The identification of batting trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape Cricket Club from its origin in 2015 – 2017.

Romano Jude Ramoo

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Supervisor: Dr. Barry Andrews

Co-supervisor: Ghaleelullah Achmat

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DECLARATION

I hereby declare that "The identification of bating trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape Cricket Club from its origin in 2015 – 2017" is my own work, that it has not been submitted before for any other degree in any other university, and that the sources I have used have been indicated and acknowledged as complete references.

Romano Jude Ramoo **November 2019**

Signed _____

DEDICATION

This thesis is dedicated to my parents (Patrick and Vanessa Ramoo) without who I would not have reached this point in life. Through your love, support, and sacrifice I have been afforded the opportunity, which both of you never had, to further my education and pursue my dreams and passion. I will always be grateful for having you in my life and I hope you can be as proud to have me as a son as I am to have you as my parents.

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ABSTRACT

Over the years cricket has developed from a traditional and conservative game into an extremely lucrative sport, which requires a great deal of professionalism in all surrounding areas. In recent years cricket has evolved and resulted in the emergence of Twenty20 cricket. The aim of this study focused on identifying batting trends through a comparative analysis between Varisty Cup winning teams and the University of the Western Cape Cricket Club between the age group of 18 – 25. The study used a quantitative research approach with a content analysis methodology research design. Nine key batting variables were analysed in three phases of a cricket match (Powerplay, Middle overs and Death overs) between winning teams and the University of the Western Cape Cricket Club to establish the magnitude of differences (Cohen's effect size). The top indicators for success in the tournament were averaging a higher number of boundary fours, accumulating a higher number of single runs throughout the match, averaging a high number of sixes during the Middle and Death Overs of a batting innings and accumulating two's throughout all three phases of a match. The overall summary of this study's results navigates to a batting strategy that should focus on batting trends by maintaining a higher batting run rate, target to scoring more boundary fours and sixes, good running between the wickets to accumulate two's, select batsmen with a low dismissal rate and select batsmen with a high single scoring rate [equates to better strike rotation].

KEY WORDS: Cricket, Twenty20, batting, singles, two's, three's, fours, sixes, runs, boundaries, trends, analysis.

LIST OF SYMBOLS, ACRONYMS AND ABBREVIATIONS

%	Percentage
SD	Standard Deviation
ITF	Integrated Test Facility
GPS	Global Positioning System
DRS	Decision Review System
SPSS	Statistical Package for the Social Sciences
ES	Effect Size
C.C	Cricket Club
T20	Twenty20
ODI	One Day International
ICC	International Cricket Council
CSA	Cricket South Africa
IPL	Indian Premier League
UWC	University of the Western Cape

Chapter 1: Introduction and Background of the Study

1.1 Introduction

Cricket has been played for over five centuries and is recognized in 100 different countries (Justham, West & Cork, 2008; Key, 2013). It is a field-based sport challenged by teams of eleven players; each having a set of specific skills such as bowling, batting and fielding which define their role and contributes to team performance (Stuelcken, Pyne & Sinclair, 2007; Key, 2013).

Over the years cricket has developed from a traditional and conservative game into an extremely lucrative sport, which requires a great deal of professionalism in all surrounding areas. Currently the game has been significantly improved by enhancing performance among cricketers, using technology and human movement sciences. The digital revolution has introduced open source technology such as online scoring which has made a wide impact on the way cricket has been viewed and learnt. The technological improvement in cricket is an important aspect for the cricket fraternity (Thakur & Kumar, 2010).

Cricket has various formats namely, Test Cricket, One Day Internationals (ODI) and Twenty20 (T20) which is played at the international level. During the past few years T20 cricket has grown exponentially, the latest format of the game has limited overs where each team is allowed to bat and bowl for a maximum of 20 overs. The format has generated a dynamic form of cricket which attracts spectators to the matches (Sharma, 2013), and lucrative global TV rights to broadcasting (Petersen et, al., 2008a).

Cricket research has expanded with the use of technologies and innovative approaches (Thakur & Kumar, 2010) such as:

- **A bowling machine** - is a machine that can replicate the spin and swing of bowlers (Thakur & Kumar, 2010).
- **Hawkeye** - is the first and only ball-tracking system to have passed rigorous Integrated Test Facility (ITF) measures. The basic idea is to examine the trajectory of the ball during the entire duration of play. This data is then processed to produce life like visualizations showing the paths which the ball took. Such data has been used for various purposes, with a number a popular uses including the LBW decision making software and colourful wagon wheels illustrating various statistics in cricket. (Bal & Dureja, 2012).
- **Hot spot -** is an infra-red imaging system. The purpose of this technology is to assist the on-field umpire in determining whether the ball has struck the batsman, bat or pad (Sangwan, 2014).
- **Snikometer -** is used in televising cricket to graphically analyse sound and video and show whether a fine noise, or snick, occurs as ball passes bat (Thakur & Kumar, 2010).
- **GPS Technology -** GPS (Global Positioning System) technology is a tracking device, which is electronically designed to track movements of players by means of satellites and radio transmitters as well as receivers around the pitch.
- **Data Analytics Software -** used to extract previously unknown information from large data bases to make decisive decisions. (Van Der Merwe, Matthee & Schoeman 2006).

Data analysis is extremely useful when selecting a cricketer in the various formats; it determines the common trends and tactical strategies of players during the T20 format of the game. According to Rein and Memmert (2016), extensive research has been conducted previously to identify the impact of technology on sports in general, however to date, there are no comprehensive cricket studies on data analytics accounting for T20 Varsity Cup cricket at university institutions. In the 21st century, more people than ever are participating in sport and as a result of this, the quest for new markets, records and sport supremacy has led to millions being spent on the development of sport techniques. As a consequence, both athletes and coaches are now involved in increasingly complex systems that rely heavily on advanced technologies (Fuss, Subic & Ujihashi, 2007).

1.2 Overview of the study

The University of the Western Cape Cricket Club (UWC CC) is a sport club that operates within the jurisdiction of the University. The club is based in the City of Cape Town, within the borders of the Western Cape Province of South Africa. The UWC CC competes in the highest respective leagues within Cricket South Africa (CSA). A season at the institution may involve the T20 Varsity Cup, University Sports South Africa (USSA) week tournament, Western Province Premier League 1 day and T20 format with progression into the National Club Champs tournament.

The Western Province cricket league is a local league in which the UWC CC participates in, as part of their six month (October – March) cricket season. The annual T20 Varsity Cup Cricket Tournament is a one week tournament, participated by the top eight Universities in South Africa. These respective tournaments, both fall under the jurisdiction of Cricket South Africa (CSA), which is "an affiliate of the South African Sports Confederation and Olympic

Committee (SASCOC) and a full member of the International Cricket Council (ICC). SASCOC is the national governing body for the sport of cricket in South Africa and administers all of South African cricket, men and women, both in the professional and amateur spheres."

For the scope of the study, the sample population was delimited to members of the winning teams and UWC CC, with the T20 Varsity Cup squad serving as the study participants. This group has been participating in the annual tournament since its origin in 2015 and has failed to qualify for the semi finals on two occasions but most importantly have not won the tournament in the club's history. Over the past few years, the UWC CC has experienced various challenges with regard to data analytics and formulating batting trends from the tournament. A high degree of focus has been put on the teams batting unit and will serve as a counter force towards suitable planning and strategies for management over the upcoming years and in the process improve and increase the probability of winning more games.

1.3 Statement of the Problem

To achieve deeper insight into crickets' tactical game, it is necessary to record the substantial tactical actions in accordance to the time they occurred, so the stream of tactical behaviour can be perceived. In the growing community of professional cricket, all teams are faced with the challenge of a competitive environment and the growing field of technology, utilised by the opposition.

The advances and the use of technology in T20 Cricket are regarded as a useful tool in gaining advantage over one's opponents. Players can now analyse and improve their performance; using technological advances such as batting trends. Adopting the use of

various data studies linked to cricket at Varsity Cup level, can significantly assist teams to strategically plan for matches in the quest to outperform their opposition. Cricket is a popular game played by skilled individuals, seeking technological and data tools to assist them in improving their playing ability and judgement during the course of a T20 Cricket match.

1.4 Research Question

In order to address the identified problem, this study answered the following question:

(i) What is the comparative batting analysis in T20 cricket between Varsity Cup winning teams and the UWC C.C from its origin in 2015 - 2017?

In order to answer the main research question, the following sub-questions were established:

1. What are the factors that contribute to the identification of batting trends in T20 cricket?
2. What will be an effective way of identifying batting trends in T20 cricket?

To answer this question it is important to understand:

a. What is the key performance indicators used to establish batting trends in T20 Varsity Cup cricket?

b. What is an effective way to optimise these indicators?

1.5 Aims and Objectives of the Study

1.5.1 Aim of the Study

The overall aim of this study is to identify bating trends through a comparative analysis in T20 cricket between Varsity Cup winning teams and the UWC C.C from its origin in 2015 – 2017.

1.5.2 Objectives of the Study

The objectives of the study are to:

1. Analyse batting performances of the University of the Western Cape Cricket Club.
2. Analyse batting performances of T20 Varsity Cup winning teams.
3. Compare batting performance variables between winning teams and the University of the Western Cape Cricket Club.

1.6 Significance of the Study

The outcomes of this study can be adopted and applied by University cricket clubs within the Western Cape and/or eventually in South Africa at large. The unknown variables of batting trends in T20 Varsity Cup cricket matches may assist teams and especially management and captains with:

I. The selection process.
II. Preparation before a game, which includes practice sessions, focussed on the execution of specific batting game plans.
III. Strategic planning sessions for teams, where batting strategies are discussed, to ensure a game plan is in place and targets are being met.

This study can also assist in improving the overall performance of players during T20 Varsity Cup cricket matches. The use and application of this study by UWC CC can significantly improve the teams on field batting performances and allow the team to strategically plan and train for match situations. In summary, the study will aim to improve the batting techniques during T20 cricket matches, assisting with match planning and become a source of knowledge in the form of a data repository within the broader cricket fraternity.

1.7 Limitations and De-limitations of the Study

1.7.1 Limitations

The sampling of participants (team and individual), will not be done randomly, so generalizations based upon this convenient sample will also be limited.

- Only completed 20 over matches will be considered for this study.
- No reduced matches (rain affected) will be considered for this study.
- Powerplay plus over will not be considered for this study. The Powerplay plus over was not indicated in the data set.

1.7.2 De-limitations

1.7.2.1 Inclusion criteria

The study inclusion criteria are the following:

- Participants must be a full-time registered male student at the University of the Western Cape and participating South African tertiary institutions.
- Participants should be between the ages of 18-25.
- Full-time registered first year student at the University of the Western Cape.
- Participants who are not in their first year of studies should have a minimum of 60 University credits from their previous year of studies.

1.7.2.2 Exclusion criteria

The study exclusion criteria are the following:

- Participants who achieve less than 60 credits in their first year and above, will be excluded

1.8 Definition of terms

Batting: Is defined as the act and skill of defending one's wicket and scoring runs (Mann, Allen & Runswick, 2016).

Batting Trends: These are a common development or style that is statistically detectable over time within a batting unit (Khan, Nicholson & Plotz, 2017).

Cricket: Is a game played between two teams, generally of 11 players each. In essence, it is single combat, in which an individual batsman does battle against an individual bowler, who has helpers known as fielders (International Cricket Council, 2015).

Data Analytics: Is the method used to analyze large volumes of data, which is collected from an assortment of sources, such as websites, social networks, videos and digital images (Turra, 2015).

Death Overs: This is the final 5 overs in a T20 match, in which most bowlers are, usually, hit for lots of runs or the batting team loses a number of wickets (International Cricket Council, 2015).

Limited Overs: The name reflects the rule that in the match each team bowls a set maximum number of overs, usually 20 and 50 (International Cricket Council, 2015).

Middle Overs: The overs 7 to 15 in a T20 cricket match is classified as the "Middle Overs" The fielding side is restricted to 5 players outside the 30 yard inner ring circle (International Cricket Council, 2015).

Over: This is a delivery of 6 consecutive legal balls bowled by one bowler (International Cricket Council, 2015).

Performance Analysis: Is a specialist discipline involving systematic observations to enhance performance and improve decision making, primarily delivered through the provision of objective statistical (data analysis) and visual feedback (English Institute of Sport, 2019).

Powerplay: The first 6 overs of a Twenty20 match are known as the "Powerplay." The fielding side is restricted to 2 players outside the 30 yard circle (International Cricket Council, 2015).

Run/s: In cricket, a run/s is the unit of scoring. To complete a run, the batsman must make their ground, with some part of their person or bat behind the popping crease at the other end of the pitch. Runs can be accumulated in the form of 1, 2, 3, 4 or 6 (Shah & Shah, 2014).

Run Rate: This is the average number of runs scored per over, and is used as a guide to a team's progress (Scarf, Shi & Akhtar, 2011)

Strike Rotation: This generally means looking for singles (one run) off as many deliveries as possible (Prakash, Patvardhan & Singh, 2016).

Tactical Analysis: The observation of detailed data from various sources including technical skill, individual physiological performance and team formations to represent the complex processes underlying team tactical behaviour (Garganta, 2009).

Twenty20: This is the shortest format of cricket where two teams have a single innings each, which is restricted to a maximum of 20 overs (Hyde & Pritchard, 2009).

Wickets Lost: Refers to a batsman being dismissed in cricket and resulting in a team losing wickets (Shah & Shah, 2014).

Chapter 2: Literature Review

2.1 Introduction

The use of science and technology in sports have helped teams, individuals, coaches and trainers to continually improve and advance the levels of performance in various sports around the world. This chapter will highlight and review the relevant literature pertaining to cricket as a sport, discussing the various formats, in particular T20 and how technology contributes towards performance, namely data analytics, performance analysis, tactical analysis and batting trends in cricket. Cricket is a sport where by statistics feature and can impact match strategy and tactics throughout (Petersen et al., 2008b).

Furthermore, this chapter reviewed various technologies that attain team statistical data to establish various types of information that could benefit the outcome of team sport namely cricket success (Sharma, 2013).

Finally, the review reveals how this information can be built upon by suggesting ways in which we may better understand the realities of technology and the importance of performance analysis within the coaching process. The review concludes by outlining the key research questions that will be addressed by this research.

2.2 Cricket

Cricket is a field based sport contested by two teams of eleven players, each possessing a set of specific skills which define their role and contribute to team performance. Cricket is a bat-and-ball game with complex rules; cricket involves physical fitness, skill and strategy. The contest is centred on a rectangular shaped pitch (Figure 2.1) surrounded by an oval field (Pardiwala, Rao & Varshney, 2018).

Figure 2.1: Illustration of a cricket field (The Karnataka State Cricket Association, 2018).

Batting and bowling are considered the two disciplines in cricket which indicates the attacking and defensive abilities of the team (Douglas & Tam, 2010). During the attacking phase (batting) the team strives to score as many runs as possible in the allocated overs by striking the ball through or over the field, scoring runs if the ball reaches the boundary (four or six) or if the batsman run the length of the pitch (Figure 2.2), as the bowling team

(opposition defensive phase) attempts to limit the amount of runs scored by the batting team. Ultimately the batting team attempts to accumulate more runs than the opposition team and batsman can be dismissed in six possible ways namely, bowled, caught, stumped, run out, leg before wicket (LBW) and hit wickets (Oslear, 2010).

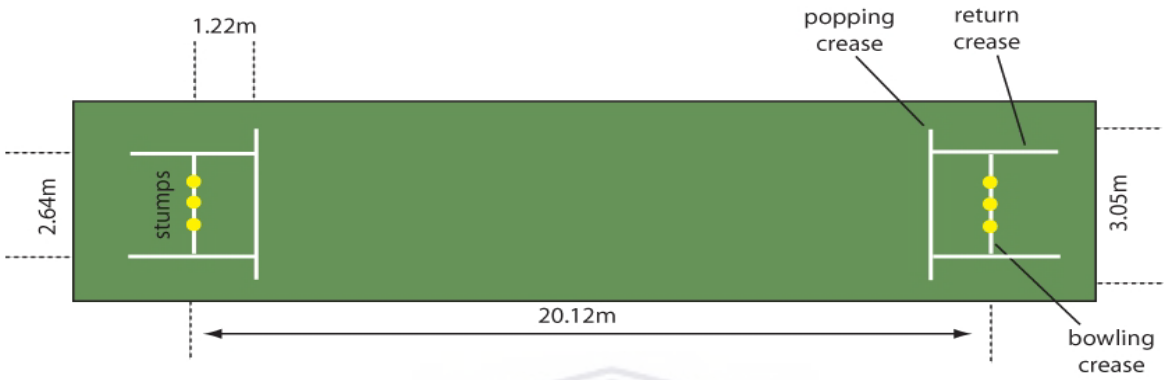

Figure 2.2: Dimensions of a cricket pitch (Ahmad, 2012).

The latest form of cricket (T20) was inaugurated in the early 2000's and as a result we find the sport of cricket in the centre of a revolution. This has provided another new exciting format of cricket which has unlocked a fresh audience and target market (Key, 2013) and is rapidly increasing in popularity, due to the huge cash injection and media publicity (Petersen, et, al, 2008a).

2.3 Twenty20 (T20)

T20 cricket is the latest version of limited overs cricket where each team is allowed to bat and bowl for a maximum of 20 overs (an over consisting of 6 legitimate balls per over), Oslear, (2010). This format of cricket is a popular evening entertainment showcase and the duration of the game or match is around two and half hours which is close to other sports such as football, basketball etc (Sharma, 2013). In T20 cricket the precision, accuracy and

implementation of all the disciplines in cricket are tested more closely than other formats of the game since the margin for error is extremely fine and often one player can make a difference between victory and defeat (Douglas & Tam, 2010).

Over the past few years T20 has grown tremendously around the sport of cricket and was introduced to create a lively form of cricket which would be attractive to spectators at the ground and viewers on television (Sharma, 2013). In an effort to increase this appeal of the sport and extent the dramatic periods beyond the culmination of an innings (Key, 2013), the International Cricket Council (ICC) introduced Powerplays (International Cricket Council, 2015).

Powerplays take place at the start of the innings (Key, 2013) and according to (Sankaranarayanan, Sattar & Lakshmana, 2014) a Powerplay is a restriction on the number of fielders that could be placed by the bowling team outside a certain range (30 yard circle) from the batsman. In a T20 match, each team is allowed a maximum of 20 overs which are broken up into three stages: (International Cricket Council, 2015).

1. Powerplay (Overs 1 - 6)
2. Middle Overs (7 - 15)
3. Death Overs (16 - 20)

For the team that is bowling, “Powerplay” has fielding restrictions put in place which strictly permits only two fielders outside of the 30 yard circle. Further fielding restrictions during the Non-Powerplay overs (7 - 20) are imposed during the “Middle” and “Death overs” which permits only a maximum of five fielders outside of the 30 yard circle for the duration of the

match. A team may use all eleven players to “bowl” but a single “bowler” may not exceed a maximum of a four over spell (four overs of six balls = 24 balls) during a complete 20 over match. (Key, 2013) states, “combined with increasing the appeal of the sport, Powerplays, and the associated fielding restrictions and tactical timings of additional Powerplays, are designed to provide an opportunity for a batting team to score more runs. However, Powerplays can also increase the risks taken by batsmen and consequently increase the chances of a fielding team taking wickets and winning a match (Key, 2013).

With the implementation of these “exciting” rules and regulations in T20 cricket, the call for fresh innovated technology in the 21st century is of great importance in the effort to attract large amount of supporters to view live matches on their television sets or at respective stadiums (Noorbhai & Noakes, 2015).

There has been many technological evolutions in the game of cricket such as Hawk-eye, Snickometer, Hot-Spot, Zing bails, Stump cameras, Decision Review System (DRS), online scoring (Cricinfo) and 22Yardz (match analysis software) that have been used in a South African context.

2.4 Technology in Cricket

Cricket is a comparatively new and promising research area in contrast to other sports like baseball, soccer etc (Amin & Sharma, 2014). Research in cricket would not be the same without the support and importance of technology and creative approaches (Noorbhai & Noakes, 2015).

Over the last decade or so, the power to produce data that provide a considerable description of performance of individuals or teams in sport, to sustain decision-making by coaches and managers, has been largely improved by technological developments (Travassos, Araújo & Esteves, 2013).

Modern technology, such as high-definition cameras, ball flight simulators, computer graphics, microphones etc, is used to re-examine debatable plays and deliver final decisions (Shivakumar, 2018). In the 21st century, the entire face of cricket has transformed considerably with the use and innovation of modern technologies (Thakur & Kumar, 2010). The technological innovation in cricket is an extremely important feature not only for the game of cricket but also for the cricketers. Among all the technological innovations mentioned above, there is no doubt that any technology that enables cricket followers to get scores more rapidly and with more reliability is going to be one of the hottest things of this generation (Thakur & Kumar, 2010). Advances in technology have meant that information is now more accessible than ever and it is the role of technology to provide spectators with the real-time information they need (Arup, 2018).

The start of various social media platforms and websites such as Instagram, Facebook, YouTube and ESPN cricinfo has greatly contributed to the popularity of the game and has brought games closer to the passionate cricket fans. The social media platforms and websites on mobile devices and desktops offer abundant options to evaluate the games in the form of live scores (ESPN cricinfo) updates, graphs and videos (Thakur & Kumar, 2010). Time has become a high value commodity and people want technology to enhance their sporting lives (Arup, 2018).

2.4.1 Online Scoring in Cricket

The World Wide Web is possibly the largest information system available at present and the most frequently used. An Internet based information system using a database as its back-end can successfully manage the cricket data and dynamically present up-to-date statistical data to all its users (Fernando & Wikramanayake, 1998).

"ESPN cricinfo", is an internet based information systems program which is a popular website amongst cricket loving people. This site also produces all forms of important statistical data on cricket and contains the archives of all previous cricket matches. The information of current and previous cricket matches is recorded on scorecards (Figure 2.3). This data consists of individual and team performance during the match. The scorecards produce both static data (once the game is complete) and dynamic data (during the playing time of the match). People who are interested in cricket will find this information system a practical and informative one as this serves as an opportunity to follow a live cricket match with ball by ball description/commentary (Fernando & Wikramanayake, 1998).

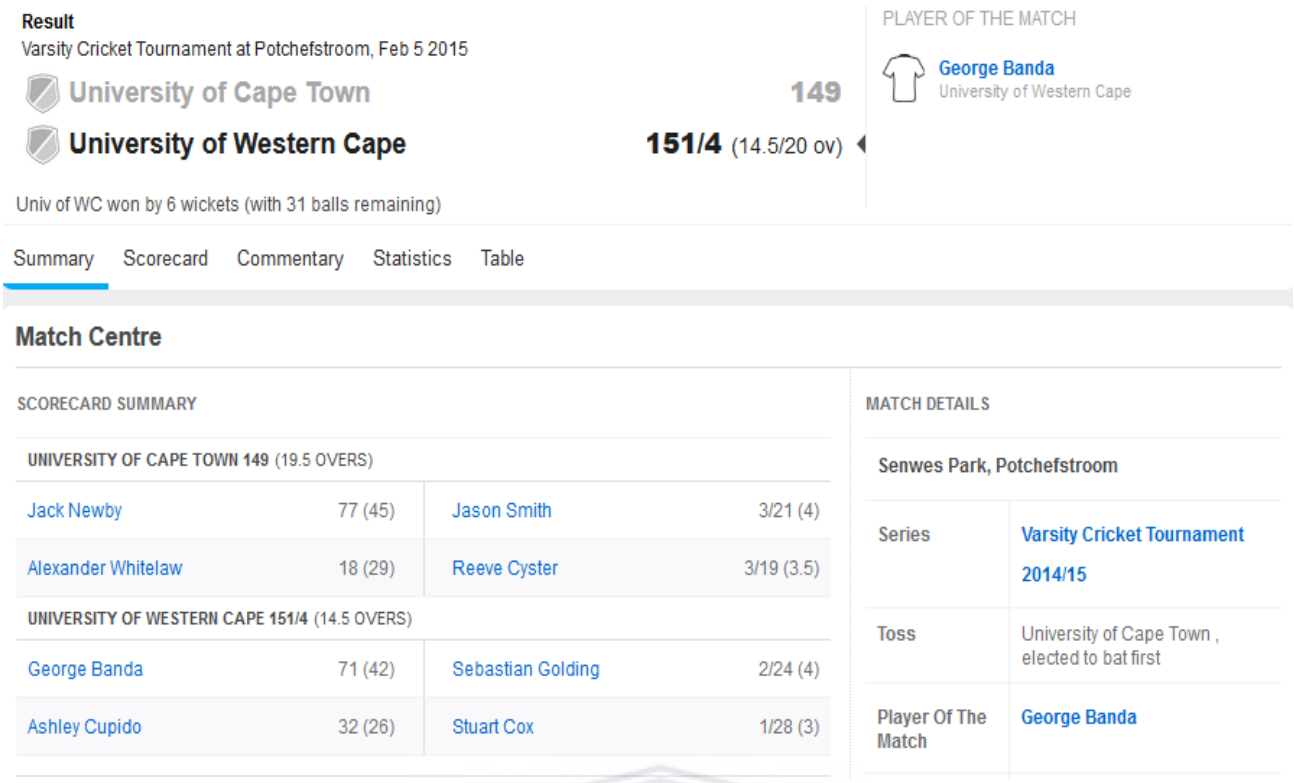

Figure 2.3: Twenty20 cricket Online Scorecard (ESPN cricinfo, 2015)

The output of this online scoring system presents the user with statistical data of series, match, team statistics, batting and bowling records, fielding, wicket keeping, player profile and all round performance. The majority of scorecard processing is carried out using the database query language. This ensures the information is available to the user and the input of the system is mainly in the form of a cricket scorecard (Figure 2.3) interface (Fernando & Wikramanayake, 1998).

2.4.2 Online Cricket Scorecards

Score-keeping which is done on an online scoring program is essential for the game of cricket. During an official cricket match, an appointment of one scorer from each team is

tasked to record each ball bowled, runs scored and wickets lost. This information is all recorded on a scorecard. The scorers' duties in the Laws of Cricket have identified the following: accept, acknowledge, record and check. The scorer must not question the judgement of the umpire but rather accept and acknowledge their decision (Siddiqui, 2016).

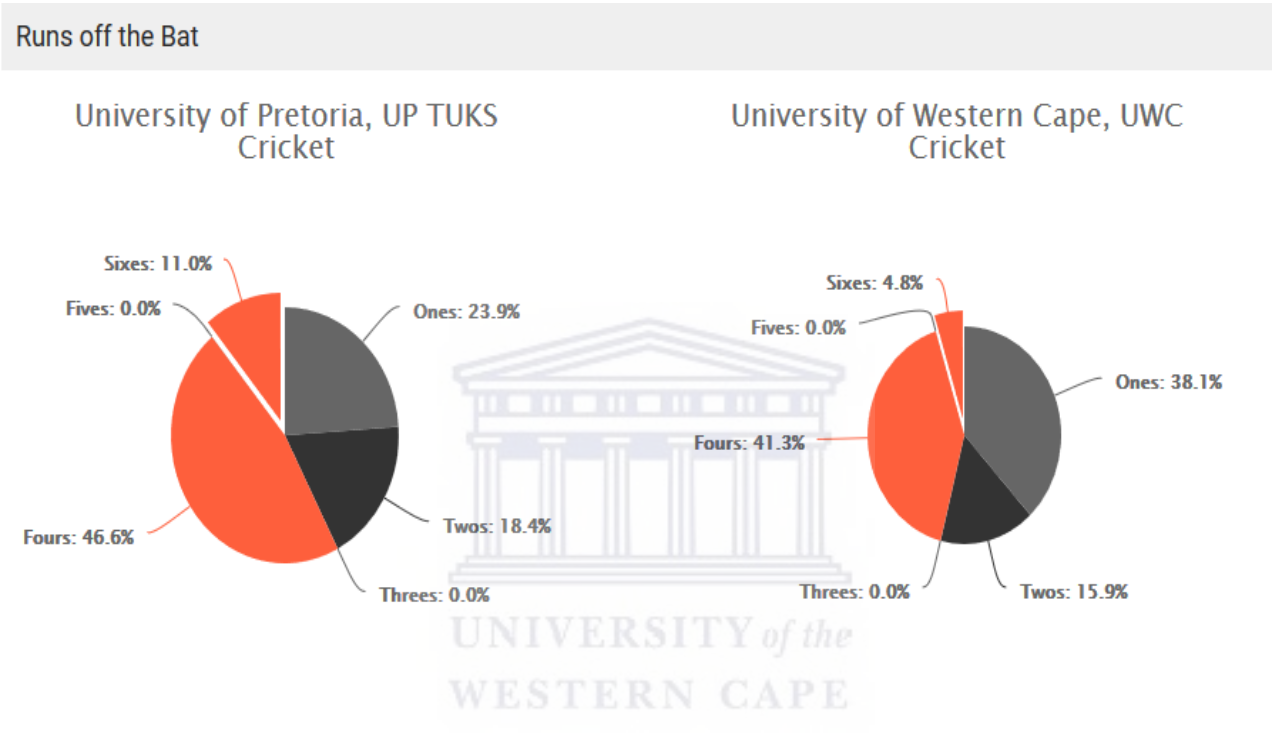

Figure 2.4: Runs scored between the winning team and UWC (CricHQ, 2016).

The data recorded consists of individual scores of players, how they scored the runs, how they were dismissed, extra runs scored (extras), total runs scored (total), when each batsman was dismissed (fall of wickets) and how the opponent players bowled (bowling figures). In essence, a cricket scorecard should be able to illustrate in detail how a particular game was played and to produce different forms of cricket statistics (Figure 2.4) and records (Fernando

& Wikramanayake, 1998). Scorecards are beneficial in data analytics to identify trends and tactics within team performance.

2.5 Data Analytics

Data analytics are defined as the process of extracting useful insights from raw data and discovering valuable information from large databases using algorithms that discover unseen patterns in data (Turra, 2015).

With a large amount of growing interest in the society of sport and the increasing availability of sport related data, there are immense opportunities to carry out sports analytics research (Swartz, 2017). Despite sports analytics rapidly developing, this has not been the case with cricket (Perera, 2015). Cricket is a fairly new and promising research area in comparison with other sports such as baseball, soccer etc (Amin & Sharma, 2014). It is a sport rich in data and therefore seems evident that analytical work shall be attended by researches fascinated in quantitative issues (Bhattacharjee, et, al, 2016b).

The rapid growth of the Internet and the digital economy has drawn a lot of attention in the Information Technology world. This has led to an exponential growth in demand for data storage and analytics. Businesses are heavily depended on this and have resulted in organizations collecting and storing more data than ever before. The type of information being created is data that include documents, images, audio, video, and social media contents known as unstructured data or Big Data (Zakir, Seymour and Berg, 2015).

Big Data Analytics is a way of extracting value from these enormous quantities of information and used to assist in predicting future volumes, gain insights, take proactive actions, and give way to better strategic decision-making (Zakir, Seymour & Berg, 2015). A vast amount of analytics in cricket, compromises in performance measurement of cricketers, especially in batting and bowling (Bhattacharjee, et, al, 2016a).

2.6 Performance Analysis

Performance Analysis is considered as a professional discipline that involves the systematic observations, used to enhance performance and improve decision making, mainly delivered through the provision of statistical data analysis and visual feedback such as Video Analysis (English Institute of Sport, 2019).

Performance analysis is currently seen as a tool used to aid performance enhancement at all levels and to create a valid and reliable record of performance by means of systematic observations that can be analysed with a view to facilitating change (Lee, 2011).

The practical importance of performance analysis is that carefully selected performance indicators highlight good and bad techniques or team performances. This process will assist coaches to facilitate a comparative analysis of teams and identify good and bad performances of an athlete (Bartlett, 2001). Game-related data in the sports fraternity are demanded (Zambom-Ferraresi, Rios & Lera-López, 2018) by sport stakeholders (coaches, players, managers, fans and performance analysts), to improve training processes and this has resulted in the rapid growth of performance analysis over the last two decades (Gomez-Ruano, 2018).

Research relating to performance analysis has primarily focused on performance indicators, data collection systems and reliability, profiling and prediction and work rate analysis (Nicholls et al., 2018). By virtue of desire, performance analysis is considered as an essential tool in providing effective and precise feedback within the coaching process (Nicholls et al., 2018). Performance analysis has benefited through the use of various innovative technologies in sport such as (GPS, tracking data, software, etc.), sport analytics (Big data) used to improve the data gathered and the analysis and findings derived from various competitions and training sessions. "Therefore, actual performance analysis is a research area that covers a wide range of aspects of sport and is studied from a multifactorial approach that allows the development of training processes and competition management." (Gomez-Ruano, 2018, p. 3).

The introduction of video review sessions into weekly training programmes, through the use of video and computer technology, has led to the belief that performance analysis in sport is now extensively accepted among coaches, athletes and sports scientists as an important input into the feedback process. With the development of computer and video supported analysis systems (such as ESPN cricinfo), it has improved the accessibility to resource and analyse sporting events objectively and as a result, research frequently uses these data in both individual and team based sports (Mackenzie & Cushion, 2013).

The role of feedback in the performance analysis process is essential, together with accurate and precise information. To ensure excellent feedback to performing athletes, coaches rely heavily on data management of precise techniques by utilising video analysis and various technological applications (Bartlett, 2001).

2.7 Tactical Analysis

In professional sports, tactical analysis is measured by the study of movement patterns, strategy and tactics in team sports. These patterns of play are often identified and used successfully in successive games. For coaches and researchers, tactical analysis can be of great assistance as they offer the opportunity to identify match regularities and random features of game events (Garganta, 2009).

To ensure a game is run tactically, a high level degree of knowledge is essential from both coaches and analysis experts. In order to identify these tactical plans and their success, it is essential, based on recordable data, to recognize and analyse the behavioural patterns of the players and in particular the teams' tactics (Perl, Grunz & Memmert, 2013). In effect, sports scientists, coaches, and athletes are continuously looking for ways to provide a slight, legal advantage in athletic performance (Garganta, 2009).

In all team sports, teamwork tactics at both attacking and defensive require an effective amount of communication among the players to ensure a correct understanding of game situations. To implement this, the role of the coach will be to set up training sessions that will change the way players think, accustoming them to various technical and tactical aspects. This method will assist the athlete with decision making and ensure them executing their skills correctly in fundamental situations (Altavilla & Raiola, 2015).

2.8 Trend identification in Cricket

A trend is defined as the estimation based on statistics that have the appearance of being physical, and fully predictable. It is often seen as something that might happen or a future maybe (Andreassen, Lervik-Olsen, & Calabretta, 2015).

With cricket containing such a large amount of data, the statistical representation has to be extremely accurate to ensure that over time a trend in play can be recognized (Skegro, Milanovic & Sporis, 2012). The progress of the game is point driven, with the structure highly formulaic and based around standard events and actions that portray trends. This entails that for point driven games such as cricket, it is likely that a high level of statistics can be extracted to generate various contents of tables and graphs, used to identify trends (Kokaram, et al. 2006).

In the 2008 IPL, a significant trend identified, suggested that the most successful batting approach involves retaining wickets, particularly in the last five overs of a T20 cricket match (Petersen, et, al, 2008a). This trend is in agreement with this study, as the winning teams averaged less “wickets lost” than UWC during the last five overs (Death overs). Noticeably there is a global scarcity of trend identification in cricket, and data analysis pertaining to major T20 tournaments such as the Mzansi Super league (MSL), which is in its second year of operation in South Africa, can be extremely beneficial to Cricket South Africa (CSA) in regards to comparing potential trends in cricket, that are developing each year (Rocke, Ramkissoon, Iton & Khan, 2016).

2.9 Summary

In this chapter, the researcher has reviewed relevant literature that pertains to this study. On the basis of the research objective and research question, the researcher has organized the literature in seven themes.

In the first theme, the researcher has reviewed cricket as a sport to give an overall and in-depth understanding of what it is and how it is played. In the second theme, the researcher has reviewed T20 cricket, the latest version of limited overs cricket where each team is allowed to bat and bowl for a maximum of 20 overs. The T20 format created a lively form of attractive cricket to spectators with it taking the shortest time to complete in comparison to other formats such as One Day Cricket (50 overs) and Test Cricket (5 Days). In the third theme, the researcher has addressed technologies used in cricket. The theme concerned Modern technology, such as high-definition cameras, ball flight simulators, computer graphics, microphones etc, used to re-examine debatable plays and deliver final decisions which technology has largely contributed to the improvement of cricket as sport.

In the fourth theme, the researcher has surveyed the processes of extracting useful insights from raw data and discovering valuable information from large databases using algorithms that discover unseen patterns in data known as Data analytics. These analytic processes have addressed how big Data are extracted from enormous quantities of information and used to assist in predicting future volumes, gain insights, take proactive actions, and give way to better strategic decision-making as far as cricket is concerned. In the fifth theme the researcher has explored Performance Analysis that involves the systematic observations mainly delivered through the provision of statistical data analysis and visual feedback such as Video Analysis. In this theme, the researcher has also outlined the debate on video analysis

and various technological applications that coaches rely heavily on to ensure excellent feedback to performing athletes.

In the sixth theme the researcher has discussed tactical analysis which aims at assisting coaches, experts and researchers on the basis of recordable data to recognize and analyse the behavioural patterns of the cricket players to identify possible tactical plans and their success. In the seventh and last theme, the researcher has discussed the Trend identification in Cricket considered as the estimation based on statistics that can be extracted to generate various contents of tables and graphs, used to identify trends. In this section, the researcher has outlined the current debates on the evaluation and improvement of cricket as a sport.

In order to answer the research questions, a suitable design that matches the objectives of the present study, addresses the research questions and complies with the study's scope and framework is essential. In light of the above claim the following chapter proposes to address this concern in the next chapter.

Chapter 3: Methodology

3.1 Introduction

This chapter examines and describes the methodological approach adopted for this study. Firstly, this study gives a brief overview of the three stages in a T20 game. Secondly, it describes the research design, quantitative research, participants and data collection used in this study. Furthermore, this chapter concludes with a description of the methods used, data reliability, statistical method and rigour and trustworthy.

3.2 Brief overview of three phases in a Twenty20 match

3.2.1 Three (3) Cycle Approach

The cycle approach of this study will primarily focus on the batting analysis of the UWC C.C in the T20 Varsity Cup Tournament from year 2015 – 2017. Over this period, the data will be gathered, analysed and broken down into three categorical stages of a T20 cricket match, namely (i) Powerplay, (ii) Middle Overs and (iii) Death Overs. These three stages are unique in its own way, as teams approach these stages differently due to fielding restrictions. The nature of such fielding restrictions is displayed below in Figure 3.1 and 3.2 and the overs during which they shall apply are set out in the following paragraphs.

3.2.1.1 Powerplay

The first six overs of a T20 cricket match are referred to as a mandatory "Powerplay". Powerplays were introduced to create more excitement for the game, as during this period of the game the fielding team is restricted to certain laws and regulations which allow the batting team an opportunity to score a high percentage of runs. A maximum of two fielders are allowed outside the 30-yard circle (Figure 3.1), which leaves a remainder of nine players inside the 30-yard circle. These restrictions need to be in place at the instant of delivery. Once the ball is bowled, these fielders may then run to any part of the field, to retrieve the ball and ensuring they remain within the boundaries of the field.

This period of the game is seen as an opportunity to take high risks from a batting teams' perspective, as there are fewer fielders protecting the boundaries of the field. "Boundaries" in cricket are referred to as, either four runs or six runs. These are the two highest run scoring options per ball in cricket and therefore targeted within the "Powerplay" stage of a cricket match. In contrast to this, a "high risk" approach by a batting team during this period can also result in a team losing a large number of wickets, meaning certain plans and strategies will then need to be adjusted accordingly for the duration of the match.

3.2.1.2 Middle Overs

During the "Middle overs" or "Non Powerplay overs" (overs 7 – 15), no more than five fielders shall be permitted outside the 30-yard circle (Figure 3.2). This period of a T20 match sees a slight dip in intensity from the batting team due to a number of reasons namely:

(i) A large amount of wickets lost during the "Powerplay" overs

(ii) A tactical strategy to ensure not many wickets are lost during this period and

(iii) The upliftment of the fielding restrictions.

During this period the fielding restrictions are uplifted, meaning the bowling team can now have a maximum of five fielders outside the 30-yard circle and a minimum of four inside the 30-yard circle. The fielding team is not obligated to have five fielders outside the 30-yard circle, if they feel it's not necessary. Due to this law in cricket, we see more fielders protecting the "Boundary" option, resulting in fewer risks been taken and therefore a more conservative approach from a batting team.

This period sees a large amount of runs scored in the form of singles, two's and three's as this is often seen as a low risk option to score/accumulate runs in cricket.

3.2.1.3 Death Overs

The last five overs (16 – 20) of a T20 limited overs cricket match is referred to as the "Death Overs". These are the final few overs before the end of an innings comes to a close. It is often during this period of the game that a batting team refers back to an approach of "high risk" and bats aggressively. The reason for this is due to the fact that the amount of overs left in the innings, requires the batting team to score as many runs as possible when setting a target. This approach can also be applied when the batting team is chasing a target as a particular run rate will be required to win a game and this may need the batting team to score runs as quickly as possible.

3.3 Fielding restrictions

Law 28 “THE FIELDER” of ICC Men’s Twenty20 International Playing Conditions (incorporating the 2017 Code of the MCC Laws of Cricket) Effective 28th September 2017 states the following:

- At the instant of delivery, there may not be more than five fielders on the leg side.
- At the instant of the bowler’s delivery there shall not be more than two fielders, other than the wicket-keeper, behind the popping crease on the on-side. A fielder will be considered to be behind the popping crease unless the whole of his person whether grounded or in the air is in front of this line.
- In the event of infringement of this clause by any fielder, the striker’s end umpire shall call and signal ‘No ball.’

3.3.1 Restrictions on the placement of fielders

In addition to the restrictions contained above, further fielding restrictions shall apply to certain overs in each innings. These additional fielding restrictions shall apply to the first six overs of each innings (Powerplay overs), overs 7 – 15 (Middle overs) and overs 16 – 20 (Death overs).

Two semi-circles shall be drawn on the field of play. The semi-circles shall have as their centre the middle stump at either end of the pitch. The radius of each of the semi-circles shall be 30 yards (27.43 metres). The semi-circles shall be linked by two parallel straight lines drawn on the field.

Figure 3. 1: Powerplay overs fielding restrictions (Sharma, 2018)

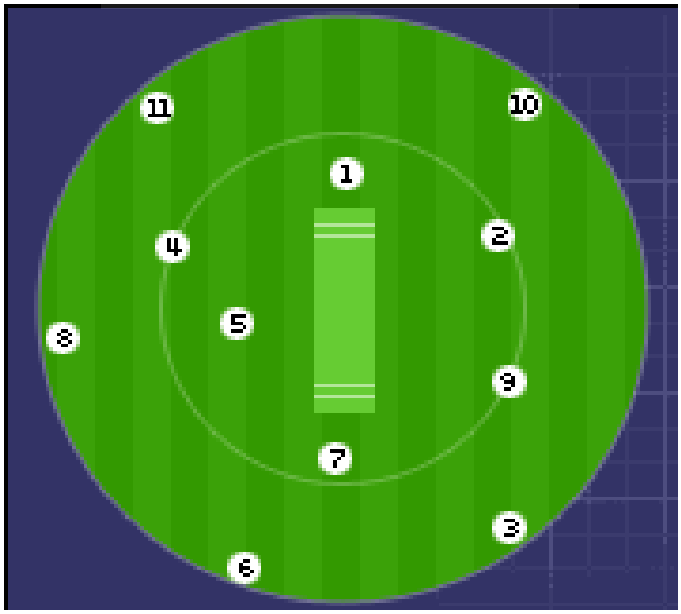

Figure 3. 2: Fielding restrictions during overs 7-20 (Sharma, 2017)

3.4 Rigour and trustworthy

Trustworthiness will be established through the procedure of triangulation. Data triangulation involves using different sources and methods of information in order to increase the validity of a study (Guion, Deihl & Macdonald, 2011).

The purpose of quantitative research was to identify batting trends of T20 Varsity Cup cricket through a comparative analysis in University cricketers. Data collected methods should be verified in order to ensure that the research performed is trustworthy, thus ensuring reliability. In addition, in presenting the information the researcher will provide enough detail of the context of the data collection procedure, setting and participants in order for others to determine whether the environment is similar to another situation and thus justifying whether the findings can be applied to another setting.

3.5 Sample

The participants in this study consisted of cricket players from the T20 Varisty Cup tournament over the three year period (2015 – 2017), from the winning teams and UWC. The participants consisted of male cricketers ranging from the ages of 18 – 25. The winning teams and UWC each consisted of fourteen participants per year resulting in the total of eighty-four participants for a period of three years (2015 – 2017). The participants were registered full-time students who have been drawn from the University of the Western Cape and respected winning tertiary institutions who participated in the T20 Varsity Cup Tournaments from 2015 – 2017. The method of recruiting the cricketers was by convenient sampling, given that the cricketers currently play for the University, allowing easier accessibility for data gathering.

3.6 Research Design

The research design can be seen as a vital part of the research as it provides a substantial road map for the collection, measurement and analysis of data. According to Schriver, (1997), a research design is a basic plan that guides the data collection and analysis phases of the research project. It provides the framework that specifies the type of information to be collected, its sources and collection procedure.

The Content Analysis Methodology was used for the data collection and analysis resulting in documenting and determining the identification of batting trends in T20 Varsity Cup cricket at the University of the Western Cape. Content analysis is a technique for systematically describing written, spoken or visual communication (Mayring, 2004). A quantitative approach was used in this study as it deals with quantifying and analysis of numerical data to get results. According to Apuke, (2017) quantitative research involves the utilization and analysis of numerical observations, using specific statistical techniques to answer questions like who, how much, what, where, when, how many, and how. Expatiating on this definition, Aliaga, and Gunderson (2002), describes quantitative research methods as the explaining of an issue or phenomenon through gathering data in numerical form and analyzing with the aid of mathematical methods; in particular statistics.

Secondary data was used for this study, as the research data was gathered from archives and repositories from an online website called ESPN cricinfo. This is an online data warehouse used by Cricket South Africa (CSA) to record and store match scorecards. Secondary data was imported from ESPN cricinfo from forty-five matches, where observations of various batting trends, such as dot balls, singles, two's, three's and boundaries scored during the Powerplay, Middle overs and Death overs was analysed throughout the innings. In

accordance with previous literature, any matches that were abandoned or shortened, and decided on Duckworth-Lewis system, were excluded from analysis (Douglas & Tam, 2010; Moore et al., 2012). This led to four matches being excluded; resulting in forty-five matches being used for data analysis. All procedures and protocols were approved by Cricket South Africa (CSA) prior to any data collection, and the use of any associated match data.

3.6.1 Data Collection

The process of data collection took place over a three month period from an online cricket scoring website ESPN cricinfo. A permission letter (Appendix C) to use the data was granted from Cricket South Africa (CSA) and the data collection process involved gathering data from forty-five matches over the three year period (2015 – 2017). All forty-five matches were recorded online and stored in a data repository on the ESPN cricinfo website for access upon review.

The process adopted required each match to by analyzed from a match scorecard, from ball-by-ball written commentary published on the ESPN cricinfo website, meaning that every action per ball was recorded and categorized into the nine variables (singles, two's, three's, fours, sixes, total runs, wickets lost and run rate) of this study. Depending on which phase of the game (Powerplay, Middle overs and Death overs), the action occurred, the data was documented and calculated separately within each of the three phases.

Coded match data from the ESPN cricinfo website was captured onto a Microsoft Office Excel spreadsheet by double entry to ensure accuracy. The data was broken down into a hundred and twenty one rows and thirteen columns (Appendix D), separating each variable

and placed accordingly within the three phases of the game. Each row accounted for one over spells, for a total of twenty overs per innings, totalling to an amount of ninety innings over the three years. The data was then exported to the Statistical Package for the Social Sciences (SPSS) version 25 for data analysis.

3.6.2 Statistical Analysis

The study utilised two principle measurement variables, namely, winning teams and UWC. Descriptive statistics (mean and standard deviation) and a t-test was used to examine nine batting variables (dot balls, singles, two's, three's, fours, sixes, total runs, wickets lost and run rate) and determine whether there were statistically significant differences between the winning teams and UWC during each of the three phases per year and during each of the three phases of the match over the three year period (2015, 2016 and 2017). A p-value of below 0.05 was considered to indicate statistical significance.

$$d = \frac{(\overline{x_1} - \overline{x_2})}{\sqrt{\frac{s_1^3 - s_2^3}{2}}}$$

Figure 3. 3: d = Cohen's formula (Larner, 2014)

Cohen's d (Figure 3.3) was used to determine the effect size between the two groups and indicate the standardised difference between two means (Batterham and Hopkins, 2006; Cohen, 1998; Cohen, 1992). The d-value calculated, X_1 and X_2 = means of the two groups; s_1

and s_2 = standard deviations of the two groups indicates the effect size or magnitude of difference. The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large (Petersen, et, al, 2008). The positive effect size values indicate a more favourable outcome of the two groups (Douglas and Tam, 2010).

3.7 Ethics Considerations

Permission to conduct this study has been obtained from the UWC Research Ethics Committee. The participants will be invited to be part of the study. In order for this research project to be classified as valid the following ethical considerations need to be taken into account. All aspects of the research project will be explained to the participants, (Appendix A: the information sheet which contains information about the study, how it will be conducted and other information) in order for the individuals to fully understand the concept of the research project. Signed voluntary consent (Appendix B: Consent form) will be obtained prior to any data collection.

All information obtained from the testing has been kept confidential by making use of a private testing environment, and by using alpha-numeric codes instead of the participant's name. All information obtained in this research will not be used for any other purpose except research, and if published, the participant's anonymity will maintained. All information regarding this research will be stored securely in the SRES department, with access available to the researchers and supervisor only. All participant information will be destroyed after a period of five years.

The costs of the research process will all be covered by the researcher, and under no circumstances will the participant be liable for any costs. The participants have the option to withdraw from the study at any point.

Chapter 4: Presentation of Results

4.1 Introduction

The purpose of this chapter is to present the results of the research. The overall aim of the research was to identify bating trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape Cricket Club from its origin in 2015 – 2017. The first objective was to investigate the use of trend identification in sport, particularly cricket. The second objective was to identify the batting trends, using a comparative analysis during T20 Varsity Cup cricket between Varsity Cup winning teams and the UWC C.C.

Descriptive statistics, from a data repository called ESPN cricinfo, of bating variables in T20 cricket between Varsity Cup winning teams and the UWC C.C are presented in this chapter. ESPN cricinfo is an online cricket scoring website, which has records of nine bating variables namely:

4.1.1 Dot balls – A dot ball/s in a cricket context indicates a null value, meaning a ball from which no run is scored (Bhattacharjee & Lemmer, 2016a). A team bowling will seek to attain as many dot balls as possible as it reduces the accumulation of runs from the batting team. In contrast, a batting team will seek to reduce the amount of dot balls accumulated as it impacts the end goal of accumulating as many runs as possible.

4.1.2 Singles - A single is the basic unit of scoring in cricket. It is scored when the striking batsman hits the ball bowled and runs between the stumps together with the non-striker (Shah, 2012).

4.1.3 Two's - A two in cricket is scored when the striking batsman takes two runs i.e. hits the ball bowled and runs twice on the pitch from one end to the other end and back to the original end together with the non-striker (Shah, 2012).

4.1.4 Three's - A three in cricket is scored when the striking batsman runs three times on the pitch together with the non-striker (Shah, 2012).

4.1.5 Fours - A four in cricket is awarded to the batting team when the ball is hit by a batsman and makes contact with the ground before crossing the boundary by either rolling over or bouncing before the boundary rope (Shah, 2012). This form of runs is known as a "boundary" or "four runs."

4.1.6 Sixes - A six in cricket is awarded to the batting team when the ball is hit by a batsman in the air and drops directly behind the boundary without making in contact with the ground before the boundary rope (Shah, 2012). This form of runs is known as a "boundary" or "six runs."

4.1.7 Total runs – Total Runs is the overall amount of runs (singles, two's, three's, fours and sixes) accumulated by one team during a cricket match.

4.1.8 Wickets lost – This is when a batsman is dismissed by any means, his wicket is said to have fallen and the fielding team are said to have taken a wicket (Shah, 2012). Each team has a total of ten wickets and once all ten players

have “lost their wickets or dismissed” the team would then be deemed bowled out.

4.1.9 Run rate - Run rate is of particular importance in a one-day game of cricket, this is the average number of runs scored per over, and is used as a guide to a team's progress through an innings (Williamson, 2019).

These variables were recorded over the three phases of a cricket match, namely Powerplay, Middle overs and Death overs for 2015, 2016 and 2017. The Levene's Test for Equality of Variances was used to calculate significant differences between the winning teams and the UWC. The Cohen’s *d*-test was used to determine the magnitude of the effect size between the two groups, to answer the following research question:

1. What are the factors that contribute to the identification of batting trends in T20 cricket?
2. What will be an effective way of identifying batting trends in T20 cricket? To answer this question, it is important to understand:
    a. What is the key technology indicators used to establish batting trends in T20 Varsity Cup cricket?
    b. What is an effective way to optimise these indicators?

The chapter then focuses on the results that address the objectives of the study, i.e., the identification of batting trends through a comparative analysis in T20 Varsity Cup cricket. The chapter concludes by identifying the batting trends of T20 Varsity Cup cricket between winning teams and the UWC C.C.

4.2 Overall Outcome

At the conclusion of the 2017 T20 Varsity Cup Cricket Tournament, a total of forty five (45) matches had been played by winning teams and UWC, thirty eight (38) during the group stages, Four (4) semi finals and three (3) final matches. Four (4) of the matches were affected by bad weather and thus the result was decided by Duckworth-Lewis System; a system designed for one day cricket, the Duckworth-Lewis method is an approach used to reset targets in interrupted cricket matches (Mankad, et, al, 2014), these four (4) matches were excluded from further analysis.

Selected results based on relative importance to successful performance, for all general batting variables are reported below.

4.2.1 Tournament Analysis 2015 - 2017

Tables 4.1 – 4.9 display the statistical data as standard deviations (±SD), effect size (ES) and p-value for statistical significance for selected batting variables of competition winning teams and the UWC from 2015 – 2017.

4.2.1.1 The finding of dot balls

As far as dot balls are concerned, a team accumulating less dot balls during a cricket game will be at a slight advantage in comparison to a team accumulating more dot balls. This was found in a study by Douglas and Tam, (2010) reporting a higher number of dot balls in the Powerplay overs to be a small disadvantage (Najdan, Robins & Glazier, 2014). The Table 4.1 below illustrates the comparison between the winning team and the UWC, during the

Powerplay, Middle overs and Death overs of cricket matches played during the T20 Varsity Cup Cricket Tournaments in 2015, 2016 and 2017.

Table 4. 1: Dot balls (±SD) of winning teams and UWC

Dot balls		Winning Team	UWC	Significance (p – value)	Effect size	Rating
Powerplay	2015	**26.5 ± 6.1**	19.7 ± 4.8	0.056	1.25	Large
	2016	**23.0 ± 3.3**	19.5 ± 3.5	0.107	1.02	Moderate
	2017	**23.0 ± 3.6**	20.0 ± 1.7	0.105	1.07	Moderate
	Overall	**24.2 ± 1.1**	19.7 ± 0.8	0.002*	1.07	Moderate
Middle overs	2015	14.6 ± 2.5	**15.3 ± 3.2**	0.577	0.33	Small
	2016	**14.2 ± 2.4**	11.2 ± 2.9	0.032*	1.34	Large
	2017	**14.0 ± 3.9**	11.2 ± 2.7	0.100	1.02	Moderate
	Overall	**14.3 ± 0.7**	12.6 ± 0.6	0.062	0.52	Small
Death overs	2015	8.8 ± 3.0	**10.2 ± 1.6**	0.391	0.52	Small
	2016	**9.2 ± 4.0**	8.6 ± 4.0	0.818	0.14	Trivial
	2017	**8.0 ± 3.7**	6.2 ± 1.9	0.376	0.55	Small
	Overall	**8.7 ± 0.9**	8.3 ± 0.8	0.779	0.10	Trivial
Overall		**15.8 ± 0.9**	13.7 ± 0.7	0.590	0.35	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large.

The Powerplay dot ball scores, seen in Table 4.1, show that in 2015 no significant difference of the dot balls accumulated between the winning team and the UWC, in 2016 again showed that there is no significant difference of the dot balls accumulated between the winning team and the UWC and in 2017 this trend continued showing no significant difference again of the dot balls accumulated between the winning team and UWC. The overall results reveal that

the winning team mean scores of dot balls accumulated was significant above the UWC dot balls over the three year period.

As for Middle overs dot ball scores, the data indicate that in 2015 no significant difference of the dot balls accumulated between the winning team and the UWC, however, in 2016 a significant difference of the dot balls accumulated between the winning team and the UWC was seen. In 2017 no significant difference of the dot balls accumulated between the winning team and the UWC within. The 2016 p-value remains the one which indicates significance difference for dot balls faced for the three years. The overall results reveal that the winning team mean scores of dot balls accumulated was not significantly above the UWC dot balls over the three year period.

With regard to Death overs the result indicates that in 2015 no significant difference of the dot balls accumulated between the winning team and the UWC, similarly in 2016 no significant difference of the dot balls accumulated between the winning team and the UWC was seen and finally in 2017 again there was no significant difference of the dot balls accumulated between the winning team and UWC. The result indicates that in 2015 the UWC mean score of dot balls was more than the winning team, with the winning team having higher mean scores compared to the UWC in 2016 and 2017. The overall results reveal that the winning team mean scores of dot balls accumulated was significantly above the UWC dot balls over the three year period, with no significant difference.

The overall results of all three phases for dot ball scores accumulated over the three year period indicate that no significant difference between the winning team and the UWC was seen.

In general, the results show that the dot ball averages are varying going up and down for both teams year after year. The highest average (26.5) for the winning team comes in Powerplay 2015 and its lowest (8.0) is that of Death overs 2017; for UWC team the highest average (20.0) is Powerplay 2017 and its lowest (6.2) is Death overs 2017. Furthermore, the analyses of dot balls in each period of the innings, suggest the difference of the dot balls scored between UWC and the winning team was small and not much significant, meaning the winning team was accumulating a greater percentage of dot balls than the UWC within each of the three years.

4.2.1.2 The finding of singles

Table 4. 2: Singles (±SD) of winning teams and UWC

Singles		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**12.5 ± 2.7**	11.7 ± 3.4	0.653	0.19	Trivial
	2016	9.8 ± 2.6	**11.8 ± 1.5**	0.128	0.96	Moderate
	2017	**11.7 ± 2.2**	6.5 ± 2.9	0.006*	2.03	Very large
	Overall	**11.3 ± 2.6**	10 ± 3.6	0.213	0.42	Small
Middle overs	2015	**26.7 ± 5.1**	17.7 ± 2.2	0.001*	2.80	Very large
	2016	15.2 ± 5.1	**19.6 ± 2.8**	0.042*	1.28	Large
	2017	**18.2 ± 5.4**	14.9 ± 2.5	0.114	0.96	Small
	Overall	**20.0 ± 7.1**	17.0 ± 3.1	0.081	0.49	Small
Death overs	2015	**19.2 ± 6.6**	13.6 ± 2.8	0.121	1.00	Moderate
	2016	9.4 ± 4.1	**12.4 ± 3.6**	0.256	0.71	Moderate
	2017	**12.2 ± 4.8**	9.0 ± 3.7	0.274	0.68	Moderate
	Overall	**13.6 ± 6.5**	11.7 ± 3.7	0.326	0.36	Small
Overall		**15.82 ± 7.0**	13.73 ± 4.77	0.060	0.35	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large.

The Powerplay singles scores, seen in Table 4.2, show that in 2015 no significant difference of the singles scored between the winning team and the UWC, in 2016 this trend continued showing no significant difference again of the singles scored between the winning team and the UWC and in 2017 a significant difference of the singles scored between the winning team and UWC was seen. The 2017 p-value remains the one which indicates significance difference for singles scores for the three years. The result indicate that the winning team mean score of singles was slightly above the UWC single score in 2015 and 2017, while in 2016 the UWC team mean score of singles was higher. The overall results reveal that the winning team mean scores of singles scored was significantly above the UWC singles over the three year period, with no significant difference.

Upon further examination of Middle overs single scores, the result revealed that in 2015 the a significant difference of the singles scored between the winning team and the UWC was seen, in 2016 this trend continued showing a significant difference of the singles scored between the winning team and the UWC and finally in 2017 there was no significant difference of the singles scored between the winning team and the UWC within. The 2017 p-value remains the one which indicates significance difference for singles scored for the three years. The overall results reveal that the winning team mean scores of singles scored was significant above the UWC singles over the three year period, with no significant difference.

Moreover, with regard to Death overs in 2015 the data indicates the absence of a significant difference of the singles scored between the winning team and the UWC, similarly in 2016 the trend continues with an absence of a significant difference of the singles scored between the winning team and the UWC and finally in 2017 again there was no significant difference of the singles scored between the winning team and the UWC within. The 2015's p-value

remains the one which indicates significance difference for singles scored for the three years. The overall results reveal that the winning team mean scores of singles scored was significantly above the UWC singles over the three year period, with no significant difference.

The overall result of all three phases for singles scored over the three year period indicate no significant difference between the winning team and the UWC was seen.

In general, the results reveal that the highest singles average (26.7) for the winning team comes in the Middle overs of 2015 and its lowest (9.4) is that of the Death overs in 2016; for the UWC team the highest average (19.6) is in the Middle overs of 2016 and its lowest (9.0) in the Death overs of 2017. The results of singles scored indicated that the winning team outscored the UWC in 2015 and 2017, with the UWC dominating the amount of singles scored in 2016 throughout all three phases of the match.

4.2.1.3 The finding of two's

Table 4. 3: Two's (±SD) of winning teams and UWC

Two's (2's)		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**3.3 ± 2.1**	1.8 ± 1.2	0.153	0.9	Moderate
	2016	**2.0 ± 1.5**	1.8 ± 1.3	0.845	0.12	Trivial
	2017	**2.5 ± 1.5**	2.2 ± 1.0	0.583	0.34	Small
	Overall	**2.6 ± 1.6**	1.9 ± 1.1	0.158	0.48	Small
Middle overs	2015	**5.0 ± 2.8**	3.4 ± 1.7	0.170	0.84	Moderate
	2016	**5.0 ± 2.2**	4.0 ± 1.6	0.282	0.64	Moderate
	2017	**4.2 ± 2.2**	4.1 ± 2.0	0.912	0.06	Trivial
	Overall	**4.7 ± 2.4**	3.9 ± 1.7	0.117	0.43	Small
Death overs	2015	**5.4 ± 3.2**	2.4 ± 1.5	0.095	1.09	Moderate
	2016	**5.8 ± 2.4**	5.4 ± 2.2	0.790	0.16	Trivial
	2017	**5.6 ± 1.5**	3.6 ± 1.1	0.049*	1.36	Large
	Overall	**5.6 ± 2.3**	3.8 ± 2.0	0.030*	0.84	Moderate
Overall		**4.3 ± 2.4**	3.3 ± 1.8	0.008*	0.49	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large.

The Powerplay two's scores, seen in Table 4.2, show that in 2015 no significant difference of the two's scored between the winning team and the UWC, in 2016 again showed that there is no significant difference and in 2017 this trend continued showing no significant difference again of the two's scored between the winning team and the UWC within. The overall results reveal that the winning team mean scores of two's scored was slightly above the UWC two's scored over the three year period, with no significant p-value.

As for Middle overs two's scores, the data indicate that in 2015 no significant difference of the two's scored between the winning team and the UWC, in 2016 again showed that there is no significant difference of the two's scored between the winning team and the UWC and finally in 2017 this trend continued showing no significant difference again of the two's scored between the winning team and UWC. The overall results reveal that the winning team mean scores of two's scored was above the UWC two's scored over the three year period, with no significant p-value.

With regard to Death overs the data in 2015 indicate that the absence of a significant difference of the two's scored between the winning team and the UWC, similarly in 2016 no significant difference of the two's scored between the winning team and the UWC was seen and finally in 2017 indicates a significant difference of the two's scored between the winning team and the UWC within. The 2017's p-value remains the one which indicates significance difference for two's scored for the three years. The overall results reveal that the winning team mean scores of two's scored was significantly above the UWC two's scored over the three year period.

The overall result of all three phases for two's scored over the three year period indicates a significant difference between the winning team and the UWC.

In general, the result show that the two's average are varying going up and down for both teams year after year. The highest average (5.8) for the winning teams comes in Death overs 2016 and its lowest (2.0) is that of Powerplay 2016; for the UWC team the highest average (5.4) is Death overs 2016 and its lowest (1.8) is Powerplay overs 2015 and 2016. The data

for two's indicated that the difference of the two's scored between the winning team and the UWC within each of the three years was small and significant.

4.2.1.4 The finding of three's

Table 4. 4: Three's (±SD) of winning teams and UWC

Three's (3's)		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**0.8 ± 1.0**	0.3 ± 0.5	0.304	0.64	Moderate
	2016	0.2 ± 0.4	0.2 ± 0.4	1.000	0.00	Trivial
	2017	0.2 ± 0.4	**0.3 ± 0.5**	0.550	0.36	Small
	Overall	**0.4 ± 0.7**	0.3 ± 0.5	0.577	0.19	Trivial
Middle overs	2015	0.6 ± 0.7	0.6 ± 0.7	1.000	0.00	Trivial
	2016	**0.4 ± 0.7**	0.2 ± 0.4	0.444	0.45	Small
	2017	0.4 ± 0.5	0.4 ± 0.7	1.000	0.00	Trivial
	Overall	**0.5 ± 0.6**	0.4 ± 0.6	0.672	0.12	Trivial
Death overs	2015	**0.4 ± 0.5**	0.2 ± 0.4	0.545	0.36	Small
	2016	**0.4 ± 0.5**	0.2 ± 0.4	0.545	0.36	Small
	2017	**0.2 ± 0.4**	0.0 ± 0.0	0.347	0.58	Small
	Overall	**0.3 ± 0.5**	0.1 ± 0.4	0.209	0.47	Small
Overall		**0.4 ± 0.6**	0.3 ± 0.5	0.270	0.20	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large.

The Powerplay three's scores, seen in Table 4.3, show that in 2015 no significant difference of the three's scored between the winning team and the UWC, in 2016 again showed that the difference of the three's scored between the winning team and the UWC is not significant and in 2017 the trend continued showing no significant difference of the three's scored between the winning team UWC. The overall results reveal that the winning team mean scores of

three's scored was significant above the UWC three's over the three year period, with no significant p-value.

As for Middle overs three's scores, the result indicate that in 2015 no significant difference of the three's scored between the winning team and the UWC, in 2016 again showed no significant difference of the three's scored between the winning team and the UWC and finally in 2017 the trend continued showing no significant difference of the three's scored between the winning team and UWC. The overall results reveal that the winning team mean scores of three's scored was significant above the UWC three's over the three year period, with no significant p-value.

With regard to Death overs the result in 2015 indicate the absence of a significant difference of the three's scored between the winning team and the UWC, in 2016 again show the absence of significant difference of the three's scored between the winning team and the UWC and finally in 2017 the trend continued showing no significant difference of the three's scored between the winning team and UWC. The overall results reveal that the winning team mean scores of three's scored was significantly above the UWC three's over the three year period, with no significant p-value.

The overall result of all three phases for three's scored over the three year period shows no significant difference between the winning team and the UWC.

In general, the data show that the three's averages are varying going up and down for both teams year after year. The highest average (0.8) for the winning teams comes in Powerplay 2015 and its lowest (0.2) is that of Powerplay 2016, 2017 and Death overs 2017; for UWC

team the highest average (0.6) is Middle overs 2015 and its lowest (0.0) is Death overs 2017. The result for three's indicate that the difference of the three's scored between UWC and the winning team within each of the three years was small and not significant.

4.2.1.5 The finding of fours

Table 4. 5: Fours (±SD) of winning teams and UWC

Fours (4's)		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**9.3 ± 3.1**	6.5 ± 2.7	0.127	0.96	Moderate
	2016	**5.5 ± 2.6**	5.0 ±2.1	0.721	0.21	Small
	2017	**8.8 ± 2.5**	5.5 ± 3.2	0.074	1.16	Large
	Overall	**7.9 ± 3.1**	5.7± 2.6	0.027	0.77	Moderate
Middle overs	2015	**5.4 ± 2.1**	2.9 ± 2.0	0.016*	1.56	Large
	2016	3.1 ± 1.3	**4.1 ± 1.8**	0.186	0.80	Moderate
	2017	**5.0 ± 2.3**	3.0 ± 1.3	0.041*	1.31	Large
	Overall	**4.5 ± 2.1**	3.3 ± 1.7	0.029*	0.61	Moderate
Death overs	2015	**4.8 ± 1.5**	1.8 ± 1.3	0.009*	1.96	Large
	2016	2.8 ± 0.8	**5.0 ± 1.6**	0.025*	1.59	Large
	2017	**3.6 ± 1.5**	0.2 ± 0.4	0.006*	2.78	Very Large
	Overall	**3.7 ± 1.5**	2.3 ± 2.4	0.061	0.71	Moderate
Overall		**5.3 ± 2.9**	3.8 ± 2.5	0.002*	0.57	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large

As far as fours are concerned, Table 4.5 illustrates the comparison between UWC and the winning team, during the Powerplay, Middle overs and Death overs of cricket matches

played during the T20 Varsity Cup Cricket Tournaments in 2015, 2016 and 2017. The Powerplay fours scores show that in 2015 there was no significant difference of the fours hit between the winning team and the UWC, in 2016 again showed that the difference of the fours hit between the winning team and the UWC is not significant and in 2017 this trend continued showing no significant difference again of the fours hit between the winning team and UWC. The overall results reveal that the winning team mean scores of fours hit was significantly above the UWC fours over the three year period, with no significant p-value.

As for Middle overs fours scores, the result indicate that in 2015 a significant difference of the fours hit between the winning team and the UWC, however, in 2016 there was no significant difference of the fours hit between the winning team and the UWC and finally in 2017 again showed there was a significant difference of the fours hit between the winning team and UWC. The 2015 and 2017 p-value remains the one which indicates significance difference for fours hit for the three years. The overall results reveal that the winning team mean scores of fours scored was significantly above the UWC fours over the three year period.

With regard to Death overs the data indicate that in 2015 there was a significant difference of the fours hit between the winning team and the UWC, in 2016 again showed a significant difference of the fours hit between the winning team and the UWC and finally in 2017 the trend continued showing a significant difference of the fours hit between the winning team and UWC. The 2015, 2016 and 2017 p-value remains the one's which indicates a significant difference for fours hit for the three years. The overall results reveal that the winning team mean scores of fours scored was significantly above the UWC fours over the three year period, with no significant p-value.

The overall result of all three phases for fours hit over the three year period indicates a significant difference between the winning team and the UWC.

In general, the data show that the fours averages are varying going up and down for both teams year after year. The highest average (9.3) for the winning teams comes in Powerplay 2015 and its lowest (2.8) is that of Death overs 2016; for UWC team the highest average (6.5) is Powerplay 2015 and its lowest (0.2) is Death overs 2017. The data for these fours indicate that the difference of the fours hit between UWC and the winning team within each of the three years was moderate and significant.

4.2.1.6 The finding of sixes

Table 4. 6: Sixes (±SD) of winning teams and UWC

Sixes (6's)		Winning Team	UWC	Significance	Effect Size	Rating
Powerplay	2015	**1.0 ± 0.6**	0.3 ± 0.5	0.073	1.15	Moderate
	2016	0.5 ± 0.5	**1.3 ± 0.8**	0.065	1.20	Large
	2017	**1.0 ± 1.3**	0.8 ± 1.0	0.804	0.15	Trivial
	Overall	0.8 ± 0.9	0.8 ± 0.9	1.000	0.00	Trivial
Middle overs	2015	0.3 ± 0.5	**0.4 ± 0.5**	0.653	0.27	Small
	2016	**1.6 ± 1.1**	1.1 ± 1.1	0.401	0.50	Small
	2017	**2.2 ± 2.0**	0.6 ± 0.7	0.031*	1.36	Large
	Overall	**1.4 ± 1.5**	0.7 ± 0.8	0.520	0.54	Small
Death overs	2015	**1.6 ± 0.9**	0.6 ± 0.9	0.115	1.02	Trivial
	2016	**1.6 ± 0.9**	1.2 ± 2.2	0.713	0.22	Small
	2017	**2.4 ± 1.3**	1.0 ± 0.7	0.084	1.19	Moderate
	Overall	**1.9 ± 1.1**	0.9 ± 1.3	0.043*	0.77	Moderate
Overall		**1.3 ± 1.3**	0.8 ± 1.0	0.012*	0.47	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large

Table 4.6 shows the comparison between the winning team and the UWC, during the Powerplay, Middle overs and Death overs of cricket matches played during the T20 Varsity Cup Cricket Tournaments in 2015, 2016 and 2017. The Powerplay sixes scores, in 2015 indicates no significant difference of the sixes hit between the winning team and the UWC, in 2016 again showed that there is no significant difference of the sixes hit between the winning

team and the UWC and in 2017 this trend continued showing no significant difference again of the sixes hit between the winning team and UWC.

The overall results reveal that the winning team mean scores of sixes hit was significantly above the UWC sixes over the three year period, with no significant p-value.

As for Middle overs sixes scores, the data indicate that in 2015 no significant difference of the sixes hit between the winning team and the UWC, in 2016 again showed that there is no significant difference of the sixes hit between the winning team and the UWC, however, in 2017 a significant difference of the sixes hit between the winning team and UWC was seen. The 2017 p-value remains the one which indicates significance difference for sixes hit for the three years. The overall results reveal that the winning team mean scores of sixes hit was significantly above the UWC sixes over the three year period, with no significant p-value.

With regard to Death overs the data indicate that in 2015 no significant difference of the sixes hit between the winning team and the UWC, in 2016 again showed no significant difference of the sixes hit between the winning team and the UWC and finally in 2017 the trend continued showing no significant difference again of the sixes hit between the winning team and UWC. The overall results reveal that the winning team mean scores of sixes hit was significantly above the UWC sixes over the three year period.

The overall result of all three phases for sixes hit over the three year period indicates a significant difference between the winning team and the UWC.

In general, the data shows that the sixes average are varying going up and down for both teams year after year. The highest average (2.4) for the winning teams comes in Death overs 2017 and its lowest (0.3) is that of Middle overs 2015; for UWC team the highest average (1.3) is Powerplay 2016 and its lowest (0.3) is Powerplay 2015. The data for these sixes indicate that the difference of the sixes hit between the winning team and the UWC within each of the three years was small and significant.

4.2.1.7 The finding of total runs

Table 4. 7: Total Runs (±SD) of winning teams and UWC

Total runs		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**72.7 ± 20.2**	49.5 ± 11.9	0.036*	1.40	Large
	2016	41.7 ± 11.2	**48.1 ± 12.5**	0.366	0.55	Small
	2017	**63.5 ± 9.0**	46.0 ± 8.1	0.005*	2.05	Very Large
	Overall	**59.3 ± 19.0**	47.9 ± 10.4	0.034	0.74	Moderate
Middle overs	2015	**70.0 ± 13.8**	43.1 ± 8.7	0.000*	15.53	Very Large
	2016	51.6 ± 7.6	**54.9 ± 6.6**	0.337	0.57	Small
	2017	**64.3 ± 12.6**	44.6 ± 6.9	0.001*	2.38	Very Large
	Overall	**62.0 ± 13.7**	47.5 ± 8.9	0.000*	1.25	Large
Death overs	2015	**63.0 ± 14.7**	32.6 ± 5.8	0.003*	2.49	Very Large
	2016	48.0 ± 14.2	**56.6 ± 8.4**	0.277	0.67	Moderate
	2017	**64.0 ± 11.4**	28.0 ± 8.2	0.001*	3.30	Very Large
	Overall	**58.3 ± 14.6**	39.1 ± 14.8	0.001*	1.31	Large
Overall		**60.3 ± 15.5**	45.5 ± 11.5	0.000*	1.08	Moderate

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large

The Powerplay total runs scores, seen in Table 4.7, show that in 2015 there was a significant difference of the total runs scored between the winning team and the UWC, however, in 2016 there was no significant difference and in 2017 a significant difference of the total runs scored was seen between the winning team and UWC. The 2015 and 2017 p-values remain the ones which indicate significance difference for total runs scores for the three years. The overall results reveal that the winning team mean scores of total runs scored was significantly above the UWC total runs scored over the three year period, with no significant p-value.

As for Middle overs total runs scores, the result indicate that in 2015 there was a significant difference of the total runs scored between the winning team and the UWC, however, in 2016 there was no significant difference of the total runs scored between the winning team and the UWC and finally in 2017 again showed a significant difference of the total runs scored between the winning team and UWC. The 2015 and 2017 p-values remain the ones which indicate a significant difference for total runs scored for the three years. The overall results reveal that the winning team mean scores of total runs scored was significantly above the UWC total runs scored over the three year period.

With regard to Death overs the result indicate that in 2015 there was a significant difference of the total runs scored between the winning team and the UWC, however, in 2016 there was no significant difference of the total runs scored between the winning team and the UWC and finally in 2017 again showed a significant difference of the total runs scored between the winning team and UWC. The 2015 and 2017 p-values remain the ones which indicate significant difference for total runs scored for the three years. The overall results reveal that the winning team mean scores of total runs scored was significantly above the UWC total runs scored over the three year period.

The overall result of all three phases for total runs scored over the three year period indicate that a significant difference between the winning team and the UWC was seen.

In general, the data show that the total runs averages are varying going up and down for both teams year after year. The highest average (72.7) for the winning teams comes in Powerplay 2015 and its lowest (41.7) is that of Powerplay 2016; for UWC team the highest average (56.6) is Death overs 2016 and its lowest (28.0) is Death overs 2017. The data for the total runs indicate that the difference of the total runs scored between the winning team and the UWC within each of the three years was moderate and significant.

4.2.1.8 The finding of wickets lost

Table 4. 8: Wickets Lost (±SD) of winning teams and UWC

Wickets lost		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**1.7 ± 0.8**	0.7 ± 1.2	0.124	0.97	Moderate
	2016	1.8 ± 1.2	1.8 ± 1.0	1.000	0.00	Trivial
	2017	**2.0 ± 0.6**	1.7 ± 1.5	0.628	0.29	Small
	Overall	**1.8 ± 0.9**	1.4 ± 1.3	0.232	0.41	Small
Middle overs	2015	2.0 ± 1.4	**2.1 ± 1.1**	0.852	0.06	Trivial
	2016	**1.4 ± 0.9**	0.9 ± 1.1	0.243	0.70	Moderate
	2017	**1.9 ± 1.8**	1.0 ± 0.7	0.204	0.78	Moderate
	Overall	**1.8 ± 1.4**	1.3 ± 1.1	0.196	0.36	Small
Death overs	2015	3.0 ± 2.6	**3.6 ± 1.8**	0.680	0.25	Small
	2016	2.4 ± 2.2	**3.0 ± 2.6**	0.700	0.23	Small
	2017	1.2 ± 0.8	**1.6 ± 1.1**	0.546	0.36	Small
	Overall	2.2 ± 2.0	**2.7 ± 2.0**	0.470	0.27	Small
Overall		**1.9 ± 1.4**	1.7 ± 1.5	0.459	0.14	Trivial

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large

The Powerplay wickets lost, seen in Table 4.8, show that in 2015 there was no significant difference of the wickets lost between the winning team and the UWC, in 2016 again showed that there is no significance difference of the wickets lost between the winning team and the UWC and in 2017 this trend continued showing no significant difference again of the wickets lost between the winning team and UWC. The overall results reveal that the winning team mean scores of wickets lost was significantly above the UWC wickets lost over the three year period, with no significant p-value.

As for Middle overs wickets lost, the data indicate that in 2015 there was no significant difference of the wickets lost between the winning team and the UWC, in 2016 again showed that there is no significant difference of the wickets lost between the winning team and the UWC and finally in 2017 this trend continued showing no significant difference again of the wickets lost between the winning team UWC. The overall results reveal that the winning team mean scores of wickets lost was significantly above the UWC wickets lost over the three year period, with no significant p-value.

With regard to Death overs the data indicate that in 2015 there was no significant difference of the wickets lost between the winning team and the UWC, in 2016 again showed no significant difference of the wickets lost between the winning team and the UWC and finally in 2017 this trend continued showing no significant difference again of the wickets lost between the winning team UWC. The overall results reveal that the winning team mean scores of wickets lost was significantly less than the UWC wickets lost over the three year period, with no significant p-value.

The overall result of all three phases for wickets lost over the three year period indicate that no significant difference between the winning team and the UWC was seen.

In general, the data show that the wickets lost averages are varying going up and down for both teams year after year. The highest average (3.0) for the winning teams comes in Death overs 2015 and its lowest (1.2) is that of Death overs 2017; for UWC team the highest average (3.6) is Death overs 2015 and its lowest (0.7) is Powerplay 2015. The data for these wickets lost indicate that the difference of the wickets lost between the winning team and the UWC within each of the three years was trivial and not significant.

4.2.1.9 The finding of run rate

Table 4. 9: Run Rate (±SD) of winning teams and UWC

Run Rate		Winning Team	UWC	Significance (p-value)	Effect Size	Rating
Powerplay	2015	**7.0 ± 1.5**	6.5 ± 0.8	0.558	0.35	Small
	2016	5.6 ± 0.3	**5.8 ± 1.2**	0.654	0.27	Small
	2017	**7.4 ± 0.3**	6.9 ± 0.6	0.087	1.12	Moderate
	Overall	**6.7 ± 1.2**	6.4 ± 1.0	0.508	0.22	Small
Middle overs	2015	**8.0 ± 0.1**	6.8 ± 0.1	0.000*	15.04	Very Large
	2016	6.5 ± 0.3	**7.3 ± 0.4**	0.000*	2.73	Very Large
	2017	**7.8 ± 0.3**	7.6 ± 0.1	0.033*	1.41	Large
	Overall	**7.4 ± 0.7**	7.2 ± 0.4	0.124	0.43	Small
Death overs	2015	**8.1 ± 0.4**	6.5 ± 0.1	0.001*	5.2	Small
	2016	7.3 ± 0.2	**8.0 ± 0.2**	0.001*	3.28	Very Large
	2017	**8.6 ± 0.6**	4.8 ± 0.5	0.000*	6.31	Very Large
	Overall	**8.0 ± 0.7**	6.5 ± 1.4	0.001*	1.4	Large
Overall		**7.3 ± 1.0**	6.7 ± 1.0	0.002*	0.58	Small

** indicates significant difference between groups (p<0.05).*

***BOLD** indicates the higher of the two results within each variable.*

Rating indicates the difference in size between the two variables

The criteria for interpreting the effect size were: <0.2 trivial, 0.2 - 0.6 small, 0.6 - 1.2 moderate, 1.2 - 2.0 large, and >2.0 very large

The Powerplay run rate achieved, seen in Table 4.9, show that in 2015 the no significant difference of the run rate achieved between the winning team and the UWC, in 2016 again showed no significant difference of the run rate achieved between the winning team and the UWC and in 2017 this trend continued showing no significant difference again of the run rate achieved between the winning team and the UWC within. The overall results reveal that the

winning team mean scores of run rate achieved was significantly above the UWC run rate achieved over the three year period, with no significant p-value.

As for Middle overs run rate achieved, the data indicate that in 2015 a significant difference of the run rate achieved between the winning team and the UWC, in 2016 again showed a significant difference of the run rate achieved between the winning team and the UWC and finally in 2017 this trend continued showing no significant difference again of the run rate achieved between the winning team and UWC. The 2015, 2016 and 2017 p-values remain the ones which indicate a significant difference for run rate achieved for the three years. The overall results reveal that the winning team mean scores of run rate achieved was significantly above the UWC run rate achieved over the three year period, with no significant p-value.

With regard to Death overs the data indicate that in 2015 a significant difference of the run rate achieved between the winning team and the UWC, in 2016 again showed a significant difference of the run rate achieved between the winning team and the UWC and finally in 2017 this trend continued showing no significant difference again of run rate achieved between the winning team and the UWC within. The 2015, 2016 and 2017 p-values remain the ones which indicate significance difference for run rate achieved for the three years. The overall results reveal that the winning team mean scores of run rate achieved was significantly above the UWC run rate achieved over the three year period.

The overall result of all three phases for run rate achieved over the three year period indicates a significant difference between the winning team and the UWC.

In general, the data show that the run rate achieved averages are varying going up and down for both teams year after year. The highest average (8.6) for the winning teams comes in Death overs 2017 and its lowest (5.6) is that of Powerplay 2016; for UWC team the highest average (8.0) is Death overs 2016 and its lowest (4.8) is Death overs 2017. The data for the run rate achieved indicate that the difference of the run rate achieved between the winning team and the UWC within each of the three years was small and significant.

4.3 Summary

In summary, the main findings in this study are that the dot balls comparison between the winning team and the UWC during the Powerplay, showed an overall significant difference 0.002 for the three year period. Noticeably the winning team averaged far more dot balls than the UWC over the three year period. The two's accumulated also showed a significant difference 0.008 throughout the overall period of three years between the winning team and the UWC. Noticeably the winning team scored more two's than the UWC in every year and every phase, over the three years.

The comparison of three's scored by the winning team and the UWC had no significant difference throughout the three years of the tournament. The amount of fours hit between the winning team and the UWC had a noticeably overall significant difference of $p = 0.029$ during the middle overs as well as an overall significant difference of $p = 0.002$ for the overall three year period. Noticeably the winning team hit more fours than the UWC in the Powerplay over the three year period.

The comparison of sixes hit between the winning team and the UWC had an overall significant difference of 0.012 throughout the overall three year period. Noticeably the

winning team hit more sixes than the UWC in the Death overs with a significant difference of 0.043 over the three year period. The total runs accumulated between the winning team and the UWC had an overall significant difference of 0.000 during the Middle overs and a significant difference of 0.001 during the Death overs. There was an overall significant difference of 0.00 between the winning team and the UWC for total runs scored over the three year period. Noticeably the UWC outscored the winning in 2016 during all three phases of the cricket match.

The comparison of wickets lost between the winning team and the UWC had an overall significant difference of 0.459 throughout the overall three year period. Noticeably for Death overs the UWC mean score (3.6 ± 1.8; 3.0 ± 2.6; 1.6 ± 1.1) was higher than the winning team (3.0 ± 2.6; 2.4 ± 2.2; 1.2 ± 0.8) in each of the three years, with an overall significant difference of 0.470. The run rate achieved between the winning team and the UWC had an overall significant difference of 0.001 during the Death overs. There was an overall significant difference of 0.02 between the winning team and the UWC for run rate achieved over the three year period.

Chapter 5: Discussion, Conclusion and Recommendations

5.1 Introduction

The aim of this study was to identify bating trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape Cricket Club over a three year period, from its origin in 2015 - 2017. The research objectives of this study was to determine the match situations that contribute to the identification of batting trends and how these factors contribute towards the success of T20 Varsity Cup cricket. In particular the research objectives were:

- To compare batting performance variables between winning teams and the University of the Western Cape.
- To use statistical data to identify batting trends in T20 Varsity Cup cricket through a comparative analysis between Varsity Cup winning teams and the UWC C.C.

This aim of this chapter is to firstly provide a discussion of the overall comparative batting trends relative to the level of participation or competition in T20 Varsity Cup cricket tournaments. Secondly it provides a conclusion, and detailing recommendations for future research, which summarize the important points of this study. In conclusion, a comprehensive summary of the study.

5.2 Discussion

5.2.1 Batting trend analysis

5.2.1.1 Dot balls

The results of this study suggest that facing dot balls when batting was a small disadvantage between the winning team and UWC. From a run scoring perspective, the significant difference (p-value = 0.002) was found between dot balls accumulated between winning and losing teams in the Powerplay overs of an innings over the three year period. Winning teams averaged 24.2 in comparison to 19.7 by UWC when batting.

Winning teams noticeably averaged more dot balls than UWC throughout their batting innings (refer to Chapter 4, Table 4.1). This is in contrast to Douglas and Tam (2010), who's study, reported that a higher number of dot balls in the Powerplay overs can be deemed a disadvantage to a teams' batting innings. This disparity once again highlights the importance of hitting boundary fours and retaining wickets in the Powerplay overs of a T20 Varisty Cup match, rather than avoiding dot balls and looking for singles. In contrast to a previous study of T20 cricket performance during the 2008 Indian Premier League, winning teams score more heavily in the Middle overs and score from a greater number of deliveries and face less dot balls (Petersen et, al., 2008a).

In reference to a teams' batting innings this study suggest that facing dot balls when batting was a small disadvantage (Effect Size = 0.35). The Effect size gives a clear indication as to the strength of the relationship between the two variables (winning teams' and UWC). However, during the Powerplay overs dot balls were found to have no effect, with winning teams accumulating on average 24.2 dot balls in comparison to UWC averaging 19.7.

5.2.1. 2 Singles

By analysing singles scored, this study found that scoring singles throughout the innings had a minimal impact on the success of winning teams, which is in agreement with Petersen et al., (2008a) who stated that in the 2008 Indian Premier League, winning teams scored 5% less singles than non-winning teams.

Over the three year period, winning teams' averaged 15.82 in singles during each phase of a match, in comparison to an overall average of 13.73 by UWC (refer to Chapter 4, Table 4.2). However, by analysing singles scored in each phase of the innings, the results of this study suggest it is important to score singles and rotate the strike in the Middle overs (7 – 15) and Death overs (16 – 20) of an innings. Winning teams maintained a higher average of singles (refer to Chapter 4, Table 4.2) than UWC during this phase and this is likely to be a consequence of a higher number of fielders being allowed outside the 30 yard circle (Najdan, Robins & Glazier, 2014) after the Powerplay overs (1 – 6) where a restriction of two fielders are allowed outside the 30 yard circle. Therefore with boundaries less likely during the Middle and Death overs, the importance of singles and strike rotation becomes important during this phase.

5.2.1.3 Two's

The results of this study indicated the value of two's in relation to the success of winning teams' in T20 Varsity Cup Cricket. In comparison to two's scored, winning teams outscored UWC during every phase of a match over the three year period. Winning teams managed to maintain an average 4.3, in comparison to an average of 3.3 by UWC. With more fielders (maximum of five), allowed to protect the boundary of the field during overs 7 – 20, more

gaps become accessible and allow the opportunity to accumulate more two's when batting. With this said, the importance of two's become more valuable as it constantly increases the total amount of runs scored by the batting team (refer to Chapter 4, Table 4.3).

Evidently in the Death overs (16 – 20) of the match, winning teams significantly averaged more two's than UWC. Winning teams maintained an average of 5.6 two's when batting in comparison to an average of 3.8 two's by UWC when batting.

5.2.1.4 Three's

From a runs scoring perspective of three's, minimal difference was found between the winning team and UWC over the three year period. Winning teams averaged 0.4 in comparison to 0.3 by UWC when batting. The low average of three's maintained between the two variables when batting indicates the scarcity of three's accumulated by teams' during the T20 Varsity Cup cricket tournament. A consequence of this can be due to conditions (small fields or hard outfields), which result in the cricket ball travelling at a faster pace over the ground when the batsmen executes a shot, meaning batsmen accumulate the majority of runs in singles, two's, fours or sixes (refer to Chapter 4, Table 4.2, 4.3, 4.5 and 4.6).

5.2.1.5 Boundaries scored

Petersen et al (2008a), reported that batsmen in the Middle overs need to be able to accumulate runs while maintaining a focus on hitting boundaries, particular fours. According to Najdan, Robins & Glazier (2014), hitting more fours has a higher contribution to success over hitting sixes, thus more emphasis should be placed on hitting boundary fours throughout

the innings without taking the risk of being dismissed in the attempt to score boundaries (in particular sixes). The examination of batting performance indicators also revealed hitting boundary fours to be of greater importance than boundary sixes.

This study revealed that on average 5.3 fours are hit by the winning teams throughout each of the three phases of the innings in comparison to an overall average of 1.3 sixes by the winning teams during the same phases. This highlights the importance of accumulating more four boundaries than six boundaries during a match and potentially increases the success of winning T20 Varsity Cup cricket matches.

The study also found that during overs 7 – 20 of the innings, more four boundaries was scored (refer to Chapter 4, Table 4.5) by the winning team. The four scoring average during these periods for winning teams were on average 4.5 and 3.7 respectively in comparison to 3.3 and 2.3 as averaged by UWC. This study highlights the significance of hitting boundary fours and sixes, particularly during the Death overs of an innings. According to Najdan, Robins & Glazier (2014), batsmen with the highest strike rates and are more capable of hitting fours and sixes should be utilised.

Najdan, Robins & Glazier (2014), suggests that the trend is to focus on selecting players who are able to score boundary fours upfront with minimal risk and mitigating the risk of losing wickets by looking to score boundary sixes. Another important trend is to select players with a higher batting strike rate and is highly capable of rotating the strike upfront.

5.2.1.6 Total Runs

From a runs scoring perspective, there was minimum difference found between the runs scored by the winning team and UWC in the first six overs (Powerplay overs). During the first six overs (Powerplay overs) of a match, the winning team scored on average 59.3 runs, compared to UWC scoring 47.9 in total. This is a result of the winning team having accumulated more runs from boundaries (refer to Chapter 4, Table 4.5 and 4.6), which is in agreement with Douglas & Tam (2010) who reported that during the first six overs (Powerplay overs) in the ICC World Twenty20 Cup 2009, winning teams scored more runs in total and scored more runs from boundaries (fours and sixes) throughout the tournament.

However, differences were significant in the number of runs scored between overs 7 – 15 (Middle overs) and overs 16 – 20 (Death overs). Winning teams scored on average 62 runs in overs 7 – 15 compared to UWC scoring 47.5 on average. Another trend identified was that the number of runs scored in the Death overs. In the final five overs of the match (Death overs), winning teams scored on average 58.3 runs as compared to 39.1 by UWC. Previous research has suggested that the Middle overs (7 – 15) of an innings is the most important phase to outscore the opposition (Petersen et al., 2008a). However, this study highlights the importance of significantly outscoring the opposition in both the Middle overs (7 – 15) and Death overs (16 – 20) of an innings as seen in the results (refer to Chapter 4, Table 4.7).

According to Douglas & Tam (2010), to accumulate more runs or maintain a higher average of runs scored during any phase of the match, the batting team should:

- Maintain a higher strike rotation between batsmen.

- Accumulate all single runs on offer, by striking the ball into gaps (not directly to a fielder) and taking quick singles.

- Accumulate boundaries, in particular fours as this is a less risky approach to scoring boundaries. A four is usually executed along the ground and reduces the chance of a batman being “dismissed” or “out caught”

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5.2.1.7 Wickets lost

Based on this study, the batting side should look to retain wickets in the first six overs (Powerplay overs) of an innings, without necessarily maximising the number of runs scored during the phase.

The results (refer to Chapter 4, Table 4.8) highlights that losing less wickets during overs 16 – 20, will significantly improve a teams’ chance of winning the match. Winning teams’ on average lost 2.2 wickets during overs 16 – 20. In comparison, UWC lost 2.7 wickets within the same period of the match. However, Petersen et al (2008a) states that losing wickets in the last six overs of an innings was found to be less important. This disparity could be due to the strategic and tactical differences in the samples analysed, such as international and Indian Premier League teams utilising wicket taking bowlers in this period, or the fact that performance indicators in the current study were based on medians, rather than means.

5.2.1.8 Run rate

In reference to Chapter 4 (4.1.9), a comparative analysis was performed on run rate to determine the fundamental differences throughout the tournament, between UWC and the tournament winning teams.

For overs 7 – 15 (Middle overs), UWC managed to accumulate on average a run rate of 7.2 runs per over. In comparison, the winning team maintained an average of 7.4. Evidently, the winning team had a higher run rate between overs 7 – 15, and therefore significantly contributed to the success of winning cricket matches. This is well supported by Petersen et al (2008b) who stated that winning teams maintained a higher run rate in the middle period of the game during the 2007 Cricket World cup and the 2008 Indian Premier League (IPL).

The results from this study were in agreement, with similar variables analysed and showing that winning teams had an overall higher run rate of (7.3 ± 1.0) in comparison to UWC who achieved a lower average run rate of (6.7 ± 1.0) over the three year period. (refer to Chapter 4, Table 4.9). The reason for winning teams' having a superior run rate can be explained by the results of this study. Winning teams averaged a higher number of runs, compared to UWC across every variable (singles, two's, three's, fours and sixes) throughout all three phases of an innings. (refer to Chapter 4, Table 4.2 - 4.6).

5.3 Conclusion

The core aim of this study was to identify the batting trends within T20 Varsity Cup matches, and how these trends impacted on the results of a match. The study has concluded the key trends and attributes and how the in-game application of these trends contributes to winning a match.

Success in cricket is all about scoring more runs. Team strategy is evident in many facets within a match, including how quickly to chase a total or how strategically to set a target. There are specific cricket statistics and key determinants of success in T20 Varsity Cup cricket tournaments. These are available to provide the support staff with the objective information to plan team selection, strategy and tactics.

The primary aim identified in this study was that from a batting approach, it is important to score boundaries, in particular boundary fours. The major difference between winning and losing the T20 match was that the winning teams averaged a higher boundary four scoring record throughout all three phases of the match, across the three year period. Team selection should look at deploying specialist batsmen in the first six overs of an innings, with strike rotation alongside scoring boundary fours being a high priority. In the final five overs (Death overs) of an innings, the batting side should look to outscore the opposition by utilising batsman with a higher strike rate and capable of maximising boundaries, particular fours. Previous research has suggested utilising specialist batsmen in the Powerplay overs of an innings (Petersen et al., 2008a; Douglas and Tam, 2010), however the current study suggests a longer period of retaining wickets and importantly outscoring the opposition in the Middle and Death overs leads to a higher success of winning a match.

Contributing to this, the study concluded that the batting side aim to accumulate the highest number of single runs throughout a batting innings. The results illustrated that a higher single run average directly leads to a higher success rate towards winning the match. Additionally, the batting side should focus on accumulating runs, particularly boundary sixes, during the Middle and Death Overs of their batting innings. The study found that the winning team scored on average more boundary sixes in the Middle to Death overs phase of the match.

Moreover, the winning team maintained a higher run rate than UWC throughout all three phases of the match, over the three year period. Maintaining a higher run rate throughout the match directly results in a higher end total and greater correlation to winning the match.

Another secondary finding of this study is that the winning team accumulated and scored more two's across all three phases of a match, over the three year period. Two's is proven to be a preferred alternative to single runs, and can significantly contribute to batting team achieving a higher total and run rate.

Other results identified in this study found that the winning team on average lost more wickets that UWC throughout a match, over the three year period. This finding indicates that wickets lost had a trivial effect on the outcome or results of a match.

Also, the winning team on average accumulated more dot balls than UWC over the three year period. Based and derived from the overall findings, this finding can be counter argued due to the winning team scoring more boundaries and maintaining a higher run rate.

The overall summary of this study's results navigates to a batting strategy that should focus on batting trends by maintaining a higher batting run rate, target to scoring more boundary fours and sixes, good running between the wickets to accumulate two's, select batsmen with a

low dismissal rate, select batsmen with a high single scoring rate (equates to better strike rotation).

In conclusion, T20 cricket is still evolving globally and the results of this study and future research can be contribute to improving the game and assist teams to better strategize, plan and prepare for T20 matches.

5.4 Recommendations

The use of this study can enable cricket administrators, coaches, captains and other stakeholders to strategize and plan for matches and in-game execution. In relation to this, the findings and results of this study recommend that future research should make use of larger amounts of data to improve the statistical power of areas such as:

- An increase in sample size (analysing more teams)
    - This will allow for a greater overall tournament analysis between all participating Varsity Cup teams.
- Analysing bowling variables
    - This will identify the match trends relating to the bowling component in cricket.
- Analysing geographical factors
    - To identify the impact factors such as rain and conditions of the outfield will have on the impact of match scenarios.
- Analysis on common scoring areas

    - Better comparison of batting trends across multiple teams. Will indicate the highest to lowest percentage of zones targeted by teams
- The effect of different venues, toss etc
    - This will give an indication on the outcome and decision of teams to either bat or ball when winning a coin toss.

Future research can attempt to investigate T20 cricket by selecting and including a larger sample of teams within the T20 Varsity Cricket tournament. In addition to aforementioned, other forms of cricket can also be studied e.g. One-Day (50 overs) and Test Match Cricket (5 Days). With the focus on other forms of cricket, the scope of future research can be attempted on an International level of competition.

Further research on this topic can possibly look at real-time data capturing & analysis through actual video recording. The findings of this study can be used and adopted for match preparation and training sessions.

Furthermore, prospective research should aim to make reference to trend analysis & identification in relation to player type, batsman and bowler. The player type can hugely contribute to the outcome or results of a particular phase within a T20 cricket match. Additionally, certain competitive combinations of player types specific to a phase in a T20 cricket match can be identified.

A further extension to this research could focus on the different batting and bowling classifications to apply during a T20 match, under specific conditions. E.g. conducting a

study to prove the perception that bowling fuller lengths during the final overs of an innings positively contributes to the results for the bowling team.

Future research can also take into account geographical factors (such as location and weather) and analyse the impact of these factors on the results of a T20 cricket match.

Another inclusion for future study is to focus on the age and experience of the participating players. This can allow cross-referencing of player performances across teams in relation to their age and experience.

Prospective research can also aim to investigate how pre-game attributes (Pitch, Team dynamics, Venue, etc.) contribute and impact the outcome/result of a T20 cricket match. Additionally, the relationship between pre-game and in-game (chapter 4 variables) attributes can support and nominate a comparative discussion/study to identify the impact of the attributes on the results of the T20 match.

This study focused and compared UWC versus the Winning teams in the varsity T20 cricket competition over the three year period, however further research can aim to compare the performances of the competition's Finalists or Semi Finalists team.

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Appendices

Appendix A: INFORMATION SHEET

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959-3688, Fax: 27 21-959-3137

E-mail: bandrews@uwc.ac.za

INFORMATION SHEET

Project Title: The identification of batting trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape from its origin in 2015 – 2017.

What is this study about?

This is a research project being conducted by Romano Ramoo at the University of the Western Cape. We are inviting you to participate in this research project because you this will be a good opportunity to understand the contribution statistical analysis has in cricket. The purpose of this research project is to identify trends of Twenty20 cricket through a comparative analysis in University cricketers.

What will I be asked to do if I agree to participate?

You will be asked to the researcher to video analyse your participation in the Varsity Cup tournament over the three year period, 2015 - 2017.

Would my participation in this study be kept confidential?

The researcher undertakes to protect your identity and the nature of your contribution. To ensure your anonymity, your name will not be included on collected data; a code will be placed on the survey and other collected data; through the use of identification key, the researcher will be and only the researcher will have access to the identification key.

To ensure your confidentiality, we will store the collected data in safe place. Only the researchers will have access to this. Your identification will be given a code and no names will be used.

If we write a report or article about this research project, your identity will be protected.

What are the benefits of this research?

The benefits to you include an analysis of your teams performance in comparison to the winning teams of the T20 Varisty Cup tournaments from 2015 – 2017.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by Romano Ramoo, a student in the Department of Sport Recreation and Exercise Science at the University of the Western Cape. If you have any questions about the research study itself, please contact at: tel.: 082 4300 675, email: 2641034@myuwc.ac.za.

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department:

Dr. Marie Young

University of the Western Cape

Private Bag X17

Bellville 7535

Tel: 021 959 3688

myoung@uwc.ac.za

Prof. Anthea Rhoda

Dean of the Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building,
C-Block, Top Floor, Room 28

This research has been approved by the University of the Western Cape's Research Ethics Committee (REFERENCE NUMBER:)

Appendix B: CONSENT FORM

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 3137, Fax: 27 21-959 3688

E-mail: bandrews@uwc.ac.za

CONSENT FORM

Project Title: The identification of batting trends through a comparative analysis in Twenty20 cricket between Varsity Cup winning teams and the University of the Western Cape from its origin in 2015 – 2017

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my child's participation will involve and I agree to allow them to participate of my own choice and free will. I understand that their identity will not be disclosed to anyone. I understand that I may withdraw them or them may withdraw themselves from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Participant's name…….

Participant's signature…….

Date……

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building,
C-Block, Top Floor, Room 28

Appendix C: PERMISSION LETTER

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959-3688, Fax: 27 21-959-3137

E-mail: bandrews@uwc.ac.za

PERMISSION LETTER

CRICKET SOUTH AFRICA

Cricket South Africa (NPC)
86, 5th Street, Melrose Estate, 2196
PO Box 55009, Northlands, 2116
Tel: +27 (0)11 880 2810
Fax: +27 (0)11 880 6578
Website: www.cricket.co.za

12 March 2018

Mr. Romano Ramoo

University of Western Cape

Mr. Ramoo

RE: Varsity Cricket statistics

This letter serves to confirm that we have no objection to you utilizing the Varsity Cricket 2015 - 2017 statistics for your study purposes only.

I trust you will find this in order.

NIELS MOMBERG

MANAGER YOUTH AND TERTIARY CRICKET

Appendix D: DATA SET

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959-3688, Fax: 27 21-959-3137

E-mail: bandrews@uwc.ac.za

DATA

No	Team	Year	Overs	Dot balls	1's	2's	3's	4's	6's	Total Runs	Wickets Lost	Run Rate
1	Winning team	2015	Powerplay	35	12	1	1	4	0	40	1	4
2	Winning team	2015	Powerplay	31	10	1	2	9	2	71	2	6
3	Winning team	2015	Powerplay	28	9	3	2	9	1	73	3	7
4	Winning team	2015	Powerplay	19	13	5	0	13	1	102	1	8
5	Winning team	2015	Powerplay	21	15	6	0	12	1	82	1	8
6	Winning team	2015	Powerplay	25	16	4	0	9	1	68	2	8
7	Winning team	2015	Middle Overs	16	27	3	0	8	0	67	2	8
8	Winning team	2015	Middle Overs	10	35	3	2	3	1	66	1	8
9	Winning team	2015	Middle Overs	17	22	6	0	8	1	80	3	8
10	Winning team	2015	Middle Overs	15	27	5	1	6	0	75	0	8
11	Winning team	2015	Middle Overs	12	33	2	0	6	0	69	2	8

12	Winning team	2015	Middle Overs	13	30	7	0	4	0	65	1	8
13	Winning team	2015	Middle Overs	15	21	11	0	6	1	95	4	8
14	Winning team	2015	Middle Overs	15	23	3	1	6	0	70	1	8
15	Winning team	2015	Middle Overs	18	22	5	1	2	0	43	4	8
16	Winning team	2015	Death Overs	9	25	2	0	5	2	67	1	8
17	Winning team	2015	Death Overs	10	23	3	1	3	2	57	2	8
18	Winning team	2015	Death Overs	7	23	7	0	5	0	58	1	8
19	Winning team	2015	Death Overs	5	16	10	1	7	2	86	4	8
20	Winning team	2015	Death Overs	13	9	5	0	4	2	47	7	9
21	Winning team	2016	Powerplay	26	7	3	0	4	0	34	1	6
22	Winning team	2016	Powerplay	26	12	0	0	3	1	32	4	5
23	Winning team	2016	Powerplay	23	9	1	0	8	1	49	1	6
24	Winning team	2016	Powerplay	22	11	4	0	3	1	39	2	6
25	Winning team	2016	Powerplay	24	7	1	0	6	0	35	2	6
26	Winning team	2016	Powerplay	17	13	3	1	9	0	61	1	6
27	Winning team	2016	Middle Overs	18	17	3	0	4	1	48	2	6
28	Winning team	2016	Middle Overs	16	15	6	1	3	0	42	2	6
29	Winning	2016	Middle	13	2	1	0	5	3	60	1	6

	team		Overs									
30	Winning team	2016	Middle Overs	14	17	4	1	2	3	56	1	7
31	Winning team	2016	Middle Overs	14	19	6	0	1	1	42	1	7
32	Winning team	2016	Middle Overs	17	16	4	0	4	1	46	3	7
33	Winning team	2016	Middle Overs	11	16	7	0	4	1	59	2	7
34	Winning team	2016	Middle Overs	14	16	8	2	2	1	50	1	7
35	Winning team	2016	Middle Overs	11	19	6	0	3	3	61	0	7
36	Winning team	2016	Death Overs	14	13	9	0	3	1	49	0	7
37	Winning team	2016	Death Overs	12	14	4	0	2	1	37	2	7
38	Winning team	2016	Death Overs	9	8	7	1	4	3	70	2	7
39	Winning team	2016	Death Overs	4	8	3	1	3	2	50	2	7
40	Winning team	2016	Death Overs	7	4	6	0	2	1	34	6	7
41	Winning team	2017	Powerplay	23	11	4	0	7	0	61	2	8
42	Winning team	2017	Powerplay	27	10	1	0	10	0	53	2	7
43	Winning team	2017	Powerplay	25	13	3	1	5	2	56	3	7
44	Winning team	2017	Powerplay	21	12	2	0	10	0	63	1	7
45	Winning team	2017	Powerplay	25	9	3	0	9	3	72	2	8
46	Winning team	2017	Powerplay	17	15	2	0	12	1	76	2	8

47	Winning team	2017	Middle Overs	14	23	4	1	5	1	60	2	8
48	Winning team	2017	Middle Overs	20	11	8	0	2	6	72	1	8
49	Winning team	2017	Middle Overs	17	21	5	1	4	0	52	2	8
50	Winning team	2017	Middle Overs	12	23	4	0	4	3	56	0	8
51	Winning team	2017	Middle Overs	14	20	3	1	4	0	48	3	7
52	Winning team	2017	Middle Overs	9	25	2	0	4	2	73	1	8
53	Winning team	2017	Middle Overs	15	11	4	0	10	4	79	2	8
54	Winning team	2017	Middle Overs	8	17	7	0	5	3	83	0	8
55	Winning team	2017	Middle Overs	17	13	1	1	7	1	56	6	8
56	Winning team	2017	Death Overs	13	15	4	0	2	4	66	2	8
57	Winning team	2017	Death Overs	10	14	7	0	4	1	51	0	8
58	Winning team	2017	Death Overs	7	16	7	0	3	1	60	1	8
59	Winning team	2017	Death Overs	7	12	4	0	3	3	61	1	9
60	Winning team	2017	Death Overs	3	4	6	1	6	3	82	2	10
61	UWC	2015	Powerplay	27	8	1	1	4	0	36	3	5
62	UWC	2015	Powerplay	22	8	2	0	7	0	50	0	6
63	UWC	2015	Powerplay	16	14	2	1	5	0	48	0	6
64	UWC	2015	Powerplay	13	16	3	0	8	1	64	0	7
65	UWC	2015	Powerplay	20	10	0	0	11	1	62	1	7
66	UWC	2015	Powerplay	20	14	3	0	4	0	37	0	7

67	UWC	2015	Middle Overs	16	22	2	0	1	1	38	2	7
68	UWC	2015	Middle Overs	17	18	4	2	0	0	34	2	7
69	UWC	2015	Middle Overs	15	17	3	1	5	1	56	0	7
70	UWC	2015	Middle Overs	17	20	4	0	1	0	33	3	7
71	UWC	2015	Middle Overs	20	15	1	0	5	1	45	4	7
72	UWC	2015	Middle Overs	11	18	7	1	5	0	57	2	7
73	UWC	2015	Middle Overs	18	17	3	0	4	0	43	2	7
74	UWC	2015	Middle Overs	14	16	4	0	2	1	38	2	7
75	UWC	2015	Middle Overs	10	16	3	1	3	0	44	2	7
76	UWC	2015	Death Overs	9	16	1	0	2	2	38	1	6
77	UWC	2015	Death Overs	9	17	1	0	1	1	34	4	7
78	UWC	2015	Death Overs	12	11	4	0	0	0	23	3	6
79	UWC	2015	Death Overs	12	13	2	1	3	0	36	6	7
80	UWC	2015	Death Overs	9	11	4	0	3	0	32	4	7
81	UWC	2016	Powerplay	25	10	1	0	3	0	29	2	4
82	UWC	2016	Powerplay	22	13	3	0	2	1	37	0	5
83	UWC	2016	Powerplay	20	11	0	0	7	2	60	2	6
84	UWC	2016	Powerplay	17	11	3	0	7	2	59	2	7
85	UWC	2016	Powerplay	16	14	1	0	6	1	53	3	7
86	UWC	2016	Powerplay	17	12	3	1	5	2	51	2	7

87	UWC	2016	Middle Overs	15	18	5	0	1	1	53	0	7
88	UWC	2016	Middle Overs	15	18	5	0	3	1	47	1	7
89	UWC	2016	Middle Overs	11	17	7	0	5	0	54	1	7
90	UWC	2016	Middle Overs	8	25	3	0	6	0	57	2	7
91	UWC	2016	Middle Overs	9	23	5	1	2	2	56	3	7
92	UWC	2016	Middle Overs	15	17	3	0	4	2	51	1	7
93	UWC	2016	Middle Overs	10	19	2	1	5	3	69	0	8
94	UWC	2016	Middle Overs	9	21	3	0	5	1	59	0	8
95	UWC	2016	Middle Overs	9	18	3	0	6	0	48	0	8
96	UWC	2016	Death Overs	15	10	4	1	3	1	47	7	8
97	UWC	2016	Death Overs	5	18	6	0	7	0	63	1	8
98	UWC	2016	Death Overs	6	14	9	0	6	0	58	4	8
99	UWC	2016	Death Overs	10	11	4	0	5	0	49	1	8
100	UWC	2016	Death Overs	7	9	4	0	4	5	66	2	8
101	UWC	2017	Powerplay	20	8	2	0	2	1	43	4	6
102	UWC	2017	Powerplay	23	7	1	1	4	2	43	0	7
103	UWC	2017	Powerplay	19	9	3	0	4	0	39	1	7
104	UWC	2017	Powerplay	18	6	3	0	10	0	51	1	6
105	UWC	2017	Powerplay	20	8	1	1	4	0	40	1	7
106	UWC	2017	Powerplay	20	1	3	0	9	2	60	3	8

107	UWC	2017	Middle Overs	13	14	5	0	3	0	44	0	8
108	UWC	2017	Middle Overs	13	18	4	0	2	0	35	1	7
109	UWC	2017	Middle Overs	13	12	2	2	6	1	55	2	8
110	UWC	2017	Middle Overs	8	19	3	0	2	2	47	0	8
111	UWC	2017	Middle Overs	12	16	3	1	4	0	43	2	8
112	UWC	2017	Middle Overs	13	12	6	1	3	1	46	1	8
113	UWC	2017	Middle Overs	14	16	4	0	3	0	52	1	8
114	UWC	2017	Middle Overs	8	13	8	0	2	0	45	1	8
115	UWC	2017	Middle Overs	7	14	2	0	2	1	34	1	7
116	UWC	2017	Death Overs	6	13	4	0	0	1	28	1	5
117	UWC	2017	Death Overs	8	9	5	0	0	1	40	2	5
118	UWC	2017	Death Overs	7	7	3	0	0	0	17	2	4
119	UWC	2017	Death Overs	3	12	2	0	0	1	26	0	4
120	UWC	2017	Death Overs	7	4	4	0	1	2	29	3	5