of Sports (Kovsie Sport) within the University of the Free State to assess the students' perception about sports at large and to find how to enhance interest and participation in sports.

This shall be achieved by:

- Construction of a questionnaire,
- Administering the questionnaire,
- Analysing the results,
- Reporting the results to the management of sport (Kovsie Sport).

Among other things, the questionnaire will

- Measure the level of preferred sporting code(s) by gender, race, age group and marital status,
- Measure participation level for specific sporting code(s),
- Measure level of non-participation on specific sporting code(s),
- Establish reasons for participation,
- Establish reason(s) for non-participation,

- Gather ideas, suggestion, and opinions about satisfaction at large within Department Sports (Kovsie Sports) in the university.

1.7 Significance of the study

The significance of the study is to identify the level of participation and non-participation amongst students and to highlight reasons for non-participation. Through questionnaire response, students will provide answers and suggestions to issues they experience as current participants/non participants. The results and recommendations of the study will be given to Kovsie Sport management as feedback on the opinions of students regarding sports participation.

1.8 Rationale of the study

The research is motivated by the fact that UFS is one of the largest residential universities in South Africa with excellent sporting activities, but still experiencing a relatively low level of sports participation by both male and female students.

1.9 Limitations

At first, the researcher intended to secure data from all junior and senior residences within the campus, and only a limited number of 20 off campus-students for the pilot study. The researcher faced challenges when the director of student's affairs at (UFS) could only grant approval for junior residences explaining that senior residences are beyond the university control. The time was also a major constraint since the researcher had to commence with interviews before the start of the examination period. The results of the survey, therefore, can be generalised to students residing in junior residences of the UFS main campus only.

1.10 Demarcation of the study

The study will focus on:

- Sports offered by UFS main campus for both male and female students and the students' level of participation.
- All junior residence students participating and not participating in sport at UFS were sampled and those selected were interviewed.
- Only a total number of 20 off-campus student sports participants and non-participants in UFS were interviewed for the pilot study.
- Only full-time male and female students at UFS main campus were qualified to take part in the study.

1.11 Ethical consideration

Ethical considerations pertaining to this study are as follows:

1.11.1 Autonomy

The researchers take the matter of independence very seriously. Publicity was well conducted to all listed junior residences, all participants or respondents were informed about the study's aims and objectives, and this applied to all students in the pilot study.

1.11.2 Quality of the researcher

The researcher and supervisor possess the required knowledge, skill and experience in terms of the scope of this study.

1.11.3 Anonymity and confidentiality

Where necessary, the anonymity and confidentiality of all respondents to this study were assured. It was agreed that this would not to be breached, and confirmed by the signing of an agreement with the Director of Student Affairs at UFS, that respondents do not have to indicate their names on the questionnaire, and no respondents would be identified, since only aggregated information is of interest to this study.

1.11.4 Harm

To the best knowledge of the researcher, no harm was likely to be caused to any of the respondents involved in the study. Participation in the study was entirely voluntary.

1.11.5 Research layout

The dissertation is organised into seven chapters. The outline of the contents of each chapter is as follows:

Chapter 1: Introduction

This chapter provides the background of student's participation and attitudes to sports at UFS, the description of the study area, the statement of the research problem, objectives of the study, specific aims of the study, significance of the study, rationale of the study, limitations, demarcation of the study, and ethical considerations of the study.

Chapter 2: Literature review

This chapter outlines some documented research on sports participation. It also discusses other related studies including definitions, formulae and derivation of equations.

Chapter 3: Research methodology and data collection

This chapter outlines the methodology applied in collecting data and challenges experienced before and during data collection process.

Chapter 4: Descriptive data analysis

In this chapter, data are analysed descriptively, in the form of tables and charts by using statistical packages including the Statistical Package for Social Sciences (SPSS), Excel and other packages.

Chapter 5 and 6: Data analysis and results

In these chapters, data are analysed by using statistical packages SPSS and Microsoft Excel, the results are compared and discussed.

Chapter 7: Conclusions, limitations and implications of the study

In this chapter, results are discussed, conclusions made and recommendations given.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter outlines the role of sports participation and interest among school leavers and students in tertiary institutions of South Africa in comparison with other countries in the world.

2.2 Literature

Regular exercise plays a major role in human development. An exercise could be in a simple form such as taking a walk from one point to the other instead of driving or taking public transport. The physical action could be beneficial for the human brain and its functional well-being. Recent studies impressively show that being physically active has multiple effects on the brain function over the course of a lifetime (Kravitz, 2007). However, it is still unknown as to what exercise design (mode, intensity, duration, and frequency) best improves the brain health. Hillman *et al.* (2008) found that early brain exercise could result in an increase of some brain neurotransmitters that induce a 'runner's high' effect with some endurance exercisers. Currently, other neurotransmitters have been proven to show an increase from exercise and appear to also increase the synapse communication capacity in the brain.

Aerobic exercises have also been shown to induce the formation of new blood vessels in the brain during childhood and adulthood, improving brain circulation (for oxygen and nutrient delivery), function and health.

Hillman *et al.* (2008) propose the findings with brain function in youth clearly indicate that early exercise in a person's life can improve the cognitive health during childhood and this may extend throughout the adult lifespan. The authors continue that many physical activity requirements in schools have been reduced or eliminated to increase a student's academic performance and yet no evidence exists that the removal of exercise has positively influenced academic achievement.

Hillman *et al.* (2008) highlight that there is very little research on the association of cognitive function and exercise in young adults. The authors note that most of the research involving young adults does so merely to better describe and explain the changes in brain health occurring in older populations.

Legislative documents issued by government pertaining to sport participation include:

- The Ministry of Sport & Recreation South Africa (SRSA) and the South African Sport Confederation and Olympic Committee (SASCOC) agreed that, due to the unique nature of student sport universally, University Sport South Africa (USSA) should be administered independently.
- University Sports South Africa (USSA) constituted on 16 April 1994, amended 20 April 2013, which is considered a unified national umbrella sports structure for the regulation, organisation and coordination of student sports activities, at regional, provincial and national levels in the tertiary education sector of South Africa.

- The Ministry of Sport Recreation South Africa (SRSA) and South African Sport Confederation and Olympic Committee (SASCOC) came to an agreement that due to the unique universal nature of student sports, University Sports South Africa (USSA) should be administered independently.
- USSAs core business is to maximise student participation and encourage sporting activities in harmony with and complementary to academic character and values of tertiary education institutions.
- USSAs membership is open to all South African Qualification Authority (SAQA) accredited institutions of higher education (universities and colleges). South African Qualification Authority Act (58 of 1995)
- USSA's fundamental goal is the development and promotion of sport at all tertiary education institutions in South Africa.

- VISION AND MISSION of USSA
  - USSAs vision is to provide opportunities for excellence in student sport in order to participate and/or compete at all levels.
  - USSA's mission is to create an environment, which will encourage student sports persons to strive for excellence on an academic and sports level, while giving participants the opportunity to interact socially and competitively.
  - USSAs fundamental goal is the development and promotion of sport at all tertiary education institutions in South Africa.
  - USSA shall within the framework of its Constitution and Regulations, attend to the development of tertiary sport at all levels, seek closer contact between students of all institutions and promote sporting opportunities for the benefit of all.

2.2.1The universal spirit of student sport

Participation in sport and other recreational activities are considered important facets in the unity and holistic education process of students. To promote sporting values, means encouraging friendship, fair play and co-operation among students who will one day occupy responsible key positions in education, politics, industry, economy and culture. It also means giving a new dimension to the student spirit of study and research in those individuals are given the opportunity to develop not just intellectually, but also morally and physically.

University sport activities provide the opportunity for youth leaders of the future to meet and to foster lasting friendships, which contributes to the development of a unified nation. Sport is considered an ideal vehicle for promoting mutual understanding amongst people with different

cultures and histories. Students learn to respect each other through the common international language of sport.

The key objectives and roles of USSA are to liaise with national and provincial federations with respect to sport at tertiary education institutions and structures, to affiliate the appropriate international, continental sports events, to cooperate with International University Sports Federation (FISU) in the fulfilment of their objectives, to respect the statutes and regulations of FISU and also to establish the rules and regulations to ensure all members abide by constitution of USSA as follows:

> The Constitution of University Sports South Africa, (Amended on 20 April 2013), which identifies preamble and founding principles stating that whereas the Sports fraternity of South African Institutions of Higher Education noted the disparities emanating from South Africa's historical past, intentional racial division and discrimination. It also recognized the need to promote unity, access and equity in sport participation at all South African Institutions of Higher Education; and to improve opportunities for development and enhancement of sporting skills by all South Africans.

> This includes lack of access to sporting opportunities and inequitable distribution of resources amongst Institutions of Higher Education. Therefore, the Sports fraternity of South African Institution of Higher Education committed themselves to establish, develop and promote sport programmes that embody tenets implied in the Constitution of Republic of South Africa[1] through organizational structures and continuing interaction among members whereby they compete equally in sport competitions, with the principles of accountability upheld, thereby agreeing and promote equal access and opportunities to all who aspire to participate in sport at Higher Education Institutions.

USSA is a respected client and/or a member of the following structures:

- South African Sports Confederation and Olympic Committee (SASCOC)
- African Zone VI Confederation of University and College Sports Associations (CUCSA)
- Africa University Sports Federation (FASU)
- International University Sports Federation (FISU)[2].

[1] as shown in the 1995 Bill of Rights

[2] **www.ussa.org.za** [Accessed 10 January 2013]

2.3 Statistical literature

In this section, statistical techniques that will be used to analyse the survey results are discussed.

2.3.1 Simple random sampling

Definition: A simple random sample is a sample of size *n* drawn from a population size N in such a way that every possible sample size *n* has the same chance of being selected **(**Garton, 1990).

2.3.2 Estimating the population μ

Estimated mean:

Given a sample size n, consider independent random variables $X_1, X_2, \ldots, X_n$ each corresponding to randomly selected observations. Each of these variables has the distribution of the population with the mean μ and the standard deviation σ.

The sample mean is defined as:

$$\bar{X} = \frac{1}{n}(X_1 + X_2 + \cdots + X_n) \quad \textbf{(2.1)}$$

2.3.3 Estimated variance of the mean:

$$v(\hat{\mu}) = \frac{s^2}{n}\left(\frac{N-n}{N-1}\right) \quad \textbf{(2.2)}$$

where:

$$S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X})^2$$

and n is the sample size out of a population size N.

2.3.4 Bound on error estimate of estimating the mean (B_x)

When sample data are collected and the sample mean $\bar{x}$ is calculated, that sample mean is typically different from the population mean μ . This difference between the sample and population means can be thought of as an error (Garton, 1990),

$$B_x = tSE(\bar{x}) = t\sqrt{\hat{V}(\bar{x})} \quad \textbf{(2.3)}$$

where $SE(\bar{x})$ refers to the standard error of $\bar{x}$ and t is a student's t value on $n\text{-}1$ degrees of freedom at the $(1-\alpha/2)$ percent level of significance. In most cases, the following approximations are reasonable: α is the statistical significance level.

For α = *0.05,* $t \approx 2.0$,

For α =0.10, $t \approx 1.6$,

For α =0.20, $t \approx 1.3$.

2.3.5 Sample size calculation

Given the error bound, the sample size can be calculated as:

$$n = \frac{N\sigma^2}{\left(\frac{B^2}{t^2}\right)(N-1)+\sigma^2} \ . \qquad \textbf{(2.4)}$$

2.3.6. Sample standard deviation

The standard deviation serves the same purpose as variance in helping to understand how clustered or spread the distribution is around the mean value. It is given by:

$$S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2. \qquad \textbf{(2.5)}$$

2.3.7 Estimated sample size

Determining sample size is a very important issue because samples that are too large may waste time, resources and money, while samples that are too small may lead to inaccurate results. In many cases, it is easy to determine the minimum sample size needed to estimate a process parameter, such as the population mean. However, the sample size and its calculations may be affected by three factors when determining the sample size for simple random samples. These factors are:

- The margin of error,
- The confidence level,
- The proportion (percentage) of the sample that will choose a given answer to a survey question. Each of these will be discussed below.

2.3.8 The margin of error

The margin of error also referred to as the confidence interval measures the precision with which an estimate from single sample approximates the population value. For example, in a national voting poll the margin of error might be + or –3%. This simply means that if 60% of the people in the sample favour Mr Zuma as the president of South Africa, one could confidently feel that if the entire population is surveyed between 57% (60-3) and 63% (60+3) of the population would favour Mr Zuma.

The margin of error in social science research generally ranges from 3% to 7% and is related closely to sample size. A margin of error will get narrower as the sample size increases. The margin of error selected depends on the precision needed to make population estimates from the sample (Cochran, 1977).

For all samples used in the modular grant application process (MGAP) outcome evaluation study, the margin of error is + or −5%. However, it is acceptable to have an interval of + or –7%.

2.3.9 The confidence level

This is the estimated probability that a population estimate lies within a given margin of error. Considering the example above, a confidence level of 95% tells that one could be 95% confident that between 57% and 63% of the population favour Zuma to be the president of South Africa.

Common confidence levels used in the social science research includes 90%, 95%, and 99%. Confidence levels are closely related to sample size in such a way that as the confidence level increases, so too does the sample size. This simply means that with a confidence level of 95%, there is a 5% chance that the estimate derived from the sample will fall outside the confidence interval of 57% to 63%. In most cases, the proportion (or percentage) of sample that chooses a given answer to a survey question is unknown, but it is necessary to estimate this number since it is required for calculating the sample size.

The researcher will use a proportion (or percentage) that is considered the most conservative estimate – that is 50% of the sample will provide a given response to a survey question. This is considered the most conservative estimate because it is associated with the largest sample. The sample size formula; given a proportion p the sample size is

$$n = \left(\frac{z}{m}\right)^2 p(1-p)$$

$$= \left(\frac{1.96}{0.0558}\right)^2 0.5(1-0.5) \ = 308$$

where,

z is the standardised normal value at α level of significance.

m is the margin of error (e.g.,0.0558 which corresponds to + or -5.58%)

p is the estimated value for the proportion of a sample that will respond in a given way to a survey question (e.g., 0.5 for 50%) (Kish,: 1965, 1995).

Thus, for this particular study, applying the above formula, for a 95% confidence level and 5.58% confidence interval, the required minimum sample size is 308. This is within all statistically reasonable bounds.[3]

2.3.9.1 The concept of probability

Processes that have some degree of uncertainty produce spatial and temporal patterns. Probability resets upon the concept of studying an occurrence or event, which can usually result in one of

[3] These figures will be used in all the following chapters

several possible outcomes. Once all possible outcomes are considered, probability represents likelihood of a given result or chance that any outcome actually takes place.

Probability is a figure that varies between 0 and 1: $[0 \leq P(A) \leq 1]$, where 1 indicates total certainty or perfect likelihood of a particular occurrence and 0 indicates no chance of this occurrence.

2.4 Data analysis: frequency distribution

In Chapter 4, descriptive data analysis will be presented in form of tables and charts to illustrate the findings using Excel software application. In Chapter 5 and Chapter 6, SPSS software is used to analyse data and data analysis techniques will be discussed.

Frequency distribution is a mathematical distribution with the objective of obtaining a count of the number of responses associated with different values of one variable, and to express the counts in percentage terms. In a frequency distribution, one variable is a considered at a time. The relative occurrence or relative frequencies of different variables are expressed in percentages (Malhotra, 2012).

According to the demographic structure of the University of the Free State (2011), a total frequency of about 26 000 registered students for the 2011 academic year was presented. The university as a whole enrolled 75% non-white and 25% white students in the year 2011 (Free State University (2010-2011) demographic structure) (www.ufs.ac.za Accessed by 10 March 2012).

These percentages reflect the whole student's population size of the UFS[4].The sample size *n* =308 (as calculated above) in 18 junior residences was drawn from the population size of about 26 000. Frequency data by gender per residence, per race, was obtained by responses from students residing at junior residences pertaining to participation and attitudes to sports amongst registered 2011 academic year at the University of the Free State. Table 2 is a representation of frequency distribution of the sample data.

[4] www.ufs.ac.za Accessed 13 August 2013

Table 2: Frequency distribution of residence occupancy by gender and sample response rate

Junior residence	Total occupants	White occupants	Black occupants	Resident gender	Response rate
1. Akasia	174	19	155	Female	6.17%
2. Armentum	105	55	50	Male	4.87%
3. Emily Hobhouse	150	81	69	Female	4.87%
4. JBM Hertzog	172	91	81	Male	5.18%
5. Karee	130	70	60`	Male	4.87%
6. Kestell	118	11	107	Female	4.22%
7. Khayalami	174	5	169	Male	6.17%
8. Madelief	180	10	170	Female	6.17%
9. NJ Vander Merwe	159	21	138	Female	4.55%
10. Rietz	95	0	95	Male & Female	3.25%
11. Roosmaryn	235	106	129	Female	8.12%
12. Soetdoring	186	93	93	Female	6.17%
13. Tswelopele	180	3	177	Male	6.82%
14. Vergeet my nie	212	106	106	Female	6.17%
15. Villa Bravado	157	10	147	Male	5.84%
16. Wag ‘n bietjie	212	111	101	Female	6.49%
17. Welwetschia	175	60	115	Female	6.17&
18. Abraham Fischer	90	50	40	Male	3.90%
TOTAL (18)	**2904**	**2002**	**2002**	**18**	**100%**

Table 2 shows the uniform distribution of respondents across the residences.

In the next subsections, we discuss some of the statistical methods that will be used to analyse the data.

2.4.1 Hypothesis testing

Hypothesis is an assumption about a population parameter, where a statement is made about the population that may or may not be true. The purpose of hypothesis testing is to make statistical conclusions about accepting or rejecting such statements (Gigerenzer *et al*. 1993)

The null hypothesis: (H_0) represents the status quo.

The alternative hypothesis: (H_1) represents the opposite of the null hypothesis and holds the true if the null hypothesis is found to be false.

- If a calculated p value associated with testing this hypothesis is bigger than the significance level chosen, the researcher accepts the null hypothesis (no statistical significance).
- If p is smaller than the significance level chosen, the researcher rejects the null hypothesis (alternative hypothesis is true- there is a statistical significant relationship between variables).

2.4.2 Hypothesis testing related to differences

In hypothesis testing related to associations, hypotheses are of the form that two variables are associated with or related to each other. For example, regular personal physical excises are related to personal healthy mind. However, hypothesis testing related to differences are of the form that two variables are different from each other, for example people living a healthy lifestyle have higher lifespan than people living an unhealthy lifestyle.

2.4.3 T-test

A univariate hypothesis test using the t distribution is used when the data are assumed to be normally distributed with standard deviation unknown and the sample is small. The variable under consideration is continuous or can be assumed to be continuous. The T -test is based on the student t-statistical distribution.

2.4.4 Student t- distribution

The t- statistical distribution is a symmetric bell-shaped distribution that is useful for small- samples (*n*<30) testing. It is similar to normal distribution in appearance. Both distributions are bell shaped and symmetric. However, t distribution has more area in the tails and less in the centre than the normal distribution. If the population variance is unknown, it is estimated by the sample variance s^2.

2.4.5 The T- statistic

The t statistic assumes that the variable has a symmetric bell shaped distribution and the mean is known (or assumed to be known) and the variable is normally distributed. The sample mean is estimated and its variance is also estimated as:

$$S_{\bar{X}} = s/\sqrt{n}\ .$$

Thus,

$$t = \frac{\bar{X} - \mu_0}{S_{\bar{x}}}$$

is said to have a t distribution with $n-1$ degrees of freedom. μ_0 is the hypothesised population mean. The above test is used to test the null hypothesis: $\mathrm{H}_0 : \mu = \mu_0$

2.4.6 Two-sample T- test

The test is used for testing the value of the difference between two population means. The measurement of one sample has no effect on the values of the other sample, *inter alia* the samples are independent (Malhotra, 2009).

To test for equality of means for two independent samples:

The null hypothesis is:

$H_0 : \mu_1 = \mu_2$

Against the alternative hypothesis is

$H_1 : \mu_1 \neq \mu_2$.

Two populations are sampled, and the means and the variances computed based on samples of sizes n_1 and n_2 .

If both populations are found to have the same variance, a pooled estimate is computed from the two sample variances and a pooled variance estimate is computed.

$S^2_{pooled} = \frac{(\sum_{i=1}^{n=1}(X_{i1}-\bar{X}_1)^2+\sum_{i=2}^{n=2}(X_{i2}-\bar{X}_2)^2)}{n_1+n_2-2}$.

The standard deviation of the test statistics can be estimated as:

$S_{\bar{x}_1-\bar{x}_2} = \sqrt{S^2_{pooled}(\frac{1}{n_1}+\frac{1}{n_2})}$.

The appropriate value for sample T statistic can be calculated as:

$t = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{S_{\bar{x}_1-\bar{x}_2}}$.

The degrees of freedom in this case are $n_1 + n_2 - 2$.

If the two populations are assumed to have unequal variances, the t-statistic can still be computed for testing the difference in the sample means, i.e.

$t = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1}{n_1}+\frac{s_2}{n_2}}}$.

2.4.7 F- test (for equality of variances)

The F-test for equality of sample variances can be performed if unknown, as follows; if the variances for the respective populations are $\sigma_1^2$and σ_2^2.

Hypotheses are:

$H_o: \sigma_1^2 = \sigma_2^2$

vs

$H_o: \sigma_1^2 \neq \sigma_2^2$.

Formula for F- test (for equality of variances) is:

$F = \frac{S_1^2}{S_2^2}$, this statistic has F$(n_1 - 1, n_2 - 1)$.

An F statistics is defined as the ratio of two sample variances, with the larger sample variance in the numerator.

The critical value of the F distribution depends on two sets of degrees of freedom, the degrees of freedom in the numerator and degrees of freedom in the denominator.

If probability (p value) associated with the calculated F is greater than the significance level α,

H_o is not rejected and the T-test based on the pooled variance estimate can be used.

If the probability (p value) associated with the calculated F is less than or equal to α,

H_o is rejected and the T-test based on two variance estimates is used.

2.4.8 Paired samples

Two sets of observations relate to the same respondents resulting in paired samples.

Related examples:

- Shoppers consider brand name to be more important than price when purchasing fashion clothing.
- Households spend more money on pizza than hamburgers.
- The proportion of households who subscribe to a daily newspaper exceeds the proportion subscribing to magazines.

2.4.8.1 Paired samples t-test

A paired sample T - is a test for difference in the means of paired samples.

To compute t-statistics for paired samples the paired difference variable (D) is formed and its true mean is(μ_D). The sample mean estimate $(\overline{D})$ is computed and the sample variance S_D is also calculated. Then the T - statistic is computed with degrees of freedom $n-1$, where n denotes the number of pairs.

The relevant formulas paired samples T - test are as follows:

$$H_0 : \mu_D = 0 \quad \textbf{(2.6)}$$

vs

$$H_1 : \mu_D \neq 0.$$

The test statistic is

$$t_{n-1} = \frac{\overline{X} - \mu_D}{S_{\overline{D}}} \quad \textbf{(2.7)}$$

where

$$\overline{D} = \frac{\sum_{i=1}^{n} D_i}{n}$$

and

$$S_D = \sqrt{\frac{\sum_{i=1}^{n} \left(D_i - \overline{D}\right)^2}{n-1}} \quad \textbf{(2.8)}$$

with

$$S_{\overline{D}} = \frac{S_D}{\sqrt{n}} . \quad \textbf{(2.9)}$$

(**2.10**)

2.4.9 Analysis of the variance (ANOVA)

Statistical techniques for testing the differences among more than two population means exist, namely the null hypotheses are that all means are equal. Testing this hypothesis is referred to as analysis of variance (ANOVA).

When conducting an ANOVA test, it is necessary to consider the following:

- Dependent and independent variables must be distinguished,
- Independent variables must be categorical (non-metric), for example age group, academic year of study.
- The general ANOVA framework can handle more than one categorical independent variable that defines various groups.

2.4.9.1 One-way ANOVA

One-way ANOVA is a technique that involves only one variable, or a single factor that defines the different samples or groups.

2.4.9.2 Factors

Factors are categorical independent variables in which all the independent variables must be categorical (non-metric) to use ANOVA.

Treatment

In ANOVA, particular combinations of factor levels categories are called treatment conditions.

Thus, different independent samples are treated as categories of a single independent variable.

In one-way ANOVA:

- Dependent variable is denoted by Y (assumed continuous and normally distributed) and
- Independent variable is denoted by X

where

X denotes categorical variable having c categories.

There are *n* observations on Y for each category of X.

The sample size of each category of X is *n*, and the total sample size $N = n \times c$.

Although the sample sizes in the categories of X (group sizes) are assumed to be equal for the sake of simplicity, the above is not a requirement.

2.5 Decomposition of total variation

In one way ANOVA, separation of the variation observed in the dependent variable into variation due to independent variables plus the variation due to error.

This variation is measured by the sums of squares corrected for the means (SS).

The total variation in Y , denoted by SS_y, can be decomposed into two components:

$SS_y = SS_{betweeen} + SS_{within}$, **(2.11)**

where

$SS_{betweeen}$ also denoted as SS_x, variation in Y related to the variation in the means of the categories of X.

This represents the variation between the categories of X, or the portion of the sum of squares in Y related to X.

SS_{within} also referred to as SS_{error}, variation in Y due to the variation within each of the categories of X.

NB! This variation is not accounted for by X.

The total variation in Y can be decomposed as:

$$SS_y = SS_x + SS_{error} \quad \textbf{(2.12)}$$

where

$$SS_y = \sum_{j=1}^{c}\sum_{i=1}^{n}(Y_{ij} - \bar{Y}) \quad \textbf{(2.13)}$$

or

$$SS_y = \sum_{i=1}^{N}(Y_i - \bar{Y})^2 \qquad SS_x = \sum_{j=1}^{c}\sum_{i=1}^{n}\left(\bar{Y}_j - \bar{Y}\right)^2 \quad \textbf{(2.14)}$$

or

$$SS_x = \sum_{j=1}^{c} n\left(\bar{Y}_j - \bar{Y}\right)^2 \qquad SS_y = \sum_{j=1}^{c}\sum_{i=1}^{n}\left(Y_{ij} - \bar{Y}_j\right)^2 \quad \textbf{(2.15)}$$

where

$Y_i =$ individual observation ,

$\bar{Y}_j =$ mean for category $\boldsymbol{j}$,

$\bar{Y} =$ mean over the whole sample, or grand mean ,

$Y_{ij=}$ i^{th} observation of the jth category ,

$c =$ *n*umber of categories of X ,

$n =$ number of observations in each category ,

$N = n \times c$ the total sample size.

2.5.1 Measuring effects of independent variables on the dependent variables

In measuring, the effects of X on Y are measured by SS_x

- Simply because SS_x is related to the variation in the means of the categories of X, relative magnitude of SS_y increases as the difference among the means of Y in the categories of X increase.
- The relative magnitude of SS_x also increases as the variations in Y within the categories of X decrease.

- The strength of the effects of X on Y is measured as follows:

$$\eta^2 = \frac{SS_x}{SS_y} \qquad \textbf{(2.16)}$$

where:

n^2 denotes a measure of variation of Y that is explained by the independent variable X, the value ranges from zero and one. This is referred to as the coefficient of determination.

Not only can we measure the effects of X on Y, but we can still test for their significance.

Test of significance

In one-way ANOVA, the null hypothesis is that the category means are equal in the population i.e.

Therefore,

$\mathrm{H}_0: \mu_1 = \mu_2 = \mu_3 = \ldots\ldots = \mu_c$ vs $H_1: H_o \; not \; true.$

2.5.2 Deriving the mean square

- Under the null hypothesis, SS_x and SS_{error} come from the same source of variation.
- The estimate of the population variance of Y can be based on either between- category variations or within –category variation.
- The estimate of the population variance of Y is equal to the sum of squares divided by the appropriate degrees of freedom.

The significance of the overall effect in terms of null hypothesis may be tested by F statistics based on the ratio between the below estimates:

$$F = \frac{\frac{SS_x}{c-1}}{\frac{SS_{error}}{N-c}} = \frac{MS_x}{MS_{error}} \; . \qquad \textbf{(2.17)}$$

The F distribution with $(c-1)$and $(\mathrm{N}-c)$ degrees of freedom (df).

The F distribution is a probability distribution of the ratios of two chi-square independent random variables.

It is characterised by degrees of freedom for the numerator and degrees of freedom for the denominator.

In Chapter 5, the means of different variables for age group, marital status and academic year of study under reasons for sports participation and non-participation are compared. The data are assumed continuous.

The hypotheses testing relating to the mean differences are

A single hypothesis:

$H_0: \mu_i = \mu_j, i = 1,2,\dots,5 \;\; j = 1,2,\dots,5.$

Against the alternative

$H_1: \mu_i \neq \mu_j \; for \; at \; least \; on \; i \neq j, i = 1,2,\dots,5 \;\; j = 1,2,\dots,5$.

The pairwise comparison procedure can be the next step after the Anova in the event of rejecting H_0 to find which pairs are different. If the decision is to reject the null hypothesis; the test is significant. A significant ANOVA indicates that at least one pair of group means significantly differs. However, this test does not tell which pairs of means differ. To determine which pairs differ, one must compute post hoc tests. These tests analyse differences for all possible pairs of group means, called pairwise comparisons.[5]

Tamhane's t2 (T2) (Post Hoc Tests algorithms) is a conservative pairwise comparisons test based on a t-test if equal variance is not assumed.

$$\mathrm{R}_{\varepsilon,\mathrm{r},\mathrm{v}} = \sqrt{\mathrm{F}_{\gamma,1,\mathrm{v}}} = t_{\mathrm{v},\gamma} \text{ where } \gamma = 1 - (1-\varepsilon)^{1/\mathrm{k}^*}.$$

The one-way ANOVA procedure is run using SPSS.

[5] *www.ibm.com/support/...22.0.0/.../alg_**posthoc**_unequalvar_t2.htm*

2.6 Cluster analysis

Cluster analysis is a class of techniques used to classify objects (respondents, products, etc.) into relatively homogeneous groups called clusters. Cluster analysis or clustering is the task of grouping a set of objects in such a way that objects in the same group (called cluster) are more similar (in some sense or another) but different to objects in another cluster (Driver and Kroeber, 1932). Classification, or grouping, is based on a set of user-defined clustering variables.

2.6.1 Cluster analysis description

Given a set of observations $(x_1, x_2, \dots, x_n)$ where each observation is a $d-$dimensional real vector, $k-$means clustering aims to partition the *n* observations into k sets $(k \leq n) S = \{S_1, S_2, \dots, S_k\}$ so as to minimise the within –cluster sum of squares (WCSS).

2.6.2 Importance of conceptual support of cluster analysis

Cluster analysis is descriptive, a theoretical and non-inferential. There is no basis of drawing inferences; cluster solution depends on many factors and many solutions that can be obtained from the same data. Cluster analysis will always create clusters regardless of any structure in the data and, therefore, cluster solutions cannot be generalised since it totally depends on the variables used as the basis of similarity.

2.6.3 Assumptions of cluster analysis

The clusters are determined by the cluster variate(s), which are variable/set of variables that determine the clusters.

Cluster variates are not statistically determined, but set a priori by the researcher. It is important to have a representative sample and lack of collinearity in the selected clustering variables. Outliers in the data and the use of collinear variables as input variables, can seriously impact upon cluster analysis.

Assumptions of cluster analysis are determined by the following factors:

- Representativeness of the sample,
- Outliers,
- Multicollinearity.

Input variables should be examined for substantial multicollinearity and if present, the following should be considered:

- Reduce the variables, through elimination of heavily correlated variables, to equal numbers in each set of correlated measures.

- Use a distance measure that compensates for the correlation, like Mahalanobis Distance.
- Take a proactive approach and include only cluster variables that are not highly correlated.

Cluster analysis is comprised of two methods, namely:

- Hierarchical methods, and
- Non-hierarchical methods.

2.6.4 Hierarchical methods

Hierarchical methods are composed of three linkage types and centroid methods:

I. **Single linkage** ('nearest neighbour') which is based on the minimum distance between clusters. It also finds two objects separated by the shortest distance forming cluster 1.With shortest distance found with another member is added to the first cluster, or another two-member cluster is formed, and so on. Distance between any two clusters, defined as the shortest distance between any two points in the cluster can lead to snake–like chains (by definition, can't be 'good' clusters) and are sensitive to extreme values.

II. **Complete linkage** ('farthest neighbour') is based on pairs of observations, with maximum distance. They can be imagined as spheres, which encompass objects linked to each other at some minimum level of similarity, and avoid the chain problem, but are sensitive to extreme values.

I. **Average linkage** lies in between single and complete linkage. It is based upon average distance between all pairs of observations on individuals in one cluster and to all individuals in another cluster. Average linkage is less sensitive to extreme values and produce clusters with small within cluster variation, and with approximately equal variances.

II. **Centroid methods** are hierarchical methods that generate clusters according to the distance between cluster centroids. Cluster centroids are the means of the observations on the clustering variables, which are like centres of mass/volume/gravity of clusters and will change as clusters are combined. They are less affected by outliers than other methods.

2.6.5 Non-hierarchical methods: k- means clustering or partitioning

Here observations are assigned into predetermined number of clusters. A four-cluster solution is selected as not just a combination of two clusters from a five-cluster solution; it is predetermined as the best four-cluster solution.

Once the number of clusters is determined, the k cluster seeds, which serve as the initial cluster centres must be selected, and individuals within a specified distance are then assigned to the appropriate cluster.

2.6.5.1 Seed points

There are three steps to select seed points:

- The first k (non-missing) observations should be sufficiently far apart,
- They should be randomly selected from all (non-missing) data,
- They should also be specified by the researcher.

It is important to note that cluster solutions are often very sensitive to this selection.

2.6.6. Limitations of k-means

K-means has problems when clusters are of differing sizes, densities and non-globular shapes. They also have problems when the data contains outliers.

2.6.7 Principles of non-hierarchical methods: Parallel threshold and optimising partitioning

In parallel threshold, k cluster seeds simultaneously assign individuals to the nearest seed. Objects are generally not allowed to be reassigned (used in SPSS). Optimising partitioning is similar to parallel threshold and allows individuals to be re- assigned if current placement is non–optimal (e.g. within cluster distance).

2.7 How to analyse data from cluster samples

Different sampling methods use different formulas to estimate population parameters and to estimate standard errors[6].

2.7.1 Measures of central tendency

The formulas below are used with one-stage and two-stage samples to estimate a population mean and population proportion.

One-stage

Mean: $\left[\frac{N}{n \times M}\right] \times \sum_{i=1}^{m} (M_{i\times}\bar{X}_i)$, **(2.18)**

Proportion: $\left[\frac{N}{n \times M}\right] \times \sum_{i=1}^{m} (M_i \times P_i)$ **(2.19)**

Two-stage estimates

[6] http://Stattrek.com/survey research/cluster-sampling analysis. [Accessed 13 December 2013]

Mean: $\left[\frac{N}{n\times\ M}\right] \times \sum_{i=1}^{m}\ (M_i \times \bar{x}_i)$, **(2.20)**

Proportion: $\left[\frac{N}{n\times\ M}\right] \times \sum_{i=1}^{m}\ (M_{i\times}\ p_i)$ **(2.21)**

Where,

N= the number of clusters in the population

n=the number of clusters in the sample

M=the total number of observations in the population

P= the population proportion

$M_i =$ The number of observations in the ith cluster

$m_i =$ The number of sample observations from the i^{th} cluster

P_i= The population proportion for the i^{th} cluster

$\bar{X}_i$ =The population mean for the i^{th} cluster

N= the number of clusters in the sample

$\bar{x}_i$ =The sample estimate of the population mean for the i^{th} cluster is $= \sum_{j=1}^{n}\left(\frac{X_{ij}}{m_i}\right)$.

$\bar{t}_i$ = The estimated total for the i^{th} cluster is $= M_i \times \bar{x}_i$

$p_i =$ The sample estimate of the population proportion for the i^{th} cluster

2.7.3 Variability of the estimate

Precision of a sample is related directly to variability of the estimate, which is measured by the standard error.

The following equations show how to compute the standard error for the mean score, in one-stage or two-stage sampling.

Standard error of the mean score (SE):

One-stage sampling:

$$\left(\frac{1}{M}\right) \times \sqrt{\left[N^2 \times \frac{1-\frac{n}{N}}{n}\right] \times \sum_{i=1}^{m} \frac{\left(M_i \times \frac{\bar{t}_{mean}}{N}\right)^2}{n-1}}. \qquad \textbf{(2.22)}$$

Two stage- sampling:

$$\frac{\left(\frac{1}{M}\right) \times \sqrt{\left[\frac{N^2 \times \left(1-\frac{n}{N}\right)}{n}\right] \times \sum_{i=1}^{m}\left(M_i \times \bar{x}_i - \frac{\bar{t}_{mean}}{N}\right)}}{n-1}$$

where[7]:

$\bar{t}_i$= The estimated total for the i^{th} cluster =$\sum({}^{M_i}/_{m_i}) \times x_{ij} = M_i \times x_i$.

$\bar{t}_{mean}$ = The sample estimate of the total population = $\left(\frac{N}{n}\right) \times \sum \bar{t}_i$.

SE: the standard error is a measure of the variability of a statistic. It is an estimate of the standard deviation of the sampling distribution**.** The standard error depends on three factors:

- N: The number of observations in the population.
- n: The number of observations in the sample.
- The way that the random sample is chosen.

[7]**(**http:**//**Stattrek.com/survey research/cluster-sampling analysis). [Accessed by 23 December 2013]

2.7.4 Test statistics.

Two statistics are provided to evaluate the performance of the test as a whole:

- Reliability coefficient: The reliability of a test refers to the extent to which the test is likely to produce consistence scores.

The inter correlations among the items the greater the relative positive relationships, and the stronger those relationships are, the greater the reliability.

Item discrimination indices and test's reliability coefficients are related in this regard. The length of a test with more items will have a higher reliability, all other things being equal.
The greater the content of the test-generally, the more diverse the subject matter tested and testing techniques used, the lower the reliability. Reliability coefficients theoretically range in value from zero (no reliability) to 1.00 (perfect reliability). In practice, their approximate range is from .50 to .90. Higher reliability means that questions of a test tended to pull together. Low reliability means that the questions tended to be unrelated to each other in terms of who answered them correctly (Nunnally, 1978).

- Standard error of measurement: The standard error of measurement is directly related to the reliability of the test. It is an index of the amount of variability in an individual student's performance due to random measurement error.

The standard deviation of the distribution is called the standard error of the measurement and reflects the amount of change in the student's score, which could be expected from one test administration to another.
Whereas, the reliability of a test always varies between 0.00 and 1.00, the standard error of measurement is expressed in the same scale as the test scores. For example, multiplying all test scores by a constant will multiply the standard error of measurement by that same constant, but will leave the reliability coefficient unchanged (scale invariance).

2.8 Factor analysis

Factor analysis is known as a technique that allows the identification of patterns that underlie the correlations between a number of variables. The information gained can function as a data reduction method, in other words it simplifies relationships between groups of variables (by identifying factors) that underlie these relationships (Hill and Lewicki, 2006).

Factor analysis is applied to detect the structure in the relationships between variables to classify and densify the data, and reduce the number of variables. Factor analysis in decision making identifies the following:

- priority variables (i.e. policy context),
- specific relationships between important variables to allow for classification (and densification) of data.

- Subtler patterns to draw meaningful conclusions in order to inform policy formation and guide investment initiatives.

In factor analysis, variables $y_1, y_2, \dots, y_p$ are represented as linear combinations of few random variables $f_1, f_2, \dots, f_m$ $(m < p)$ called factors.

The factors are underlying constructs or latent variables that generate the y's unlike original variables, factors cannot be measured or observed. Therefore, the existence of these hypothetical variables is open to question (Rencher, 1988).

If the original variables $y_1, y_2, \dots, y_p$ are at least moderately correlated, the basic dimensionality of the system is less than p .

The goal of factor analysis is to reduce redundancy among the variables by using a smaller number of factors.

2.8.1 Orthogonal factor model

Factor analysis is a one–sample procedure for possible applications to data with groups (Rencher, 1998). It is a statistical method used to describe variability among observed correlated variables in terms of potentially lower number of unobserved variables called factors.

The information gained about the interdependencies between observed variables is used later in chapter 6 (data analysis and results) to reduce the set of variables in a data set.

If we assume a random sample $y_1, y_2, \dots, y_n$ from a homogenous population with mean vector μ and covariance matrixΣ. In factor analysis each variable is expressed as a linear combination of the underlying common factors $f_1, f_2, \dots, f_m$ with an accompanying error term to account for that of the variable that is unique.

For $y_1, y_2, \dots, y_p$ in any observation vector $\mathbf{y}$ the model is as follows:

$$y_1 - \mu_1 = \lambda_{11} f_1 + \lambda_{12} f_2 + \dots\dots\dots + \lambda_{1m} f_m + \varepsilon_1 \qquad \textbf{(2.23)}$$

$$y_2 - \mu_2 = \lambda_{21} f_1 + \lambda_{22} f_2 + \dots\dots + \lambda_{2m} f_m + \varepsilon_2 \qquad \textbf{(2.24)}$$

$$\vdots$$

$$y_p - \mu_p = \lambda_{p1} f_1 + \lambda_{p2} f_2 + \dots\dots + \lambda_{pm} f_m + \varepsilon_p \qquad \textbf{(2.25)}$$

Ideally, *m* should be substantially smaller than p otherwise a parsimonious description of variables as functions of few underlying factors would not be achieved.

The f 's in the equations 2.23 to 2.25 may thus be regarded as random variables that engender the y's. The coefficients λ_{ij} are called loadings and serve as weights, to show how each y_i individually depends on the f 's. By making appropriate assumption that,λ_{ij}, indicates the importance of the j^{th} factor f_j to the i^{th} variable y_i and can also be used to interpret factor f_i.

Therefore f_2 is described or interpreted by for example examining its loadings, $y_{12}, y_{22}, \ldots\ldots\ldots y_{p2}$ where larger loadings relate f_2 to the corresponding $y's$.

From these $y's$, a meaning or description of f_2 is inferred. After the λ_{ij}'s is estimated, it is hoped that they will partition the variables into groups corresponding to factors. It is assumed that for $j = 1,2, \ldots, m \qquad E_{fj} = 0, var(fj) = 1, cov(f_i, f_k) = 0, j = k$

The assumptions to $\varepsilon_i = 1,2\ldots\ldots\ldots, p$ be similar, except that for in case that ε_i must be allowed to have different variance, since it shows the residual part of y_i that is not in common with other variables.

By assuming that $\mathrm{E}(\varepsilon_i) = 0,\ \mathrm{var}(\varepsilon_i) = \psi_i$, and $\mathrm{cov}(\varepsilon_l, \varepsilon_k) = 0, i \neq \kappa$.

We also assume that $\mathrm{cov}(\varepsilon_i, f_i) = 0$ for all i and j.

We refer to ψ_i as the specific variance. These assumptions are natural consequences of the basic model and the goals of factor analysis. Since $\mathrm{E}(y_i - \mu_i) = 0$, we need $\mathrm{E}(fj) = 0,\ j = 1,2,\ldots\ldots m$

The assumption $\mathrm{cov}(fj, fk) = 0$ is made for parsimony in expressing the $y's$ as functions of as few factors as possible. The assumption $\mathrm{var}(f_j) = 1, \mathrm{var}(\varepsilon_i) = \psi_i \mathrm{cov}(fj, fk) = 0$, and $\mathrm{cov}(\varepsilon_i, f_i) = 0$ yield a simple expression for the variance of $\mathrm{var}(y_i) = \lambda_{i1}^2 + \lambda_{i2}^2 + \ldots\ldots\ldots \lambda_{im}^2 + \psi_i$, it is also important to note that assumptions $\mathrm{cov}(\varepsilon_l, \varepsilon_K) = 0$ implies that the factors account for all correlations among the $y's$ that is , all that $y's$ have in common.

The model can be written in matrix notation as

$\mathbf{y} - \boldsymbol{\mu} = \Lambda \mathbf{f} + \boldsymbol{\varepsilon}$,

where $\mathbf{y} = (y_1, y_2, \ldots\ldots y_p)', \boldsymbol{\mu} = (\mu_1, \mu_2, \ldots\ldots \mu_p)', \mathbf{f} = (f_1, f_2, \ldots\ldots\ldots f_p)', = \boldsymbol{\varepsilon} = (\varepsilon 1, \varepsilon 2, \ldots \varepsilon p)$

and

$$\Lambda = \begin{pmatrix} \lambda_{11} & \lambda_{12} & \cdots & \lambda_{1m} \\ \lambda_{21} & \lambda_{22} & \cdots & \lambda_{2m} \\ \vdots & \vdots & & \vdots \\ \lambda_{p1} & \lambda_{p2} & \cdots & \lambda_{pm} \end{pmatrix} \quad . \qquad \textbf{(2.26)}$$

2.8.2 Steps in factor analysis involve the following:

- Correlation,

- Eigenvalues,
- Scree test (scree plot),
- Factor loadings,
- Interpreting the factor loadings,
- Giving the factors names.

2.8.3 Eigenvalues

According to Hill and Lewicki (2006), each eigenvalue is a measure of the amount of variability variance in the data explained by a given factor.

2.8.4 Scree test (scree plot)

- It plots the eigenvalues by size in order to provide a visual assessment that allows the analyst to see which factors should be accepted/ extracted.
- It plots the factors/ components on the x axis and the corresponding eigenvalues on the y axis.

2.8.5 Factor loadings

- Are described as correlation coefficients between the variables (rows) and factors columns.
- The squared factor loadings are the percent of variance in that variable explained by a factor.
- Factor loadings indicate the strength of each variable in defining the factor.
- Loadings on factor can be positive or negative i.e., $-1 \leq \lambda_{ij} \leq 1$.
- The larger the absolute value, the stronger the link between that variable and the factor.
- A negative loading indicates that the variable has an inverse relationship with the factor.

2.8.6 Interpreting the factor loadings

- Factor loadings should be 0.6 of higher to confirm that the independent variables are represented by a particular factor.
- 0.6 corresponds to about half of the variance in the indicator being explained by the factor.
- Factor loadings must be interpreted in the light of the theory not by arbitrary cut off levels (Hill and Lewicki, 2006).

2.8.7 Giving the factor names

Giving factor names is based on their characteristics, interpretation of the study problem(s) and in light of theory for example Factor 1: Reasons to participate in sports (two blocks load highly: the highest one with the value closer to 1 must be taken).

Factor analysis can be used as variables in subsequent analysis such as cluster analysis.

2.9 Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy/Bartlett's Test of Sphericity.

Prior to the extraction of the factors, several tests should be used to assess the suitability of the respondent data for factor analysis. These tests include Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity (Hill and Lewicki, 2006).

The KMO index, in particular, is recommended when the cases to variable ratio are less than 1:5. The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis.
The Bartlett's Test of Sphericity should be significant ($p<.05$) for factor analysis to be suitable.

2.9.1 How will the factors be extracted?

The aim of rotation is to simplify the factor structure of a group of items, or in other words, high item loadings on one factor and smaller item loadings on the remaining factor solutions (Rencher, 2002).

There are numerous ways to extract factors:

- Principal components analysis (PCA),
- principal axis factoring (PAF),
- image factoring, maximum likelihood,
- alpha factoring, and canonical.

The most common extraction methods used in factor analysis Exploratory factor analysis (EFA) and Confirmatory factor analysis (CFA) are listed as follows:

- Principal components analysis (PCA),
- Principal axis factoring (PAF),
- Maximum likelihood,
- Unweight least squares,
- Generalised least squares,
- Alpha factoring,
- Image factoring (Rencher, 2002).

CHAPTER 3: RESEARCH METHODOLOGY AND DATA COLLECTION

In this chapter, the data collection methods and challenges faced are discussed.

3.1 Introduction

Data were collected using a questionnaire. The participants (or respondents) were students within the University of the Free State (main campus). The focus was on participation and attitudes to sports. The sporting division within the university is concerned with the relatively low level of interest in sport participation and lack of positive attitudes to sporting activities among both male and female students within the University of the Free State. This provided the main motivation of the study. The outcome of the study is to identify concerns and problems of students and collect suggestions from students that will help enhance participation in either sports or good health activities amongst students at the University of the Free State.

3.2 Consent(s)

The necessary formalities of requisitioning for permission from the director of sports and the dean of students of the university were undertaken. The director was happy with the questionnaire and expressed his desire to see the final report; he showed enthusiasm and offered his support. He expressed a hope that the results will enable the department of sports (Kovsie Sport) to identify and target student groups in terms of their perception about sport and participation to enable developing effective interaction and communication that may enhance participation in sports and healthy activities. The sporting director availed all sporting codes/disciplines of the university to the researcher.

A similar meeting was arranged with the dean of students. The aim was again to explain reasons behind the chosen topic and to request approval to conduct a survey on sports participation and attitudes to sports. Permission was granted and detailed information on how the sample will be chosen had to be supplied to the dean of students office.

Similar permission was sought from the director of residence affairs. The request was for approval to conduct a survey on all residences around the campus. Permission was granted to conduct the survey at all junior residences as the period of request was nearing examination sittings, and there was some concern about possible disruption to students preparing for the examinations.

Considering the challenges, the methodology had to be modified. For the reasons outlined, the proposed questionnaire was edited, as well as the methodology, in a manner that would bring it in line with what had been approved. The target population eventually became resident junior students on the main campus of the University of Free State.

The researcher signed a confidentiality oath and other clauses before the director of residence affairs. Thereafter, permission was granted to undertake the survey.

UFS has two campuses in Bloemfontein, namely the main campus and the smaller southern campus formerly known as Vista University. The target population was initially the 2011 registered students residing in and outside of the main campus. However, permission was granted only to interview junior resident students.

3.3 Data collection instrument

The questionnaire was designed to collect data on sport participation and attitudes towards sport among the junior resident university students.

3.3.1 The structure of the questionnaire

A covering letter was prepared and attached to the questionnaire; the purpose of the covering letter was to introduce the researcher and to the outline the purpose of the study to be undertaken. The letter:

- Gave reasons behind the study, and how it would be of benefit to the sporting department within the university and to the students at large.
- Outlined the purpose and objectives of the survey, and provided details about the critical sections within the questionnaire.
- Encouraged participant response and assured respondent's confidentiality.

The questionnaire is divided into three (3) sections, namely:

- Section 1. Biographical information, which included university studies information and residence information.
- Section 2. Questions to measure level of interest in sport participation and attitudes to sports amongst students.
- Section 3. Overall suggestions pertaining to sport participation.

3.4 Pilot study methodology

Immediately after approval, one Friday and Saturday (two days) were used to collect data amongst non-residents and resident students for piloting purposes. As a result, a total of 20 questionnaires are used to collect data among all students. The aim was to measure (the relationship/influence) between the resident and non-resident students and identify any shortcomings in the questionnaire.

Targeted places included the student centre (Thakaneng Bridge), university library, and the on-campus university taxi rank. Within two days, information on a total of 20 students with different age groups, race, gender and faculty of study was collected. The method used to select students was convenience sampling (haphazard). The approximate time taken to interview at least one student was 10-15 minutes. During the pilot stage, the researcher realised that students spent a significant amount of time answering questions on suggestion and opinions regarding sport participation and non-participation. Students were instructed to provide direct answers as an expression of their opinions and views. This section is regarded as very crucial as the aim is to find out why students are participating in sports or not. The process of pilot testing helped the enumeration team with providing information about the questionnaire, respondents reaction, time needed to complete the questionnaire and was also the best tool to provide a thorough practical training to enumerators to prepare them to commence with the data collection process. In addition to this, the researcher provided one day theoretical refresher training to the enumerators' team; the aim was to allow

them to raise their concerns and to prepare them to commence the data collection process with confidence.

3.4.1 Sampling method for pilot study: haphazard sampling

For the pilot study, haphazard sampling, sometimes called the grab or opportunity sampling was used. Its main disadvantage is that it is classified as non-probability sampling, because elements in the population are included since they are easily and conveniently available, but may not necessarily be representative of the population. However, it is chosen because respondents can be reached easily, costs can be kept to a minimum, and most importantly, it is useful in exploratory research to get a quick approximation of the truth.

In haphazard sampling, samples are selected based on convenience but preferably should still be as random as possible (Westfall, 2011).

3.4.2 Why convenient sampling?

Convenient sampling is usually quicker and uses a smaller sample size than other sampling techniques. The disadvantage of convenient sampling is that since it is not statistically based, generalisations about the total population should be made with extreme caution. It also gives little guarantee that the sample used to conduct the survey may predict the actual outcome. Convenient sampling occurs when samples are collected in the field without any pre-determined method for deciding where to sample. Data collected with this technique are considered anecdotal information (Berger, 2004; Bonham, 1989).

3.5 Data collection preparations

Before commencing with data collection, the team of enumerators were instructed clearly by the researcher to take full responsibility of their work. The researcher also explained that each team member will be paid according to the number of quality questionnaires signed (on top of the cover page), fully completed, and submitted to the researcher for a quality check.

Upon arrival at each residence, after the formal introductions, the objectives of the survey were discussed with the housing committee members, hostel mothers and fathers; this made the data collection process easy for the team of enumerators to gain access and the attention of students.

Appointments were secured with relevant superiors within the residence as to when (date and time) to come and commence with data collection. Expected number of students required, in terms of gender and race distribution were made known. The researcher received a lot of support from almost all listed hostels but it was not always easy to get hold of hostel representatives as exam time was approaching. A total of 18 junior residents were visited and interviewed. Most respondents were available after 16H00 during the week and from 08H00 on weekends.

3.5.1 Data collection process and challenges

Upon arrival at some residences, some students (respondents) were not willing to allow the team of enumerators to knock at their doors (as per methodology). The researcher was then forced to go back and arrange with the person doing telephone duty at the ground floor and those sampled students were given reasons to open and allow the team to enumerate, which they eventually did.

The enumerators' team also struggled to gain access to some of the male residence because of security procedures but the researcher managed to contact the responsible house members telephonically to secure appointment times, and these eventually were sorted out in all cases.

3.5.2 Time taken to do data collection

It took the team three weeks to visit and locate all sampled junior residents for data collection. A total of 308 questionnaires were completed successfully**.**

3.6 Data quality assurance and monitoring

Enumerators assured the quality of data collected immediately after they were done with enumerations per residence (on daily basis). The researcher encouraged enumerators to do data cleaning by checking grammar, spelling mistakes, accuracy, consistency, etcetera, before they could submit questionnaires for capturing.

Notwithstanding being part of the enumeration team, the researcher was responsible to monitor enumerators' performance on a daily basis during the process of data collection and afterwards. The following were observed: The standard in which the questionnaire was administered (questions were asked exactly the same as they were written in the questionnaire); the enumerators approach to the respondents (showing respect and thoroughly explaining the purpose of the survey); the time spent on each questionnaire (avoid creating boredom while interviewing); checking for possible errors immediately after completion of interviews (accuracy and consistency).

3.6.1 Data quality challenges

The team (enumerators) experienced a challenge when respondents were hesitant to be interviewed, and asked questions like "How long is it going to take?" In these cases, the team had to assure potential respondents that it would take approximately 10 minutes depending on how fast the responses were (as it was proven during pilot stage).

Another challenge was that enumerators did not want to create boredom in respondents by visiting the same residence for two consecutive days. So each enumerator had to work as fast as possible and try to collect data as accurately as possible (the focus was on one resident per day). Each enumerator completed a set of the questionnaire(s) and signed their name and date on their individual completed questionnaire(s). This would enable the researcher to hold enumerators accountable for errors and also for payment purposes it also allowed monitoring progress and to identify those enumerators who may need additional refresher training from time to time. The procedure was repeated for all 18 junior residences within the University of the Free State.

In other female residences, respondents would insist on self-enumeration, which was not in line with the methodology (face-to-face interview method). The enumerator's team could not allow this as it

might have a bad effect on the quality of data to be provided. Other respondents would opt out in the middle of the interview and such questionnaires had to be cancelled (destroyed) due to incompleteness.

During data collection and quality assurance process the following were taken into consideration by the researcher: statistical quality control and simple random sampling technique.

3.6.2 Statistical quality control (SQC)

Statistical quality control, also called statistical process control, uses statistics to determine when processes or product quality deviate from specifications. The primary goal of statistical quality control is to maintain and improve processes through techniques such as sampling and process improvement projects, which reduce variations in product. Statistical process control often uses control charts to monitor changes in processes, machinery, labour or the environment. Inspections and sampling to determine when a process is outside of the control parameters, which can result in a reduction in quality. Advantages of statistical quality control are identified as providing instant feedback when a process goes outside of the process. It also allows production to stop and be corrected before creating a great deal of defective product. However, the disadvantage is that if proper training is not implemented, statistical quality control may be useless. The above processes were used to check daily targets of interviews for the three-week period.

3.7 Why simple random sampling technique?

Initially, the simple random sampling technique was considered during data collection and analysis, and used as a tool to produce prior results.

3.7.1 Simple random sampling

A sample size (n) is drawn from a population size N in such a way that every possible sample of size n has the same chance of being selected. Therefore, each unit in the population has the same chance of being chosen for the sample at each draw. This sample can be drawn using a table of random numbers or by drawing names out of a hat. The sample must reflect the population. In statistics, there are basic definitions, which are in line with simple random sampling:

A population: the total collection of individual items or units, which are the subjects of investigation (students at the University of Free State).

The target population: the population from which information is required (students in junior residence of the University of the Free State).

The study population: refers to population from which the sample data are obtained (students residing in the 18 junior residences identified).

A simple random sample: is a sample in which the units in the sample must be drawn in such a way that each unit in the population must have an equal chance of being drawn. This is to avoid bias and ensure that the sample is truly representative.

One of the advantages of simple random sampling is the ease of assembling data. It is also considered to be a fair way of selecting samples from a given population since every member in a

group is given a fair chance to be selected. Simple random sampling's obvious limitations are that it needs a complete list of all numbers of the population, and that list has to be accurate and complete.

From a target population (*N*) is equal to students within UFS and thus sample size (*n*) is equal to 308 students residing at junior residences. The respondents' characteristics were classified as follows:

- Gender.
- Age.
- Race.
- Educational attainment.
- Sports participation.
- Residence during studies.

The margin of error calculation and how the sample size was determined is mentioned in the literature review, in section 2.3.9 (The confidence level).

3.8 Systematic random sampling

Systematic random sampling is when a sample is obtained by randomly selecting one element from the first k elements (units) in the frame and every k^{th} element thereafter is called a 1-in-k systematic sample, with a random start. K=N/rounded to the nearest integer. N is the population size.

3.9 Why systematic random sampling was considered?

Systematic random sampling is easier to perform in the field and hence less subjected to selection errors by field workers than simple random sampling. Systematic sampling generally is spread more uniformly over the entire population and thus may provide more information about the population than equivalent amount of data contained in a simple random sample. However, its limitation is that it is not suitable when a cycle (or periodicity) is present.

Before the data collection process, a list of numbers of occupants from each residence by gender and race was presented accordingly. A systematic random sampling technique was used when the team knocked on every fifth door in a given residence to ensure that all corners of each residence were reached. During the final data collection process, a total of 308 questionnaires were distributed. This excludes the 20 questionnaires designed and administered for pilot purposes.

3.9.1 The actual method of data collection used

A face-to-face (personal interview) method was applied for the following reasons: to receive high response rate, gather data accurately, to observe and note nonverbal responses, to allow more general questions to be asked by respondents and to allow more probing from the interviewer's side.

Although the face-to-face (personal) interview method was applied, some limitations were experienced where personal interviewing was time consuming to some students respondents. The possibility of gathering biased data was noticed on the interviewer's influence, during the time, the aim and objectives of the survey were introduced to the respondents. However, such cases were corrected during data analysis in Chapter 5, where both paired and unpaired T - tests for assessments of significance were considered for better dissemination of the results.

South African Statistical Quality Assurance Framework has identified eight quality dimensions.

Table 3: Illustrating eight quality dimensions identified by SASQAF

Quality Dimension	**Purpose addressed**
1. Relevance	Meeting real needs of the users (clients, students, stakeholders)
2. Accuracy	Correctly describes phenomena it is designed to measure (target population)
3. Timeliness	Information available at desired reference (Dissemination of results)
4. Accessibility	Ease of obtaining information from agency
5. Interpretability	Availability of supplementary information metadata
6. Coherence and comparability	Harmonisation of different information within a broad analytical and temporal framework
7. Methodological soundness	Sound methodologies: Agreed practices, data-specific, international standards and guidelines
8. Integrity	Free from political interference: Adherence to objectivity, professionalism, transparency, ethical standards.

CHAPTER 4: DESCRIPTIVE DATA ANALYSIS

4.1 Introduction

In this chapter, the analysis and the results obtained from the survey questionnaire of participation and attitudes to sports among students residing within the University of the Free State will be discussed. The results are based on a systematic random sampling of the students residing in junior residence within the University of the Free State. The results are in a form of tables and charts. The tables and charts mainly give estimates of proportions $\hat{p}$ of interest. All 18 junior residences are covered out of 23 residence (the five senior residences were not included). The sample size was 308.

4.2 Demographic section

Table 4: Gender of students

Gender	Respondents
Male	38.64%
Female	61.36%
Grand Total	**100%**

Table 4 shows the majority of female student respondents (61.36%) residing in junior residence on campus. In 2011, the university had 60% female students and 40% males enrolled in their database. Therefore, the sample is a representative of the gender proportions of registered students. (www.ufs.ac.za Accessed by 12 December 2012)

Table 5: Age group of students

Age Group	Respondents
Below 17	0.65%
Between 17 to 25	99.35%
Grand Total	**100%**

Table 5 shows that the majority of the respondents indicated their age as between 17 to 25 years (99.35%). This is to be expected for a junior residence at a university. The students often complete the final year at high school (grade 12) at the age of 18 and immediately proceed with their tertiary education.

Table 6: Race of students

Race	Respondents
White	24.68%
Non White	75.32%
Grand Total	**100%**

Table 6 shows the distribution of the students by race. 75% of students residing at junior residences indicated their race as non-white. This percentage represented all non-white students, namely black, coloured and Asian, thus the whites could be considered as a significant demographic group. The university as a whole enrolled 75% non-white and 25% white students in the year 2011 (Free State University (2010-2011) demographic structure) (www.ufs.ac.za Accessed by 10 March 2012).

Table 7: Marital status of students

Marital Status	Respondents
Never married	97.08%
Living together like husband and wife	1.95%
Divorced/Separated	0.97%
Grand Total	**100%**

Table 7 shows almost two percent of students reported to be living together as husband and wife at home. Almost one percent of students are separated or divorced (0.97). The majority of respondents were never married (97.08%). This is in line with expectations of junior residences on this campus.

4.3 Study section

Table 8: Preferred language of study

Language of study	Respondents
English	73.94%
Afrikaans	26.06%
Grand Total	**100%**

Table 8 shows the preferred language of study of the respondents. The majority of respondents indicated English (73.94%) as their preferred language of study. The other language of study at the university is Afrikaans. The proportion of students preferring to study in English is larger, Student enrolments suggest some non-white students prefer to study in Afrikaans. Historically, the medium of instruction for the university was English, and the name of the University was once University College of the Orange Free State; the Afrikaans version of the name change is the source of the word

used to this day to refer to students of the university (Kovsies). However, in the late 1940s, the medium of instruction was changed to Afrikaans and the university was declared a fully-fledged independent university in 1950, and the name was again changed to the University of the Orange Free State (UOFS).

In 1993, the university adopted a system of a parallel medium of instruction tuition and even today all classes are offered in both Afrikaans and English. In February 2001, the university name changed to the University of the Free State, which was adopted to reflect the new character of the institution and its real environment (www.ufs.ac.za Accessed 15 September 2013).

Table 9: Response rate of sampled residents

List of Junior Residences	Respondents
Rietz	3.25%
Abraham Fischer	3.90%
Kestell	4.22%
N.J. Van der Merwe	4.55%
Emily Hobhouse	4.87%
Karee	4.87%
Armentum	4.87%
JBM Hertzog	5.18%
Villa Bravado	5.84%
Akasia	6.17%
Soet Doring	6.17%
Welwestchia	6.17%
Madelief	6.17%
Vergeet my nie	6.17%
Khayalami	6.17%
Wag ‘n bietjie	6.49%
Tswelopele	6.82%
Roosmaryn	8.12%
Grand Total	**100%**

Table 9 consists of the response rate of interviewed students from 18 junior residences within the University of the Free State. The most responses in terms of female residents were from house Roosmaryn (8.12%), and the least was from house Kestell (4.22%).

Male junior residents were also represented, starting from house Tswelopele to house JBM Hertzog (refer to Table 2). From seven male junior residents house Khayalami (6.17%) was the leading male residence, house Armentum (3.9%) was the lowest in terms of response rate.

House Rietz, in exclusion, represented both male and female respondents. These respondents were interviewed in accordance with prescribed methodology of systematic random sampling upon arrival at their residence. A response rate of 3.25% was achieved.

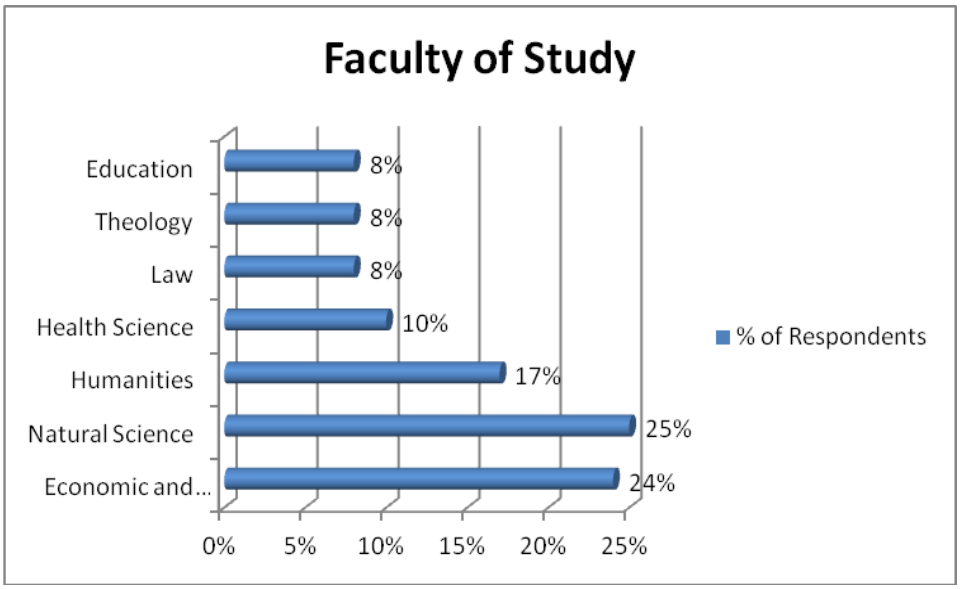

Figure 1: Faculty of study

Figure 1 is a representation of study faculties. The University of the Free State has seven faculties in total. The faculties in terms of student responses in descending order (in junior residences) were faculty of natural and agricultural science (25%), faculty of economic and management science (24%), followed by faculty of humanities with 17%, while faculty of health science had 10% and faculties of education, law and theology all had an 8% response rate. Some faculties may be under represented e.g., the largest faculty should be the Faculty of Management and Economic Sciences. However, some students in these faculties study part time and only come to the University in the evening to attend classes. These students were not targeted since the emphasis in the research was on junior residences on campus.

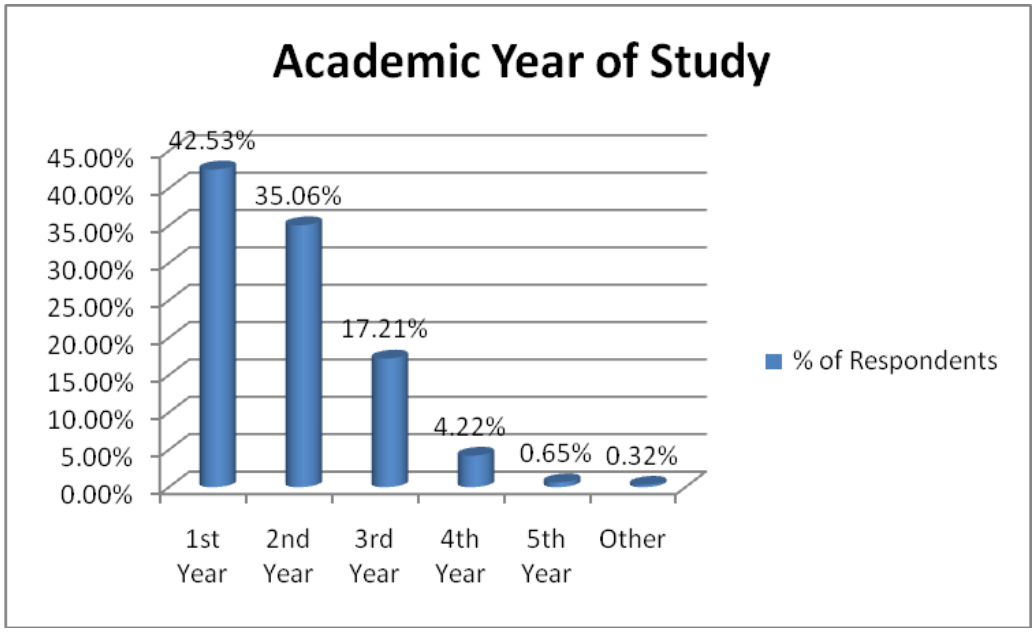

Figure 2: Academic year of study in 2011

Figure 2 presents the distribution of respondents by academic year of study registered in 2011. The majority of students (respondents) were first year academics (42.53%), followed by second academic year (35%) and 17% were third academic year, 4.22% shows those respondents registered for a four year degree who were mostly in their final year. Less than 1% of the respondents studied under senior degree, this is because most students, after their first degree, start residing at senior residences while others look for work opportunities. A few senior students continue to dwell in junior residences.

Looking at the above figure, there is a sudden drop in residents by year, and reasons could be (1) the university accepts the majority first year students every year into campus residence than any other academic year of study. Many universities prefer students to live in the on-campus dorms for the first year or two to help them be acclimated to the university life. Although living on campus is not the cheapest of options, it offers the convenience of a single predictable cost for parents and bursary/study loan holders. Most parents or bursary/study loan holders prefer on-campus room fees, if arranged through university, as they usually quote on a quarter or semester basis. However, even if one lives on campus, accounting for food cost is a separate line item in the university budget. (2) Being first year students, they have had no time to find alternative accommodation at acceptable prices in nearby suburbs. (3) Some students have formed partnerships and living out of university residences becomes convenient. (4) Parents are more likely to let senior students stay away from the university than first years and most second and third year students prefer the freedom offered by living away from the university. Even though living off-campus can be cheaper, it can be filled with financial surprises such as security deposit, unfavorable roommates, and paying rent during seasonal vacations.

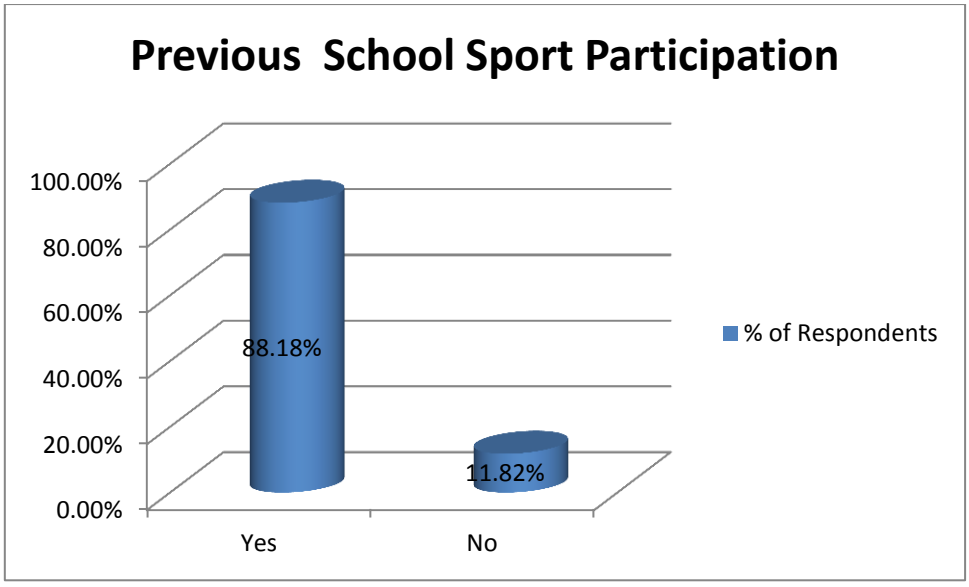

Figure 3: Previous school sport participation

Figure 3 shows response rates by students who previously participated in sports at their former schools and most respondents (88.18%) participated in various sporting activities during their schooling period even though it was not a compulsory activity. Respondents were only questioned about general sport participation.

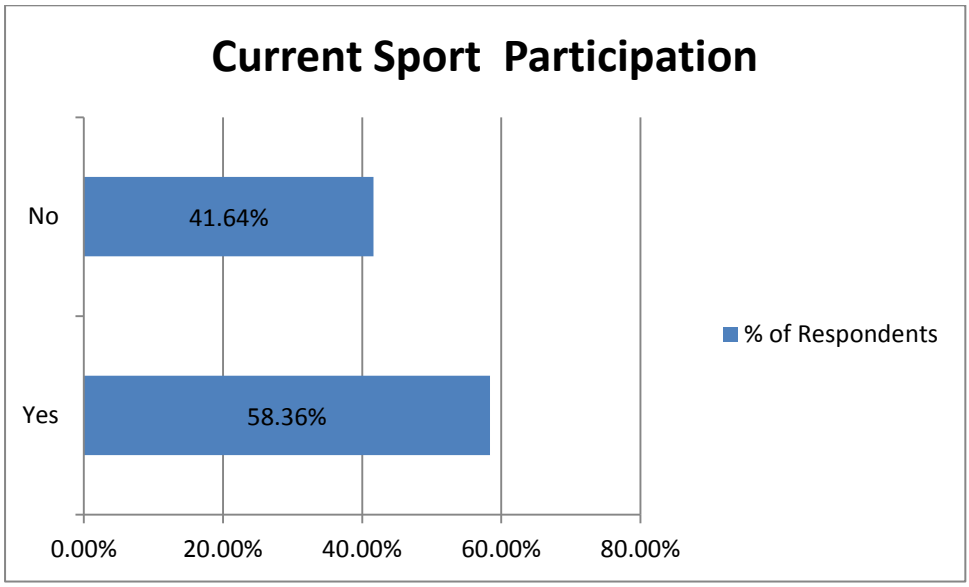

Figure 4: Current sport participation

Figure 4 shows the distribution by student's responses that were participating in sport within the University of the Free State during 2011 academic year. Even though more than 80% respondents showed participation in various sporting activities during their previous schooling period (in Figure 4 only 58.36% junior residence respondents continued to participate in sporting activities whilst they were studying at the university). This sudden drop might be influenced by various factors such as (1) most students, especially first years, tend to focus more on their studies than being involved in

university activities, (2) others rely on being encouraged by their superiors to take part in such activities.

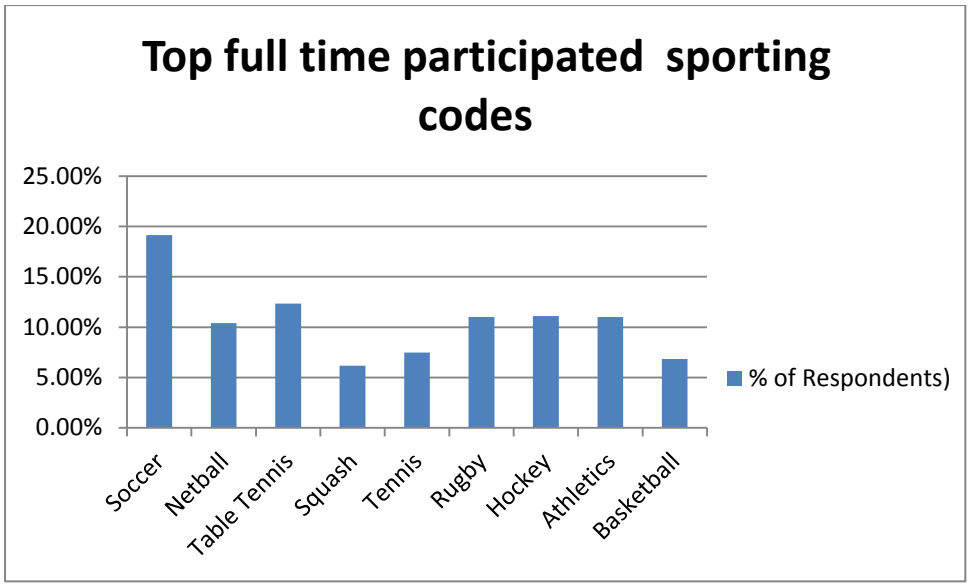

Figure 5: Top full time participated sporting codes

Figure 5 shows representation of top frequently participated sporting codes by percentage within the University of the Free State. Soccer was the most favored (19.16%) sport. Most respondents who answered positively were from male residences and were mainly black, only a few black females indicated their interest in soccer participation.

Table tennis (12.34%) was the second favored sporting code participated in by residents. Participating respondents were both black and white males. Both race and gender were represented equally in respondents who participated in athletics (11%). Hockey (11.1%) was one of the most enjoyed and participated by white respondents both males and females while rugby was participated mostly by white male respondents (11%). Netball (10.39%) was participated and enjoyed by both black and white females. Even though only few white female respondents showed their interest in tennis (7.47%), squash (6.17%) was the least performed sporting code responded to mostly by female white students.

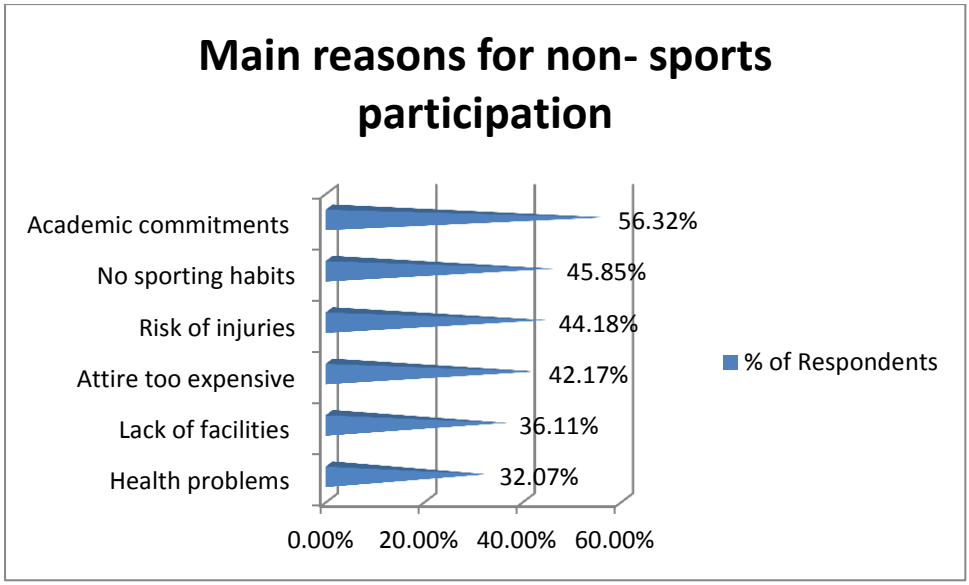

Figure 6: Main reasons for non-sports participation

Figure 6 outlines the six main factors, which influenced reasons for non-participation in sports. Most respondents agreed to have not participated because of their academic commitments (56.35%), the rest were neutral and disagreed. Respondents who did not have sporting habits from former school (45.85%) were also represented. 44.18% were afraid of risk injuries. 42.17% indicated their reason for non-participation as non-affordability of sports equipment or attire for their desired sport. Some respondents (36.1%) indicated their influence in non-participation as lack of facilities for new/type of sport they would like to take up. Only 32.07% indicated health problems including disability and pregnancy.

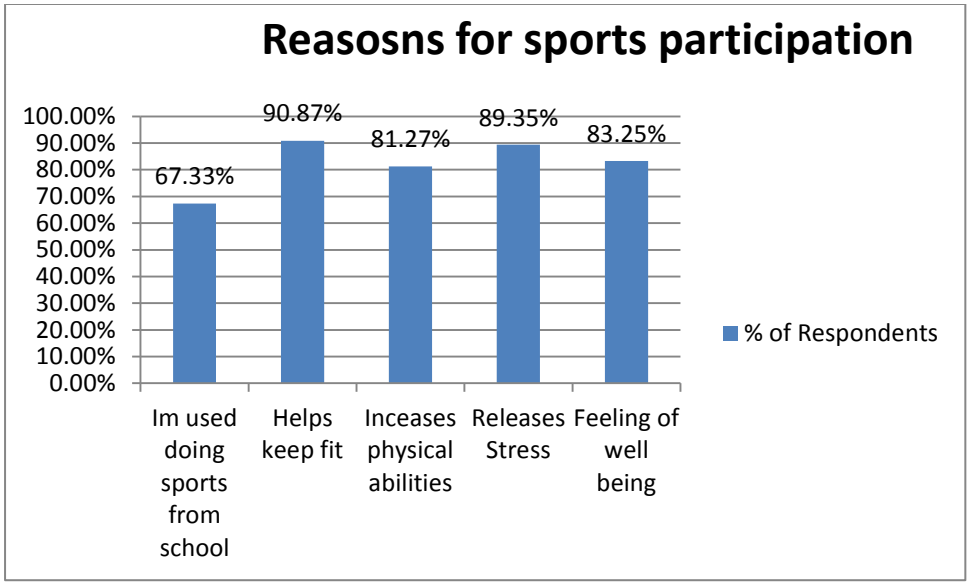

Figure 7: Main reasons for sports participation

Figure 7 explains distribution of top five factors under the variable reasons for sports participation. Each set of blocks represents a response to a question. There are four questions represented in the graph. The majority of respondents participated to keep fit (90.87%), 89.35% indicated participation

to release stress, 83.25% participated to gain a feeling of wellbeing. Increase in physical abilities (81.27%) was also a reason for sports participation, 67.33% showed their interest in participation was because of their previous school sports involvement. This prevalence shows that even though 42% respondents did not participate in any sporting activities, the value of sports involvement was still recognised by students.

Table 10: Suggestions raised by students on how to improve levels of participation at UFS

Suggestions Raised	Blacks	Whites	Males	Females
Get proper funding; organise more kinds of sports	✓		✓	
The university should have orientation on sports and physical test for students who like to try new sport	✓			✓
Provide access and transparency to everyone	✓		✓	
Accommodate off-campus students to participate, and those who want to learn	✓		✓	✓
Make sport more accommodating, interesting and fun		✓		✓
Make public transportation available especially for late games, e.g organise shuttle	✓			✓
Add other sporting codes like gymnastics and dance		✓		✓
Advertise using posters, media, and encourage more students to participate		✓		✓
University should enforce participation from first year students starting at every faculty level not at residence only.		✓		✓
Provide awareness about upcoming trails; create leagues for the university, only friendly games not competitive	✓	✓		✓
Organise competitive games with other universities	✓		✓	
Ensure that every residence within the university participates.				✓
Have beginner's league for students with no previous experience university is a great place to try new sport	✓			✓
Just like other institutions around the country, athletes who represent the university must be paid	✓		✓	✓
Provide assurance of less injuries	✓	✓		✓
Encourage self-belief in rugby	✓		✓	✓
Provision of sport attire to the needy	✓		✓	✓
Unlike rugby field lights, soccer field lights are never switched on at night	✓		✓	

Table 10 presents suggestions, which were raised in general by respondents to improve their interest in sports participation. Each questionnaire had six questions (from question 76 to question 81 of the questionnaire) covering overall comments and suggestions from respondents and those suggestions were grouped into different themes. As there were more than 1800 suggestions raised by respondents (sport participants and non-participants) the researcher opted to best present such information by reporting only those nominated by more than 25% of respondents. Different themes were expressed as follows; (1) Are there any changes to be done to improve sport participation in general at UFS? (2) Are there any changes to be done to improve sports participation among male

and female students? (3) Are there any changes necessary to current sport facilities/equipment at UFS? (4) Are there any changes to be made by directors, coaches and management of sports? (5) Is there any impact either good or bad resulting in sports participation among students at UFS?

The researcher reported this information collectively on race and gender separately since this might encourage different marketing and communication within the university at large. However, a list of all suggestions raised by sampled respondents is compiled and well presented in Annexure D.

CHAPTER 5: DATA ANALYSIS AND RESULTS (T-TEST AND ONE-WAY ANOVA)

5.1 Introduction

In this chapter, the researcher investigates and analyses differences in sport participation. Various comparisons are made to identify any differences in attitude to sport across different demographic groups. The groups could be disaggregated by gender, race, age groups and year of study. The year of study, namely first, second, third or later years did not show any significant differences and will not be discussed further in the study. The results are based on the mean (μ) difference where the original null hypothesis is that:

$\mathrm{H}_0 : \mu_1 = \mu_2$ Versus $\mathrm{H}_1 : \mu_1 \neq \mu_2$.

T -test and one-way analysis of variance (ANOVA) were used as appropriate. Tables are expressed in variables pertaining to different reasons for participation and non-participation in sports. To run the test, a score is constructed on overall reasons for participation and non-participation of students in different sporting codes available at the University of the Free State. The score is calculated by summing up the responses of the students on the questions about reasons for sports participation and non-participation. The questions are 46 to 75 of the questionnaire (see annexure F). The score is assumed to be a continuous variable and normally distributed by appealing to the central limit theorem.

The T test and/or ANOVA are used to test for the differences in the participation and non-participation of students in sporting codes available at the university based on the calculated score. The higher the score, the stronger one feels about the reason for participation or non-participation because the assigned values of strongly disagree = 1, disagree = 2, neutral = 3, agree = 4 and strongly agree = 5.

The means of the first two groups, namely males and females; non-whites and whites are compared using the t-test, since this is a comparison of only two means. The score is assumed to be a continuous statistical variable.

The T -test is used to make inferences about the difference between two population means by assuming:

- The two populations from which the two samples are drawn are normally distributed.
- The samples can be small $\left(n_1 < 30 \quad and ... n_2 < 30\right)$ and independent.
- The population variance $\left(\sigma_1^2 and\ \sigma_2^2\right)$ and are unknown.

The following tables present the findings followed by a brief discussion.

The T -test for the difference in means of males and females is tested below. The hypothesis is tested running the mean procedure on the males and females using SPSS.

H_0 : No differences in opinions between male (M) and female (F) students' sport participation.

vs

H_1 : There are differences in opinions between male and female students' sport participation.

Table 11: Comparisons of reasons to participate by gender

Reason for participation in sport Variable	Mean Scores			T-test	Alternative Hypothesis Supported Yes/ No
	Male (M)	Female (F)	Difference		
Feeling of well being	2.71	2.63	0.09	1.15	No
Releases stress	2.85	2.75	0.11	1.75	No
Helps keeping fit	2.90	2.79	0.11	2.10*	M>F
Increases physical abilities	2.70	2.57	0.13	1.67	No
Friends participate	2.16	2.25	-0.89	-0.40	No
Can meet new people	2.44	2.29	0.15	1.66	No
Gives chance to travel	1.92	1.94	-0.26	-0.26	No
Other financial benefit	1.91	1.77	1.40	1.36	No
Like Competitions	2.66	2.14	0.53	6.57***	M>F
Like prizes	2.46	2.13	0.34	3.70***	M>F
Personal publicity	2.40	2.04	0.37	3.90***	M>F
Certain sports are prestigious	2.50	2.15	0.35	3.72***	M>F
Used to participating in sports at school	2.43	2.21	0.22	2.31*	M>F
There are good coaches for my sport/s	2.03	1.91	0.123	0.185	No

***p<.05; **p<.01; ***p<.001**

Table 11 shows an output of analysed data for gender reasons to participate in sports. First, the Levene test of equality of variances was examined. The results did not show significant differences. The t-values were read from the first row of the computer output (equality of variance assumed). If the test indicated the variances were different, then the t-values were read from the second row of the output (equality of variances not assumed.)The output showing the whole t-test table when equality of variances is assumed and when not assumed is well presented in table 36 (Appendix F).

There is a significant difference, in that male students participate more than female students to keep fit. Most male students participated in sports because they like competitions, prizes, opportunities for personal publicity, belief in certain sports being prestigious and they tend to do more sport at school than female students do.

Men are physically competitive by nature, in most cases they prefer to compete amongst themselves and express their winning power to impress others (especially women). Most men like offering/dedicating their awards to their partners to enhance the quality of being prestigious

(Deaner, 2012). The one objective/purpose of this study is to test the hypothesis that one would expect to find more competitive balance of interest in male sports participation than in women. So the hypothesis should be $\mathrm{H}_0 : \mu_M > \mu_F$.

The results of this analysis are viewed against existing literature. According to Deaner (2012), American men play sports three times as often as American women. After conducting a new research, Deaner said the results challenge a blank slate view of human sex differences, whereby men and women only differ because of social environment that shaped them throughout their lives (Deaner, 2012).

There were no significant differences in other variables. The next table gives reasons for non-participation by gender.

H_0 : No differences in opinions between male (M) and female (F) students' non sport participation.

vs

H_1 : There are differences in opinions between male and female students' non-sport participation.

Table 12: Reasons for not participating by gender

Reason for non-participation in sport					
			Mean Scores		
Variable				**T-test**	**Alternative hypothesis Supported Yes/ No**
	Male (M)	**Female (F)**	**Difference**		
Don't have sporting habits	1.76	1.70	0.58	0.579	No
Academic commitments	1.92	1.92	0.086	0.0009	No
Equipment too expensive	1.71	1.75	-0.45	-0.466	No
No facilities	1.55	1.61	-0.059	-0.622	No
Sports are childish	1.23	1.22	0.001	0.160	No
My friends don't like me to do sports	1.17	1.16	0.04	0.082	No
Sport is waste of time	1.24	1.28	-0.045	-0.663	No
Friends don't do sports	1.39	1.39	0.003	0.0042	No
Religion prevents me from doing sports	1.28	1.22	0.055	0.830	No
Health issues	1.54	1.46	0.083	0.897	No
Risks of injuries	1.97	1.67	0.308	3.202***	M>F
Sports attire exposes body	1.64	1.52	0.115	1.340	No
Find spectators unpleasant	1.57	1.54	0.032	0.356	No
Reluctant to walk to and from sports field	1.71	1.56	0.153	1.669	No
Level of competition is too high	1.64	1.70	0.153	-0.704	No
Found it difficult to be selected for teams	1.70	1.73	0.117	0.176	No

***p<.05; **p<.01; ***p<.001**

Table 12 presents the reasons for non-participation across genders. There is a significant difference between males and females in their perception of risk with rather surprisingly males being more risk averse than females. It can be inferred that male sports may be more prone to participants receiving more serious injuries than in female sports. This finding suggests a need for further research since on the surface it is counterintuitive. However, sporting activities may be classified differently, namely extreme sports and traditional sports.

The meaning of extreme sport is not exact and the origin of the term might be unclear but gained popularity in the 1990s when it was picked by marketing companies to promote sport games and extreme sports channels.

Extreme sports tend to have younger-than-average target demographic and rarely sanctioned by schools. They tend to become more solitary than traditional sports and in most cases men are more likely to participate than women, for example, extreme athletes tend to work on their craft without the guidance of a coach (or hire a coach later), while traditional sporting activities compete against each other under controlled circumstances. Literature also suggests that differences are also present among different racial groups. This conjecture is tested below:

H_0 : No differences in opinions between blacks and whites students' sport in participation.

vs

H_1 : There are differences in opinions between blacks and whites students' sport in participation.

Table 13: Reason for participation in sport by race

Reason for participation in sport Variable	Mean Scores			T-test	Alternative hypothesis Supported Yes/ No
	Blacks (B)	Whites (W)	Difference		
Feeling of wellbeing	2.84	2.60	0.24	3.14***	B>W
Releases stress	2.86	2.77	0.09	1.45	No
Helps keeping fit	2.82	2.84	-0.20	-0.31	No
Increases physical abilities	2.71	2.59	-0.12	1.35	No
Friends participate	2.29	2.19	0.01	0.40	No
Can meet new people	2.25	2.38	-0.13	-1.30	No
Gives chance to travel	1.92	1.94	-0.02	-0.13	No
Other financial benefit	1.67	1.87	-0.20	-1.72	No
Like competitions	2.12	2.41	-0.30	-2.93**	W>B
Like prizes	1.96	2.35	-0.39	-3.84***	W>B
Personal publicity	1.95	2.25	-0.37	-2.86**	W>B
Certain sports are prestigious	2.18	2.32	-0.14	-1.28	No
Used to participating in sports at school	2.39	2.26	0.14	1.25	No
There are good coaches for my sport/s	2.13	2.01	0.12	1.08	No

***p<.05; **p<.01; ***p<.001**

Table 13: Reason for participation in sport by race illustrates that there are significant differences arising from race. There is a significant difference in that black students participate more than white students do to keep fit. Most white students participate in sports because they like competitions, prizes, and personal publicity more than black students do.

Black athletic superiority is the belief that black people possess certain traits that are acquired through genetic and/or environmental factors that allow them to excel over the other races in athletic competitions. A 1991 poll in the United States indicated that half of the respondents agreed with the belief that "blacks have more natural physical ability" Giulianotti, Richard (2005). Edwards (1971) wrote a book about the myth of the black male's racially determined, inherent physical and athletic superiority over white male, rivals the myth of black sexual superiority in antiquity. He claims that Africans from different parts of the continent have different body types and on average excel in different sports. He added that people with ancestral roots in the western region of Africa have bigger, more visible muscles along with a higher number of fast-twitch fibres in their muscles. They also have less natural body fat, narrower hips, and higher levels of testosterone. In 2010, running sports International Journal Design and Aerodynamics reported that black people have a lower centre of mass that benefits them in running sports, and that white people have lower centre of mass that benefits them in swimming, Edwards (1971).

There are socioeconomic factors, which support the researcher's hypothesis that most whites participate in certain sport(s) for competitions, prizes and personal publicity than blacks or Asians do. Ferrante (2011), a professor of sociology at Northern Kentucky University, suggested that geographic location, financial resources, and the influence of peers, parents and role models were involved in channelling individuals of certain races towards particular sports and away from others.

Table 14 reveals an output of analysed data by race; reasons for non-participation in sports using Levene's test for equality of variances and different variables were analysed. The following hypothesis was considered.

H_0: No differences in opinions between blacks and whites students' sport in non-participation.

vs

H_1: There are differences in opinions between blacks and whites students' sport in non-participation.

Table 14: Reason for not participating by race

Reason for non-participation in sport Variable	Mean Scores			T-test	Alternative hypothesis supported Yes/ No
	Blacks (B)	Whites (w)	Difference		
Don't have sporting habits	1.60	1.75	-1.01	-0.89	No
Academic commitments	1.75	1.97	-0.22	-1.91	No
Equipment too expensive	1.62	1.77	-0.15	-1.40	No
No facilities	1.51	1.62	-0.103	-0.96	No
Sports are childish	1.08	1.27	-0.19	-3.58***	W>B
My friends don't like me to do sports	1.08	1.19	-0.12	-2.46**	W>B
Sport is waste of time	1.13	1.31	-0.17	-2.80**	W>B
Friends don't do sports	1.14	1.47	1.47	-4.64***	W>B
Religion prevents me from doing sports	1.20	1.26	-0.06	-0.82	No
Health issues	1.38	1.52	-0.14	-1.37	No
Risks of injuries	1.67	1.82	-0.15	-1.34	No
Sports attire exposes body	1.45	1.61	-0.16	-1.71	No
Find spectators unpleasant	1.49	1.57	-0.09	-0.86	No
Reluctant to walk to and from sports field	1.42	1.69	-0.26	-2.50**	W>B
Level of competition is high	1.51	1.73	-0.22	-2.12*	W>B
Found it difficult to be selected for teams	1.57	1.77	-0.21	-1.92	No

***p<.05; **p<.01; ***p<.001**

There is a significant difference in white's non-participation to blacks. Most whites did not participate in sports because of a belief that sports are childish, their friends do not like them to do

sports, they see sports as a waste of time, their friends do not do sports, they were reluctant to walk to and from sporting fields, and because they perceived the level of competition at UFS as too high. There were no significance differences in other variables.

Racial integration, re-segregation, and controversy at the University of the Free State played a role in enhancing the level of interest in sports participation by students. After having previously been open only to whites, the University of the Free State admitted its first black students in the early 1990s as apartheid in South Africa began to end. Large majorities of students of all races supported racial integration of the housing facilities, and several years later, the University of the Free State was seen as a model integration project (www.ufs.ac.za Accessed 14 September 2014). However, from the mid to late 1990s blacks began to form a larger percentage of the student body, and began to be less enthusiastic about continuing traditions from the white-only history of the Free State University.

Taking into consideration the fact that South African sport is still divided by race, since Bafana Bafana (South African soccer team) days of the1990s; when white players such as Nail Tovey (who captained the team in 1996 when South Africa won African Cup of Nations), Mark Fish (former Bafana Bafana defender) and Erick Tinkler (former middle fielder) were among the core group, which formed the heart and soul of the national team, South Africa has failed to produce similar skilled white players at the highest level, and these could be the reasons of differential participation in most sporting codes by race difference at the university.

5.2 Age group

Some students believe that because they belong to a certain age groups (age differences) they are eligible to participate in any social activity within the university and others do not believe so. The researcher thought that running tests on this variable might indicate differences in sport participation. The one-way ANOVA were run for age group participation and non-participation. No significant differences could be found.

5.3 Marital status

Because there were students with different marital status registered within the university, it would have been more interesting for the researcher to find out how many of them were participating in sports irrespective of their marital status. One-way Anova were run under variable marital status and no significant difference could be found. Sample sizes for the married were rather small.

Table 15 shows an output of analysed data for language study, reasons for participation in sports using Levene's for equality of variances; different variables were analysed and the following hypothesis was considered:

H_0: No differences in opinions between English (E) speaking and Afrikaans (A) speaking students' sport participation

vs

H_1: There are differences in opinions between English speaking and Afrikaans speaking students' sport participation.

English speaking students refers to students using English as a language of instruction at the university. Afrikaans speaking students refer to students using Afrikaans as a language of instruction at the university.

Table 15: Reasons for participation by study language

Reason for participation in sport **Variable**	**Mean Scores**			**T-test**	**Hypothesis supported Yes/ No**
	English (E)	**Afrikaans (A)**	**Difference**		
Feeling of well being	2.61	2.81	-0.20	-2.97**	A>E
Releases stress	2.75	2.89	-0.14	-2.48*	A>E
Helps keeping fit	2.81	2.89	-0.08	-1.42	No
Increases physical abilities	2.57	2.76	-0.19	-2.60**	A>E
Friends participate	2.18	2.30	-0.12	-0.47	No
Can meet new people	2.39	2.23	0.91	1.67	No
Gives chance to travel	1.93	1.93	0.00	0.008	No
Other financial benefit	1.82	1.81	0.12	0.11	No
Like competitions	2.38	2.24	0.14	1.39	No
Like prizes	2.33	2.05	0.28	2.74**	E>A
Personal publicity	2.23	2.03	0.20	1.95*	E>A
Certain sports are prestigious	2.31	2.23	0.08	0.81	No
Used doing sports from school	2.25	2.43	-0.18	-1.67	No
Good coaches	2.00	2.16	-0.12	-1.4	No

***p<.05; **p<.01; ***p<.001**

There is a significant difference in Afrikaans study language for respondents who participated for feelings of wellbeing and stress release, also in English study language for respondents who participated because they like prizes and personal publicity. There were no significant differences in other variables.

The people of South Africa are highly diverse; South Africa has eleven official languages, Blacks make up 79.2%, Whites 8.9%, Coloureds 8.9%, Indians/Asians 2.5% and other/unspecified at 0.5% of the population (Census, 2011). They all come from several different ethnic backgrounds. Most whites are Afrikaans speakers from Dutch, German, French, Huguenot ancestry but there is a substantial English speaking white minority. The remainder of the population are Asian, largely of Indian descent and people of mixed race. By ethnicity 0.7% of black South African residents speak Afrikaans at home, 0.5% speak English at home. About 65% of white residents speak Afrikaans at home, about 35% speak English and 0.5% speaks other official languages at home (Census, 2011).

According to National Census demographics 2011, Sesotho is the most dominant home language in the Free State province, while Afrikaans is widely spoken throughout the province as the first language for the whites and coloureds and the second language by Sesotho, Setswana and isiZulu speakers.

Although the number of first language English speakers is relatively low, it is becoming increasingly important as the language of business and government and thus further evidenced by the shift of tertiary institutions such as University of the Free State from Afrikaans to English/Afrikaans medium of instruction.

Table 16 indicates output of analysed data for study language, reasons for non-participation in sports using Levene's test for equality of variances; different variables were analysed and the following hypothesis was considered:

H_0: No differences in opinions between English speaking and Afrikaans speaking students' sport non-participation.

vs

H_1: There are differences in opinions between English speaking and Afrikaans speaking students' sport non-participation.

Table 16: Reasons for not participating by study language

Reason for non-participation in sport	**Mean Scores**				
Variable				**T-test**	**Alternative hypothesis Supported**
	English (E)	**Afrikaans (A)**	**Difference**		**Yes/ No**
Don't have sporting habits	1.74	1.68	0.06	0.56	No
Academic commitments	1.97	1.76	0.21	1.82	No
Equipment too expensive	180	1.55	0.25	2.31*	E>A
No facilities	1.63	1.49	0.14	1.42	No
Sports are childish	1.25	1.14	0.11	1.89	No
My friends don't like me to do sports	1.18	1.13	0.05	1.03	No
Sport is waste of time	1.31	1.14	0.17	2.73**	E>A
Friends don't do sports	1.46	1.20	0.26	3.38***	E>A
Religion prevents me from doing sports	1.27	1.18	0.09	1.36	No
Health issues	1.51	1.43	0.08	0.82	No
Risks of injuries	1.85	1.61	0.24	2.19*	E>A
Sports attire exposes body	1.59	1.51	0.08	0.81	No
Find spectators unpleasant	1.57	1.49	0.09	0.88	No
Reluctant to walk to and from sports field	1.69	1.43	0.26	2.72*	E>A
Level of competition is too high	1.73	1.54	0.19	1.87	No
Found it difficult to be selected for teams	1.79	1.53	0.26	2.52*	E>A

***p<.05; **p<.01; ***p<.001**

There is a significant difference in English study language for respondents who are not participating because of lack of facilities for learning new sports they would like to take up, because they believe sports are a waste of time, because their friends do not do sports, because there is a risk of injuries, because they are reluctant to walk to and from sporting fields, and because they found it difficult to be selected for teams. Race and language preferences are parallel to race. Most blacks prefer to study in English and most white students prefer to learn in Afrikaans the dominant language among the whites in the Free State.

5.4 Faculty of study

Students have different concepts on how they handle their study routine from different fields of study they fall under, in such a way that they rate the weight of their faculties differently and create a concept that other fields of study propel them to find themselves in classrooms or at the library all the time and limit their social activities such as participating in sports. However, the researcher thought that there were going to be differences in this variable, therefore, the one-way ANOVA was also run under the variable faculty of study and no significant differences could be found.

5.5 Academic year of study

Because of different perceptions that can also create different impressions among students about their level of academic studies registered, either that being first or senior academic year of study, students find themselves in a situation whereby they can or cannot be involved in other social activities ‘ like sports participation’ except studying . The researcher also thought that there were going to be differences, the one-way ANOVA was also run under the variable academic year of study and no significance differences could be found.

CHAPTER 6: DATA ANALYSIS AND RESULTS (CLUSTER COMPARISON OF PROFILE VARIABLES)

6.1 Introduction

In chapter 6, the initial aim was to reduce the number of sports by clustering (there were 22 sports codes). It was assumed that these could cluster into about 4-5 clusters, *inter alia* games that use feet, games that use hands, games that use sticks and possibly water sports and others. Both hierarchical clustering and K-clustering were attempted and the results are in Annexure E. Cluster comparison of profile variables was considered to answer the questions on whether the level of sports participation depends on gender, race, or study language. Differences were then tested to find whether males participate regularly (RP) than females, or females participate occasionally (OP) than males, or whether both males and females appear not to participate at all (NP) are tested in this chapter.

Table 17: Cluster comparisons of profiled variables

Variable	**Mean Score**			**F-test**	**Significance**	**Significance difference Yes/ No**
	Regular participants (RP)	**Occasional Participants (OP)**	**Non participants (NP)**			
Gender	1.587	1.3636	1.6697	7.605	0.001***	NP>OP:F>M
Age group	2.00	2.000	1.9908	0.413	0.662	No
Race	1.6522	1.6136	1.8028	5.126	0.006***	NP>OP:W>B
Study Language	1.3261	1.5000	1.1972	9.852	0.000***	OP>NP:A>E
Faculties	3.6087	3.8636	3.4817	0.712	0.491	No
Class hours	1.3696	1.5682	1.4633	1.733	0.169	No
Academic year of study	1.9565	1.8636	1.8624	0.21	0.804	No
Study year	1.2609	1.2727	1.2702	0.390	0.677	No

Table 17 shows output comparisons of different variables across sport participation levels. The classification variable was participation level (a) regular participants (RP), (b) occasional participants (OP) and (c) non-participants (NP) of all variables listed as profiles. Hypothesis testing from ANOVA procedure using SPSS were run and the following results were obtained. For F- test if $p < 0.05$, it shows that at least one pair is significantly different. At this stage at least one pair is significantly different. $H_0 : \mu_{RP} > \mu_{OP}$.

The classification variable was participation level (a) regular participants (RP), (b) occasional participants (OP) and (c) non-participants (NP) of all variables listed as profiles. Hypothesis testing from ANOVA procedure using SPSS were run and the following results were obtained. There is a significant difference in that majority of females were not participating (NP) in sports compared to males who participated occasionally (OP). Another significant difference reveals where: whites show a total lack of participation (NP) compared to blacks who participated occasionally (OP).

There is a significant difference in study language, where students studying in Afrikaans participated more in occasional cases than those studying in English who did not participate at all. There were no significance differences in others variables.

Post hoc analysis is shown in the last column of table 17.

Table 18: Construct comparisons of reasons for participation in sports

Reason for participation in sport	Mean Score			F-test	Significance	Significance difference Yes/ No
Variable	**Regular participants (RP)**	**Occasional Participants (OP)**	**Non participants (NP)**			
Feeling of well being	2.6957	2.7500	2.6376	0.630	0.533	No
Releases stress	2.8478	2.9318	2.7431	2.671	0.071	No
Helps keeping fit	2.8300	2.9500	2.8100	1.586	0.206	No
Increases physical abilities	2.7800	2.9300	2.5200	8.787	0.000***	RP and OP>NP
Friends participate	2.2800	2.9500	2.0500	4.326	0.014	No
Can meet new people	2.3900	2.5500	2.3000	2.084	0.1260	No
Gives chance to travel	1.8700	2.2000	1.8900	2.6313	0.0750	No
Other financial benefit	1.7000	1.9800	1.8200	1.1570 0	0.316	No
Like Competitions	2.2800	2.4500	2.3300	0.6260	0.5350	No
Like prizes	2.260	2.1400	2.2800	0.5990	0.5500	No
Personal publicity	1.9800	2.3400	2.1900	2.2600	0.1060	No
Certain sports are prestigious	2.3300	2.4500	2.2250	1.2170	0.2980	No
Used to participate in sports at school	2.6500	2.5200	2.1700	8.9050	0.0000***	RP and OP>NP
There are good coaches for my sport/s	2.2800	2.0900	1.9800	2.5100	0.083	No

Table 18: Construct comparisons of reasons for participation in sports reveals output comparisons analysed data for variables under reasons for participation in sports of different levels of occasions in sports. The means were from regular participants (RP), occasional participants (OP) and non-

participants (NP) of all variables listed. Hypothesis test from ANOVA procedure using SPSS were run and the following results were obtained.

There is a significant difference in that regular participants are students participating in sports to increase their physical abilities, than occasional and non-participants. There is also a significance difference in that regular participants are those who used to participate in previous schools than occasional participants (OP) and non-participants (NP).

Students who believe that sports increase physical abilities regularly and occasionally participate more than those who did not believe. Students who previously participated in school sports participated more than those without that background.

There were no significance differences in other variables. After rejecting the null hypothesis using F-test, to further know which pairs are statistically different, the one way ANOVA and the use of Tamhane's t2 post hoc test equality of variances (Not assumed) were run to look at pairwise comparisons in Table 38 (Appendix G).

Table 19: Cluster comparisons of reasons for non-participation

Reason for non-participation in sport	Mean Scores				Significance	Significance difference Yes/ No
Variable	Regular participants (RP)	Occasional Participants (OP)	Non participants (NP)	F-test		
Don't have sporting habits	1.65	1.64	1.75	0.510	0.601	No
Academic commitments	1.63	1.77	2.01	4.180	0.016***	NP>RP
Equipment too expensive	1.72	1.73	1.74	0.014	0.986	No
No facilities	1.72	1.57	1.57	0.654	0.520	No
Sports are childish	1.15	1.18	1.24	0.691	0.502	No
My friends don't like me to do sports	1.11	1.20	1.17	0.616	0.541	No
Sports is waste of time	1.26	1.25	1.22	0.014	0.984	No
Friends don't do sports	1.11	1.25	1.48	6.841	0.001	NP>RP
Religion prevents me from doing sports	1.15	1.25	1.26	0.701	0.494	No
Health issues	1.46	1.43	1.50	0.195	0.823	No
Risks of injuries	1.63	1.70	1.83	1.386	0.252	No
Sports attire exposes body	1.52	1.55	1.58	0.164	0.849	No
Find spectators unpleasant	1.52	1.34	1.60	2.192	0.113	No
Reluctant to walk	1.46	1.41	1.70	3.678	0.026***	NP>RP
Level of competition is too high	1.52	1.36	1.78	6.255	0.0002***	NP>RP
Difficult to be selected for teams	1.52	1.55	1.78	2.322	0.1000	No

Table 19 gives an output of comparisons of analysed data for variables under reasons for non-participation in sports. Different levels of occasions in non-participation sports are compared. The means were comparisons for regular participants (RP), occasional participants (OP) and non-participants (NP) of all variables listed. Hypothesis testing from ANOVA procedure using SPSS were run and the results in Table 19 were obtained. There is a significant difference in that students who did not participate in sports felt that sports interfered with their study commitments more than those who participated regularly.

There is also a significant difference between students with friends who participate in sport compared to those whose friends did not. If friends did not participate, then the respondent did not participate.

The respondents who did not participate were more reluctant to walk to from and from sporting fields than those who participated regularly or occasionally.

Those who did not participate at all felt that a sport was too competitive more than those who participated occasionally.

There is a significant difference in that most students never participated in sports than they would have performed regularly, simply because their friends did not do sports. A significant difference was noticed when more students never participated in sports because of their reluctance to walk to and from the sporting field than they would perform regularly. There is also a significant difference that more students were non-sports participants than regular because the level of competition at the university is too high. After rejecting the null hypothesis using F-test, to further know which pairs are statistically different, the one way ANOVA and the use of Tamhane's t2 post hoc test equality of variances (Not assumed) were run to look at pairwise comparisons in Table 39 (Appendix G).

There were no significance differences in other variables.

6.2 Exploratory factor analysis

The central idea of exploratory factor analysis (EFA) is to reduce the dimensionality of a data set consisting of a large number of correlated variables, while retaining as much as possible of the variation present in the data set, using fewer meaningful variables. It also allows measuring how reliable ideas or concepts are. Factors obtained will then be used for further analysis. This is achieved by transforming the original variables to a new set of variables, the principal components (PCs), which are uncorrelated, and which are ordered so that the first few retain most of the variation present in all of the original variables. Rotated component matrix tables are created in SPSS and the following will be analysed:

- Univariate descriptive: we want to know the mean, standard deviation, and Number of observations.
- Correlation matrix: the Kaiser-Meyer-Olkin (KMO) and the Bartlett's test of sphericity will be used to measure quality of data used.

6.3 Extraction of factors

In order to run the principal component analysis (PCA) it should be taken into consideration that the variables included must be metric level or dichotomous nominal level. The sample size must be 50 or greater than. The number of valid cases for this set of variables is 308 for this study. The ratio of the cases to fraction in the principal component analysis should be at least five to one. With 308 and 75 variables (questions number 24 to 75); the ratio of the cases to variable is 4.10 to one, which meets the requirements for EFA (Rencher, 2002).

The correlation matrix for the variables must contain two or more correlations of 0.30 or greater. In this set of variables there is a substantial amount of correlation in the matrix greater than 0.30.

One variable was removed from this research since variables with measures of sampling less than 0.5 must be removed. The Kaiser-Meyer-Olkin measure of sampling adequacy is 0.50 or higher and for this study it is 0.699. The Bartlett's test of sphericity gives a value less than the level of significance and the Bartlett's test is $p < .001$, which satisfies the requirement.

The first phase of a principal component analysis is devoted to verifying whether the requirements are met (there is no reason not to use it or change it); if they are not met, factor analysis is not appropriate.

The second phase of the principal component factor analysis focuses on deriving a factor model, or pattern of relationships between variables and components that satisfies the following requirements:

- The derived components should explain at least 50% or more of original variable's variance, so the communality value for each variable should be 0.70 or higher.
- For this research, they were all higher than 0.50. None of the variables has a loading, or correlation of 0.40 or higher for more than one component.
- If an item has a complex structure it must be removed because of cross-loading.
- For this study variables (from question 46 to question 59: reasons to participate in sport) were removed. None of the components has only one variable in it. To meet this requirement, problematic variables were removed from the analysis then principal component analysis was repeated.

- To run this method, SPSS is used. Eigen values-greater-than-one rule was used to determine number of factors extracted.
- It explains how many factors summarise the original data in the case of five factors.

Table 20 gives the factor loading of five principal components. The extraction of principal component amounts to a variance maximising (varimax) rotation of the original variable space. This type of rotation is called variance maximising because the criterion is to maximise the variance (variability) of the new variable (factor) or to maximise differences between factors extracted, this is achieved by minimising the variance around new variable (cross loadings). Options were sorted by size and loadings were arranged according to size. Small coefficients were suppressed to allow clean output by removing small cross loadings.

Table 20: The extraction of principal component (reasons to participate in sports)

Total variance explained			
Component	**Extraction sums of squared loadings**		
	Total	**% of Variance**	**Cumulative %**
1	3.662	26.157	26.157
2	1.814	12.955	39.112
3	1.245	8.895	48.007
4	1.174	7.671	55.678
5	1.011	7.7219	62.897

Table 20 shows the variance explained by the extracted factors before rotation. The cumulative variance explained by these five factors in the extracted solution is 62.897%.

Component 1 describes the feeling of well being "There is a feeling of well-being for students who participate in sport at the university", and component 1 has a strong positive relationship with the well-being of the students either physically or mentally while taking part in sporting activities.

Component 2 includes "Stress release". There is a strong positive relationship among students who participated in sports within the university and being stress free, in component 2 there is a high correlation between the variables of component 2.

Component 3 includes "The keeping fit" There is physical evidence of fitness among students who participate in sports within the university. There is a strong positive relationship between component 3 and the variables.

Component 4 includes the "increases in physical abilities" and sports participation amongst students, there is a strong positive relationship between component 4 and the variables.

Component 5 includes that "My friends participate" there is a strong pressure influence in sports participation among students within the university. There is a strong positive relationship between component 5 and the variables.

The five components explain 63.0% of the total variance in the variables, which are included in the components. The number of variables has been reduced from 14 to five.

Table 21: KMO and Bartlett's test (reasons for sports participation)

Kaiser-Meyer-Olkin measure of sampling adequacy		0.769
Bartlett's test of sphericity	Approx. chi-square	949.621
	Df	91
	Sig.	0

Indicating the suitability of data for the structure detection, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value is 0.769. This value indicates the proportion of variance that might be caused by underlying factors. High values close to 1.0 generally indicate that the factor analysis may be appropriate; in this case 0.769 is close to the value 1.0, which means that factor analysis is appropriate for this data. If the (KMO) value is less than 0.50 the results of the factor analysis probably won't be useful.

Bartlett's test of sphericity tests the hypothesis that correlation matrix is an identity matrix, which would indicate that variables are correlated and, therefore, unsuitable for structure detection. Small values less than 0.005 of the significance level indicate that a factor analysis may be useful with the data; in this case significance level is 0.000, which means that factor analysis is appropriate.

Table 22: Factor loading of the five principal components (rotated component matrix): Reasons to participate in sports

Rotated Component Matrix					
Variables	**Components**				
	1	2	3	4	5
Sports are prestigious	.741				
Release stress		.842			
Feeling of well being		.794			
Keeping Fit		.724			
Meet new people		.729			
Financial benefit			.854		
Friends participate					.824

Table 22 explains that the fourth factor is largely unaffected by rotation, but the first two are easier to interpret. The first rotated factor can be interpreted as "sports prestige". The second factor can be interpreted as "feeling of wellbeing" The third factor is "financial benefit" and the fifth is

"participation of friends". Thus, factor 1, 4 and 5 are single item scales while factor 2 is a multi-item scale.

6.4 Item analysis

Item analysis is a process which examines student's responses to individual test items (questions) in order to assess the quality of those items and of the test as a whole. Item analysis is especially valuable in improving items, which will be used in later tests, but can also be used to eliminate ambiguous or misleading items in a single test administration. Item analysis is valuable for increasing instructor's' skills in test construction, and identifying specific areas of course content, which needed emphasis or clarity content[8].

6.5 Statistical reliability

Statistical reliability is needed in order to ensure validity and precision of the statistical analysis. It refers to the ability to reproduce the results repeatedly as required. This is essential as it builds confidence in the statistical analysis and the results obtained. Table 23 shows a fair uniform distribution of measure of reliability and interpretation.

Table 23: Measure of reliability and interpretation

Reliability	Interpretation
.90 and above	Excellent reliability; at the level of best standardised tests
.80- .90	Very good for a classroom test
.70-.80	Good for a classroom test; in the range of most. There are probably a few items which could be improved
.60-.70	Somewhat low. This test needs to be supplemented by other measures. (e.g., more tests) to determine grades. There are probably some items which could be improved
.50-.60	Suggested need for revision of test, unless it's quite short (ten or fewer items).
.50 or below	Questionable reliability. This test should not contribute heavily to the course grade, and needs revision.

6.6 Cronbach's alpha: an index of reliability

Reliability comes from the forefront of variables developed from summated scales and used as a predictor component in objective models. Variables derived from test instruments are declared to be reliable only when they provide stable and reliable responses over repeated administration of the rest.

If one was given an evaluation survey it would have been nice to know that the instrument used will always elicit consistent and reliable responses even if original questions were replaced with

[8] (www.washingtonedu/oea/score1.htm Accessed 25 September 2013).

other similar questions. When we have a variable generated from such a set of questions that returns a stable measure then the variable set is reliable.

Cronbach's alpha equation 6.1 is an index of reliability associated with the variation accounted for by the true score of the underlying construct. A construct is the hypothetical variable that is being measured (Hatcher, 1994).

The alpha coefficient ranges in the value from zero to one and may be used to describe the reliability of factors extracted from the dichotomous (questions with two possible answers) or multi-point formatted questionnaire or scales (i.e. rating scale 1= poor, 5= excellent).

The higher the score, the more reliable the generated scale is. However, Nunnally (1978) has indicated 0.7 to be an acceptable reliability coefficient but lower thresholds are sometimes used in the literature.

Cronbach's alpha is defined by the following equation:

$$\alpha = \frac{\mathrm{K}}{\mathrm{K}-1}\left(1-\frac{\sum_{i=1}^{k}\sigma_{\mathrm{Y}i}^{2}}{\sigma_{\mathrm{X}}^{2}}\right) \qquad \textbf{(6.1)}$$

where

K= Number of components ,

$\sigma_{\mathrm{X}}^{2} =$ Variance of the observed total test scores,

$\sigma_{\mathrm{Y}i}^{2} =$ Variance of component i for the current sample of persons.

In Table 26 factors that came out with acceptable Chronbach alphas are grouped as follows:

(1) 69, 72. 73 and 71----lack of interest
(2) 64, 68, 66 and 65----sports are waste of time,
(3) 74 and 75----competitiveness of sports.

The others do not form reliable factors since Cronbach alphas are below .60. Cronbach alphas above .65 are acceptable (Nunnally, 1978). They are not the best, but acceptable.

Table 24: The extraction of principal component (reasons for non-participation in sports)

Total Variance Explained			
Component	**Extraction Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**
1	4.034	25.211	25.211
2	1.501	9.379	34.590
3	1.482	9.266	43.866
4	1.159	7.246	51.102
5	1.015	6.343	57.445

Table 24: The extraction of principal component (reasons for non-participation in sports) explains that component 1 describes the lack of sporting habits as "There is lack of sporting habits for students who do not participate in sport at the university" and component 1 has a strong positive relationship with the lack of sporting habits amongst students, hence non-involvement in sporting activities is experienced.

Component 2 includes "Academic commitments don't allow me". There is a strong positive relationship among students who did not participate in sports within the university and having too much academic commitment, in component 2 and there is a high correlation between the variables of component 2.

Component 3 includes "No opportunity for learning new sports." There is significant evidence for lack of opportunities in teaching new sports to students who did not participate in sports within the university. There is a strong positive relationship between component 3 and the variables.

Component 4 includes "No facilities and non-participation amongst students". There is a strong positive relationship between component 4 and the variables.

Component 5 includes "My friends don't approve my participation," "there is a strong peer group pressure in failure for not taking part in sporting activities among students within the university". There is a strong positive relationship between component 5 and the variables.

The five components explain 57.0% of the total variance in the variable, which are included on the components. The number of variables has been reduced from 16 to 5.

The factor solution explains at least half of each original variable's variance; in this case the communality value for each variable exceeds 0.50.

Table 25: KMO and Bartlett's test (reasons for non-participation)

Kaiser-Meyer-Olkin measure of sampling adequacy		.779
Bartlett's test of sphericity	Approx. chi-square	1025.492
	Df	120
	Sig.	.000

Table 26: Item-total statistics (reasons for non-participation)

	Scale mean if item deleted	**Scale variance if item deleted**	**Corrected item-total correlation**	**Squared multiple correlation**	**Cronbach's alpha if item deleted**
63. There are no learning facilities for new sports	2.98	1.332	**.410**	.179	**.289**
64. Sports are childish	3.67	1.348	**.523**	.274	**.569**
65. My friends don't like me to do sports	3.73	1.580	**.491**	.243	**.605**
66.Sports is waste of time	3.63	1.335	**.457**	.238	**.621**
67. My friends don't do sports	3.32	1.881	**.235**	.57	**.560**
68.My religion prevents me from doing sports	3.65	1.414	**.402**	.184	**.653**
69.I have some health problems including (pregnancy, disability)	6.53	4.869	**.365**	.148	**.675**
70. There is risk of injuries	6.23	4.639	**.397**	.183	**.664**
71. Sports attire exposes body	6.44	4.782	**.473**	.259	**.631**
72. I find spectators unpleasant	6.46	4.425	**.548**	.351	**.596**
73. I am reluctant to walk to and from sports field	6.39	4.598	**.457**	.254	**.636**
74. The level of competition at UFS is too high	1.72	0.664	**.523**	.274	
75. I found it difficult to be selected for teams	1.68	0.623	**.523**	.274	

Table 27: Factor loadings of the five principal components: (reasons for non-participation) rotated component matrix

Rotated component matrix					
Variables	**Components**				
	1	2	3	4	5
Spectators are unpleasant	.698				
Sports are childish		.752			
My religion don't do sports		.711			
No facilities			.744		
No opportunities for learning new sports			.734		
Level of competitions is too high				.835	
Difficult to be selected in teams				.737	
Academic commitments are too much					.752
No sporting habits					.703

CHAPTER 7: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

In this chapter, results are to be discussed further, conclusions and recommendations are given.

The aim of the research is to find reasons for participation and non-participation in sports among students residing at junior residences of the University of the Free State (main campus), and identifying participant's satisfaction level and reasons for non-participation in sports. UFS sports department (Kovsie Sport) organises a large number of sporting activities for students and staff. The main objective is to assess and quantify participation in sporting activities by students, and to determine factors influencing their intentions to participate or not to participate. The intention is also to provide feedback to management of sports about the outcome of the findings of the research. This will enable assessment on students' perception about sports so that Kovsie can enhance student interest and participation.

7.2 Findings and conclusions

The following is a summary of the findings analysed in chapter(s) 4, 5, and 6 as well as conclusions on the findings.

Sport is an essential activity in the development of any individual person. It assists in the stimulation of the brain, hence assisting in the improved performance in school work. Further, it is another form of exercise, which becomes very important to people with disabilities. Through sports, students are able to interact with one another and participate in different sporting codes offered by the university.

The researcher interviewed students between the age groups of 17 to 25 during the course of the research. It became evident that junior residents of the University of the Free State comprise a majority of students within the 17 to 25 age groups and most of these students are undergraduates in early stages of their first degrees. The students often complete the final year at high school (grade 12) at the age 18 years and immediately proceed with their tertiary education. However, some students fail to attend during their teen years for various reasons such as inability to raise the university fees, poor results, pregnancy, and many other reasons.

Three hundred and eight (308) students living in junior residences were interviewed for this research and participation of 61% females and 39% males was achieved.

It is reported in Chapter 4 that the majority of the participants in terms of race were non-whites (blacks, colored's, and Asians) who constituted 75% of responses, the prevalence was. However, in line with the University of the Free State 2010/2011 demographic structure (i.e. 75% non-whites and 25% whites). Initially the researcher wished to conduct a survey on all residences (senior and junior) around the campus**.** Permission was granted by the dean of residences to conduct the survey at junior residences only, as period of request was close to examination sittings, and there was some concern about possible disruption to students preparing for the examinations. As further explained

in Chapter 4, the majority of respondents indicated English (74%) as their preferred language of study. The other language of study at the university is Afrikaans.

It has become a norm/culture of the university that at the beginning of each year before lectures commence, orientations are held especially to students residing on campus residences. This kind of orientation is usually offered to first year students with the aim of familiarising themselves with the new environment, as they are briefed about university life.

During registration process, students complete forms for administration purposes, and some students, during survey interviews, requested that questions on interest in sports participation appear in these forms to enhance their interest. However, some insisted that it remains their responsibility to enquire further about such, should they feel interested.

According to a report in Figure 2, first years were more in academic years of study (43%) followed by second academic year 35% and 17% respondents represented third academic year(s). This shows that the majority of the participants in the survey were first years. Figure 3 shows more than 80% of the respondents participated in various sporting activities during their previous schooling period and Figure 4 shows that only 58 % of students continued to participate in sporting activities within the university. This shows that most students who used to participate in sports during their former school days did not continue when they arrived at the university because of various reasons mentioned; they tend to focus more on their studies than being involved in university activities. Others rely on being encouraged by their superiors to take part in such activities.

It has also been reported in Figure 5 that soccer was the most favored (19.16%) sport in junior residences. Most respondents who answered positively were black male residents. Only a few black females indicated their interest in soccer participation. Respondents have raised their concerns regarding unfair treatment when it comes to race. They have abandoned soccer fields that do not have lighting and as a result, they struggle to play their games at night.

Table tennis (12.34%) was the second favored sporting code participated in by residents and the respondents were a good mix of black and white males particularly from male residences. Respondents who participated in athletics (11%) represented both race and gender equally. Hockey (11.1%) was one of the third favoured and participated by white respondents both males and females while rugby (11%) was mostly participated by white male respondents. The researcher probed more on what interests different races the most, as there was less positive responses by blacks on rugby participation. Black students are of the opinion that they are not given a fair chance to be selected in the rugby team, as whites are mostly favoured. Both black and white females mostly participated in netball (10.39%). White female respondents showed their outmost interest in tennis (7.47%) while squash (6.17%) was the least performed sporting code responded to mostly by female white students.

As reported in Figure 7, the researcher probed more on reasons for participating in sporting activities and the majority participated to keeping fit (91%). On another question, 89.35% indicated participation to release stress, and on yet another question (83%) participated to gain a feeling of wellbeing. Increase in physical abilities (81%) was also a reason for sports participation according to responses to a question. In another question, 67% showed their interest in participation was because of their previous school sports involvement. The researcher picked up that students from

second academic year upwards mostly raised this positive response, and they mostly emphasised that they could not do well at their studies without some regular excises. This concludes that regular exercises indeed play a major role in human development. The physical action could be beneficial for the human brain and its functional wellbeing (Kravitz, 2007), especially in students.

The researcher continued to probe more to gather information on reasons for non-participation in sports and Figure 6 explains that 56.35% students agreed to have not participated because their academic commitments did not allow them to do so. The rest were neutral and disagreed. In responses to other questions, students did not have sporting habits from their former schools (45.85%). Further, a proportion of 44, 18% respondents did not participate because they were afraid to risk injuries. 42.7% indicated unaffordability of sports equipment or attire in response to a question. The researcher picked up that black students of both genders raised these concerns. A proportion of 36.1% indicated their lack of participation as lack or inadequate facilities for new sports they would have liked to take up. This suggests that there are not enough facilities available at the University for students to learn new sports. On a health question, only 32.07% indicated health problems including disability and pregnancy.

According to Table 10 in Chapter 4, suggestions raised in general by respondents to improve their interest in sports participation were grouped into different themes. As there were too many suggestions raised, the researcher opted to best present such information by reporting only those nominated by more than 25% of respondents. The researcher reported this information collectively on separate race and gender since this may encourage different marketing and communication within the university and especially at Kovsies. Further, the rest of the suggestions mentioned are discussed in annexure D.

In Chapter 5, it is reported based on Tables 11 and 12 that there is a significant difference in that males participate more than females to keep fit. Most males participated in sports because they like competitions, they like prizes, opportunities for personal publicity, belief in certain sports being prestigious and that males are used to doing sports from school more than females. There is also a significant difference between males and females in their perception of risk with rather surprisingly males being more risk averse than females. It can be inferred that male participant's sports may be more prone to receiving more serious injuries than in female sports. Therefore, this finding suggests that a need for further research since on the surface it is counterintuitive.

Tables 13 to 14 further suggest that there is a significant difference between racial groups in that blacks participate more than whites to keep fit. Most whites participated in sports because they like competitions, they like prizes, they like personal publicity, than blacks. There is a significant difference between white and black non-participation than in blacks. Most whites did not participate in sports because of the belief that sports are childish, their friends don't like them to do sports, they took sports as a waste of time, their friends don't do sports, and they were reluctant to walk to sporting field to participate. They also perceived that the level of sports competition at UFS was too high, in comparison with other tertiary institutions. Tables 15 to 16 show that there is a significant difference in English study language for respondents who are not participating because of lack of facilities for learning new sports they would like to take up, because they believe sports are waste of time, their friends do not do sports, there is a risk of injuries, they are reluctant to walk to sporting fields, and because they found it difficult to be selected for teams. Race and language preferences

are parallel to race. Most Blacks prefer to study in English and most White students prefer to learn in Afrikaans, the dominant language among the whites in the Free State.

In Chapter 6, Tables 17 to 18 shows that another significant difference was that most whites never participated (NP) in sport than blacks who participated occasionally (OP). However, there is a significant difference in study language, where students studying in Afrikaans participated more in occasional cases than those studying in English who did not participate at all. There is also a significant difference among regular participants, those used to participating in previous schools, occasional participants (OP) and non-participants (NP). Students who believe that sports increase physical abilities regularly and occasionally participate more than those who did not believe. It is thus concluded that students who previously participated in school sports participated more than those without that background. Furthermore, the aim of Chapter 6 was to reduce the number of sports by clustering (there were 23 sporting codes). It was assumed that these could cluster into about 4-5 clusters, *inter alia* games that use feet, games that use hands, games that use sticks and possibly water sports and others. Both hierarchical clustering and K-clustering were attempted and the results are in annexure E. The most satisfactory appears to be a three-cluster solution with reasonable numbers in each cluster. The clusters can be used to analyse interest in and level of participation in sports at the University of the Free State.

Table 19 shows that there is also a significant difference between students with friends who participate in sport compared to those whose friends did not. If friends did not participate, then the respondents did not participate. The respondents who did not participate were more reluctant to walk to the sporting fields than those who participated regularly or occasionally. Those who did not participate at all felt that sports were too competitive more than those who participated occasionally. However, as far as relative/parental support is concerned, according to Hoyle and Leff (1997) sports participants who reported a higher level of parental support tended to report greater enjoyment of sports, and view sports as important part of their lives. In agreement with this, 60% of respondents said that relatives or parents play an important role in sport activities. They agreed that with the parent and relative involvement, their motivation is heightened. They also agreed that parent encouragement and involvement is one of the main factors for their success in the sport. Thus, parents are important role models who imprint their values and attitudes on their children. These values and love for sport may continue even when the students have left home for university studies.

The principal components analysis is performed to reduce the questionnaire questions to the most relevant ones for the research and to find a correlation between variables and group them into components. The five components explain 63.0% of the total variance in the variable which are included on the components. The number of variables has been reduced from 14 to 5.

Component 1 describes “the feeling of well-being”. Component 2 includes “stress release”. Component 3 includes “keeping fit”. Component 4 includes “increases in physical abilities” and “sports participation amongst students”. Component 5 includes “my friends participate”.

The researcher concluded that these variables are the most important variables that the Kovsie Sport and management of sports and the university should focus on in order to encourage students to participate in sporting activities.

The study came to a conclusion that the majority (approximately 60%) of students have the potential to participate effectively and become professionals, irrespective of their limitations. Further, students from all races and gender should acquire adequate encouragement to enhance their interest to participate continuously. However, there is room for improvement.

These factors could have been used for comparisons of one-way ANOVA and for the various T-tests. This was not done in order to capture the richness in the data by using the original questionnaire. Admittedly, the questionnaire was never designed with exploratory factor analysis as a primary objective.

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ANNEXURE A: DESCRIPTIVE ANALYSIS FOR PARTICIPATION IN OTHER SPORTING CODES

This section explains frequency distribution of respondents' participation in other sporting codes available at the UFS as per question 24 to question 45 of the questionnaire (Annexure F).

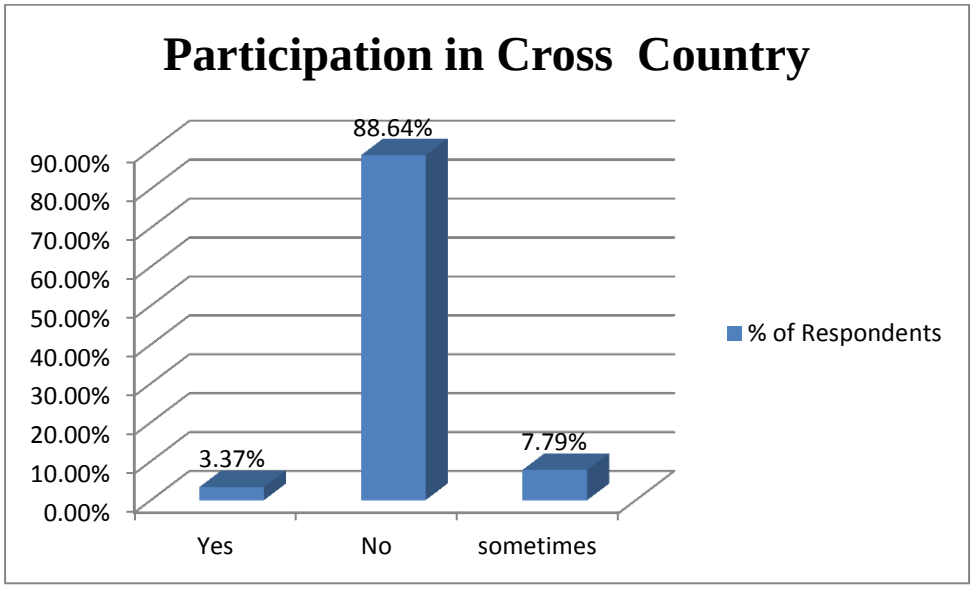


Figure 8: Participation in cross country

Figure 8: Participation in cross country, shows that most respondents (88.64%) did not participate in cross country. These are respondents who indicated their lack of knowledge and understanding of the sporting code but were willing to try should they be awarded an opportunity to do so. 7.79% participated sometimes, these respondents explained that they have a minimal knowledge of the sport but rely on others to teach them. Only 3.37% of respondents indicated their frequent participation in the sport and having the best knowledge in it.

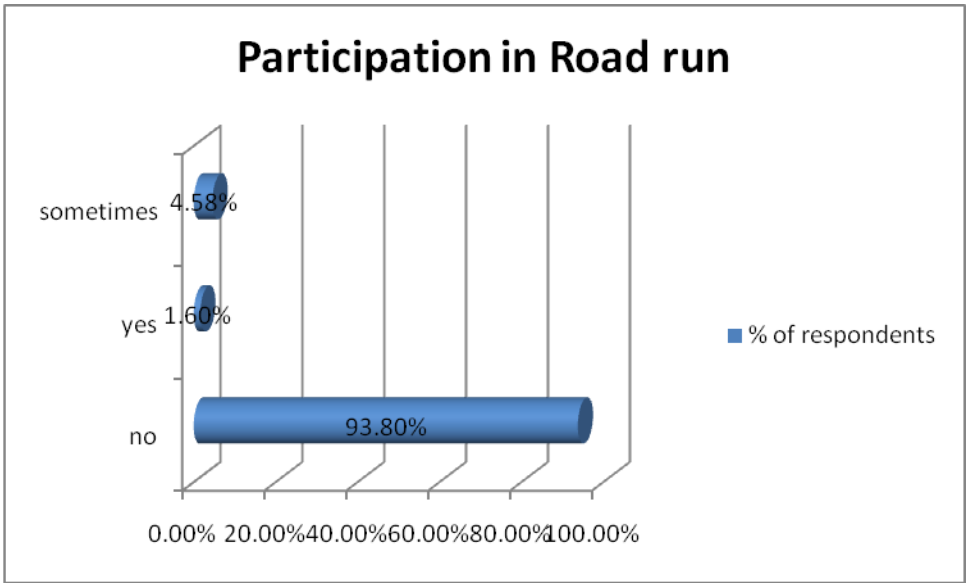


Figure 9: Participation in road run

In Figure 9: Participation in road run, there seemed to be the least (1.6%) interest in frequent participation by respondents, and most respondents (93.8%) did not participate at all as they indicated not liking the sport, with only 4.58% participating sometimes.

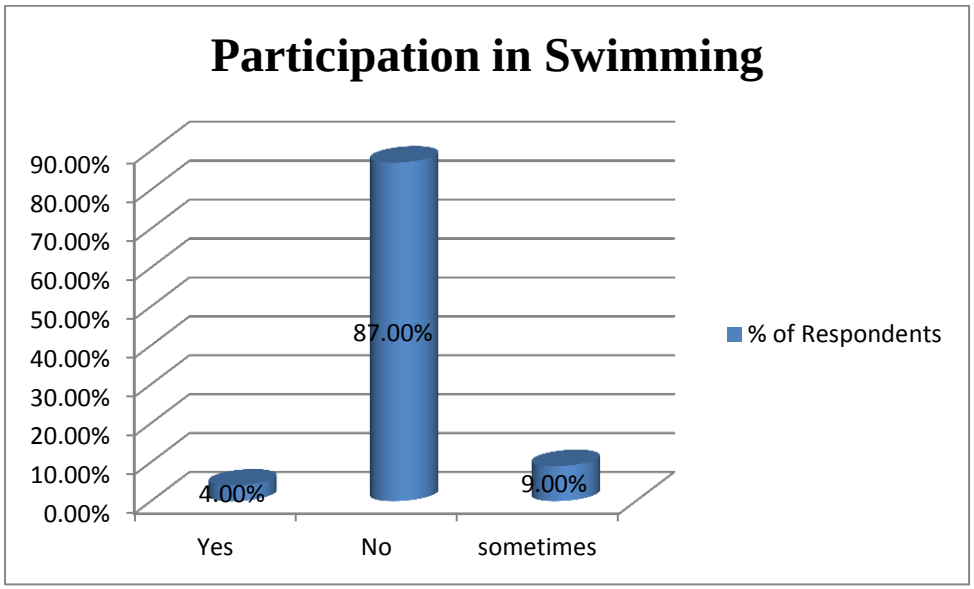


Figure 10: Participation in swimming

In Figure 10, only 4% of respondents indicated their full time participation in swimming, these are respondents who indicated having a swimming background with their former schools, and some indicated having learnt it from home. 9% participated sometimes, as they showed their continuous

interest in learning and planning to become the best in a swimming career even though they did not have much exposure in the sporting code before. 87% did not participate and explained that they were afraid of water; the highest responses coming from black residents.

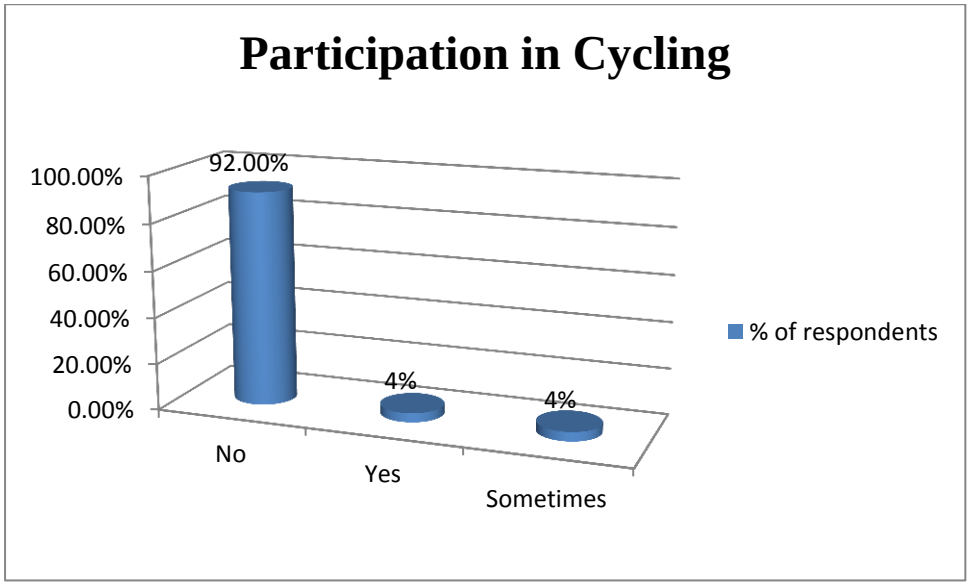


Figure 11: Participation in cycling

Figure 11 reveals that the majority of respondents did not show interest in participating in cycling (92.21%). Equal interest of 4% was shown for respondents participating full time and sometimes.

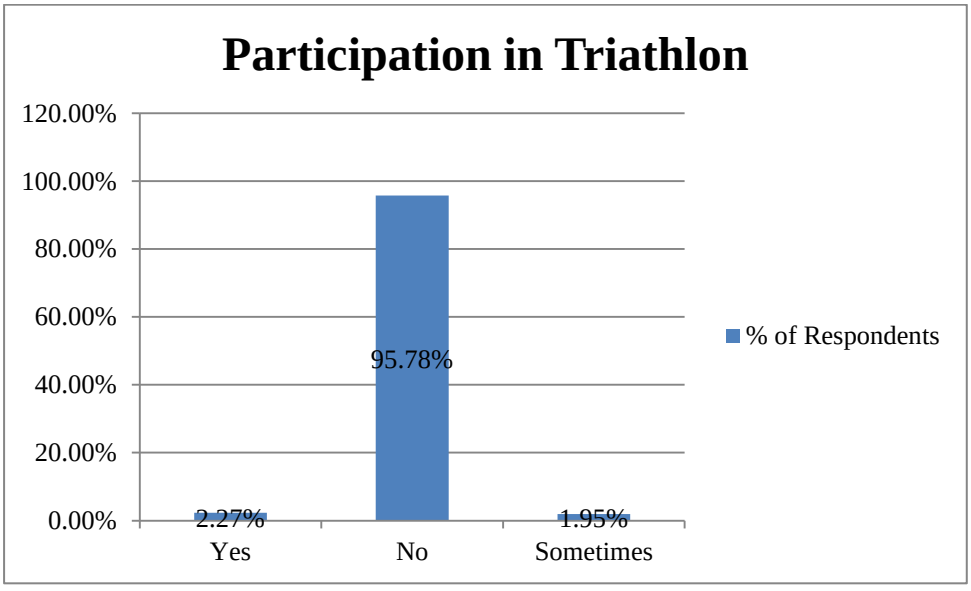


Figure 12: Participation in triathlon

Figure 12: Participation in triathlon, shows most respondents (95.78%) did not know how to play the sport, both race groups showed lack of interest in participation and only 2.27% participated and 1.95% participated sometimes.

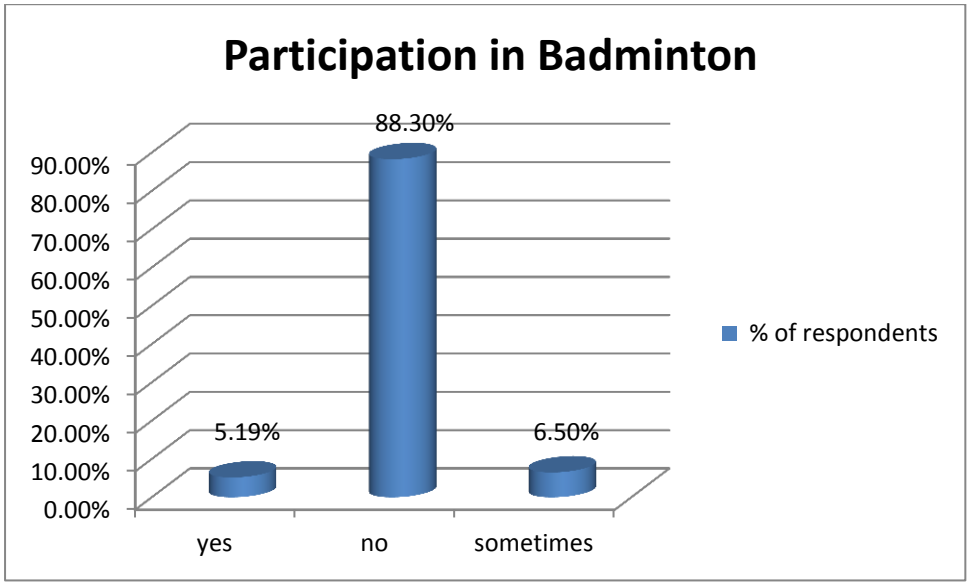


Figure 13: Participation in badminton

Figure 13 indicates that only 5.19% of the respondents participate in badminton. The majority did not participate (88.3%), and 6.51% played sometimes. Most respondents indicated that they do not have clear knowledge of the sporting code.

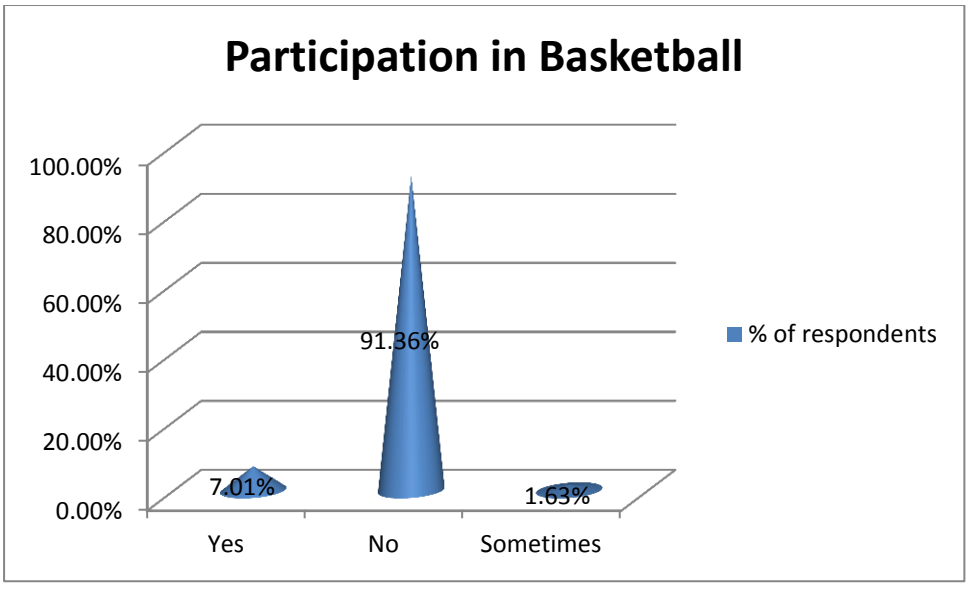


Figure 14: Participation in basketball

Figure 14: Participation in basketball illustrates that the majority of students (91.36%) did not participate, only 7.01% participated and these respondents explained that the sporting code requires certain physical characteristics, such as being extremely tall, for them to participate and enjoy it. Only 1.63% participated but not frequently and indicated that they are willing to try the sport irrespective of their physical characteristics.

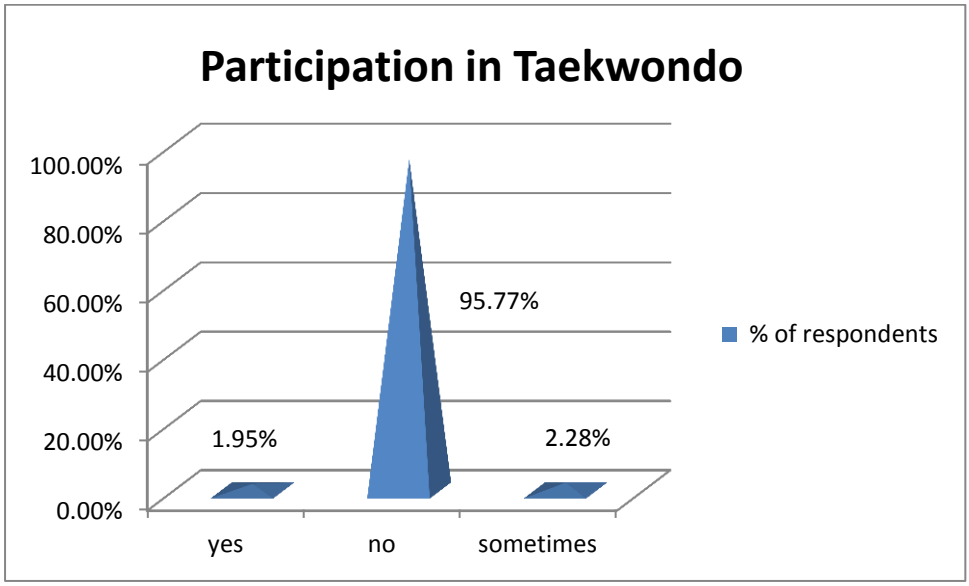


Figure 15: Participation in taekwondo

Figure 15 shows that the majority of respondents (95.77%) did not participate; most respondents both black and white indicated that they have not had about such sporting code, only 1.95% had knowledge and participated and 2.28% participated sometimes.

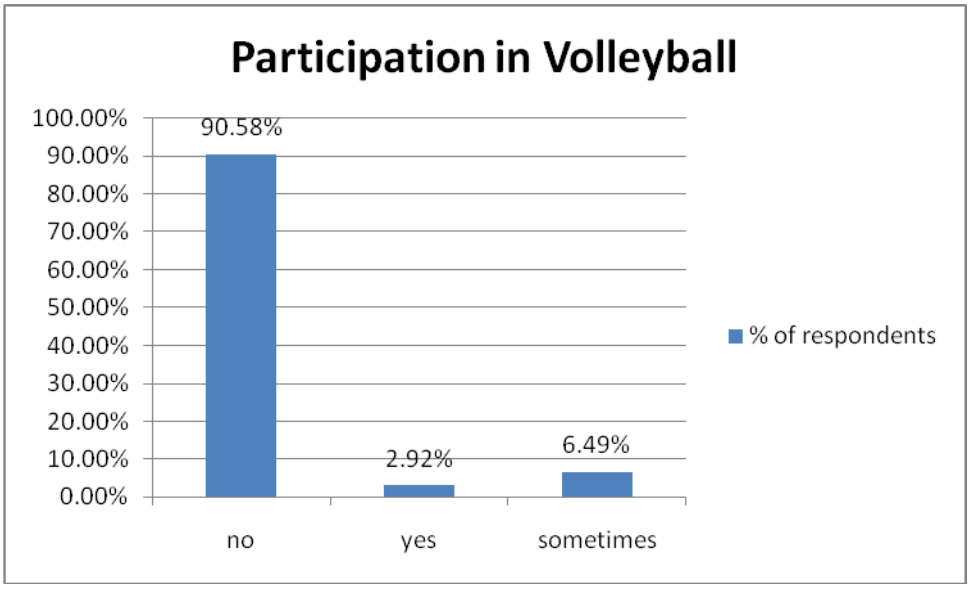


Figure 16: Participation in volleyball

Figure 16 illustrates that the majority of respondents (90.58%) did not participate, only 2.92% participated in volleyball, and 6.49% participate sometimes. Interest in participation mostly comes from white female residences.

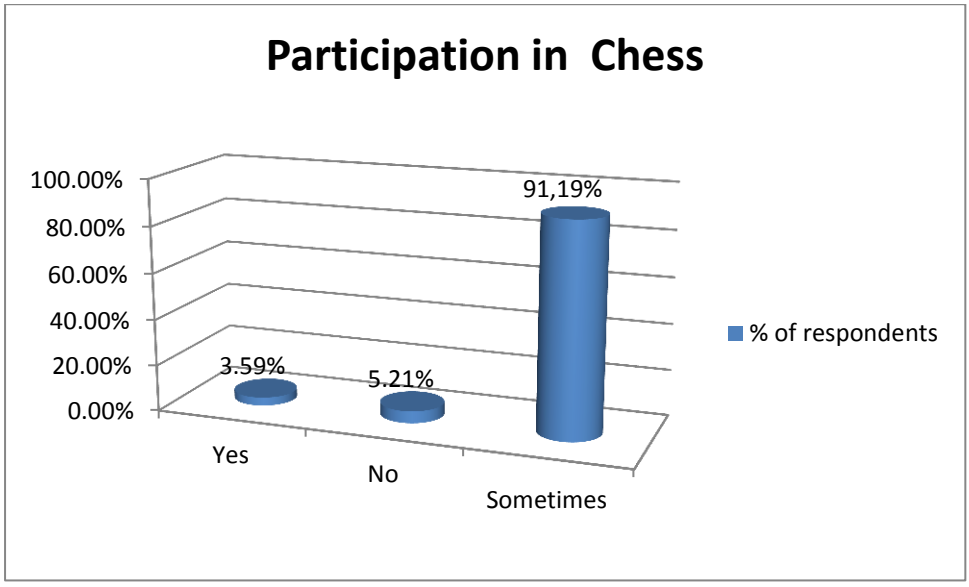


Figure 17: Participation in chess

Figure 17 indicates that the majority of respondents (91.19%) did not participate in chess, only 3.59% of respondents participated and 5.21% participated sometimes. Most students seem to not have had a thorough understanding on how to play the sport, they actually relied on their friends for assistance, hence interest in participation was shown most in the sometimes option.

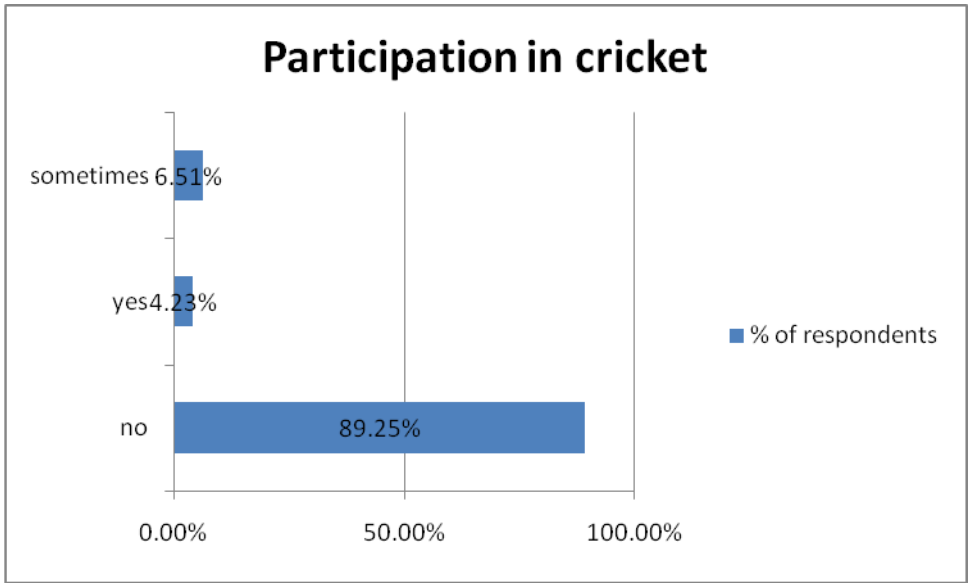


Figure 18: Participation in cricket

Figure 18 shows that most respondents indicated to have liked the sport but not to have knowledge of the basics, hence the majority (89.25%) did not participate, only 4.23% participated in cricket and 6.51% participated sometimes.

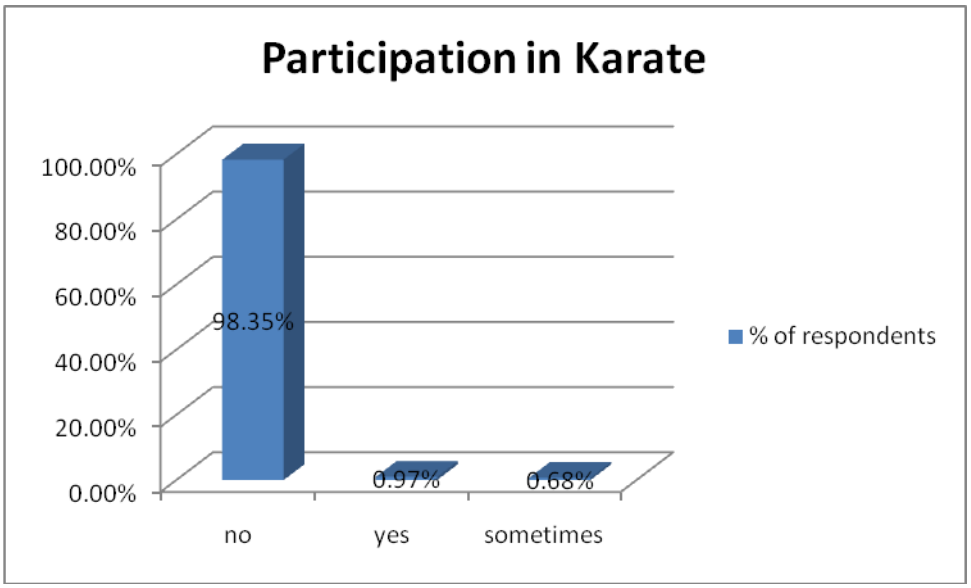


Figure 19: Participation in karate

Figure 19 illustrates that most respondents did not show their interest in participating in karate (98.35%), the percentage of interest shown was less than one, (0.97%), for both those whom participated seldom.

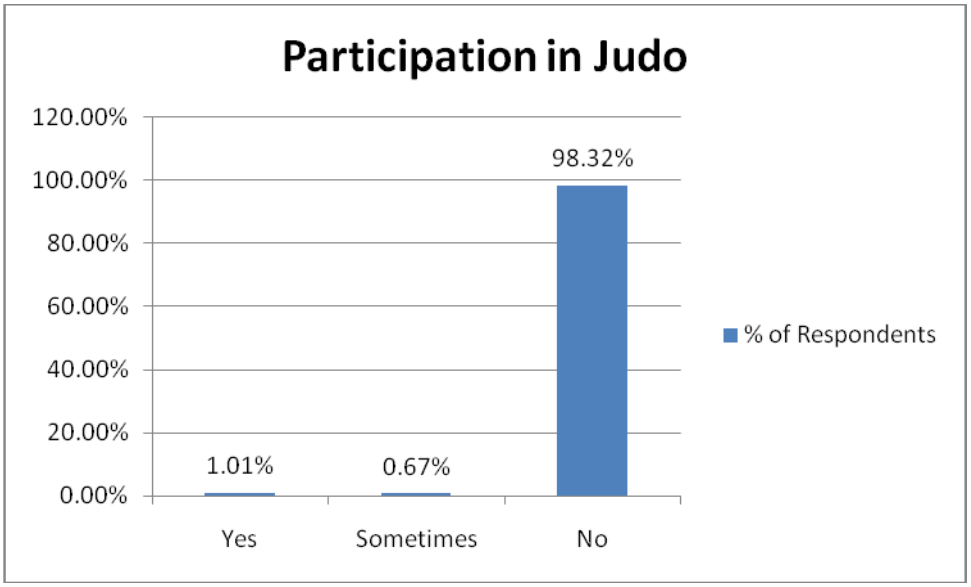


Figure 20: Participation in judo

Figure 20 illustrates that the majority of students were 98.32% who did not participate. Only 1% of the respondents participated in judo, 0.67% participated sometimes. Respondents explained that they do not know what judo is and further indicated that such sporting codes need to be publicised well to everyone within the university as to allow them to try them.

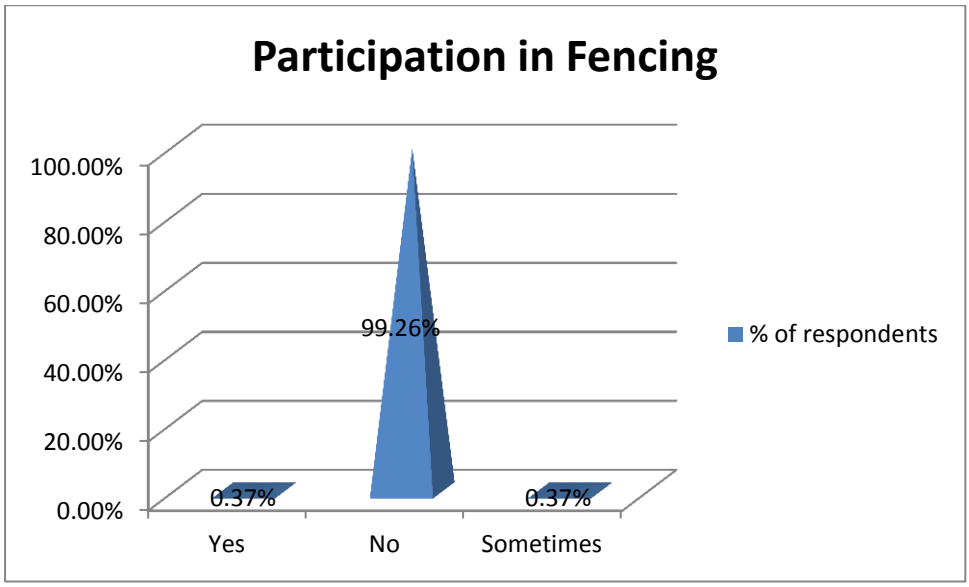


Figure 21: Participation in fencing

Fencing shows that the vast majority of respondents did not participate in fencing (99.26%), both participation and sometimes shared a percentage of 0.37%.

Comments

Out of a total of 13 available listed sporting codes at UFS (from figure 8 to 21); it is evident that most respondents did not frequently participate in the above sporting codes for various reasons. However seldom and full time participation indicates that there is at least interest in sport participation among students at UFS. In Chapter 4 the top leading sporting codes are also discussed as the most popular and frequently participated at UFS.

ANNEXURE B: DESCRIPTIVE DATA ANALYSIS OF REASONS FOR SPORTS PARTICIPATION

This section covers illustration of distribution for other reasons provided by respondents for sports participation as per 46 to question 59 of the questionnaire apart from the top leading five reasons discussed in Chapter 4.

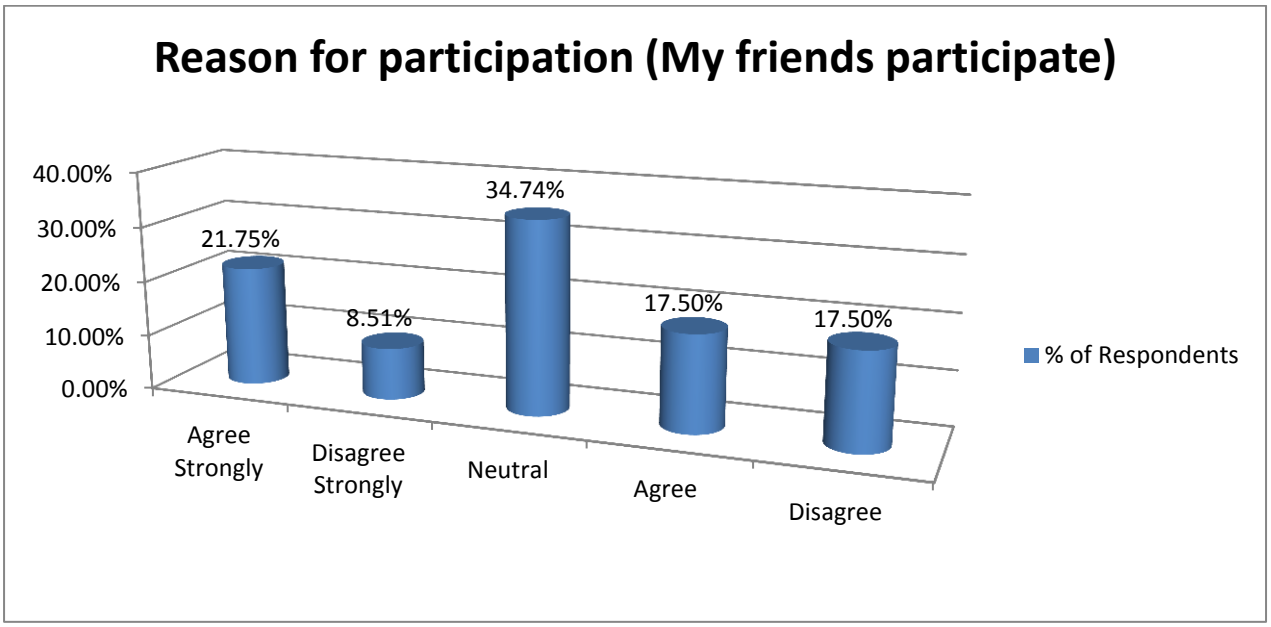


Figure 22: Reason for participation (my friends participate)

Figure 22 shows that most respondents were neutral (34.74%) and 21.75% agreed strongly that they do participate in sports because of their friends influence 8.51% disagreed strongly; these respondents were confidently expressing their views of sports participation as an individual benefit, not a friend's benefit. The rest agreed and disagreed accordingly (17.5%).

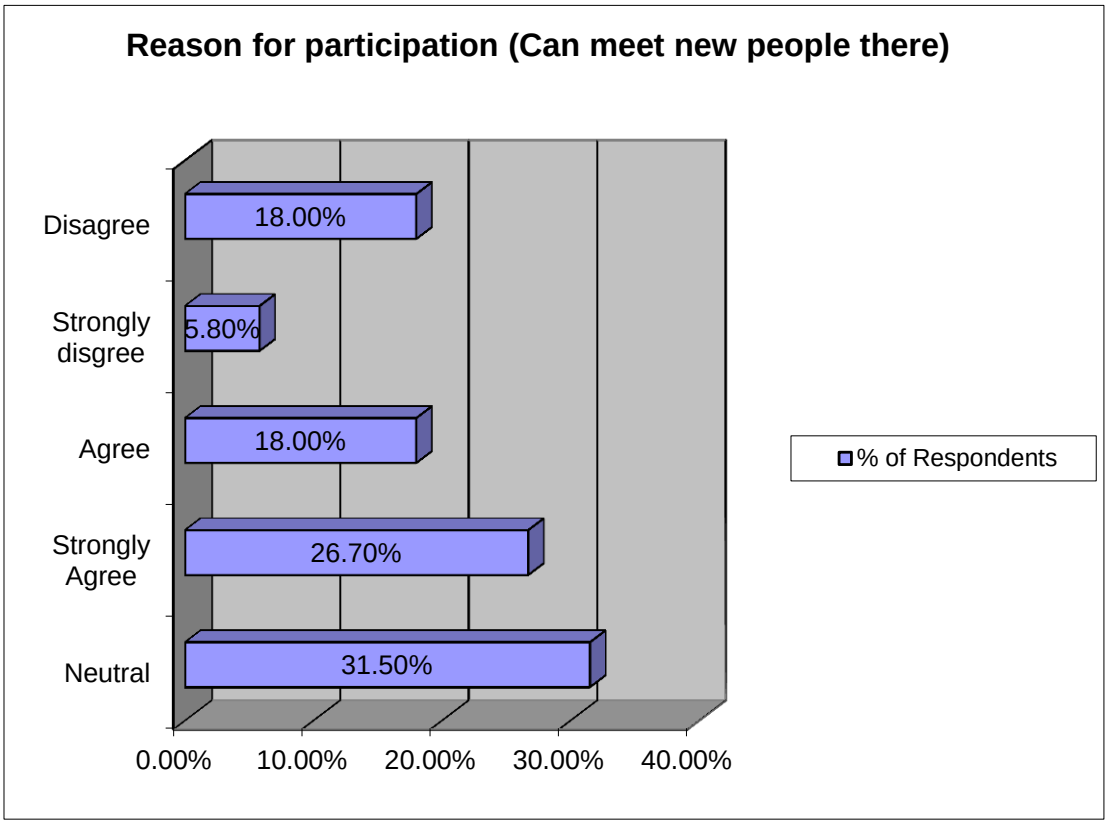


Figure 23: Reason for participation (can meet new people there)

Figure 23 illustrates that the majority of respondents were neutral (31.5%) about participating to meet new people, they claimed that it was two way, one could meet with new people and become encouraged to participate, and others believed that it might reduce their interest in participation depending on their individual behaviour. Moreover, a percentage of 26.71% respondents agreed strongly that sports participation encourages meeting new faces which they enjoy. Whereas 5.8% disagreed strongly, a percentage of 18% agreed and disagreed with the statement.

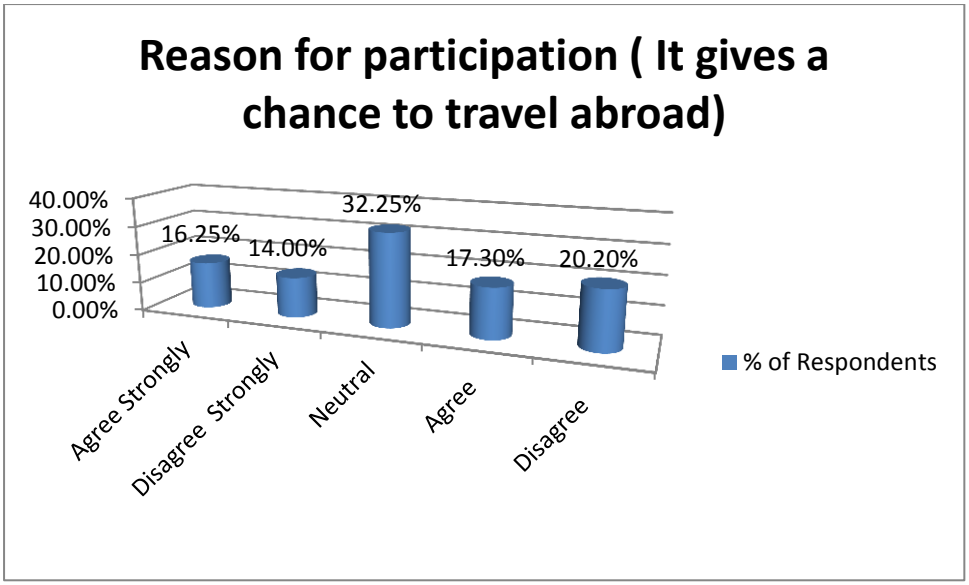


Figure 24: Reason for participation (it gives me a chance to travel abroad)

The majority of respondents (32.25%) were neutral about the reason that participating in sports provides a chance to travel abroad, about 20% disagreed and 17.3% agreed strongly that opportunities to travel abroad through sport participation within UFS are possible and others reported to have personally benefited from the opportunity in the past.

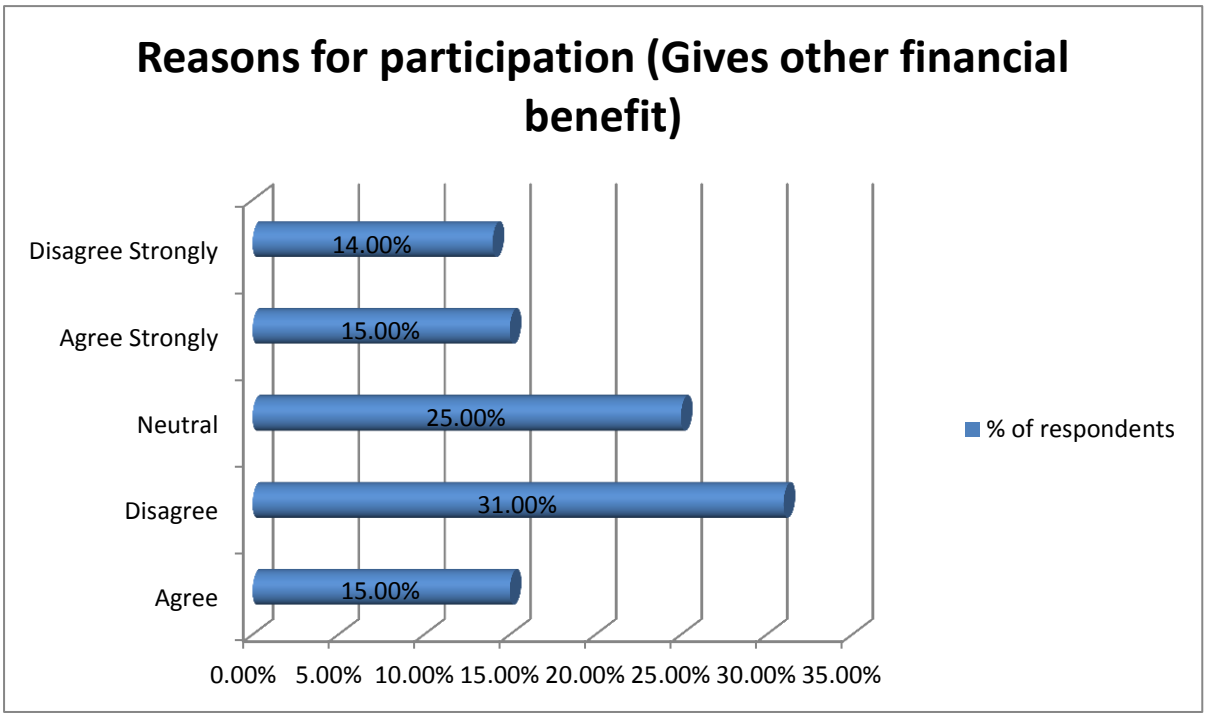


Figure 25: Reason for participation (gives other financial benefit)

Figure 25 explains that the majority of respondents (31%) disagreed to the reason that they participate in sport for financial benefit. Although 25% were neutral to say that not all respondents would participate for the same reasons wherein some would. Respondents who disagreed strongly (14%) indicated there is no financial benefit in sport at the university level, they emphasised the benefit is only available at a level of professionals. An equal percentage of 15% was shared when students also agreed that there are financial benefits at the university, which they actually benefited already; they mentioned the university sports representatives gave prizes like trophies that go along with certain amounts of money.

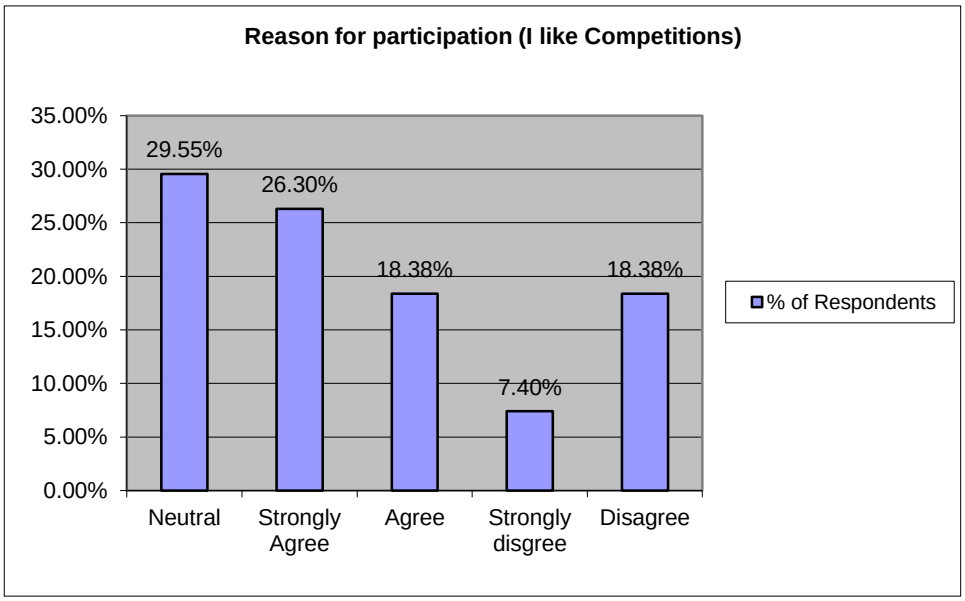


Figure 26: Reason for participation (I like competitions)

According to Figure 26: Reason for participation (I like competitions) most respondents were neutral (29.55%) about the fact that they participate because they liked competitions.26.3% agreed strongly that they become motivated to participate only when competitions are organised. Only 7.4% disagreed strongly.

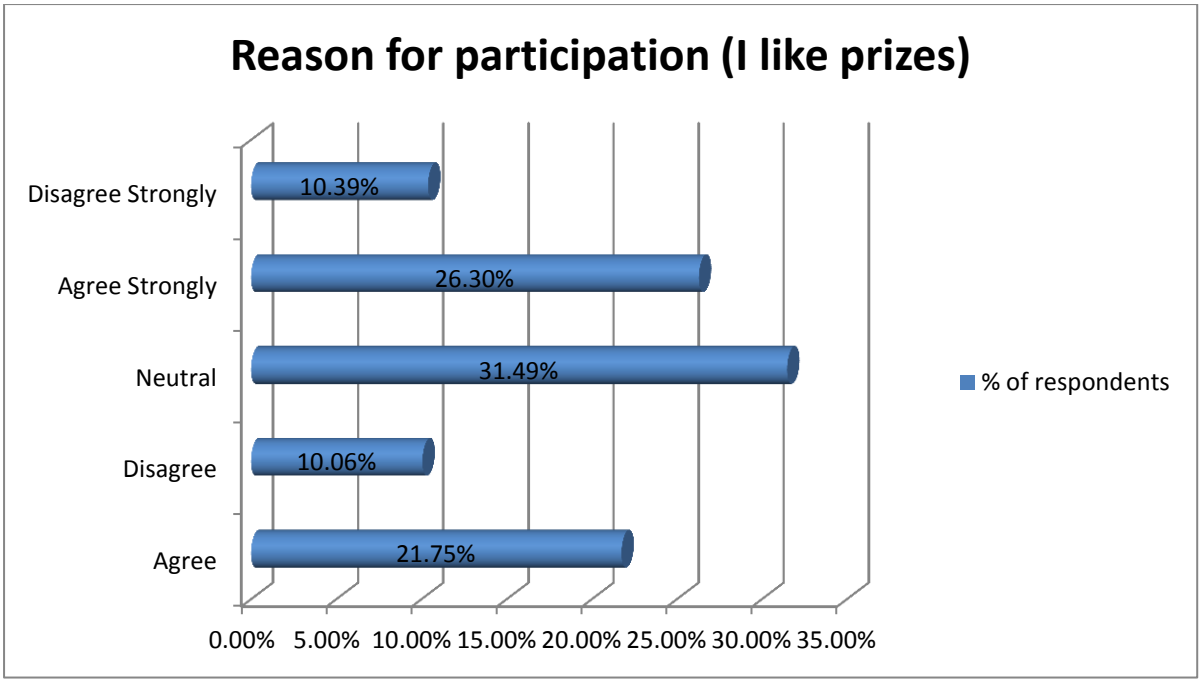


Figure 27: Reason for participation (I like prizes)

Figure 27 represents that most respondents were neutral (31.49%) about participating in sports because they like prizes, they also mentioned that it depends on an individual perspective .These prevalence is followed by 26.30% of those who strongly emphasised that their inspiration comes from the prize. Only 10.39 disagreed strongly.

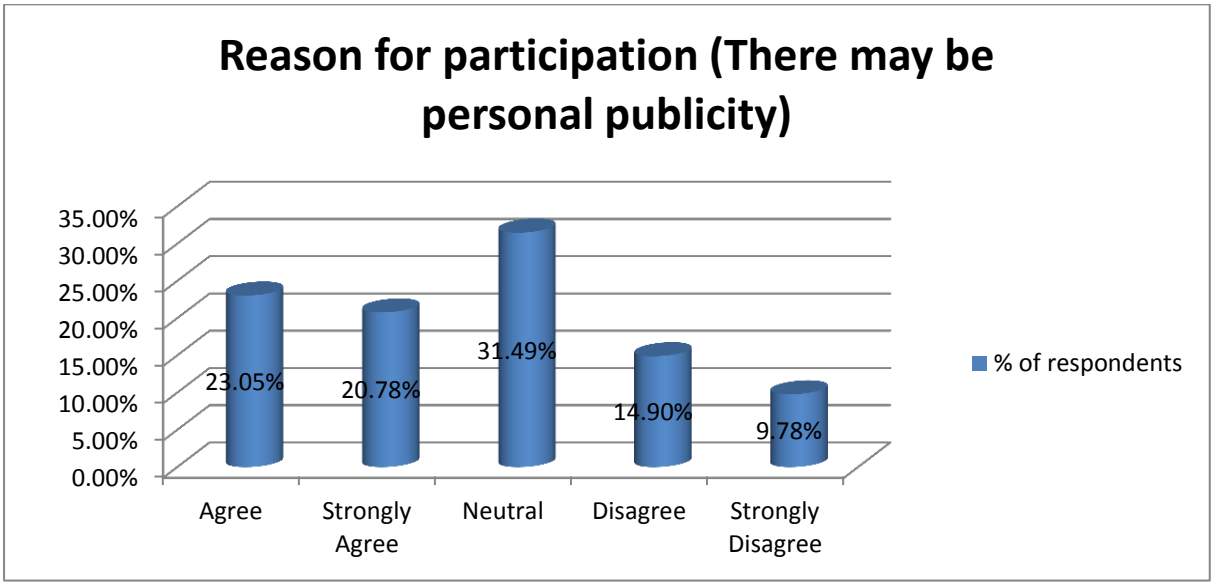


Figure 28: Reason for participation (there may be personal publicity)

Figure 28 illustrates that most students (31.49%) were neutral about the fact that they participate because of personal publicity. A percentage of 20.78% agreed strongly, these are respondents who mentioned that they get their motivation from popularity. They showed an interest in liking publicity and claimed to do everything for it. Only 9.74% disagreed strongly.

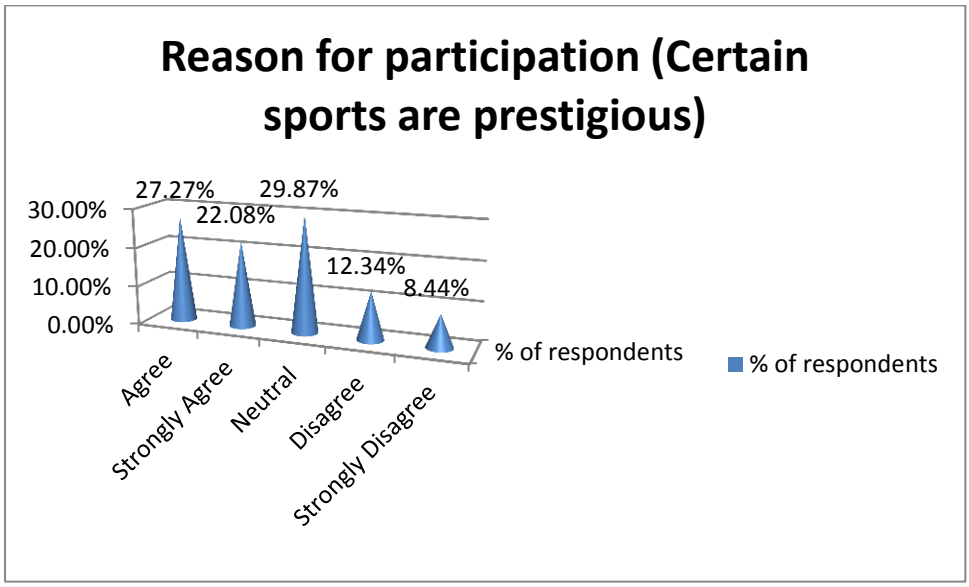


Figure 29: Reason for participation (certain sports are prestigious)

Figure29 explains that the majority of respondents disagreed that they participate because they consider other sports prestigious. 29.87% were neutral, a percentage of 27.27% respondents agreed and only 8.44% disagreed strongly.

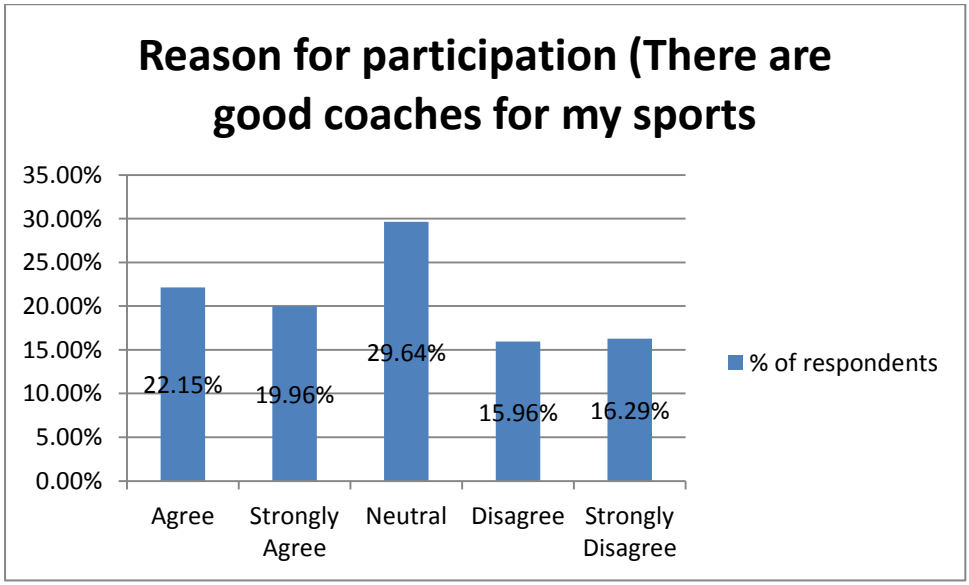


Figure 30: Reason for participation (there are good coaches for my sports)

Figure 30 highlights that the majority of respondents (29.64%) were neutral that they do participate because of availability of good coaches within the university or they do not .22.15% agreed that they participate because of availability of good coaching. A percentage of 16.29% disagreed strongly that even though there are no good coaches for their sports they are still participating for the love of it.

ANNEXURE C: DESCRIPTIVE DATA ANALYSIS OF REASONS FOR NON SPORTS PARTICIPATION

The following covers distribution for other reasons provided by respondents for not participating in sport as per 60 to question 75 of the questionnaire apart from the top leading six reasons provided in chapter 4.

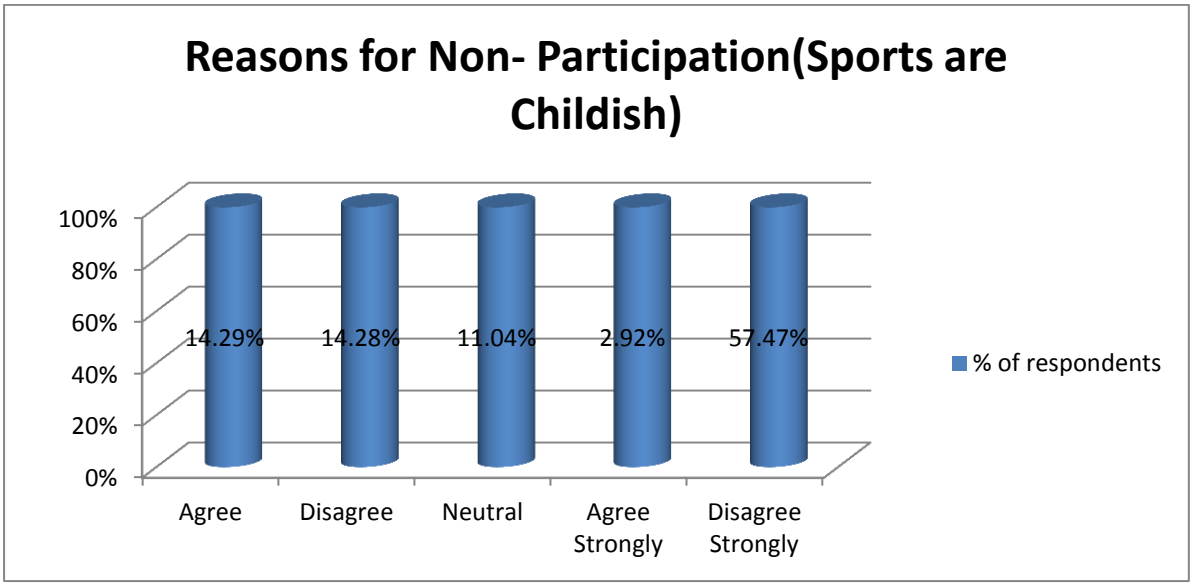


Figure 31: Reason for non-participation (sports are childish)

Figure31 illustrates that the majority of respondents (57.47%) did not agree that sports are childish; respondents believe that sports is important to everyone even though people could have different reasons not to participate. A percentage of 11.28% were neutral, these respondents did not have an exact reason why they were not involved in sporting activities within the university, and some indicated that they were involved in sports in their past school years. Only 2.92% agreed strongly that sports are childish that is why they are do not participate, these respondents reported that they were never involved in any sporting activity since ever.

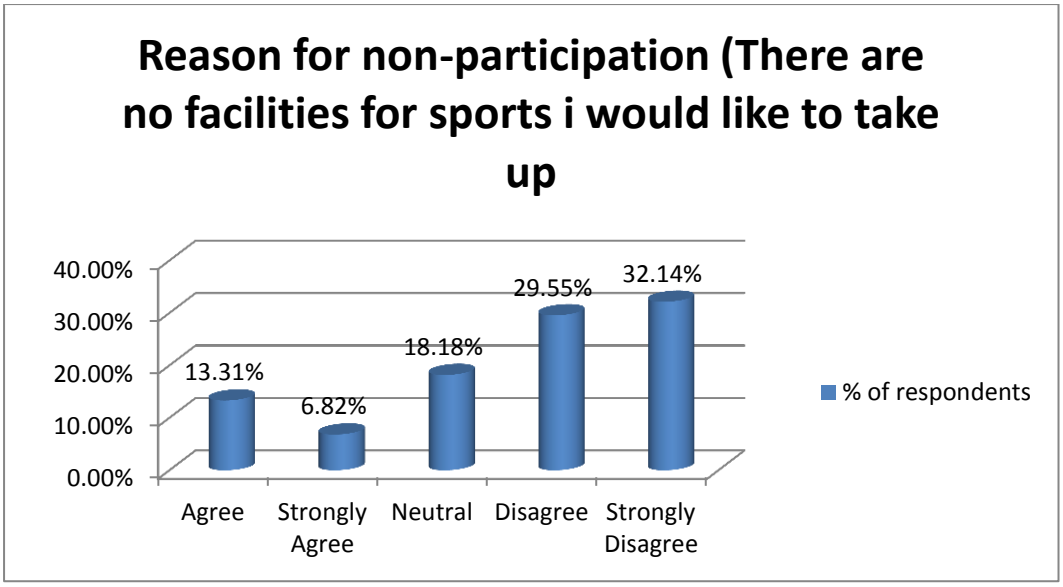


Figure 32: Reason for non-participation (there are no facilities for sports I would like to take up)

Figure 32 illustrates that the majority of respondents (32.14%) disagreed strongly that they don't participate because of lack of facilities around UFS; they mentioned that sports management does not consult with team players before they make facilities available. 18.18% respondents were neutral, and supported their statements to say facilities for students with disabilities were overlooked. Only 6.82% respondents agreed.

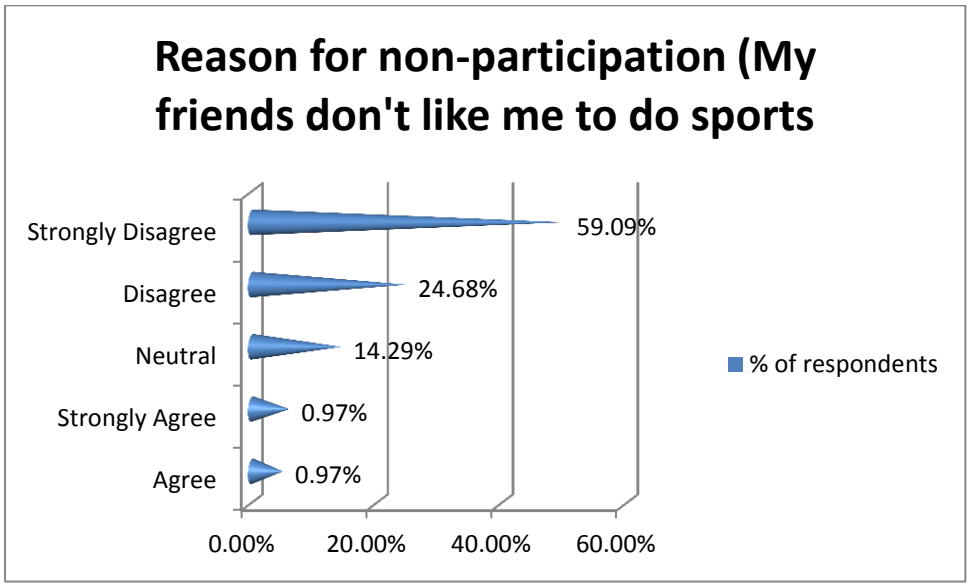


Figure 33: Reason for non-participation (my friends don't like me to do sports)

According to Figure 33 most respondents (59.09%) disagreed strongly with the fact that they do not participate because of their friends influence(s), they indicated that their lives in terms of decision making at the university are dependent on their friends. 14.29% respondents were neutral and only 0.97% agreed strongly.

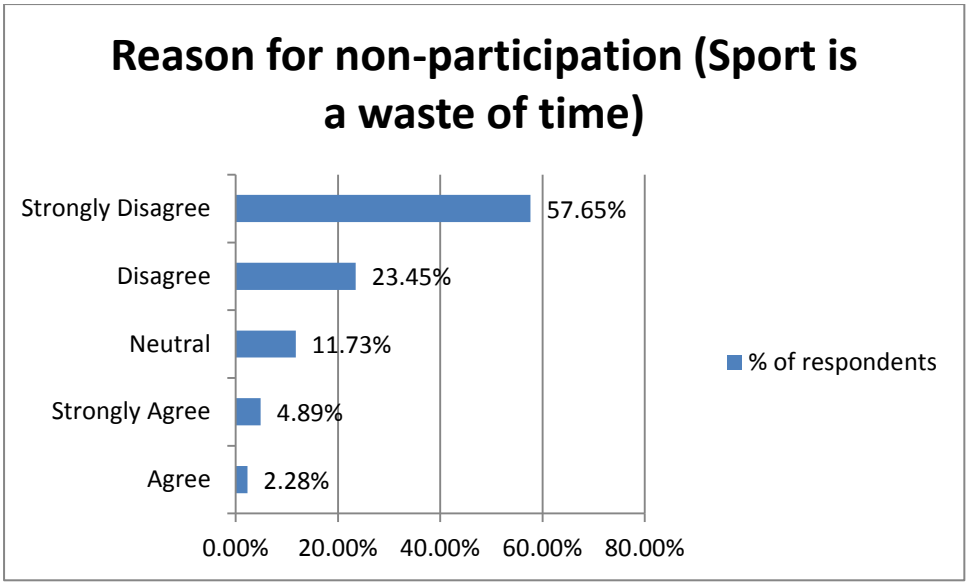


Figure 34: Reason for non- participation (sport is a waste of time)

Figure 34 illustrates that most respondents (57.65%) disagree strongly that sports is a waste of time. 23.45% disagreed, 11.73% were neutral saying that it depends on how an individual's manage their time. Only 4.89% agreed strongly, these respondents indicated that they came to the university to study not to be involved with other matters like sports.

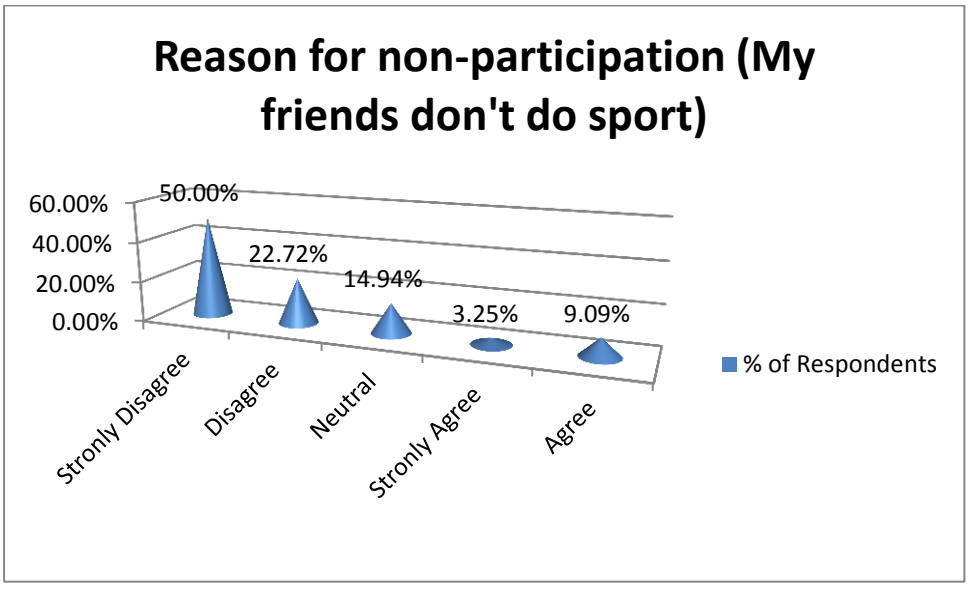


Figure 35: Reason for non-participation (my friends don't do sport)

Figure 35 shows that the majority of respondents disagreed strongly that they do not participate in sports because their friends do not. Respondents believe that participating in sports is a choice that

should not be influenced by anyone. 14.94% were neutral these respondents explained that they do not enjoy doing sports when their fellow friend are absent and other respondents indicated that it is easy to participate in the absence of a friend for non-disturbance.

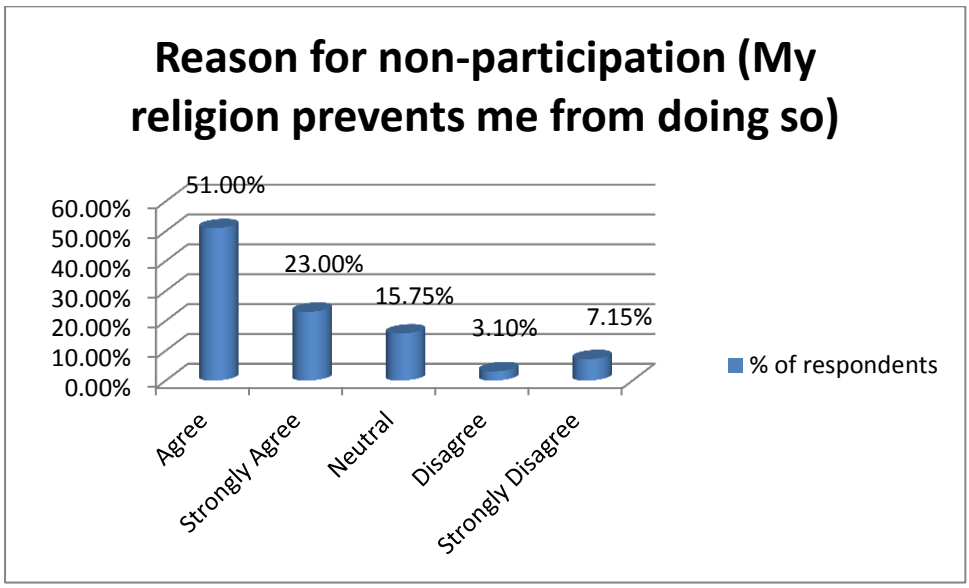


Figure 36: Reason for non-participation (my religion prevents me from doing sports)

Figure 36: Reason for non-participation (my religion prevents me from doing sports)Most students indicated that they are fully commitment in different religious beliefs the figure 28 confirms that majority of students(51%) strongly disaggre that their reliogion(s) prevents them from participating.A percenatge of 15.75% students were neutral, they indicated that there are some reliogins which prompt its memebers not to be involved in such matters wheren others actually encouge its members to be invoveld in sports .Only 3.10 % agreed.

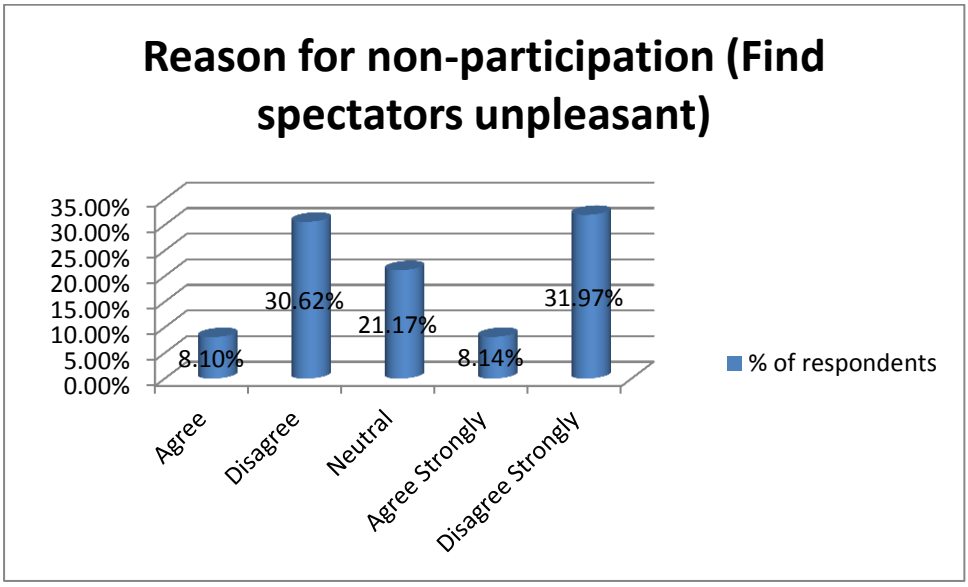


Figure 37: Reason for non-participation (find spectators unpleasant)

Figure 37 outlines that the majority of respondents (30.62%) do not find spectators unpleasant, but 21.17% indicated to be neutral to say that sometimes they do, they mentioned that some spectators might react rudely in favour of the supported team, which might lead to harm to the players. They also mentioned that this does not happen often. The minority of the students (9.12%) agreed that they do not participate because they find spectators unpleasant for various reasons mentioned such as being targeted for sexual attraction.

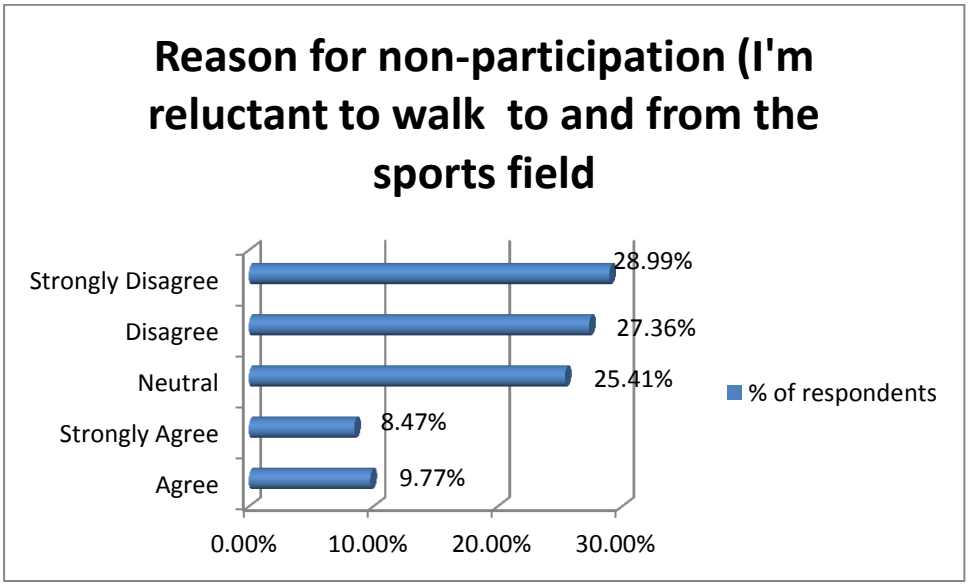


Figure 38: Reason for non- participation (I'm reluctant to walk to and from the sports fields)

Figure 38 explaines that most students(28.99%) do not have a problem to walk to and from the sports fields. 25.41% are neautral indicating that sometimes it is difficult to travel from the residence to sporting fields especially after class, due to weather conditions and seasonal factors, although sometimes it is easy. The minority of students (8.47%) agreed strongly.

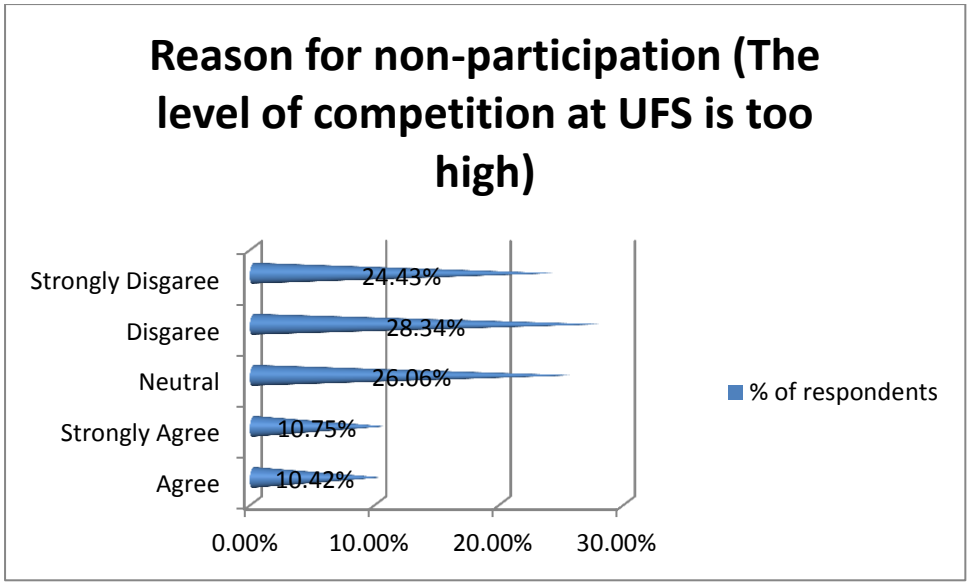


Figure 39: Reason for non- participation (The level of competition at UFS is too high)

Figure 39 reveals that most respondents (24.43%) do not find the level of competition too high to participate at UFS, therefore they disagreed strongly. 26.04% were neutral saying the level of the institution does not have impact on how players should play, others believed some do. Minority of (10.42%) agreed that they could not participate because of the high standard level of the University of the Free State (UFS) compared to other Universities.

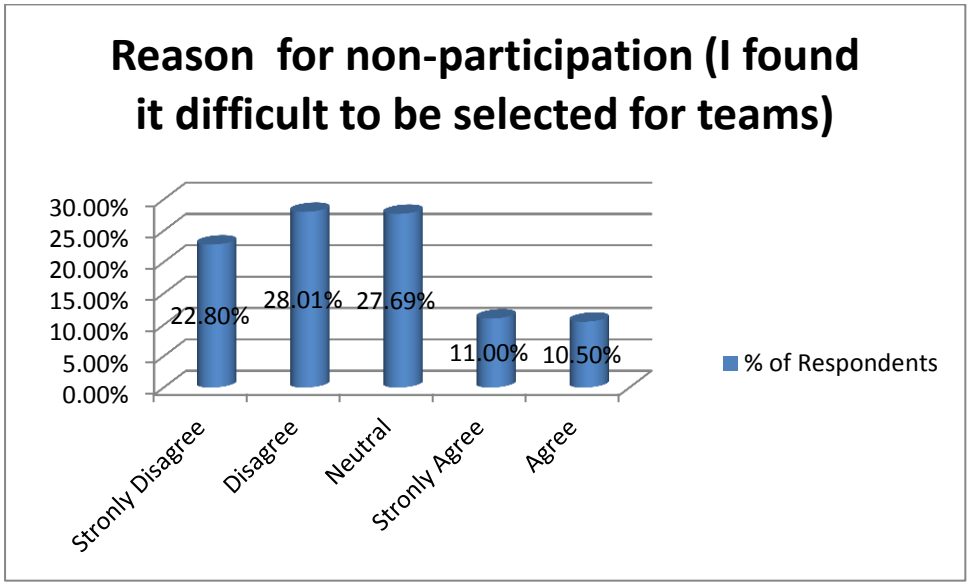


Figure 40: Reason for non- participation (I found it difficult to be selected for teams)

The majority of respondents 28.8% disagreed strongly that they found it difficult to be selected for teams. However, most students lose hope when their efforts are not being recognised. Figure 40 explains that 27.69% were neutral to say that sometimes they do find it difficult to be selected and sometimes not. Only 10.50% agreed that it is difficult to be selected for teams at the University of the Free State.

ANNEXURE D: DESCRIPTIVE DATA ANALYSIS OF OVERALL SUGGESTIONS FOR SPORTS PARTICIPATION

Apart from 25% nominated suggestions raised in chapter 4 the following is a representation of other comments and suggestion mentioned by respondents as per question 76 to question 81 of the questionnaire students were asked to answer questions pertaining overall suggestions or provide comments on sports both participants and non-participants at the UFS.

Q. 76 what changes would you suggest to increase sports participation in general at UFS?

- Provide access and transparency to everyone
- Accommodate off campus students to participate, and those who want to learn
- Advertise using posters, media and encourage more students to participate. (This was mentioned several times)
- Advice students about benefits and advantages of sports participation.
- The University should enforce students especially first years to join from the faculty level not from residence awareness only.
- Encourage more support from fellow friends, and other students.
- Communication with all first years about different sporting codes offered should be offered.
- Organise competitive games with other universities.
- Ensure that every residence within the university participates
- University should have a formal spots day on calendar where every residence and off campus students will be represented and participate.
- Organise more sporting codes that will enable students with different cultures to participate.
- University should provide scholarships or bursaries to encourage students to study sports and to participate in it.
- Have beginners league for people with no previous experience, university is a great time of one's life time to try new sports.
- Organise fun indoors sports activities e.g table tennis and encourage students to participate.
- Just like other institutions around the country, athletes who represent the University must be paid.
- Stop organising sports events on Saturday it Sabbath day.
- The University should include question(s) like 'what sport do you do' on the application form for first time students.

Q. 77 what changes would you suggest to increase sports participation in women?

- Encourage girl students to give it a try, even if it's just for their good health
- Make more sports that cater women .e.g. Water polo
- Organise sports courses to encourage women participation.

Q. 78 what changes would you suggest to increase sports participation in men?

- Encouraged to have self-belief in rugby
- Organise sports courses to encourage men.

Q.79 what changes would you like to see in sport equipment and facilities?

- Facilities must be improved
- Organise better equipment for all sporting codes
- Make squash fields bigger to accommodate more participants, and more time scheduled overall.
- Sports with expensive equipment must be paid by the residence.

Q.80 what changes would you like to see in Director(s), Coaches and Management of Sports?

- Coaches should practice fairness to selection, schedule more proper practice times to accommodate everyone.
- Get better coaches, I like to learn something new.
- All sporting codes should be given an equal attention and treatment.
- Best players should be selected on performance not on merit and skin colour.
- Change the way other sporting codes are administered.
- Coaches from different sports must hold workshops on the benefit of that specific sport.
- Coaches should continuously view performance of the players, to enable to identify good and fair quality.
- Increase number of teams and openings, e.g Judo should have more openings.
- Invite more black students in sport like swimming and chess.
- Current marketing activities are not working, especially for off campus students, this should be marketed better.
- Marketing of smaller sporting codes should also be considered by coaches.

- Provide more exposure for sporting codes, I feel like rugby overshadows other sports.
- Make it easier for players to qualify. e.g Provide more teams.
- Management must make sure that they make sports entertaining.
- I think the University manages sports very well, keep it up.
- Management should be more interactive with SRC Sports.

Q.81 Do you think taking part in sports has any impact on your studies?

- Yes, Good impact because I can perform well on my studies
- No. It does not make any impact
- Yes, it is quite beneficial to participate in sports, reward is good results.
- Yes, my mind is always fresh after participation.
- Yes but negatively so. I am always very tired and unable to study
- Yes. Most of the time I am become fresh like a baby
- Yes, because when I become less interested in my studies I revitalise with sports.
- Yes, positively I gain concentration, but sometimes become exhausted and not study.
- Yes, healthy mind produce good results all the timed.

ANNEXURE E: ATTEMPTED CLUSTER ANALYSIS RESULTS AS USED IN THE STATISTICAL LITERATURE

This section illustrates attempted cluster analysis results as used in the statistical literature (Chapter 2). The aim was to reduce the number of sports by clustering (there were 22 sport codes). It was assumed that these could cluster into about 4-5 clusters i.e. games that use feet, games that use hands, games that use sticks and possibly water sports and others. The cluster can be used to analyse interest in and level of participation in sports at UFS. Both hierarchical clustering and K-clustering were attempted and the results are discussed.

Table 28: Initial cluster centers (K cluster) five cluster solution

	Cluster				
Sporting codes	**Games that use feet**	**Games that use hands**	**Games that use sticks**	**Water sports**	**Others**
Athletics	3.00	3.00	1.00	1.00	1.00
Cross country	3.00	3.00	3.00	1.00	3.00
Road run	3.00	3.00	3.00	2.00	3.00
Hockey(field/indoor)	3.00	3.00	1.00	3.00	3.00
Rugby	3.00	1.00	3.00	3.00	1.00
Netball	3.00	3.00	3.00	3.00	1.00
Swimming	3.00	1.00	3.00	1.00	3.00
Cycling	3.00	1.00	3.00	3.00	1.00
Triathlon	3.00	1.00	3.00	3.00	3.00
Tennis	2.00	3.00	1.00	1.00	3.00
Squash	3.00	1.00	1.00	3.00	1.00
Badminton	3.00	1.00	1.00	3.00	3.00
Table tennis	2.00	2.00	1.00	3.00	3.00
Soccer	3.00	2.00	3.00	1.00	1.00
Basket ball	3.00	2.00	3.00	1.00	1.00

Taekwondo	3.00	2.00	1.00	3.00	3.00
Volley ball	3.00	3.00	3.00	2.00	3.00
Chess	4.00	1.00	3.00	1.00	3.00
Cricket	4.00	2.00	1.00	1.00	1.00
Karate	5.00	1.00	3.00	2.00	1.00
Judo	5.00	2.00	3.00	3.00	3.00
Fencing	3.00	3.00	3.00	3.00	3.00

Table 28 shows a representation of assigned observations into predetermined number of clusters, a five cluster solution is selected, k cluster seeds, which serve as initial cluster centers, are selected and sporting codes within specified distance are then assigned to appropriate cluster.

Table 29: Iteration history (five cluster solution)

	Change in cluster centers				
Iteration	**Games that use feet**	**Games that use hands**	**Games that use sticks**	**Water sports**	**Others**
1	3.468	3.221	3.283	3.610	3.551
2	.136	.675	.436	.629	.975
3	.100	.751	.227	.496	.621
4	.071	.645	.148	.274	.530
5	.043	.598	.127	.243	.064
6	.086	.648	.000	.402	.093
7	.041	.000	.000	.135	.000
8	.017	.000	.127	.122	.063
9	.016	.000	.123	.109	.000
10	.000	.000	.000	.000	.000

Table 29 represent a convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. The current iteration is 10. The minimum distance between initial centers is 5.657.

Table 30: Final cluster centers (five cluster solution)

Sporting codes	Cluster				
	Games that use feet	Games that use hands	Games that use sticks	Water sports	Others
Athletics	2.85	1.60	1.73	2.56	2.54
Cross country	2.94	3.00	2.30	2.77	2.96
Road run	2.94	3.00	2.33	2.69	3.00
Hockey(field/indoor)	2.83	2.40	2.00	2.87	2.46
Rugby	2.98	1.60	2.50	2.92	1.07
Netball	2.74	2.40	2.63	2.58	2.96
Swimming	2.96	2.00	2.50	2.62	2.89
Cycling	2.95	1.00	2.73	2.85	3.00
Triathlon	2.97	1.40	2.77	3.00	3.00
Tennis	2.93	2.00	1.97	2.77	2.89
Squash	2.95	1.00	2.27	2.87	2.75
Badminton	2.91	2.60	2.23	2.98	2.93
Table tennis	2.91	2.40	1.43	2.42	2.71
Soccer	2.96	1.40	2.13	1.27	2.21
Basket ball	2.94	2.20	2.70	2.54	2.93
Taekwondo	2.96	2.80	2.63	2.96	3.00
Volley ball	2.94	2.60	2.60	2.81	2.89
Chess	2.94	2.20	2.93	2.63	2.96
Cricket	2.98	1.80	2.67	2.77	2.50
Karate	3.03	2.40	2.97	2.96	3.00

Judo	3.06	3.20	3.00	2.94	2.89
Fencing	3.06	3.00	3.17	2.94	3.00

Table 30 explains final cluster centers for five cluster solution, which are assigned for observations within specified distance, which are then assigned to appropriate clusters.

Table 31: Number of cases in each cluster (five-cluster solution)

Cluster	Games that use feet	193.000
	Games that use hands	5.000
	Games that use sticks	30.000
	Others	52.000
	Water sports	28.000
Valid		308.000
Missing		.000

Table 31 shows a five cluster solution distribution of number of cases in each cluster.

Table 32: Initial cluster centers (K cluster) three cluster solution

	Cluster		
Sporting codes	Games that use feet	Games that use hands	Games that use sticks
Athletics	1.00	3.00	1.00
Cross country	3.00	3.00	3.00
Road run	3.00	1.00	3.00
Hockey(field/indoor)	3.00	1.00	1.00
Rugby	1.00	3.00	3.00
Netball	1.00	3.00	3.00
Swimming	3.00	1.00	3.00

Cycling	1.00	3.00	3.00
Triathlon	3.00	3.00	3.00
Tennis	3.00	3.00	1.00
Squash	1.00	3.00	1.00
Badminton	3.00	3.00	1.00
Table tennis	3.00	3.00	1.00
Soccer	1.00	3.00	3.00
Basket ball	1.00	.00	3.00
Taekwondo	3.00	3.00	1.00
Volley ball	3.00	3.00	3.00
Chess	3.00	3.00	3.00
Cricket	1.00	3.00	1.00
Karate	1.00	3.00	3.00
Judo	3.00	3.00	3.00
Fencing	3.00	3.00	3.00

Table 32 shows a representation of the most satisfactory clustering of assigned observations into a predetermined number of clusters, a three-cluster solution is selected, k cluster seeds, which serve as initial cluster centers are selected and sporting codes within a specified distance are then assigned to appropriate cluster.

Table 33: Iteration history (three-cluster solution)

Iteration	Change in Cluster Centers		
	Games that use feet	Games that use hands	Games that use sticks
1	*4.122*	4.346	3.638
2	*.591*	.245	.568
3	.273	.089	.167
4	.243	.085	.000
5	.117	.020	.130
6	.141	.019	.181
7	.137	.008	.165
8	.000	.000	.000

Table 33 explains a convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. The current iteration is eight. The minimum distance between initial centers is 6.633. The most satisfactory clustering appears to be a three-cluster solution with reasonable numbers.

Table 34: Final cluster centers (three-cluster solutions)

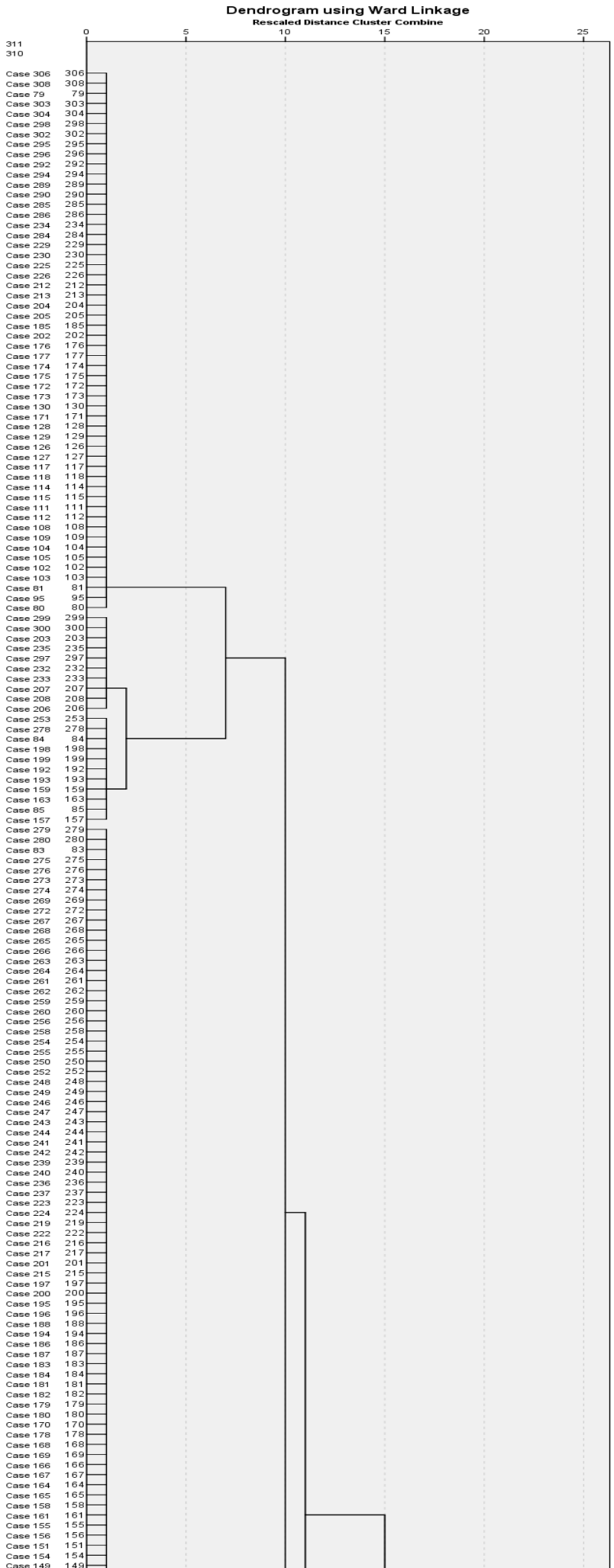
Sporting codes	Cluster		
	Games that use hands	Games that use feet	Games that use sticks
Athletics	2.56	2.86	1.82
Cross country	2.83	2.94	2.49
Road run	2.78	2.94	2.51
Hockey(field/ indoor	2.78	2.84	2.09
Rugby	2.57	2.88	2.29
Netball	2.63	2.76	2.64
Swimming	2.67	2.96	2.51
Cycling	2.84	2.97	2.60
Triathlon	3.00	2.98	2.67
Tennis	2.84	2.93	2.11
Squash	2.79	2.98	2.18
Badminton	2.98	2.93	2.36
Table tennis	2.48	2.94	1.67
Soccer	1.25	2.96	2.22
Basket ball	2.56	2.96	2.71
Taekwondo	2.97	2.96	2.73
Volley ball	2.81	2.95	2.67
Chess	2.68	2.95	2.87
Cricket	2.70	2.97	2.58
Karate	2.94	3.03	2.96
Judo	2.95	3.05	3.00
Fencing	2.95	3.06	3.11

Table 34 represents final satisfactory cluster centers for three-cluster solution assigned observations within reasonable distance, which are then assigned to appropriate clusters.

Table 35: Number of cases in each cluster (three-cluster solutions)

Cluster	Games that use feet	200.000
	Games that use hands	63.000
	Games that use sticks	45.000
Valid		308.000
Missing		.000

Table 35shows a fairly satisfactory uniform distribution of a three cluster solution of a number of cases in each cluster, where the majority of respondents showed a high level of participation in games that use feet (200 cases) followed by the ones that use hands (63 cases), and those that use sticks (45 cases).


Dendrogram using Ward Linkage
Rescaled Distance Cluster Combine
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ANNEXURE F: OUTPUT LEVEN'S TEST OF EQUALITY OF VARIANCES WHEN EQUAL VARIANCES ASSUMED AND WHEN NOT ASSUMED.

Table 36: Levene test when equality of variances is assumed and when they are not: Reasons for participation in sports.

Independent Samples Test (from table11)										
Reason for participation in sport **Variable**		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Feeling of well being	Equal variances assumed	3.983	.047	1.126	306	.261	.08466	.07520	-.06332	.23263
	Equal variances not assumed			1.145	264.942	.253	.08466	.07392	-.06088	.23019
Releases stress	Equal variances assumed	12.410	.000	1.645	306	.101	.10271	.06243	-.02014	.22555
	Equal variances not assumed			1.748	294.912	.082	.10271	.05877	-.01295	.21836
Helps keeping fit	Equal variances assumed	20.859	.000	1.896	306	.059	.111	.058	-.004	.226
	Equal variances not assumed			2.100	305.929	.037	.111	.053	.007	.215
Increases physical abilities	Equal variances assumed	9.619	.002	1.607	306	.109	.126	.078	-.028	.280
	Equal variances not assumed			1.666	279.213	.097	.126	.076	-.023	.275
Friends participate	Equal variances assumed	.274	.601	-.402	306	.688	-.089	.221	-.524	.346
	Equal variances not assumed			-.479	258.741	.632	-.089	.186	-.455	.277
Can meet new people	Equal variances assumed	.753	.386	1.662	306	.097	.146	.088	-.027	.319
	Equal variances not assumed			1.687	262.860	.093	.146	.087	-.024	.316
Gives chance to travel	Equal variances assumed	3.827	.051	-.256	306	.798	-.026	.101	-.224	.173
	Equal variances not assumed			-.254	245.006	.800	-.026	.102	-.226	.174
Other financial benefit	Equal variances assumed	1.220	.270	1.361	306	.175	.140	.103	-.063	.343
	Equal variances not assumed			1.355	247.104	.177	.140	.104	-.064	.344
Like Competitions	Equal variances assumed	16.100	.000	6.163	306	.000	.526	.085	.358	.694
	Equal variances not assumed			6.569	296.643	.000	.526	.080	.369	.684
Like prizes	Equal variances assumed	.526	.469	3.689	306	.000	.335	.091	.156	.514
	Equal variances not assumed			3.764	267.295	.000	.335	.089	.160	.511
Personal publicity	Equal variances assumed	.195	.659	3.898	306	.000	.366	.094	.181	.551
	Equal variances not assumed			3.991	270.029	.000	.366	.092	.186	.547
Certain sports are prestigious	Equal variances assumed	.795	.373	3.723	306	.000	.351	.094	.165	.536
	Equal variances not assumed			3.767	260.418	.000	.351	.093	.167	.534
Used to participating in sports at school	Equal variances assumed	1.348	.247	2.314	306	.021	.222	.096	.033	.411
	Equal variances not assumed			2.360	267.038	.019	.222	.094	.037	.408
There are good coaches for my sport/s	Equal variances assumed	.367	.545	.185	306	.853	.019	.101	-.180	.217
	Equal variances not assumed			.185	250.992	.853	.019	.101	-.180	.217

***p<.05; **p<.01; ***p<.001**

Table 36 shows an output analysis of the whole Levene t-test when equality of variances are assumed and when they are not assumed (reasons for participation across genders) from Table 11. First, the Levene test of equality of variances was examined the results did not show significant differences. The t-values were read from the first row (equality of variance assumed). If the test indicated the variances were different, then the t-values were read from the second row of the output (equality of variances not assumed.)

Table 37: Levene test when equality of variances are assumed and when they are not: Reasons for non- participation in sports.

Independent Samples Test(from table12)										
Reason for non-participation in sport **Variable**		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Don't have sporting habits	Equal variances assumed	.090	.764	.579	306	.563	.058	.100	-.139	.255
	Equal variances not assumed			.576	248.013	.565	.058	.100	-.140	.256
Academic commitments	Equal variances assumed	.510	.476	.086	306	.931	.009	.105	-.197	.215
	Equal variances not assumed			.087	254.412	.931	.009	.104	-.196	.214
Equipment too expensive	Equal variances assumed	.037	.848	-.466	306	.641	-.045	.097	-.237	.146
	Equal variances not assumed			-.468	252.904	.640	-.045	.097	-.237	.146
No facilities	Equal variances assumed	.005	.942	-.622	306	.535	-.059	.095	-.246	.128
	Equal variances not assumed			-.623	252.066	.534	-.059	.095	-.246	.128
Sports are childish	Equal variances assumed	.109	.742	.160	306	.873	.010	.062	-.113	.133
	Equal variances not assumed			.158	244.899	.874	.010	.063	-.114	.134
My friends don't like me to do sports	Equal variances assumed	.056	.813	.082	306	.935	.004	.049	-.093	.101
	Equal variances not assumed			.081	239.458	.936	.004	.050	-.095	.103
Sport is waste of time	Equal variances assumed	1.716	.191	-.663	306	.508	-.045	.068	-.179	.089
	Equal variances not assumed			-.677	268.310	.499	-.045	.067	-.176	.086
Friends don't do sports	Equal variances assumed	.204	.652	.042	306	.966	.003	.081	-.156	.163
	Equal variances not assumed			.042	241.437	.967	.003	.082	-.158	.165

Religion prevents me from doing sports	Equal variances assumed	3.170	.076	.830	306	.407	.055	.066	-.076	.186
	Equal variances not assumed			.800	220.881	.425	.055	.069	-.081	.191
Health issues	Equal variances assumed	1.064	.303	.897	306	.371	.083	.092	-.099	.264
	Equal variances not assumed			.892	246.501	.373	.083	.093	-.100	.266
Risks of injuries	Equal variances assumed	.870	.352	3.202	306	.002	.308	.096	.119	.497
	Equal variances not assumed			3.136	233.847	.002	.308	.098	.115	.502
Sports attire exposes body	Equal variances assumed	5.198	.023	1.381	306	.168	.115	.083	-.049	.279
	Equal variances not assumed			1.340	226.630	.182	.115	.086	-.054	.284
Find spectators unpleasant	Equal variances assumed	2.956	.087	.356	306	.722	.032	.089	-.144	.207
	Equal variances not assumed			.348	232.569	.728	.032	.091	-.148	.212
Reluctant to walk to and from sports field	Equal variances assumed	1.562	.212	1.669	306	.096	.153	.092	-.027	.334
	Equal variances not assumed			1.646	239.614	.101	.153	.093	-.030	.337
Level of competition is too high	Equal variances assumed	.847	.358	-.704	306	.482	-.065	.092	-.247	.117
	Equal variances not assumed			-.697	242.990	.486	-.065	.093	-.249	.119
Found it difficult to be selected for teams	Equal variances assumed	.024	.877	.176	306	.860	.017	.096	-.171	.205
	Equal variances not assumed			.174	241.815	.862	.017	.097	-.173	.207

***p<.05; **p<.01; ***p<.001**

Table 37 presents output of the whole Levene t-test when equality of variances are assumed and when they are not assumed (reasons for non-participation across genders) from Table 12.The t-values were read from the first row (equality of variance assumed). If the test indicated the variances were different, then the t-values were read from the second row of the output (equality of variances not assumed.)

There is a significant difference between males and females in their perception of risk with rather surprisingly males being more risk averse than females. It can be inferred that male sports may be more prone to participants receiving more serious injuries than in female sports. This finding suggests a need for further research since on the surface it is counterintuitive. However, sporting activities may be classified differently, namely extreme sports and traditional sports.

ANNEXURE G: OUTPUT ANALYSIS AFTER REJECTING THE NULL HYPOTHESIS USING F-TEST, TO FURTHER KNOW WHICH PAIRS ARE STATISTICALLY DIFFERENT, THE ONE WAY ANOVA AND THE USE OF TAMHANE'S T2 POST HOC TEST EQUALITY OF VARIANCES.

Table 38: Multiple comparisons: Reason for participation in sport

Multiple Comparisons-From Table18							
Tamhane t2 post hoc test							
	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Reason for participation in sport		Regular	.12603	.08012	.314	-.0676	.3197
	Occassional	Non-participant	-.10944	.08178	.458	-.3091	.0902
		Regular	.16976*	.06400	.026	.0153	.3242
	Non-participant	Non-participant	.06032	.08614	.864	-.1496	.2702
		Regular	.10944	.08178	.458	-.0902	.3091
Feeling of well being	Regular	Occassional	-.06032	.08614	.864	-.2702	.1496
		Occassional	-.095	.062	.344	-.25	.06
	Occassional	Non-participant	-.012	.076	.998	-.20	.17
		Regular	.095	.062	.344	-.06	.25
	Non-participant	Non-participant	.083	.082	.682	-.12	.28
		Regular	.012	.076	.998	-.17	.20
Releases stress	Regular	Occassional	-.083	.082	.682	-.28	.12
		Occassional	-.290*	.084	.002	-.49	-.09
	Occassional	Non-participant	-.280*	.096	.014	-.51	-.05
		Regular	.290*	.084	.002	.09	.49
	Non-participant	Non-participant	.010	.106	1.000	-.25	.27
		Regular	.280*	.096	.014	.05	.51
Helps keeping fit	Regular	Occassional	-.010	.106	1.000	-.27	.25
		Occassional	-.558	.488	.589	-1.75	.64
	Occassional	Non-participant	-.377*	.130	.015	-.70	-.06
		Regular	.558	.488	.589	-.64	1.75
	Non-participant	Non-participant	.181	.498	.977	-1.04	1.40
		Regular	.377*	.130	.015	.06	.70
Increases physical abilities	Regular	Occassional	-.181	.498	.977	-1.40	1.04
		Occassional	.024	.107	.994	-.23	.28
	Occassional	Non-participant	-.290*	.112	.034	-.56	-.02
		Regular	-.024	.107	.994	-.28	.23
	Non-participant	Non-participant	-.314	.134	.061	-.64	.01
		Regular	.290*	.112	.034	.02	.56

Friends participate	Regular	Occassional	.314	.134	.061	-.01	.64
		Occassional	.126	.114	.614	-.15	.40
	Occassional	Non-participant	-.258	.149	.244	-.62	.11
		Regular	-.126	.114	.614	-.40	.15
	Non-participant	Non-participant	-.384	.167	.069	-.79	.02
		Regular	.258	.149	.244	-.11	.62
Can meet new people	Regular	Occassional	.384	.167	.069	-.02	.79
		Occassional	.067	.136	.946	-.26	.40
	Occassional	Non-participant	.067	.134	.944	-.26	.39
		Regular	-.067	.136	.946	-.40	.26
	Non-participant	Non-participant	.000	.169	1.000	-.41	.41
		Regular	-.067	.134	.944	-.39	.26
Gives chance to travel	Regular	Occassional	.000	.169	1.000	-.41	.41
		Occassional	-.134	.106	.499	-.39	.12
	Occassional	Non-participant	-.023	.131	.997	-.35	.30
		Regular	.134	.106	.499	-.12	.39
	Non-participant	Non-participant	.111	.149	.841	-.25	.47
		Regular	.023	.131	.997	-.30	.35
Other financial benefit	Regular	Occassional	-.111	.149	.841	-.47	.25
		Occassional	-.131	.106	.521	-.39	.12
	Occassional	Non-participant	.139	.136	.675	-.20	.47
		Regular	.131	.106	.521	-.12	.39
	Non-participant	Non-participant	.270	.153	.223	-.10	.64
		Regular	-.139	.136	.675	-.47	.20
Like Competitions	Regular	Occassional	-.270	.153	.223	-.64	.10
		Occassional	.000	.120	1.000	-.29	.29
	Occassional	Non-participant	-.025	.142	.997	-.37	.32
		Regular	.000	.120	1.000	-.29	.29
	Non-participant	Non-participant	-.025	.167	.998	-.43	.38
		Regular	.025	.142	.997	-.32	.37
Like prizes	Regular	Occassional	.025	.167	.998	-.38	.43
		Occassional	-.171	.124	.430	-.47	.13
	Occassional	Non-participant	-.301*	.123	.049	-.60	.00
		Regular	.171	.124	.430	-.13	.47
	Non-participant	Non-participant	-.130	.154	.784	-.50	.24
		Regular	.301*	.123	.049	.00	.60
Personal publicity	Regular	Occassional	.130	.154	.784	-.24	.50
		Occassional	-.370*	.109	.003	-.63	-.10
	Occassional	Non-participant	-.319	.142	.082	-.67	.03
		Regular	.370*	.109	.003	.10	.63
	Non-participant	Non-participant	.051	.159	.985	-.34	.44
		Regular	.319	.142	.082	-.03	.67

Certain sports are prestigious	Regular	Occassional	-.051	.159	.985	-.44	.34
		Occassional	.031	.126	.993	-.28	.34
	Occassional	Non-participant	-.207	.153	.452	-.58	.17
		Regular	-.031	.126	.993	-.34	.28
	Non-participant	Non-participant	-.238	.181	.470	-.68	.20
		Regular	.207	.153	.452	-.17	.58
Used to participate in sports at school	Regular	Occassional	.238	.181	.470	-.20	.68
		Regular	.207	.153	.452	-.17	.58
	Occassional						
		Non-participant	-.238	.181	.470	-.68	.20
	Non-participant						
There are good coaches for my sport/s	Non-participant						
	Non-participant						
***The mean difference is significant at the 0.05 level.**							

Table 38 presents an output analysis of the one way ANOVA and the use of Tamhane's t2 equality of variances (Not assumed). After rejecting the null hypothesis using the F- test, multiple comparison was done to see which pairs are statistically different as run in Table 18.

Table 39: Multiple comparisons: Reason for participation in sport

Multiple Comparisons- From table 19							
Tamhane 's t2 post hoc test							
Reason for non-participation in sport	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Don't have sporting habits	Regular	Occassional	.082	.124	.881	-.22	.38
		Non-participant	.187	.132	.408	-.14	.51
	Occassional	Regular	-.082	.124	.881	-.38	.22
		Non-participant	.105	.159	.884	-.28	.49
	Non-participant	Regular	-.187	.132	.408	-.51	.14
		Occassional	-.105	.159	.884	-.49	.28
Academic commitments	Regular	Occassional	.131	.128	.669	-.18	.44
		Non-participant	.509*	.130	.001	.19	.83
	Occassional	Regular	-.131	.128	.669	-.44	.18
		Non-participant	.378	.158	.056	-.01	.76
	Non-participant	Regular	-.509*	.130	.001	-.83	-.19
		Occassional	-.378	.158	.056	-.76	.01
Equipment too expensive	Regular	Occassional	-.023	.118	.996	-.31	.26
		Non-participant	.177	.135	.475	-.15	.51
	Occassional	Regular	.023	.118	.996	-.26	.31
		Non-participant	.200	.158	.507	-.19	.59

	Non-participant	Regular	-.177	.135	.475	-.51	.15
		Occassional	-.200	.158	.507	-.59	.19
No facilities	Regular	Occassional	-.076	.121	.898	-.37	.22
		Non-participant	-.003	.130	1.000	-.32	.32
	Occassional	Regular	.076	.121	.898	-.22	.37
		Non-participant	.073	.158	.955	-.31	.46
	Non-participant	Regular	.003	.130	1.000	-.32	.32
		Occassional	-.073	.158	.955	-.46	.31
Sports are childish	Regular	Occassional	.060	.070	.773	-.11	.23
		Non-participant	.013	.087	.998	-.20	.22
	Occassional	Regular	-.060	.070	.773	-.23	.11
		Non-participant	-.048	.096	.946	-.28	.19
	Non-participant	Regular	-.013	.087	.998	-.22	.20
		Occassional	.048	.096	.946	-.19	.28
My friends don't like me to do sports	Regular	Occassional	-.015	.068	.995	-.18	.15
		Non-participant	-.018	.064	.990	-.18	.14
	Occassional	Regular	.015	.068	.995	-.15	.18
		Non-participant	-.003	.085	1.000	-.21	.20
	Non-participant	Regular	.018	.064	.990	-.14	.18
		Occassional	.003	.085	1.000	-.20	.21
Sports is waste of time	Regular	Occassional	.063	.085	.843	-.14	.27
		Non-participant	.063	.082	.831	-.14	.26
	Occassional	Regular	-.063	.085	.843	-.27	.14
		Non-participant	.000	.101	1.000	-.25	.25
	Non-participant	Regular	-.063	.082	.831	-.26	.14
		Occassional	.000	.101	1.000	-.25	.25
Friends don't do sports	Regular	Occassional	.189	.098	.159	-.05	.43
		Non-participant	.297*	.078	.001	.11	.49
	Occassional	Regular	-.189	.098	.159	-.43	.05
		Non-participant	.108	.101	.639	-.14	.35
	Non-participant	Regular	-.297*	.078	.001	-.49	-.11
		Occassional	-.108	.101	.639	-.35	.14
Religion prevents me from doing sports	Regular	Occassional	.148	.065	.069	-.01	.30
		Non-participant	.008	.091	1.000	-.22	.23
	Occassional	Regular	-.148	.065	.069	-.30	.01
		Non-participant	-.140	.094	.364	-.37	.09
	Non-participant	Regular	-.008	.091	1.000	-.23	.22
		Occassional	.140	.094	.364	-.09	.37
Health issues	Regular	Occassional	.076	.114	.882	-.20	.35
		Non-participant	.120	.109	.618	-.15	.39
	Occassional	Regular	-.076	.114	.882	-.35	.20
		Non-participant	.044	.135	.983	-.28	.37
	Non-participant	Regular	-.120	.109	.618	-.39	.15
		Occassional	-.044	.135	.983	-.37	.28
Risks of injuries	Regular	Occassional	.110	.123	.752	-.19	.41
		Non-participant	.218	.123	.221	-.08	.52
	Occassional	Regular	-.110	.123	.752	-.41	.19

		Non-participant	.108	.151	.856	-.26	.47
	Non-participant	Regular	-.218	.123	.221	-.52	.08
		Occassional	-.108	.151	.856	-.47	.26
Sports attire exposes body	Regular	Occassional	.171	.098	.232	-.07	.41
		Non-participant	-.022	.114	.996	-.30	.26
	Occassional	Regular	-.171	.098	.232	-.41	.07
		Non-participant	-.194	.132	.376	-.51	.13
	Non-participant	Regular	.022	.114	.996	-.26	.30
		Occassional	.194	.132	.376	-.13	.51
Find spectators unpleasant	Regular	Occassional	.149	.111	.453	-.12	.42
		Non-participant	.292*	.101	.015	.05	.54
	Occassional	Regular	-.149	.111	.453	-.42	.12
		Non-participant	.143	.127	.602	-.17	.45
	Non-participant	Regular	-.292*	.101	.015	-.54	-.05
		Occassional	-.143	.127	.602	-.45	.17
Reluctant to walk	Regular	Occassional	.182	.110	.273	-.08	.45
		Non-participant	.223	.106	.108	-.03	.48
	Occassional	Regular	-.182	.110	.273	-.45	.08
		Non-participant	.041	.128	.984	-.27	.35
	Non-participant	Regular	-.223	.106	.108	-.48	.03
		Occassional	-.041	.128	.984	-.35	.27
Level of competition is too high	Regular	Occassional	.277*	.110	.038	.01	.54
		Non-participant	.341*	.110	.008	.07	.61
	Occassional	Regular	-.277*	.110	.038	-.54	-.01
		Non-participant	.063	.131	.949	-.26	.38
	Non-participant	Regular	-.341*	.110	.008	-.61	-.07
		Occassional	-.063	.131	.949	-.38	.26
Difficult to be selected for teams	Regular	Occassional	.128	.117	.620	-.16	.41
		Non-participant	.328*	.119	.022	.04	.62
	Occassional	Regular	-.128	.117	.620	-.41	.16
		Non-participant	.200	.145	.428	-.15	.55
	Non-participant	Regular	-.328*	.119	.022	-.62	-.04
		Occassional	-.200	.145	.428	-.55	.15
*** The mean difference is significant at the 0.05 level.**							

Table 39 presents an output analysis of the one way ANOVA and the use of Tamhane's t2 equality of variances (Not assumed).After rejecting the null hypothesis using the F- test, multiple comparison was done to see which pairs are statistically different as run in Table 19.

ANNEXURE H: QUESTIONNAIRE

SECTION 1

This section covers particulars of each student in (biographical information)

Indicate with an 'X' the following

Q1

Gender

1 =Male ☐

2 =Female ☐

Q2

What is your age group…?

1=Below 17 ☐

2=Between 17-25 ☐

3=Between 26-35 ☐

4=Between 35-40 ☐

5= Between 41-55 ☐

6= Above 55 ☐

Q3

What Race do you belong to …?

1. = Black African ☐
2. = Colored ☐
3. = Indian /Asian ☐
4. = White ☐
5. = Other (specify**)** ☐

……

……

Q4

What is your present marital status …?

1= Never Married ☐

2 =Living together like ☐

Husband and wife

3 =Widow/widower ☐

4= Divorced/ Separated ☐

5 = Married ☐

6= other (specify) ☐

…….

…….

Q5

What is your studying Language?

1 =English ☐

2 = Afrikaans ☐

Q6

What degree are you registered for?

Q7

What faculty of study do your belong to? ***(Please tick on the box that best suites you)***

1=Faculty of Economic and Management Science ☐

2=Education ☐

3=Health Sciences ☐

4=Humanities ☐

5=Law ☐

☐

6=Natural & Agricultural Science ☐

7=Theology ☐

Q8

What is your academic year of study?

1 = 1st Year ☐

2= 2nd Year ☐

3 = 3rd Year ☐

4= 4th Year ☐

5 = 5th Year ☐

6 = other (specify**)** ☐

……..

……..

Q9

Are you residing on campus?

1=Yes ☐

2= No ☐

Q10

What residence are you?

1=Non Resident ☐

2=Akasia ☐

3=Abraham Fischer ☐

4=Arentum ☐

5=J.B.M. Hertzog ☐

6= Marjoelein ☐

7=Roosmaryn ☐

8=Villa Bravado ☐

9=Marula ☐

10 =Wag ‘n Bietjie ☐

11= Kagiso ☐

12=Medical School ☐

13= Soetdoring ☐

14=Khayalami ☐

15=N.J VD Merwe ☐

16=Welwitchia ☐

17=Khayalami ☐

18=Tswelopele ☐

19= Madelief ☐

20=Vergeet my nie ☐

21= Other Specify

……..

……..

SECTION2

This section covers interest on participation and attitudes to sports

Q22

Have you participated in sports at your previous school(s)?

1=Yes ☐

2= No ☐

Q23

Do you currently participate in any sport?

1=Yes ☐

2= No ☐

The following questions are on sports activities. Select to choose one or more which you are currently participating

Q24

Athletics

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q25

Cross-country

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q26

Road run

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q27

Hockey (field / Indoor)

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q28

Rugby

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q29

Netball

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q30

Swimming

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q31

Cycling

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q32

Triathlon

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q33

Tennis

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q34

Squash

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q35

Badminton

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q36

Table Tennis

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q37

Soccer

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q38

Basket ball

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q39

Teakwondo

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q40

Volley Ball

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q41

Chess

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q42

Cricket

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q43

Karate

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q44

Judo

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Q45

Fencing

1=Yes ☐ 2= Sometimes ☐ 3= No ☐

Indicate your level of agreement or disagreement with the following statements

Reasons for participating in sports:

REASONS	1= Strongly Disagree	2= Disagree	3= Neutral	4= Strongly Agree	5= Agree
46. It gives me a feeling of well being					
47. It releases stress					
48. It helps me keep fit					
49. It increases my physical abilities					
50. My friends participate					
51. Can meet new people there					
52. It gives me a chance to travel abroad					
53. It gives me other financial benefit					
54. I like competitions					
55. I like prizes					

56. There may be personal publicity					
57. Certain sports are prestigious					
58. I'm used doing sports from school					
59. There are good coaches for my sport/s					

Indicate your level of agreement or disagreement with the following statements

Reasons for not participating in Sports:

Reasons	1=Strongly Disagree	2= Disagree	3= Neutral	4= Strongly Agree	5=Agree
60. I don't have sporting habits from my former school					
61. My academic commitments don't give me time to do so					
62. The equipment / attire needed is too expensive					
63. There are no facilities for learning new sport which I would like to take up					
64. Sports are childish					
65. My friends don't like me to do sports					
66. Sports is waste of time					
67. My friends don't do sports					
68. My religion prevents me from doing					

sports					
69. I have some health problems (including disability, pregnancy)					
70. There is risk of injuries					
71. Spots attire exposes body					
72. I find spectators unpleasant					
73. I'm reluctant to walk to and from the sports field					
74. The level of competition at UFS is too high					
75. I found it difficult to be selected for teams					

SECTION 3

SUGGESTIONS

THIS SECTION COVERS OVERALL SUGGESTIONS PERTAINING STUDENT(S) PARTICIPANTS AND NON-PATICIPANTS IN SPORT(S) AT UFS.

76= What changes would you suggest to increase sport participation in general at UFS?

77= What changes would you suggest to increase sport participation in women?

78= What changes would you suggest to increase sport participation in men?

79= What changes would you like to see in sport equipment and facilities?

80= What changes would you like to see in director(s), coaches and management of sports?

81= Do you think taking part in sport has any impact on your academic studies?

THANK YOU FOR YOUR TIME.