# STUDENTS' PERCEPTIONS OF GREEN SPACE ON A UNIVERSITY CAMPUS: AN ATTENTION RESTORATION THEORY PERSPECTIVE

by

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# ABSTRACT

Previous research has revealed that green spaces provide numerous benefits to human beings. One such benefit is the proven ability of green spaces to restore individuals' attention capacities. However, there exists very little literature that examines these benefits in the context of tertiary education campuses. University campuses are hubs where full-time students spend many hours daily during the course of their studies and are therefore exposed to the benefits of the landscaping on their campuses. This study therefore aimed to determine the manner in which students at the University of Pretoria perceive the on-campus green spaces, specifically in terms of the restorative properties of these areas. Quantitative data collection strategies were utilised, yielding a final sample size of 286 participants. A survey was employed as the research design, and included both closed and open-ended questions. Results indicated a generally positive perception of the green spaces on campus. Students tend to enjoy spending time in green spaces and find all green spaces that were addressed restorative. The Manie van der Schijff Botanical Garden was rated as the most restorative green space on campus. Future research includes exploring the link between attention restoration and academic achievement of students in order to better understand the role green spaces play in this regard.

**Key terms:** green space, attention restoration, stress reduction, evolutionary psychology, biophilia hypothesis, involuntary attention, perceived restorativeness, perception, students, university campus.

# CHAPTER 1: INTRODUCTION

*"I felt my lungs inflate with the onrush of scenery — air, mountains, trees, people. I thought, "This is what it is to be happy."* (Plath, 1963, p.122)

## 1.1 Introduction

The Bell Jar, the book from which the above quote originates is a semi-autobiographical novel detailing one woman's spiral into depression and suicide. The ability of nature to elicit a positive affective response in human beings as illustrated by this quote forms an integral part of the basis of the present study. The influence of green spaces on well-being, affect and quality of life has been well documented over the years, with various authors focusing on different aspects of green space (Felsten, 2009; Kjellgren & Buhrkall, 2010; McFarland, Waliczek, & Zajicek, 2008). However, there appears to be a paucity of research that documents these effects in the context of tertiary education institutions' campuses. This lack of research is noteworthy, as informal observations of student's behaviours on the campus of the University of Pretoria seem to display a trend of preference for outdoor areas. Moreover, these preferred outdoor areas are almost always characterised by natural vegetation. This apparent trend of a preference for outdoor, natural areas on campus is what gave rise to the research problem which is discussed in section 1.5 below. However, it is first necessary to clarify certain key terms and acronyms that were used in this study.

## 1.2 Defining Key Constructs

Green space is defined by the Merriam-Webster (2014) online dictionary as "community space consisting of land (as parks) rather than buildings". Alternatively, green space (as used in this study) can be described as borrowing from the field of landscaping. Landscape designers distinguish between hard and soft landscapes, in which the former refers to the built environment (paved surfaces, buildings, walkways, etc.) and the latter includes plantations, trees, shrubs, ground cover and gardens (Shah, Kale, & Patki, 2002). This study focussed on students' perceptions of the soft landscape. For the sake of standardisation of concepts, however, the term 'green space' is used consistently.

Perception can be defined as “the process by which our brains give meaning to the stimuli registered by our senses…the process of recognizing, identifying, and interpreting the input from the senses” (Robbins, 2003, p. 45). The interpretation stage of the process of perception has received the most attention in this study. The researcher sought to understand how students interpret the green spaces on campus. In addition, it was interesting to note how perception is involved in attention restoration. This process will be described more fully in the following chapter.

## 1.3 Acronyms

“UP” refers to the University of Pretoria. All references to “the university” and “on-campus” are with reference to UP, unless otherwise stated.

“ART” refers to Attention Restoration Theory, one of the underlying theories informing this study. This theory will be fully explored in Chapter 2.

“PRS” refers to the Perceived Restorativeness Scale, one of the measurement instruments used in the study. The PRS will be explained and expanded on in Chapters 4 and 5.

## 1.4 Research Problem

Very few studies exist that examine the restorative effects of green spaces on university/tertiary institution campuses. The research relating to on-campus green spaces is comprehensively explored in the literature review. Inasmuch, it is initially sufficient to note that these studies have either taken a purely experimental approach or have not included ART. There exists only one study in which students were able to express their opinions of the green spaces on campus (Speake, Edmondson & Nawaz, 2013). This study was however more focused on conservation issues than the positive effects that nature has on the students. No studies have examined the extent to which students perceive these green areas as restorative. The present study sought to draw together the descriptive approach and ART in the context of on-campus green spaces to address the aims and objectives mentioned in section 1.5 below.

UP’s intake of students increases annually, which relates to the added demand for learning space. This has resulted in the construction of additional buildings on campus, which subsequently results in the destruction of green space. The construction of even more

additional buildings is planned, further threatening the green space on campus (N. Dunstan, personal communication, 20 August 2012). It is therefore important to determine whether or not green space is actually appreciated by students, and whether they find these spaces restorative. If the results demonstrate that students are largely ambivalent, or negative, towards natural spaces, or that these green spaces are not perceived as restorative, then the increase of the on-campus hard landscapes will have a minimal effect on students. However, should students' responses reveal a general appreciation and affinity towards these green spaces, then these results could be used to inform and guide future hard and soft space development on campus.

In addition to determining the extent to which students find the green spaces restorative, providing justification for the maintenance of green spaces on campus will benefit the university in terms of prospective students. McFarland, Waliczek, and Zajicek (2008) noted that it has been found that "the appearance of the campus was the most significant factor for students in deciding which university to attend" (p. 232). According to Griffith (1994),

> A well laid out campus with sufficient open space will assist in the recruitment of top notch students and faculty. A student's perception of how a campus looks and feels plays a critical role in the choice of a higher education institution. (p. 650)

It is evident from the information shared above that there is a need for comprehensive research relating to on-campus green spaces. As such, the issues that were raised are addressed next by explaining the aims and objectives of this study.

## 1.5 Aims and Objectives

The aim of the present study was to determine the students' perceptions of the green spaces on UP's Hatfield campus. Subsequently, the objectives of this study were the following:

- To determine the amount of time students spend on campus;
- To determine where students prefer to spend their free time on campus;
- To determine what students think of the green spaces on campus in terms of aesthetic appeal, cleanliness and maintenance;

- To determine what types of natural vegetation are most popular amongst the students who spend their free time in green spaces;
- To determine the purpose for which students use these green spaces;
- To determine—in the case of students who spend their free time in green spaces — the extent to which they perceive such spaces as restorative;
- To determine the green space that is considered to be most restorative.

## 1.6 Structure of the Dissertation

Chapter 2 presents a discussion of the theoretical paradigms that underpinned the study. These paradigms include evolutionary psychology and the biophilia hypothesis, an offshoot of the evolutionary approach. A second theoretical approach, namely ART is then discussed and includes an exposition of the cognitive processes of attention restoration. The way in which evolutionary psychology and ART are linked as well as their applicability to the present research study is then discussed.

Chapter 3 includes a comprehensive review of literature related to the benefits of green space from both a physiological and psychological perspective. This is followed by an in-depth discussion of all available literature relating to on-campus green spaces. Finally, the local context is studied by examining South African literature on the topic of perceptions of green spaces.

In Chapter 4, the research methodology used during the course of the present study is described. The research design and sampling strategy are discussed followed by a description of the sample obtained. The measurement instrument, data collection and analysis procedures are then discussed and the chapter concludes with an overview of the ethical considerations involved in the study.

Chapter 5 presents the results of the data analysis. The chapter is divided into four topical sections. Each section includes a brief description of the type of analysis done as well as justifications concerning why it was deemed appropriate for use.

Chapter 6 is the final chapter and includes the interpretation and discussion of results found in Chapter 5. These results are interpreted in the context of the research problem and refer to the literature reviewed in Chapter 3. The chapter concludes with a discussion of the limitations of the study and subsequent recommendations for future research.

## 1.7 Conclusion

This chapter provides the framework and context for the implementation of the present study. Important terms used in the study were explained, followed by a discussion of the research problem. The problem's relevance to South Africa was also addressed. The subsequent aims and objectives of the study were then mentioned. A short outline of the study was presented to provide structure for subsequent chapters. The theoretical underpinnings of the study are now presented in Chapter 2.

# CHAPTER 2: THEORETICAL BACKGROUND

## 2.1 Introduction

Evolutionary psychology and the sub-theory of the biophilia hypothesis is the theoretical perspective underpinning this research study. Evolutionary psychology is an approach to any aspect of psychology which holds at its core the adaptive processes of natural selection of our ancestors (Cosmides & Tooby, 1997). As a result of these adaptive processes, the biophilia hypothesis maintains that all humans have within them an innate love of nature; specifically settings that have promoted the survival of the human species (Wilson, 1984). Additionally, ART is discussed in section 2.4 to provide the theoretical approach that informs the research design of this study. Essentially, this theory posits that not only do humans have an innate enjoyment of nature, but that exposure to nature actually has a positive effect on the restoration of one's attentional capacities (Kaplan & Kaplan, 1989). Following from this is an exploration into the cognitive and neurological processes of attention restoration in order to fully understand the process of attention restoration.

The three theories discussed below should not be viewed in isolation; rather, they should be viewed as complementary to one another. Holistically, these theories help shape one's understanding of why humans seem to have an affinity towards pleasant natural settings.

## 2.2 Evolutionary Psychology

### 2.2.1 Development of Theory

Evolutionary psychology is a theoretical perspective that dates back to Charles Darwin's 1859 theory of natural selection. It suggests that evolution is responsible not only for individuals' physiological adaptations, but also for their psychological characteristics and processes (Buss, 1995; Confer et al., 2010). As an example, according to evolutionary theorists, humans generally exhibit a preference for open spaces where a clear line of sight exists due to the survival advantage it gave the hunter-gatherer ancestors (Ulrich, 1993). This example is discussed in greater detail in section 2.3. This field emerged as a response to shortcomings in theoretical perspectives of the time, such as the Standard Social Science Model (SSSM) and the resultant blank-slate view of the mind. The main challenge that Tooby and Cosmides (1992) had with the progress of social science at the time (and the

resulting SSSM) was the so-called 'intellectual isolation' of social scientists. Tooby and Cosmides (2005) believed that social science was completely ignoring advances in other scientific fields and as such, the experts in the social science field continued to draw inaccurate conclusions. The field of evolutionary psychology therefore aimed to replace the SSSM with what was called the Integrated Causal Model that created links from fields such as biology and primatology. As a result, evolutionary psychology aimed to provide a theory of psychological, behavioural and social sciences that synthesised research approaches (Tooby & Cosmides, 2005).

During the twentieth century, psychology for the most part marginalised Darwinism. This was a time where behaviourism (as initiated by John Watson in the early 1900s) and then cognitive science (Noam Chomsky was the main proponent in the 1950s) were the predominant approaches in the field of psychology (Mandler, 2007). Researchers such as Tinbergen, Lorenz and von Frisch were a minority group who maintained interest in the work of Darwin and produced fields of study such as the ethological approach and the sociobiological approach.

#### *2.2.1.1 The Ethological Approach*

Ethology refers to the study of animal behaviour in natural environments. The focus of the study of observable behaviour is the underlying physiological mechanisms that cause said behaviours (Konishi, 1971). According to this perspective, the nervous system produces impulses which cause instinctive behaviours that are only activated when certain inhibitory mechanisms are released by external stimuli. Nest-building activity serves as one such example: a bird's neural impulses cause the animals to 'know' that they need to collect twigs to build a nest. However, birds only perform the action when the external stimuli of time of day or existence of a mate are present. The external environment is thus the mediator of certain behaviours, hence the focus of animal behaviours in natural habitats (Griffiths, 2008; Konishi 1971).

Tinbergen (1963) was influential in the field of ethology and succinctly described it as "the biology of behaviour" (p. 411). He argued that the biological study of an animal requires that the following four issues are addressed:

1. Causation (what mechanism underlies observable behaviour);
2. Survival value (whether the observed behaviour contributes to the survival behaviour of the species);
3. Ontogeny (how the mechanisms identified in the first issue above are built);

4. Evolution (the exposition of the assumed course evolution has taken, and an explanation of its dynamics).

These four issues remained part of popular scientific literature for many years, even after ethology had lost its prominence. Ethology did not lose popularity because of any fundamental flaws in its approach; rather, it simply became eclipsed by the popularity of the approach which followed during the 1970s, namely sociobiology (Griffiths, 2008).

#### *2.2.1.2 The Sociobiological Approach*

Sociobiology was an approach that, as the name suggests, combined sociology and biology. It holds the baseline assumption that social behaviours are a result of evolutionary processes. It is defined by Edward Wilson (1978) as "the systematic study of the biological basis of all forms of social behaviour, including sexual and parental behaviour, in all kinds of organisms, including man" (p. 10). This theoretical approach posited that social behaviours resulted from evolutionary adaptive processes due to natural selection. Subsequently, the theoretical implication of pure sociobiological theory is that human behaviour is prescribed by genes which have evolved over time (Wilson, 1978). This approach came under attack from biologists, sociologists and other scientists as it was understood that Wilson was proposing a purely genetic and biological explanation of social behaviour. By doing this he was entirely ignoring the 'nurture' side of the 'nature *versus* nurture' debate (Griffiths, 2008).

Wilson attempted to defend his position by emphasising that there exists genetic variation among individuals. The implication of this is that humans will still behave in unique ways and therefore possess unique capabilities for social learning (Wilson, 1978). Although the approach has lost popularity, there are still a few authors who attempt to preserve the theory. Alcock (2001) in *The Triumph of Sociobiology* explained how sociobiology actually focused on exploring the effects of the social environment on behavioural evolution. It thereby analysed the relationship between social behaviour and evolution from an entirely different angle. He also asserted that it is incorrect to assume that "sociobiology is a reductionist discipline based on the proposition that some behavioural traits are genetically determined" (p.5). In addition, it is incorrect to think that "sociobiology cannot account for learned behaviour or human cultural traditions, only rigid instincts" (p.5).

The ethological and sociobiological approach served to provide some explanation for human behaviour by exploring the genetic bases thereof, but these theories did not manage to provide a universal 'map' of human behaviour, which is the ultimate goal of evolutionary psychology (Tooby & Cosmides, 2005). The criticisms against sociobiology outweighed the defences and as a result, the field of evolutionary psychology was founded by Leda

Cosmides and John Tooby in the 1980s. Cosmides and Tooby were two of the greatest critics of sociobiology and are currently the leading authors in the field of evolutionary psychology, and are subsequently referred to frequently in this research study (Webster, Jonason & Schember, 2009). A description of the theory of evolutionary psychology is discussed in the following section.

### 2.2.2 An Explanation of Evolutionary Psychology

Evolutionary psychology is neither a theory of behaviour within psychology nor a field of psychological study. According to Cosmides and Tooby (1997), it is an approach to psychology. It can be viewed as a way of thinking about psychology that can be applied to any topic in the field of psychology. The main focus of evolutionary psychology is the human mind, which is viewed as a set of "information-processing machines that were designed by natural selection to solve adaptive problems faced by our hunter-gatherer ancestors" (Cosmides & Tooby, 1997, p. 1). Evolutionary psychology shares many theoretical conceptualisations with cognitive science and the underlying logic is essentially that the human brain is a product of evolution which evolved over time to regulate behaviour in an adaptive way. The cognitive processes of the brain therefore reflect prior adaptive successes and have an evolutionary history. Principally, it is proposed that all cognitive mechanisms can be understood in terms of the evolutionary adaptive processes they underwent (Sznycer, Tooby & Cosmides, 2011).

One of the defining features of evolutionary psychology is the emphasis it places on obtaining information-processing descriptions of the mind, in addition to neurobiological descriptions. The focus is not purely on the cognitive aspects of the brain, but rather, these descriptions should be understood in parallel with the explanations by related fields. Determining the physiological areas of the brain that are responsible for certain processes may be useful, but there still exists the need to understand the computational steps that result in the eventual behavioural output (Sell, Hagen, Cosmides & Tooby, 2003; Sznycer, Tooby & Cosmides, 2011). Evolutionary psychology's means of achieving this goal is by viewing the brain as an evolved organ of computation. The brain is responsible for transforming information inputs to behavioural outputs and as such, can be most effectively described in terms of its information-processing mechanisms. The programmes/mechanisms of the brain were designed by natural selection in a continual process of retaining or discarding design features which ultimately ensure optimal problem solving. It is important to note that the brain is therefore not one 'all-purpose' system; rather, it is comprised of numerous highly specialised programmes evolved to serve extremely specific purposes

(Cosmides & Tooby, 2013; Dawkins, 1982; Sell, Hagen, Cosmides & Tooby, 2003; Sznycer, Tooby & Cosmides, 2011; Tooby & Cosmides, 2005).

This perspective of the brain led researchers to propose what is known as the Massive Modularity Hypothesis, which, as discussed above, proposes that the mind consists of many systems (modules) that have evolved to perform specific functions. These modules have three properties. First, they are domain specific – each module is devoted to solving only one problem, or a set of closely related problems. Second, each module is equipped with inherent knowledge about the problem domain and subsequent problem solving procedures for that domain. Third, these modules develop reliably and internally in so-called 'normal' members of the species (Buller, 2006). This hypothesis has encountered large amounts of criticism and resistance (Machery, 2007), some of which will be discussed in section 2.2.3.

As mentioned above, evolutionary psychology is a perspective that has the ability to address the vast majority of topics covered in psychology. Focus is however placed on the same topics that are covered by social psychology. Pro-social behaviour, physical attractiveness, partner selection, antisocial behaviour, jealously, motivation and anger are a few examples of topics that can be explored and explained by evolutionary psychology. Psychopathology, religion and cognitive matters are also addressed by this approach. Although an in-depth explanation of each topic is beyond the scope of the current research, it is sufficient to note that the explanations for the above topics all stem from a view that certain behaviours and mechanisms evolved as a result of adaptive and reproductive processes (Cosmides & Tooby, 2013; Crawford & Krebs, 2008). No theory exists without critique and contention, and as such a brief exposition of the two main critiques against evolutionary psychology is presented.

### 2.2.3 Critique of Evolutionary Psychology

Despite the manner in which evolutionary psychology has managed to provide explanations for a large portion of human behaviour and functioning, there still exists contention regarding many of its propositions. The most predominant critique against the perspective is focused on the Massive Modularity Hypothesis, discussed in section 2.2.2. One of the basic assumptions of evolutionary psychology is that the brain is hardwired to perform certain tasks in a certain manner – the wiring of which is complete by birth, and is minimally amenable to influence of external factors. With regard to lower-level functions such as motor control and autonomic responses, there exists evidence for the modularity of functions. However, at a higher cognitive level the application of evidence becomes

increasingly dubious (Peters, 2013). Neuroplasticity refers to the brain's ability to maintain certain functions by parts of the brain not originally responsible for the specific function. The discovery of neuroplasticity has formed the basis of the contradiction to the modularity of all brain functioning (Zilmer, Spiers & Culbertson, 2008). Neurological studies indicated that the relationship between mental function and brain structure is exceptionally flexible, especially regarding higher level functioning. It has further been revealed that this flexible relationship occurs on a continuous basis throughout the life span of an individual (Hamilton, 2008).

In a similar vein, it is important to acknowledge the way in which humans are capable of refining certain functions. The skill involved in being a gymnast or musician serves as an example. If one analysed the neurological structure of a gymnast, one would appreciate a greater amount of differentiation and representation in the areas responsible for fine motor coordination and movement dexterity than in a non-gymnast. When considering the amount of rigorous training involved in becoming a gymnast, it is a sensible conclusion that these neural areas were shaped by the environment. It cannot be concluded that the individual was born with an innate mental module for acrobatic ability. If this was the case, anyone could be a high level gymnast without environmental influences such as training (Panksepp & Panksepp, 2000; Peters, 2013). The aforementioned criticisms are placed primarily on the fundamental concern that the core assumptions of evolutionary psychology lie in the brain and its evolution, yet these criticisms fail to provide neurological evidence of its assumptions (Hamilton, 2008).

The second most prominent criticism against evolutionary psychology is that of adaptation. Robert Richardson (2007), an evolutionist himself, questioned the testability of the hypothesis that psychological traits are evolutionary mental adaptations. He does not question that humans have evolved both psychologically and physically, or that our psychological traits can be adaptive to species survival; rather, he questions evolutionary psychology's explanation of the emergence (origin) of traits in terms of natural selection. To claim that a trait is an adaptation is to make a claim about history. Inasmuch, adaptations do not happen by accident, they happen as a result of a number of influences. Therefore, in order to accurately claim that a trait is an adaption, an evolutionary psychologist needs to present historical evidence in support. More precisely, if one wants to make a claim about a psychological trait being an adaptation,

> We would need to show that they were the products of natural selection. For that, we would need evidence concerning variation in ancestral populations. We would need evidence concerning their heritability. And if we wanted a full explanation of their

> presence, we would need evidence concerning the advantage they offered to our ancestors. (Richardson, 2007, p. 12)

Richardson (2007) acknowledges that this would indeed be a nearly impossible task and that this concern alone is not sufficient cause to undermine the basis of evolutionary psychology. He implores evolutionary psychologists to potentially readdress the type of claims they make and the conclusions they draw based on the available evidence.

The above concerns have been countered and attacked by evolutionary psychologists, although an in-depth exposition of such arguments falls beyond the scope of this study. At the present stage is it sufficient to conclude that the field of evolutionary psychology is a contested one, but nonetheless one which maintains popularity and prominence. There is on-going research in the field of evolutionary psychology and it is one that holds the promise of continued success and theoretical soundness (Confer et al., 2010). For this reason, in addition to the fact that it is exceptionally well-suited to the topic of the study, it has been chosen as the theoretical basis for the study. The influential Edward O. Wilson propounded a sub-theory of evolutionary psychology called the biophilia hypothesis, which is discussed next.

## 2.3 The Biophilia Hypothesis

Erich Fromm, in his 1964 book *The Heart of Man: It's Genius for Good and Evil*, describes a psychological orientation of being attracted to all that is alive and vital. Twenty years later, Edward O. Wilson (1984) who came from an environmental, evolutionary perspective, decided to call this orientation 'biophilia'. 'Biophilia' is "the innate tendency to focus on life and lifelike processes" (Wilson, 1984, p. 1). This marked the beginning of Wilson's (1984) musings on human beings' apparent inherent love of living things. Nine years later he redefined it in his 1993 co-edited book *The Biophilia Hypothesis* as the "innately emotional affiliation of human beings to other living organisms" (p.31).

The opposite of biophilic responses are termed biophobic, and refer to an innate fear/avoidance of certain nature stimuli, such as snakes. Biophobic and biophilic responses together are believed to have a genetic basis, implying that these responses are adaptively significant during evolution. The argument propounds that both the rewards and dangers of natural settings during evolution are critical enough to require both biophilic and biophobic adaptive responses. Biophilic responses to natural landscapes are proposed to be linked to the evolutionary proposition that numerous highly important survival-related advantages

were linked to the environment's characteristics. Examples that support this notion include the fact that humans tend to prefer landscapes in which they can see for miles, and this may be linked to the fact that this visibility had the evolutionary advantage of being able to spot predators and invaders in the past (Ulrich, 1993).

A partial explanation for such behaviour suggests biologically prepared learning; that is, that evolution has caused humans, and many animals, to rapidly and effortlessly learn associations and responses that allows for survival of the species when in contact with certain objects or environments (Seligman, 1970). Although the modern day environment has largely eliminated the continual danger of exposure to certain objects (e.g. one is unlikely to encounter a lion in the middle of Pretoria), these responses have remained in the gene pool because they serve adaptive purposes (Ulrich, 1993).

When considering the positive relation to natural environments (biophilia), Wilson also proposed that this behaviour of attraction to living things is likely to be mediated by rules of prepared and counter-prepared learning. This means that humans' instinctive affiliation to other living organisms is moderated by rules that are taught by socialisation and other cultural influences (Wilson, 1993). This implies that while humans exhibit genetic attraction/avoidance traits as a result of biologically prepared learning, the exhibition of these behaviours is mediated by one's culture.

These genetic predispositions and resulting behaviour persists throughout generations and can be evidenced by urban dwellers' tendencies to seek natural settings, even within the city. In the absence of this behavioural evidence, Wilson believed that the hypothesis would continue to be plausible simply by evolutionary logic. According to this perspective, from the origin of the genus *Homo* up until modern days, people have lived as hunter-gatherers and have depended entirely on an intimate knowledge of their natural environment to survive. Therefore, the brain is considered to have evolved biocentrically as opposed to technologically (Wilson, 2003). At this point, it should be noted that although the learned behaviour of individuals in this modernised world may often result in a decision to spend free time in urban, technological environments, the theory nonetheless posits an instinctive, unconscious urge to connect to natural environments (Hinds & Sparks, 2008; Wilson, 1993).

Although this theory is not widely used in popular psychology—possibly for the same reasons evolutionary psychology is criticised—it nonetheless lingers in academia. Regarding the current research study, the biophilia hypothesis serves to provide one possible explanation about why humans feel drawn to nature. That is, it is a more specific theory than the broad field of evolutionary psychology (Green, 2012).

Although the theories discussed thus far seek to prove that human behaviour is impacted upon and shaped by the environment, and that humans are drawn to natural environments, none of these concepts have focused specifically on why human beings are attracted to natural surroundings. As a result, a decision was made to incorporate another theory into the study, namely the Attention Restoration Theory. This theory's development and pertinent concepts are discussed next.

## 2.4 The Attention Restoration Theory

### 2.4.1 Introduction

The Attention Restoration Theory is the theoretical culmination of over 20 years of research by Rachel and Stephen Kaplan (1989). These authors became aware that the natural environment is a source of fascination and affection, yet congruently there was little literature to offer explanations. The researchers were of the opinion that although there had been much written on nature, there still existed the need for a comprehensive, scientifically reliable work proving that humans are intricately attracted to nature. Moreover, they wanted to investigate what it is, exactly, that causes such positive experiences while exposed to natural environments. This knowledge gap lead to the writing of the 1989 book *The Experience of Nature: A Psychological Perspective.* The book traces their studies and their results regarding topics related to nature, human preference and the benefits of nature. The book is divided into three parts, as is the discussion below. The final section is a synthesis of Rachel and Stephan Kaplan's results, which forms the basis of ART. The most pertinent portions of their findings are also discussed to provide an insight into the basis of this theory.

### 2.4.2 Development of the theory

#### *2.4.2.1 The Preference for Nature*

In the first section of the book, Kaplan and Kaplan (1989) examined people's perceptions of nature, first from the individual's perspective, and then from the perspective of the environment. The human perspective dealt with the manner in which individuals perceive and categorise natural spaces, whereas the environmental perspective focused on predictions of what types of natural environments would be preferred by people. Kaplan and Kaplan (1989) conducted studies to determine what is involved when natural spaces are perceived from an individual perspective. They determined that categorisation seemed to be the most important. Specifically, two categories were identified, namely content based and

spatial configuration. Content based categories focus on the physical composition of the setting (i.e. a river, a house and a field). Spatial configuration categories focus on the way in which the elements of the scene are arranged. This is extremely important because the researchers realised that the way in which people evaluate a scene is based on a subconscious response to imagining themselves in the setting, and the subsequent determination of how easily one could move around in the setting.

Based on the above categories, and an analysis of the important facets thereof, Kaplan and Kaplan (1989) developed The Preference Matrix. Below is a visual representation of the matrix:

*Table 2.1: The Preference Matrix*

| | **Informational needs** | |
|---|---|---|
| **Level of Interpretation** | **Understanding** | **Exploration** |
| **Immediate (2D)** | Coherence | Complexity |
| **Inferred, predicted (3D)** | Legibility | Mystery |

Informational needs are vitally important when considering one's relationship with the environment. The need to understand is universal and fundamental in all areas of life. Kaplan and Kaplan (1989) used the example of frustration that arises in people who are unable to make sense of modern art: When faced with a setting, people's first instinct is to make sense of and/or understand the material. However, simply understanding the environment may not be sufficient. It was found that people also have a preference for environments that allow for the possibility of exploration. Exploration can serve to enhance understanding, or it can simply be a function of inquisitiveness. Irrespective of the reason, it was determined that exploration is an important aspect of environmental preference.

The second domain involves the degree of inference needed to obtain the required environmental information. Immediate or two-dimensional environments require minimal inference – a photo of a small garden in a back yard provides concise information about the setting and does not require imagination or inference to fully grasp the setting. In contrast, environmental information is not quite as readily available in inferred or three-dimensional settings. These scenes may consist of partially hidden objects or shadows and they invite the imagination to customise the setting in order to more fully gain information about the scene.

The combination of the above domains results in four distinct environmental settings defined by a particular characteristic: coherence, complexity, legibility and mystery. That is,

for example, an environment that provides immediate information and is easy to understand can be considered a coherent environment. Mystery refers to an environment where exploration is possible and inference is required to make sense of the environment.

With respect to these factors' abilities to predict environmental preference, it was found that the most preferred scenes reflected were high in mystery, followed by those which reflected legibility. In contrast, disliked scenes were low in coherence and complexity. While these four factors and The Preference Matrix are no longer used in literature, they formed the basis for the four tenets of ART, which is discussed in section 2.4.3.

#### *2.4.2.2 Benefits and Satisfactions*

The second section of the book *The Experience of Nature: A Psychological Perspective* (Kaplan & Kaplan 1989) is dedicated to exploring the benefits and satisfactions of exposure to nature. With respect to residential satisfaction, studies found that natural environment aspects had the greatest contribution to their overall residential satisfaction scores. Involvement with and access to nature both contributed positively to neighbourhood/residential satisfaction (Frey, 1981). In terms of job satisfaction and stress, it was also found that access to nature in the work place was related to lower levels of perceived job stress and higher levels of job satisfaction. Furthermore, employees with easily accessible views of nature reported lower levels of headaches and other ailments (Lewis, 1979).

Kaplan and Kaplan (1989) also addressed the benefits of gardening. The results of a large study (Kaplan & Kaplan, 1987) were clear: some of the greatest benefits of gardening are related to the physical and psychological aspects of exposure to nature.

#### *2.4.2.3 Toward a Synthesis*

In the third section of the book Kaplan and Kaplan (1989) conceptualised their theory, based on synthesising the findings from previous sections. In order to demonstrate and fully appreciate the concept of the attentional restorativeness of nature, the authors provided an exposition of the types of attention involved.

The authors explained terms like mental fatigue, and they emphasised that stress and mental fatigue may not necessarily be the same thing. Inasmuch, stress refers to the preparation for an event that has been evaluated as being potentially harmful. Mental fatigue can occur even when working for extended periods of time, even when this work is concentrated on an enjoyable project (Kaplan & Kaplan, 1989).

In addition, it is possible for an individual to be mentally fatigued but still able to spring into action in the case of an emergency, or pay attention to something of personal interest. William James (1982) explained this phenomenon when he introduced the concept of involuntary attention, which refers to attention that requires absolutely no effort, such as when something exciting is happening nearby. Conversely, he proposed the concept of voluntary attention, which is essentially attention that needs to be paid to something important, in a situation where the object itself does not attract attention (James, 1892). Kaplan and Kaplan (1989) then evolved this term into 'directed attention'. The distinction between these two types of attention has received validation in recent neurobiological studies. One such study included 16 adults who underwent event-related functional magnetic resonance imaging (fMRI) while completing tasks in the attention network test (ANT). The results clearly indicated differentiation in cortical areas while completing different tasks, providing support for the distinction between types of attention (Buschman & Miller, 2007; Fan, McCandliss, Sommer, Raz, & Posner, 2005),

James (1982) conceptualised the process of mental fatigue through the mechanism of inhibition. He proposed that the way in which people maintain focus on a task is not by heightening their focus on that task, but by inhibiting all other distractions. When the task involves the use of directed attention, the effort required to avoid distractions is large. Irrespective of the task at hand, the same inhibitory mechanisms and the same directed attention are used to avoid external stimuli. James (1982) and Kaplan and Kaplan (1989) therefore concluded that mental fatigue is directly caused by the fatigue of directed attention. This fatigue comes at a cost of an individual displaying irritability, aggressiveness and slowed response time, as well as many other symptoms that quantify a mentally fatigued individual (James, 1982; Kaplan & Kaplan, 1989).

The understanding of the process of mental fatigue and the costs thereof lays the groundwork for conceptualising the importance of the need for a restorative environment, and the way in which the four aspects discussed in section 2.4.2 below assist in the restoration of directed attention. The four properties discussed refer to four types of characteristics that natural environments should exhibit in order to assist in the process of attention restoration. Each of these characteristics in isolation can aid in attention restoration, but in order to obtain maximum benefit, all four should ideally be present.

### 2.4.3 Central tenets of Attention Restoration Theory

#### *2.4.3.1 Being Away*

Psychologically, being away is related to the cognitive involvement in an activity/environment different from what one experiences on a daily basis. It also refers to the notion of escape. This escape need not be to the extreme extent of going on holiday to an isolated cottage in a foreign country; it can happen in the workplace. Escape can take on three possible forms: getting away from distractions, putting aside work one normally does or taking a rest from mental effort of any kind. These three aspects may, in isolation or in combination, provide the potential for psychological disengagement. However, an environment that only provides the feeling of being away could potentially be considered boring or confining – hence the need for the remaining three aspects; extent, fascination and compatibility (Kaplan & Kaplan, 1989; Norling, 2008). These aspects are discussed next.

#### *2.4.3.2 Extent*

The extent of a landscape is comprised of two properties: connectedness and scope. Connectedness refers to the interrelatedness of characteristics or features so they form one coherent whole, whereas scope refers to something that invokes the imagination (in the sense that the environment promises more which is unseen) (Hartig, Kaiser & Bowler, 1997; Kaplan & Kaplan, 1989). These concepts together are important in defining what the authors term being in “a whole other world” (p. 184). While being away may provide some sense of relief, escaping from a prison cell hardly constitutes a restorative environment. Rather, the environment should invoke the feeling of being in an entirely different world. As an example, Kaplan and Kaplan (1989) explained how zoos are often designed in such a way that one feels completely immersed in the animals’ natural habitats. In terms of natural environments then, the elements of the landscape should have interrelatedness to constitute the whole which in turn causes the viewer to be drawn into this ‘other world’. Conceptually, the landscape should also hold the promise of continuation beyond what meets the eye – it should invoke a sense of curiosity and interest. Below is a depiction of a landscape that exhibits extent.


*Figure 2.1:* Photograph of the Allegheny National Forest. *United States Department of Agriculture: Forest Service, http://www.fs.usda.gov/allegheny*

### *2.4.3.3 Fascination*

Fascination refers to a stimulus which is interesting but requires only involuntary attention – it therefore forms an integral part of the experience of restorativeness as it attracts people but does not require the use of directed attention. It is important to note that the stimulus must be interesting enough to capture one's attention (albeit involuntary attention). Watching a sunset in a natural environment serves as an example of a fascinating stimulus (Norling, 2008). It is also important to note that fascination needs to be grounded on connected and scope, as described above. Although human fascination can be related to a drive to recognise stimuli where recognition is difficult, or to predict uncertain events, if the stimulus is not connected to a larger framework it will not sustain the fascination.

Later in the book, Kaplan and Kaplan (1989) refined the concept of fascination to the term "soft fascination" (p. 192). They describe how some stimuli are so fascinating that they do not allow one to think of anything else (driving past the scene of a vehicle accident serves as an example of this). In contrast, soft fascination invokes the use of involuntary attention, but it still allows the individual the mental space to be reflective. These settings tend to invoke only a medium amount of involuntary attention and they are generally aesthetically pleasing. Below is one such example of a scene that invokes soft fascination.

*Figure 2.2: Photo of Sunset on Melkbosstrand. Author's own photograph*

#### *2.4.3.4 Compatibility*

The fourth component of a restorative environment is that of compatibility. This characteristic requires a fit between an individual's inclinations and what the environment can support (Kaplan & Kaplan, 1989). A person's activity in a particular environment can therefore be defined as the "function of personal intentions as well as environmental dictates" (Hartig et al., 1997, p. 5). Essentially, this refers to the extent to which a particular environment can support that which a person wishes to do while in it.

Interestingly, Kaplan and Kaplan (1989) found that functioning in natural environments seem to be easier for people than functioning in urban settings. One possible explanation for this returns to the evolutionary perspective discussed in section 2.2.2 above. Human ancestors evolved in environments far more natural than those in which humans currently live, therefore it can be understood that humans still have a particular resonance and ease of movement with and around natural environments.

The above characteristics form the central tenets of Attention Restoration Theory. An environment that displays all four aspects is usually perceived as highly restorative. While the concern of measurement of this perceived restorativeness is addressed in later chapters, it is still necessary to address the question of exactly how this process of attention restoration occurs. Although there is a dearth of literature on the topic, there have been some attempts made to explain the process, as discussed below.

### 2.4.4 Cognitive Process of Attention Restoration

#### *2.4.4.1 Kaplan and Kaplan's (1989) four-stage process of restoration*

According to Kaplan and Kaplan (1989), a four-stage process is proposed to understand how one 'gets restored'. Cognitive psychology is a rapidly changing field and so it is acknowledged that even the potential explanations provided below may soon be considered archaic (Sternberg, 2009). The explanation given by Kaplan and Kaplan (1989) is therefore more theoretical than cognitively precise.

Kaplan and Kaplan (1989) postulated that individuals progress through four stages of cognition, as it were, in order to attain full restorativeness. The first stage, following the visual perception of the environment and the subsequent determination of it as restorative, is clearing one's head. In this stage, the remaining "cognitive leftovers" from previous activities are allowed to slowly leave one's mind (p. 196). The second level of restoration involves the recovery of directed attention, by the implementation of involuntary attention. During the third level, a heightened level of cognitive quiet is achieved by way of fascination discussed in section 2.4.1.3 above. As a result of this third level, the fourth level can be achieved which requires not only the three abovementioned aspects, but also a significant duration of time spent in the environment. This deeply restorative level includes "reflections on one's life, on one's priorities and possibilities, on one's actions and one's goals" (p. 197). Once these four levels have been experienced, one can be said to have undergone a fully restorative practice.

#### *2.4.4.2 Current research findings on the process of attention restoration*

Current research has shown that the fundamental characteristic concerning the understanding the process of attention restoration lies in an understanding of the process of environmental perception, the types of attention required for this perception, and the way in which it occurs normally and not only in mentally fatigued individuals (Berman, Jonides, & Kaplan, 2008). Environmental perception is a process that depends on a number of smaller, interrelated processes. Neurologically, visual perception is a process involving light stimuli, rods and cones in the eye, feature detectors (groups of neurons specialised to respond to bars of light of different lengths, directions and orientations) and the visual cortex of the brain (Goldstein, 2008). A detailed exposition of the neurological processes of visual perception lies beyond the scope of this study; for the purposes of this research paper it is sufficient note that there exists a complex process of visual perception.

The importance of noting the complex process of visual perception is related to the cognitive process of perception which involves both top-down and bottom-up processing. When an individual comes into contact with a stimulus, perception happens as a result of these two processes, although at times one may be more prominent than the other. Bottom-up processing describes the activation of sensory neurons as visual stimulation travels up to the brain, resulting in the conscious awareness (perception) of the object (Gibb, Gray & Scharff, 2010). In contrast, bottom-down processing describes the way humans make sense of the stimulus by use of prior knowledge they bring to the situation (Goldstein, 2008; Theeuwes, 2010) For example, if an individual living in an urban residential area is confronted with the visual stimulus of a large shadow in the form of a lion in their garden at night, top-down processing will induce that the object is more likely to be a cat reflected in an unusual manner than the lion which bottom-up processing would suggest. A highly important point to raise here is that bottom-up processing occurs relatively automatically whereas top-down process is an active, volitional process (Theeuwes, 2010).

This distinction between the types of visual perception forms the basis of the later conclusions drawn by researchers in determining how attention restoration occurs. The voluntary/involuntary processes involved in perception have been largely replicated into the process of paying attention. It should be noted that perception and attention are not the same process; however, they are processes which are intimately linked. In the same way perception can happen either automatically in the form of bottom-up processing, or volitionally by top-down processing, so can attention. Attention can be focused volitionally as the result of a task demand, or it can be focused automatically by salient and prominent stimuli (Buschman & Miller, 2007). This similarity between the types of processing in both perception and attention has been succinctly discussed by Kaplan and Berman (2010):

> For example it could be argued that involuntary attention has some similarities to bottom-up attention, whereas directed attention may have more similarities to top-down attention. We make these comparisons because directed attention is less stimulus-driven than involuntary attention and thus would be more related to top-down attention, whereas involuntary attention would be more related to bottom-up processing. (p. 46)

The conclusion that is drawn from the above, and that serves ultimately as the cognitive explanation for the process of attention restoration is that the use of automatic perception (by means of bottom-up processing) induces the use of involuntary attention. This

use of involuntary attention does not place strain on one's cognitive abilities as the process is effortless. Consequently, by exposing oneself to environments that generate involuntary attention, top-down processing and subsequently directed attention are not required. This results in the 'freeing up' of one's directed attentional resources and stimulates restoration (Berman, Jonides, & Kaplan, 2008; Buschman & Miller, 2007; Kaplan & Berman, 2010; Theeuwes, 2010).

Neurologically, studies have also shown that different areas in the brain are likely responsible for the different types of attention. The cognitive control required by directed attention is managed by the frontal and pre-frontal cortex, whereas bottom-up attention is more driven by parietal lobe neurons (Buschman & Miller, 2007; Kaplan & Berman, 2010). While it is acknowledged that further research is required to reach more concrete conclusions, the implication of this is that while exposed to restorative environments, one may in fact be largely resting an entire portion of the brain. This suggests that the cognitive processes involved in attention restoration are not merely theoretical – there is neurological evidence for the brain activity involved in attention restoration.

## 2.5 Conclusion

It is evident that this study is underpinned by both evolutionary psychology and ART. The theoretical perspectives of evolutionary psychology and the biophilia hypothesis underpin the study in the sense that the biocentric evolution of humans will assumedly result in an innate love of nature by students on campus (Hinds & Sparks, 2008). Should the biophilia hypothesis have relevance in today's society and culture, one would expect to find an affinity towards natural spaces on campus.

The ART arose in 1989 from a need to develop a theory that comprehensively and scientifically explained human being's pleasure of the experience of nature. Although the biophilia hypothesis existed, Kaplan and Kaplan (1989) felt the need for a more scientifically grounded approach. This theory is extremely popular in environmental psychology and although it is old, it is still used as a theoretical basis for studies today (Stack & Shultis, 2013; Townsend & Weerasuriya, 2010). Moreover, cognitive psychologists and neuropsychologists have expanded on and provided scientific support for the principles of ART regarding the mental relief that is experienced from being exposed to nature. Kaplan and Kaplan (1989) may not have been aware of the neurological principles behind their theory, but those scientific facts have nonetheless been explored in recent years (Buschman

& Miller, 2007). The combination of the original theoretical postulation and recent neurological studies make ART a well-founded and suitable theory for future study.

Chapter 3 focusses more on studies that have examined green spaces and the benefits of exposure to natural settings. The understanding of exactly how the restorative process occurs has therefore been fundamental.

# CHAPTER 3: LITERATURE REVIEW

## 3.1 Introduction

Exposure to natural green spaces is highly beneficial to humans, providing numerous benefits and positive outcomes, including the improvement of overall well-being (Bratman, Hamilton & Daily, 2012; Howell, Dopko, Passmore & Buro; 2011, Lohr, 2011). For many years, scholars have been studying the positive impacts that natural green spaces have on humans. As science progresses, so do the amount of studies on this topic (Bratman et al., 2012).

The literature reviewed in this chapter is divided into three comprehensive sections. The first section analyses the benefits of green spaces; dividing green space into the physiological and psychological domains. Following this is an exposition of the available research on green spaces in the context of universities and other academic settings. The literature reviewed in this section excludes research with the ecological focus of green space conservation, as it falls outside of the scope of this study. Studies investigating students' perceptions of on-campus green spaces are addressed, as well as studies examining the benefits and connections between green spaces and students' well-being. The final section presents the local context and focuses on research in South Africa on green space perceptions.

The findings of the three sections are emphasised in the conclusion, and the importance of green spaces will be reiterated, in the context of both students and the general population. To begin, however, the focus moves to a discussion regarding the physiological benefits of green spaces.

## 3.2 Benefits of Green Space

### 3.2.1 Physiological Benefits

Exposure to green spaces has been proven to hold physiological benefits to human beings (Lohr, 2011). In terms of overall health, a number of studies have been conducted that investigate the relationship between exposure to green spaces and reported general health (Maas, Verheij, Groenewegen, de Vries & Spreeuwenberg; 2006). One such study conceptualised health on three domains: the number of self-reported physical symptoms

recounted in the past 14 days, perceived general health and the participants' scores on the Dutch version of the General Health Questionnaire. It was found that exposure to natural areas had a positive influence on all three domains; most significantly the self-reported physical symptoms domain. Participants reported fewer physical complaints following exposure to green areas than those who were not exposed to green areas (de Vries, 2003). In another instance, general health was classified into short-term recovery from stress or mental fatigue, faster physical recovery from illness and long-term overall improvement in health and wellbeing. When viewing natural landscapes it was found that there was an improvement in all three aspects of general health (Verlade, Fry & Tveit, 2007).

With regard to individuals who are already sick, natural areas have been found to have a healing effect. Roger Ulrich (1999) referred to such an area as a healing garden. A healing garden is ''a garden in a healing setting designed to make people feel better'' (Eckerling, 1996). Ulrich (1999) investigated the impact of healing gardens on the stress levels of patients in hospital and determined the health benefits that could be attributed to these gardens. He concluded that "there are sound scientific grounds for contending that gardens in healthcare facilities will improve health outcomes to the extent that they are effective in fostering restoration and coping with respect to the stress that accompanies illness and hospitalization" (p. 35). Ulrich (1999) also noted that these gardens fostered a sense of control and provided access to privacy, social support, physical movement and exercise. Healing gardens also provided patients with access to nature and other positive distractions (Ulrich 1999). These findings have been supported in more recent studies (Hartig & Marcus, 2006; Horowitz 2012; Relf, 2005; Sherman, Varni, Ulrich & Malcarne; 2005).

Green spaces do not only aid in the healing process in the context of hospitals and specially designed gardens, however. In urban areas where individuals are exposed to spaces such as parks, forests or fields, a lower stroke mortality rate as well as reduced mortality rates from patients suffering from circulatory disease were reported (Hu, Liebens, & Rao, 2008; Lee & Maheswaran, 2011; Mitchell & Popham, 2008). A significant association has been found between green urban spaces and reduced cardiovascular and respiratory disease. Similarly, positive associations have been found between green spaces and lowered incidents of long-term illnesses (Richardson & Mitchell, 2010).

Another way in which green spaces have a positive effect on physiological well-being is that they provide an ideal setting for exercise. In this context, green spaces indirectly influence health as they enhance the already-present health benefits of exercise and physical activity (Duvall, 2011). Exercising in green areas has been found to improve both

self-esteem and mood. This effect was heightened in mentally ill patients in one related study (Barton & Pretty, 2010). This finding was confirmed by Bowler, Buyung-Ali, Knight and Pullin (2010) who conducted a systematic review of literature relating to the added health benefits of exercising in green areas.

A final physiological benefit of green areas on health is related to the role trees and plants play in the ecosystem. While it is acknowledged that the pollen of certain flowers may cause allergies at specific times of the year, it has been found that trees tend to absorb pollutants and stabilise dust in the atmosphere, thereby acting as a natural filter (Cicea & Pirlogea, 2011; Freer-Smith, El-Khatib & Taylor, 2004). Natural areas also act as buffers against noise pollution as they absorb high levels of noise (de Ridder et al., 2004).

It can be therefore concluded that green spaces have a positive effect on the health and physical well-being of human beings (Groenewegen et al., 2006). These positive health effects are likely to be related to psychological and cognitive benefits, which are discussed next. It should be noted that while many of the psychological benefits discussed below have a physiological basis, the studies reviewed focus largely on the psychological aspects alone, and as such these benefits are discussed separately from the physiological benefits mentioned above.

### 3.2.2 Psychological/Cognitive Benefits

#### *3.2.2.1 Attention Restoration*

As discussed in Chapter 2, section 2.4, natural environments play a large role in the restoration of directed attention by the induction of involuntary attention (Berman, Jonides, & Kaplan, 2008). Since the initial proposal of Kaplan and Kaplan's (1989) theory, which states that exposure to green spaces assists in the restoration of humans' attention, there has been sustained interest in the restorative benefits of nature. In 1995 Stephen Kaplan expanded on Kaplan and Kaplan's (1989) theory by including the concept of stress. He maintained that exposure to natural areas could assist in attention restoration and stress recovery (a theory devoted to stress reduction is discussed in section 3.2.2.2 below). Two years later another study was conducted by Herzog, Black, Fountaine and Knotts (1997) on 187 undergraduate students. The aim of the study was to compare the perceived restorativeness of natural and urban environments, and the findings indicated that the natural environments uniformly had the highest perceived restorativeness rating (Herzog et al., 1997).

In a study conducted by Berto (2005) the researcher measured fatigued participants' directed attention capabilities by requiring them to perform a sustained attention test. One group of participants was then exposed to natural settings while the other group was not. Afterward all participants were required to re-take the sustained attention test. Participants exposed to the green spaces performed better when doing the sustained attention test for the second time. The findings of this study support the notion that exposure to natural areas assists in the restoration of directed attention (Berto, 2005). Another study related to restoration compared perceived restorativeness over various natural settings. What was interesting was the finding that urban parks were associated with the lowest levels of restoration (White, Pahl, Ashbullby, Herbert & Depledge, 2013). Many of the studies mentioned within the context of the present study utilised urban parks as the natural setting around which the research centres, but White *et al.*'s (2013) study suggested that urban parks might not be the best setting to test restorativeness. The researchers (White et al., 2013) found that coastal environments were most conducive to restoration, trailed by rural/countryside environments, and then followed by urban green spaces that were considered to be the least conducive to restoration. Consideration should be taken however that in many of the studies mentioned in the current study, access to coastal environments is not always a viable option. So while it is interesting to note that coastal environments have been found to have the highest association with restoration, urban parks are still the best possible option for inner-city dwellers.

An interesting finding related to attention restoration is that one's beliefs about the likelihood of a particular environment providing restoration directly influences one's perceived level of restoration (Staats, Kieviet & Hartig, 2003). In a study that used a forest as the natural setting, participants expressed a preference for the forest over the city when asked to imagine themselves as mentally fatigued. Moreover, perceived restoration was higher when participants considered the forest than when they considered the city setting. This finding provides an interesting connection between the reciprocal nature between humans and their environments – it is possible that by simply expecting to be restored one will experience a mental state of restoration (Hartig & Staats, 2006; Staats, Kieviet & Hartig, 2003).

A link has also been found between the positive restorative effects of nature and Attention Deficit Hyperactivity Disorder (ADHD) in children (Taylor, Kuo & Sullivan, 2001). In a study conducted by Van den Berg and Van den Berg (2011), children diagnosed with ADHD were required to perform concentration tasks in a wooded area and in a city area. It was found that the children displayed better concentration when exposed to wooded areas. They also displayed less aggressive, non-social and inattentive behaviours when in these

areas (van den Berg & van den Berg, 2011). Similar studies that were conducted revealed that time spent in green areas helped reduce the symptoms of ADHD (Taylor & Kuo, 2008; Taylor & Kuo, 2011).

#### *3.2.2.2 Stress Reduction*

Not only do restorative environments assist in restoring attentional capacities, they also assist in the reduction of stress. This concept was originally examined by Roger Ulrich in 1991 when he found that psychophysiological responses to viewing natural landscapes indicated a greater recovery from stress (as induced by watching a stressful movie) than when viewing urban landscapes. His research in this area led to the introduction of the Stress Reduction Theory (SRT). Interestingly, the differentiation between Ulrich's theory and Kaplan and Kaplan's (1989) theory is that Ulrich is not focused on attentional capacities, but rather on the emotional and physiological recovery from stress (Han, 2010).

The stress reducing effects of green spaces have been examined both in their psychological and physiological components (an increase in mood and affect in conjunction with systolic and diastolic blood pressure and salivary cortisol levels). Studies over the last ten years have provided support for Ulrich's notion that exposure to green areas assists in the reduction of stress levels, both psychologically and physiologically (Keniger, Gaston, Irvine, & Fuller, 2013; Maller, Townsend, Pryor, Brown, & St Leger, 2006).

One such study conducted by Thompson *et al.* (2012) on 25 middle-aged urban dwellers analysed the extent to which green spaces, salivary cortisol patterns and green spaces influenced one another. The results indicated significant relationships between self-reported stress, cortisol secretion and the quantity of green space in the living environment. A similar study using salivary cortisol secretion as a measure of stress relief was conducted in 2011 by van den Berg and Custers. Thirty sampled gardeners performed a stressful Stroop task and were then divided into two groups; one group gardened for 30 minutes while the other group read a book indoors. Salivary cortisol levels were measured repeatedly. The findings clearly indicated that gardening resulted in lower salivary cortisol levels following the stressful stimulus than the reading group.

Hartig, Evans, Jamner, Davis, and Gärling (2003) compared psychophysical stress recovery and attention restoration in natural and urban settings using measures of ambulatory blood pressure, emotion and attention. The sample group was 112 randomly assigned young adults and they were required to take a walk in either a natural or urban environment following a Stroop and binary classification task. The results indicated lowered

systolic and diastolic blood pressure, increased positive affect and improved directed attention in the natural environment condition (Hartig et al., 2003).

The above studies reveal that exposure to green spaces assists in the reduction of stress. Stress manifests primarily as a physiological concept, but it is also experienced psychologically and as such it has been discussed as a psychological concept (Keniger, 2013).

#### *3.2.2.3 Other Psychological Benefits*

The psychological benefits of green spaces are not limited to only stress reduction or attention restoration. Vitality is defined by Ryan and Deci (2008) as the presence of physical and mental energy that allows people to experience a sense of enthusiasm, 'aliveness', and energy. Vitality has been proposed to be one of the central indicators of psychological well-being as it is positively linked to many other well-being indicators such as self-actualisation, self-esteem and autonomy. Additionally, it is negatively linked to indicators of depression, anxiety and pain (Nix, Ryan, Manly & Deci, 1999). For this reason, studies that find positive links between green space exposure and vitality also contribute indirectly to the knowledge field of green spaces and well-being. In a study conducted by Ryan *et al.* (2010) it was found that being outdoors was positively associated with higher levels of self-reported vitality. The results of Ryan *et al.'s* (2010) study have been corroborated in Nisbet, Zelenski and Murphy's (2011) study where they examined and found positive links between being in nature and subjective well-being and vitality.

Similarly, researchers in England examined how the psychological benefits of being exposed to green spaces increased with the increase in the biodiversity of those spaces (Fuller, Irvine, Devine-Wright, Warren & Gaston, 2007). Factor analysis of the measure used in the study identified the components of psychological well-being to include reflection, distinct identity, continuity with the past and attachment to green spaces. The findings also indicated that psychological benefits were positively related to the species richness (density) of plants, and to a lesser extent, an increase in green space area. These findings conclude that it is possible to erroneously assume that the benefits of exposure to green spaces can be derived simply by increasing the physical area of the natural setting. In the context of the present study, it could be suggested that on-campus green spaces should be comprised of greater biodiversity and plant species rather than simply creating larger green space areas.

Yet another psychological benefit of exposure to nature explored by scholars is positive affect. Positive affect and psychological well-being do not refer to the same concept,

but positive affect is often considered a construct within the greater notion of psychological well-being (Kahneman & Krueger, 2006). A study conducted by Mayer, Frantz, Bruehlman-Senecal and Dolliver (2009) on undergraduate psychology students examined the causal mechanisms underlying the beneficial features of nature and the extent to which they influence affect. The study established that exposure to nature caused an increase in nature connectedness (the extent to which an individual feels part of nature), attentional capacity, positive affect and the ability to reflect on a life problem. Nature connectedness and increases in attentional capacity were found to have mediating effects on the positive links between nature and positive affect. Moreover, the positive outcomes were distinctly higher when participants were exposed to real green areas (as opposed to virtual nature scenes) (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009). Similarly, Van den Berg, Koole and Van der Wulp (2003) examined the link between green space exposure and affect restoration in a study, which included 106 university students. Participants viewed a frightening movie that was followed by a video of either a natural or built environment. They then completed a mood test. It was found that those who watched the video of the natural environment reported significantly more positive moods than those who watched the built environment video (Mayer et al., 2009).

Apart from studies conducted on positive affect, one should also take note of studies that examined the link between nature and a decrease in aggression. Kuo and Sullivan (2001) found that females in an urban public housing complex who had been exposed to green areas outside their apartments experienced significantly lower levels of aggression than their counterparts who did not. Additionally, the residents who were exposed to green areas performed consistently better on attention tasks. The inverse correlation established between green spaces and aggression reduction was also revealed in a study conducted by Hartig *et al*. (2003). These researchers discovered decreased scores on self-reported measures of aggression following a walk in a natural green area.

### 3.2.3 Conclusion on the benefits of green spaces

From the above discussion is it evident that exposure to green spaces undoubtedly has a positive effect on human beings (Chiesura, 2004). These positive effects range from restored attentional capacities, improved mood and effect, the reduction of stress, as well as a whole range of physiological benefits. These benefits are important to note, as students on university campuses are able to profit significantly from green spaces. Academic pressures, financial stress, family pressures, career planning and identity issues are a few of the common stressors applicable to university students (Stress points, n.d., para. 2; Vaez,

Kristenson & Laflamme, 2004). Studies that investigated the perceived quality of life (PQoL) of students have found that psychological and emotional health is of a greater concern to students than physical health. In most other population groups physical health is considered to be of greatest importance (Stewart-Brown, 2000; Vaez, & Laflamme, 2002). While psychological support is a valuable tool in the reduction of these abovementioned stressors, green spaces can offer numerous natural and free psychological and physical benefits.

## 3.3 Green Spaces on Academic Institution Campuses

Although there is not a great deal of literature regarding students' perceptions of the green spaces on their university campuses, research has been conducted to evaluate the importance of on-campus green spaces and some related effects and benefits to humans. A comprehensive review of the available literature on this topic yielded seven significant articles, which are discussed below. Articles related to ecological matters, pro-environmental behaviour and perceived on-campus safety were excluded as they fall outside of the scope of the present study.

Starting chronologically, the earliest study that addressed students' perceptions of outdoor spaces on university campuses was conducted by Abu-Ghazzeh in 1999 and analysed the factors affecting the perceptions and use of outdoor spaces at the University of Jordan. The study utilised a qualitative approach through content analysis of qualitative decision-making transcripts. The study included students, administrative staff and lecturers and required all respondents to explain their decisions regarding where they spend their free time. The most prominent finding was an attraction to outdoor social interaction and the attractiveness of the landscape. Participants reportedly perceived the outdoor areas on the campus to be green and 'park-like.' Many respondents noted that while their original understanding of their desire to spend time in these areas was related to the social aspects, further self-reflection revealed that it was in fact further due to the presence of the trees and grass. Social interaction was however still an important factor in the overall appeal (Abu-Ghazzeh, 1999).

This finding can be interpreted from the biophilic approach (as discussed in Chapter 2, section 2.3), which states that humans have an intrinsic attraction to natural settings (Wilson, 1993). The participants were able to identify an attraction to green areas but were not initially aware that an internal magnetism to nature may have been at play. Instead, students attributed their attraction to the area and to the social interactions that occurred there.

Recently, a similar study was conducted by Speake, Edmondson and Nawaz (2013). This study examined students' perceptions and usage patterns of green spaces on campus. The researchers sought to determine where students at Liverpool Hope University chose to spend their free time, why they chose to spend it there and what they thought about the landscaping and aesthetics of the campus. More than half of the students that participated in the study chose to spend their free time in green spaces near their classrooms. Students cited relaxation and socialising as the predominant use of green spaces. This finding is supported by Maas, van Dillen, Verheij and Groenewegen (2009) who posited that green spaces are important for increased social contact and reduced loneliness. Although Speake *et al.,* (2013) did not address ART, it would appear that this use of green spaces for socialisation provides restorative benefits to students, irrespective of whether they are aware of it or not.

McFarland, Waliczek, and Zajicek (2008) were however aware of the potential benefits of the relation between green space usage and social interactions and they discovered important associations between these two spaces. MacFarland *et. al.'s* (2008) study investigated links between on-campus green space usage and PQoL. As mentioned in section 3.2.3, PQoL consists of numerous domains, namely health, emotional and financial domains (Vaez, Kristenson & Laflamme, 2004). In this study PQoL consisted of an affective domain (measuring dimensions of total positive affect, interaction with students, and interaction with professors), and a cognitive domain (measuring the extent to which students felt they were experiencing sufficiently ''demanding cognitive challenges'') (p. 233). Statistically significant correlations were found between green-user scores (GUS) (amount of time spent in green spaces) and overall PQoL, between GUS and the affective PQoL domain (specifically the interaction with students and total positive affect dimensions), and between GUS and the cognitive domain of the PQoL measure (McFarland et al., 2008). It was reported that the students had rated their "ability and challenge to apply knowledge learned in the university as higher when compared with low users of campus green spaces" (p. 234).

Once again it is important to note the positive correlation between students' use of campus green spaces and the interactions between students regarding the PQoL scale. As discussed above, social interaction appears to be an important aspect of attraction to green spaces (Abu-Ghazzeh, 1999) and social interaction holds the benefit of reduced loneliness (Maas et al., 2009). Essentially, it appears that not only do green spaces on campus provide direct restorative benefits to users (as evidenced by ART and SRT); they also provide the platform for social interactions which further assist in the reduction of stress.

The findings of McFarland *et al.'s* (2008) study are unique, noteworthy and highly relevant to the present study as the implications are vast. A simple change such as providing more green spaces on campus that are more accessible to students can result in students spending more time in these areas and therefore experiencing a higher PQoL. As mentioned in section 3.2.3., there are numerous common stressors which affect students and can negatively impact on their moods. While natural areas may not be responsible for solving personal problems, the increase in positive affect and PQoL induced by green space exposure can provide a positive platform from which problem solving can take place. These implications are discussed in greater detail in Chapter 6 as part of a discussion suggesting improvement on green spaces at the University of Pretoria.

In a study similar to that of McFarland *et al*. (2008), the researcher investigated the relationships between high school student performances and the landscapes of the school (Matsuoka, 2010). Matsuoka (2010) employed an ART approach and postulated that the benefits of restored attention following exposure to green spaces would be related to better school performance. Student performance was operationalised to include five tenets: performance on a standard school test (which all students were required to take), graduation rates, plans to attend a four-year college, student disorderly conduct and student criminal activity. The degree of 'naturalness' of certain views on campus was quantified by Matsuoka's (2010) use of a five-point rating scale (from "no view" to "all natural") and exposure to these areas was used as the predictor variable (p. 276). Multiple regression determined the amount of variance in these outcome variables explained by exposure to nature. The results were statistically significant and confirmed that increased exposure to nature during the school day is positively associated with performance on the standard test, graduation rates and college attendance plans. Student disorderly conduct also decreased when exposure to nature increased (Matsuoka, 2010). As was the case with McFarland *et al.*'s (2008) study, the potential implications of these results are enormous since they suggest that restorative green spaces contribute positively to academic performance.

A second study taking an ART approach was conducted in 2009 by Felsten. Working from the theoretical assumption that exposure to green spaces assists in attention restoration; he aimed to determine the types of nature that have the greatest restorative effects on students who are attentionally depleted after classes. He included both real and non-real nature settings (i.e. wall murals) and found that the more dramatic nature scenes – especially those including water – had a greater restorative effect than mundane, but real, nature settings. The key point of Felsten's (2009) study was that it did not matter whether the nature scene was real or not – it was the intensity of the setting that influenced perceived

restorativeness. Expansive all-natural scenes with water features (coastlines, rivers and waterfalls) were rated as the most intense. This suggested that water features induce a high level of perceived restorativeness (Felsten, 2009).

Kjellgren and Buhrkall (2010), however, contended Felsten's (2009) key finding and suggested that the essence of the natural environment—thus whether it is natural or not—plays a role in the effectiveness of restoration. They conducted a mixed method study during which participants were exposed to 30 minutes of either a natural environment, or an indoor simulation of the natural environment. Results indicated that the real natural environments brought about the highest levels of restoration and increased energy. This study does not counter the point that the content of the view influences restorative perception; it merely proposes that maximum restoration is gained from real natural, outdoor settings (Kjellgren & Buhrkall, 2010; Mayer et al., 2009). These two findings can be incorporated by universities to make use of both real natural settings and striking indoor murals. In this way, maximum restoration of students can be achieved.

If, however, a university is extremely compact and dense and the above suggestion is not feasible, university stakeholders can consider the possibility of implementing small, but highly restorative spaces (Lau & Yang, (2009). Lau and Yang (2009) based their research on Ulrich's (1999) findings regarding the benefits of healing gardens (discussed in section 3.2.1. above). These researchers examined the potential advantages of having a healing garden on campus to promote student well-being. The authors found that having a healing garden on a compact campus provided students with a range of psychological and physiological benefits that are similar to those mentioned in section 3.2.

The final study reviewed in this section is a paper by Griffith (1994). She was one of the first authors to write about the importance of green spaces on campuses and despite not having a firm theoretical foundation, her study titled *Open space preservation: an imperative for quality campus environments* noted fundamental points about on-campus green spaces that have since received corroboration in recent literature (Gumprecht, 2007; Lawrence, 2012; Strange, 2003). Despite not specifically taking an ART approach, Griffith (1994) alluded to the importance of the concept of compatibility (as discussed in Chapter 2, section 2.4.3.4) by stating (with reference to green spaces) that:

> After passing through gateways that establish the college as a special place apart, the entrant should feel that the campus expresses a high level of involvement

> through a thoughtful, effective physical layout that facilitates the execution of campus functions in a comprehensible, people-serving manner. (p. 645)

Moreover, these spaces are also imperative for creating a sense of campus identity and community. These green spaces can either be habitats left in their natural form (i.e. small forests or rivers) or designed landscaped green areas. Irrespective of the form of the green space, these areas can be used to accentuate important buildings and landmarks. In this way, the green areas and buildings serve to complement one another (Griffith, 1994; Gumprecht, 2007; Lawrence, 2012).

Griffith (1994) stated an important point that individuals' perceptions of the open green spaces of a university plays a critical role in attracting high quality potential students, faculty members and investors. Speake *et al*. (2013) found that students believed the green spaces on campus were imperative to the overall university image, and this image is what attracts students, faculty members and investors. Due to the ever-increasing demand for buildings, parking lots and student densities, some suggestions for preservation of green spaces have been mentioned. Griffith (1994) stressed the importance of including green spaces in the master plan of the university. However, even if green space preservation does not take top priority, the techniques mentioned below can be incorporated to whatever extent possible for the university in question. These techniques include:

> (1) treatment of open space as sacred ground, (2) designation of open space preserves, (3) open space land banks, (4) creation of an open- space land use category, (5) percentage open space set asides, (6) ground area coverage restrictions, (7) floor area ratio requirements, (8) setback requirements, (9) building height restrictions, (10) density management policies, (11) impact statement requirements, (12) removal of surface parking and roadways, and (13) the construction of underground facilities. (Griffith, 1994, p. 659)

The seven crucial articles discussed above provide an illustration of the research about the relationship between on-campus green spaces and the users of these spaces. The potential benefits of exposure to green spaces include attention restoration, stress reduction, higher PQoL and improved academic performance (Felsten 2009; Lau & Yang, 2009; Matsuaoka, 2010; McFarland et al., 2008). These findings are extremely encouraging as secondary and tertiary institutions could potentially improve not only the well-being of

students, as indicated by PQoL and restoration, but also the reputation of the institution by means of better academic output.

## 3.4 The South African Context

To return to a local focus, there appears to be little research interest in green spaces in South Africa, with specific regard to the perceptions and benefits thereof to humans. Two South African studies were found that analysed the public's perception of urban green spaces and as such, these are discussed below.

Shackleton and Blair (2013) conducted a study in which they investigated the perceptions and use of public green spaces (PGS) in two small towns in South Africa. They discovered that the results yielded insight into the public perception of green spaces in their neighbourhoods. Essentially, the researchers found that PGS were considered important by nearly all the respondents, citing relaxation and recreation as the main reasons for their importance. The more affluent respondents indicated a greater willingness to invest both time and money to maintain these spaces. Additionally, the relative abundance of the spaces influenced participants' satisfaction levels of them. The conclusion drawn from this study was that higher levels of green spaces result in higher public satisfaction with green spaces. The implication for South African authorities therefore is that greater attention should be given to the quantity and maintenance of public green spaces, both for the benefit of residents, and to encourage residents to participate in the maintenance of these spaces.

A similar study was conducted by Ward, Parker and Shackleton (2010). The researchers investigated the use and appreciation of botanical gardens in South Africa and found that 99% of participants felt that PGS was important (botanical gardens form a part of PGS). These researchers found an overall dissatisfaction with the amount of PGS in the country. The most commonly cited reasons for visiting botanical gardens was the enjoyment of the natural beauty, exercise and "to get a breath of fresh air" (p. 53). Participants appeared to be aware of the benefits of green spaces. These benefits once again included psychological, recreational, and ecological as well as PQoL benefits (Ward et al., 2010).

Based on the two articles reviewed above, it would appear that dissatisfaction with the amount of PGS is a common concern for both the public and researchers. International research provides a solid foundation for determining the best ways of improving PGS, but more local research needs to be done. This is due to the fact that South Africa is a developing country with a unique socio-political climate (Schäffler & Swilling, 2013).

## 3.5 Conclusion

It is hoped that the above review of literature relating to green spaces has allowed little room for the notion that exposure to green space does not provide any benefits to humans. As the biophilia hypothesis suggests, humans can be attracted to nature and natural settings without even being aware of the reasons for and the benefits of this attraction (Wilson, 1993). The benefits of green space exposure are multi-dimensional and include physiological benefits such as heightened perceived health, quicker healing from illness and lower mortality rates after strokes. Psychological benefits include attention restoration, heightened affect and stress reduction (Berman et al., 2008; de Vries, 2003; Maas et al., 2006; Ulrich, 1991; Ulrich, 1999; van den Berg, 2003; Verlade et al., 2007).

Some of these benefits have been investigated in relation to students on campus environments and support has been found for positive correlations between on-campus green spaces and attention restoration, stress reduction, higher PQoL and improved student performance (Felsten, 2009; Lau & Yang, 2009; Matsuoka, 2010; McFarland, 2008). The potential implications for these findings are of great importance to university stakeholders worldwide, as both students and academic institutions can benefit from natural green spaces, both directly and indirectly. While it is acknowledged that green space maintenance is by no means a low-cost affair, the benefits discussed in section 3.2 and 3.3 are equivalent to (if not outweigh) the cost of implementation and maintenance.

Within the South African context there is a paucity of research regarding the perceptions of green spaces, and a complete lack of research within the school/university context. South Africa is a developing nation, and as such, it is acknowledged that current focus of the South African government is on economic stability, crime reduction, HIV/AIDS reduction and socioeconomic equality, rather than green space perceptions (Benatar, 2004; Seedat, Van Niekerk, Jewkes, Suffla, & Ratele, 2009). While the Department of Environmental Affairs has a “People and Parks programme” that aims to encourage conservation by communities, the focus remains on ecological green space conservation rather than on the physical and psychological benefits to humans (People and Parks programme, 2013, para. 1). South Africans, however, appear to be aware of the benefits of green spaces, and it is therefore recommended that more attention is paid to the improvement of public and university green spaces in the country.

# CHAPTER 4: RESEARCH METHODOLOGY

## 4.1 Introduction

The goal of the present study was to investigate the perceptions of students at the University of Pretoria regarding the on-campus green spaces. Additionally, the researcher sought to determine the extent of restorativeness that was experienced when these green spaces were utilised. To this end a descriptive research design consisting of a survey design was used. This chapter outlines the research methodology used to obtain the aforementioned goals. A description of the research strategy and design is discussed first, followed by a discussion of the sampling techniques utilised. A full description of the sample regarding the demographic variables ensues, in order to provide both the researcher and reader with a clearer representation of the sample population. An exposition of the measurement instrument used is followed, after which an explanation of the process of data collection is presented. The chapter concludes with a brief description of the method of data analysis and the ethical considerations incorporated into the execution of the study.

## 4.2 Research Strategy and Design

Due to the fact that the present study aims to obtain a description of a variable, descriptive research was chosen as the suitable research strategy. Typically, descriptive research seeks to measure or describe variables as they occur naturally (Gravetter & Forzano, 2009). Essentially, this approach aims to gain a better understanding of a variable. Descriptive research cannot answer 'how' or 'why' questions regarding the variable, it simply provides a depiction of a variable (Gravetter & Forzano, 2009; Tredoux & Smith, 2006). In this study the variable being investigated is perceptions of on-campus green space; particularly the perceived restorativeness of these spaces.

With respect to the research design, a survey research design was utilised. A survey can be defined as "a systematic method for gathering information from (a sample of entities) for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are members" (Groves et al., 2011, p.4). Essentially, by asking a sample population questions about a topic, a survey aims to provide a description of the topic as well as the sample (Groves et al., 2011). Although surveys as a means of

data collection can be used in almost any research design, the defining factor of a survey research design is that the purpose is simply to describe the variable (Gravetter & Forzano, 2009).

## 4.3 Sampling

### 4.3.1 Sampling Technique

Sampling techniques can be divided into two main categories, namely probability and non-probability sampling (Babbie, 2013). Probability sampling methods utilise random sampling which is a technique in which all members of the population have an equal chance of being selected to participate. This method ensures that the final sample is representative of the population of interest, thereby allowing for generalisability of results. Conversely, non-probability sampling techniques do not involve random sampling and therefore they exclude the possibility of generalisation of results. Due to time and cost restraints convenience sampling, a type of non-probability sampling was selected for the present study. Convenience sampling relies on the ease of availability of participants and includes those who are willing to participate (Babbie, 2013; Gravetter & Forzano, 2009). As such, the results of the study should be interpreted with caution and cannot be generalised to the greater population.

### 4.3.2 Sampling frame

The sampling frame consisted of second, third and fourth year full-time students enrolled for classes on the Hatfield campus of the University of Pretoria. First year students were excluded because they may have potentially not yet developed a preference for where they spend their time. Those sampled needed to have been students at the University of Pretoria for an extended period of time to be familiar with the campus and its various open spaces. One year was deemed a sufficient length of time, hence the minimum requirement of participants to be second year students.

Respondents were sampled from four different departments during lecture time on the Hatfield campus of the University of Pretoria. The departments included were: Architecture, Music, Psychology and Plant Production and Soil Science. These departments are respectively represented by the following buildings: the Architecture building, the Music building, the Human Sciences Building and the Agricultural Annex. These departments and their lecture halls are on different areas of campus and their immediate surroundings contain

different types of green space vegetation. It was acknowledged prior to data collection that there exists the possibility that students from these departments do not spend their free time in the green space surrounding their lecture halls. This was investigated in the questionnaire (discussed in section 4.4 below). However, to avoid obtaining a sample comprising entirely of students from only one department (and thus the potential for exposure to only one green area), sampling incorporated students who are required to spend time in different campus spaces as a result of where they attend their lectures.

### 4.3.3 Description of Sample

The sample obtained in the study consisted of 286 respondents who are full-time students at the University of Pretoria. The respondents varied on a number of demographic characteristics. This biographical information is presented in detail below.

#### *4.3.3.1 Age of Respondents*

As can be seen in Figure 4.1 below, the majority of students (86.7%) were aged between 20 and 23. The largest age group was 21 years old (30.8%), and 18 respondents (6.3%) were older than 25 years of age.

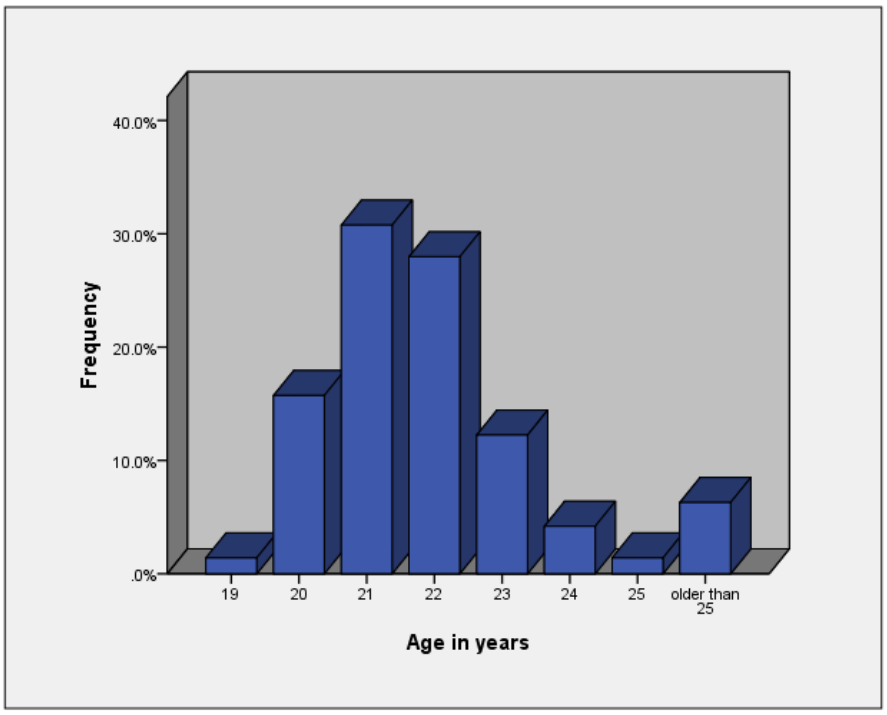


*Figure 4.1: Age of respondents*

### *4.3.3.2 Gender of Respondents*

Figure 4.2 below indicates that almost two thirds (62.2%; *n*=178) of the respondents were female, while 37.8% were male.

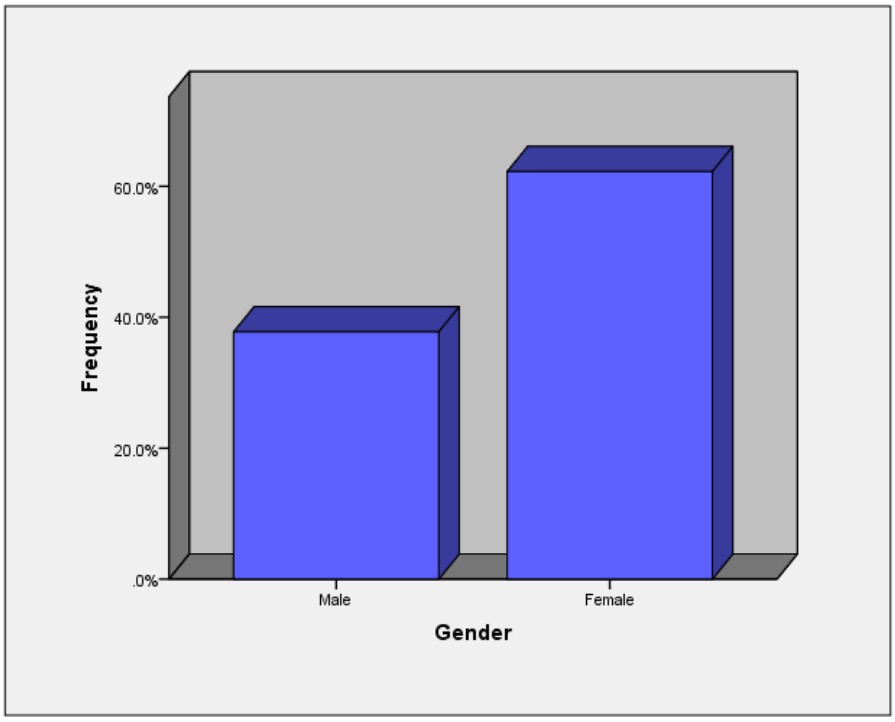


*Figure 4.2: Gender of respondents*

### *4.3.3.3 Race of Respondents*

As depicted by Figure 4.3 below the vast majority of respondents were white (77.9%), followed by black respondents (16.5%). In the minority were Asian, Coloured and Indian respondents comprising 2.1%, 1.8% and 1.8% of the total sample respectively.

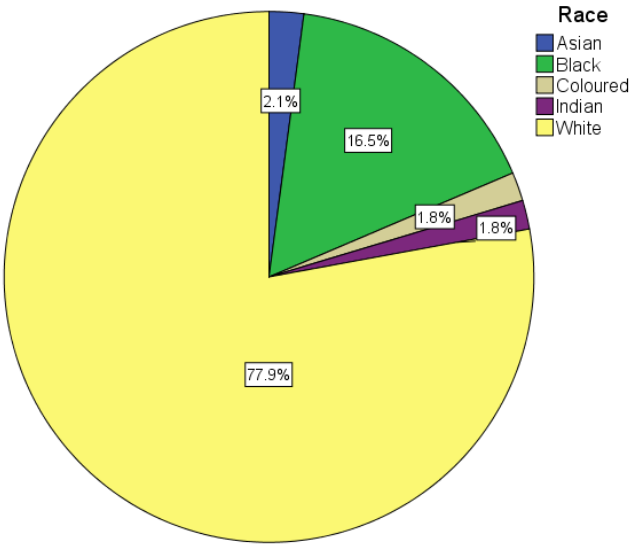


*Figure 4.3: Race of respondents*

### *4.3.3.4 Chosen Degree of Respondents*

Figure 4.4.1 below depicts the degrees for which the respondents have enrolled. As can be seen, the largest number of responses (*n*=101) indicated “Other” as their chosen degree. This was an unexpected finding and as a result the researcher analysed the degrees mentioned within the “Other” category. These responses are shown in Figure 4.4.2. In order to compare responses, results have been given as the actual number of responses, not percentages. With regard to the available options listed on the questionnaire, however, the largest number of respondents (*n*=55) reported being enrolled for BSc. Architecture, followed closely by B.Mus. (*n*=51).

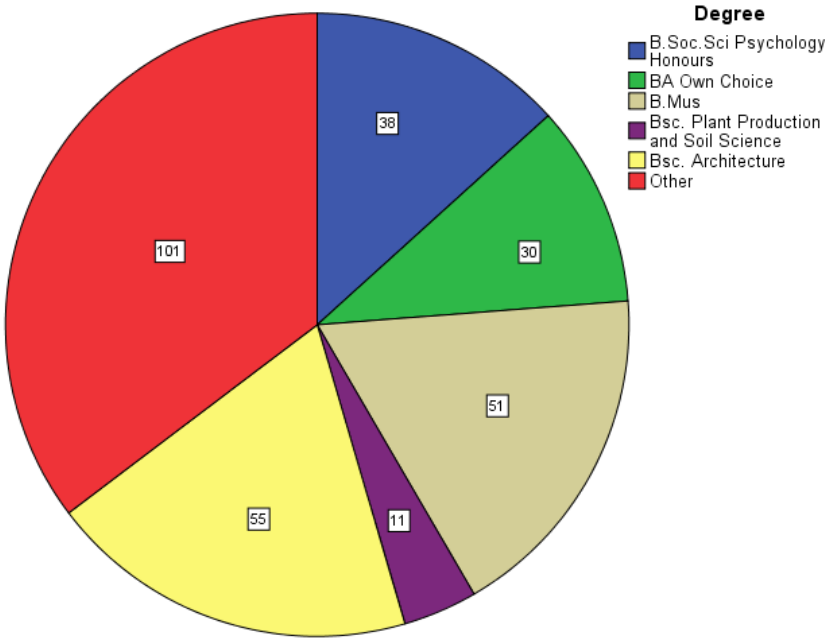


*Figure 4.4: Degree respondents are enrolled for*

As was mentioned above, there were a surprisingly large number of respondents who were not enrolled for any of the degrees listed and subsequently chose “Other” as their response. The following figure illustrates a classification of the remainder of the degrees mentioned by respondents. From the data retrieved, it was evident that 31 respondents are enrolled for Bsc. Animal Science, followed by BSc. Interior Architecture (*n*=16). The third most mentioned degree was BSc. Geology (*n*=14). The figures depicted in Figure 4.4.2 are important to include, because in some cases there are a higher number of respondents enrolled for some of the degrees mentioned under “Other” than those originally included in the degrees listed on the questionnaire. The two graphs together therefore form an accurate picture of the various degrees for which the respondents had enrolled.

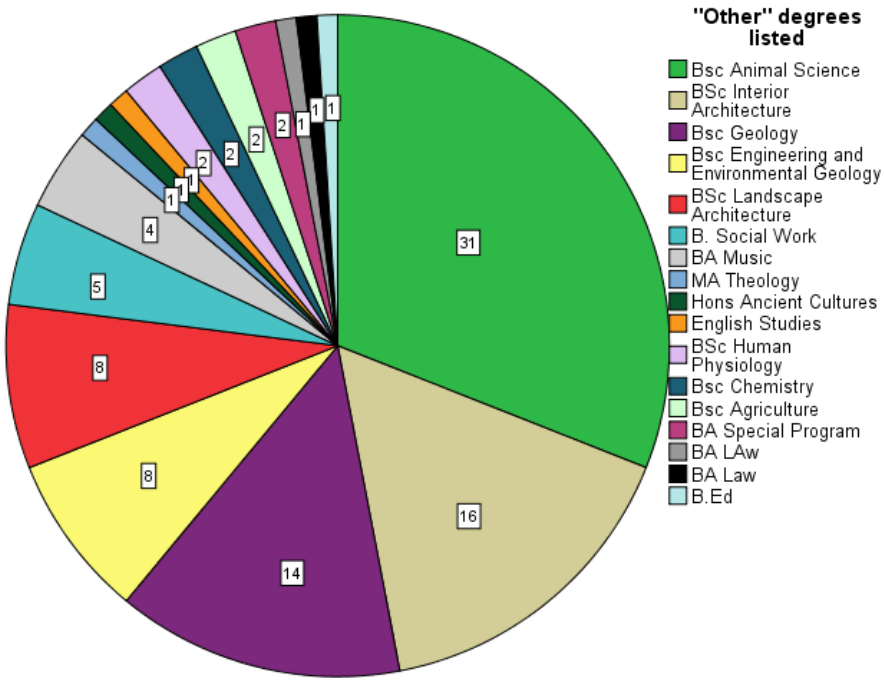


*Figure 4.5:* Classification of degrees listed in “Other” category of Figure 4.4.1.

### *4.3.3.5 Level of Degree Chosen*

As depicted by Figure 4.5 below, the vast majority of respondents (68.9%) were in their third year of study, followed by fourth years that comprised 17.8% of responses. There was one participant enrolled for a MA Theology who was in one of the classes sampled; this accounts for the 0.3% of responses enrolled for MA as depicted below.

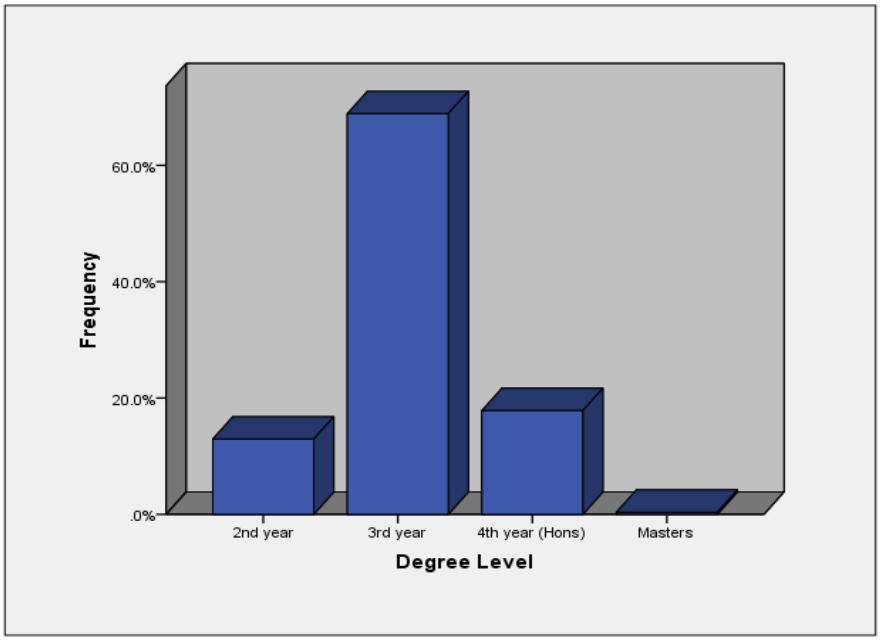


*Figure 4.6: Level of degree chosen*

## 4.4 Measurement Instruments

The measurement instrument used in this study was a questionnaire that comprised of three parts. A short section of demographics, a section addressing green space usage, and the Perceived Restorativeness Scale (PRS) were used to address all of the aims and objectives discussed in Chapter 1. The entire questionnaire was given to a statistician for revision prior to data collection and was deemed acceptable for use. The questionnaire used is provided in Appendix A. Each of the sections mentioned are discussed individually below.

### 4.4.1 Demographics

The first section, developed by the researcher, included questions relating to age, gender, race, current degree, and the level of said degree. The analysis of these demographics provided the researcher with the description of the sample, discussed in section 4.3.3 above. These demographics were included to both understand the fundamental characteristics of respondents and to enable the researcher to examine any significant differences between responses on subsequent measures with regard to any demographic.

### 4.4.2 Green Space Usage

This section was also developed by the researcher and included questions relating to green space usage and students' opinions of the quality of green spaces on campus. Questions in this section took on three forms: closed ended, open ended, and Likert-scale type questions. For example, students were required to indicate how much time they spend on campus (other than during lectures) by choosing one of five time categories given. Students were also required to indicate the extent to which they enjoy spending time in green spaces on campus as measured by a five-point Likert scale. Additionally, two open ended questions were included in which short responses were captured relating to students' opinions of the aesthetics and landscaping of campus. Students were also allowed to provide suggestions for the improvement of the green spaces on campus. Some questions in this section were adapted from Speake *et al.*'s (2013) study. Ms. Speake provided the researcher with a template of the types of questions used in their study, which the researcher then adapted for the present context. Questions such as "are you familiar with the term 'green spaces'?" and "for what purpose do you use this green space?" were adapted from Speake *et al.*'s (2013) study.

### 4.4.3 The Perceived Restorativeness Scale (PRS)

The PRS scale was originally developed in 1996 by Hartig, Korpela, Evans and Gärling, based on the Attention Restoration Theory (ART) discussed in Chapter 2. Hartig *et al*. (1996) were of the opinion that a measurement instrument was needed that accurately represented the core constructs of the theory due to ART's increasing popularity. The original scale consisted of 16 items, based on the ART components of being away, fascination, extent, and compatibility. It was later further expanded by Hartig, Kaiser and Bowler (1997) into a 26-item scale in an attempt to address previous concerns regarding item characteristics and a potential lack of correspondence between PRS indicators and the four theoretical components of ART.

The 26-item version is the most recent version of the scale and has been used in studies with highly satisfactory reliability ratings. Cronbach's alpha for the PRS over many studies ranges from α=0.71 to α=0.93 (Galindo & Hidalgo, 2005; Korpela, & Hartig, 1996; Korpela, Hartig, Kaiser, & Fuhrer, 2001; Purcell, Peron & Berto, 2001; Tenngart Ivarsson, & Hagerhall, 2008). A slightly revised version of the PRS was used in the present study. The wording of the questions was not changed but two items inapplicable to the context of the study were omitted. Nonetheless, Cronbach's alpha for the 24-item scale used was 0.92.

This is considered an excellent reliability score, since a Cronbach value of over 0.7 is generally considered acceptable (Pallant, 2010).

## 4.5 Data Collection Procedures

Initially, permission was obtained from the relevant Head of Departments to collect data during lecture time. Once this permission was received, contact was made with various lecturers within each department to use 15 minutes of lecture time to collect data. The researcher then attended the lectures in the agreed upon time slot and explained the nature of the study to the students. Those who were willing to participate were handed information sheets and informed consent forms. The questionnaire was then distributed. The researcher collected the completed questionnaires and signed informed consent forms. This process was repeated until the desired sample size was obtained.

## 4.6 Data Analysis

Data was analysed using the Statistical Package for the Social Sciences (SPSS), version 21. Descriptive statistics were obtained to better understand the sample population as well as the frequency of responses to the Likert-scale questions. Both parametric and non-parametric statistics were utilised during the process of data analysis. This was necessary because in a small amount of cases the assumptions for parametric statistics were violated, and this resulted in the need for non-parametric alternatives. Spearman's correlation was used to investigate potential correlations between PRS scores and the amount of time students spend on campus. Furthermore, a one-way ANOVA was conducted to determine any significant differences between the amount of time spent on campus and PRS scores. The results of the data analysis are comprehensively discussed in Chapter 5.

## 4.7 Ethical Considerations

When conducting a research study there are always many ethical considerations. These considerations are addressed by guidelines laid out in the American Psychological Association (APA) Ethical Principles of Psychologists and Code of Conduct manual (2010). The relevant sections of the manual, and the way in which they were addressed in the present study are now discussed below.

Firstly, section 8.01 states that when institutional approval is required, full details of the proposed study are to be supplied and the commencement of the study is only to occur once approval has been granted (APA, 2010). Prior to commencement of the study ethical clearance was obtained from the University of Pretoria's Faculty of Humanities' Research and Ethics Committee. This clearance was given in the understanding that the proposed study would not violate the subsequent ethical guidelines discussed below.

Potential respondents are expected to be provided with a full understanding of what they will be consenting to prior to the involvement in any study. Section 3.10 and section 8.02 of the APA (2010) ethical guidelines explains informed consent with respect to all psychological services, including research. Regarding this research, the consent must have been attained before the research begun.

In accordance with the requirements for consent, the purpose of the research (including the expected duration and the data collection procedure) was explained to participants, and it was communicated that they had the right to not participate or withdraw at any time, without any consequence to them. The extent of confidentiality was explained and the fact that there were no incentives for participation was expressed. In addition, the researcher's contact details were provided to ensure that any questions regarding the research that the students had, or their participant rights, could be addressed directly by the researcher. All of the above information was included in the participant information sheet. Participants were required to sign a separate consent form that was handed in together with the completed questionnaires.

Section 4 of the ethical guidelines emphasises privacy and confidentiality, wherein the underlying principle is that confidentiality and privacy of research participants is maintained as far as possible (APA, 2010). This concern was addressed in the present study by not requiring participants to provide their names or contact details on the questionnaires. No demographic information provided allowed for any individuals to be singled out, and so anonymity was maintained.

A problem that often arises in research studies is that people have the tendency to alter answers once they know what the expected results are. Deception regarding the true nature of the study is often used to avoid this problem (Gravetter & Forzano, 2009). Deception is however prohibited by the APA (2010) ethical guidelines unless the prospective scientific value of the study outweighs the potential negative impact of deceiving participants. Due to the nature of the present study there was no need to deceive participants as the

subject matter is completely innocuous. Therefore the true nature of the research was explained to participants and any questions relating to the study were answered honestly.

## 4.8 Conclusion

This chapter provided an exposition of the methodology utilised to meet the desired outcomes of the study. A survey research design was utilised in which participants were recruited through non-probability convenience sampling during lecture time. The final sample size was 286 students who were predominantly white and female. It is acknowledged that these demographics are not characteristic of the broader population; however it has already been noted that since generalisability is not made possible by this study these results should be interpreted with caution. Essentially, this study sought to determine the thoughts of a specific group of students regarding the on-campus green spaces and the research design was able to achieve this. The measurement instrument was a questionnaire largely designed by the researcher. The PRS was also included to assess perceived restorativeness and this scale produced a reliability score of 0.92 which is considered excellent (Pallant, 2010). As was thoroughly explained in section 4.7, care was taken to address all possible ethical concerns of research. Participants were informed of the true nature of the study and were required to consent to participation prior to the commencement of data collection. Anonymity was maintained and no deception was used. The results of the study are discussed in Chapter 5.

# CHAPTER 5: RESULTS

## 5.1 Introduction

This chapter displays the results of all the analyses conducted on the data. It is divided into four topical sections relating to the questionnaire used in the study (see Appendix A). The first section deals with the opinions of students relating to the green spaces on UP campus. This section includes responses to question 8, and questions 14 to 21. The second section investigates the location of where students spend their free time and how much time is spent on campus (excluding lecture time). Included in this section are questions 6, 7 and 12. The third section explores the purpose for which students use green spaces, and questions 2 and 13 are addressed. Finally, a comprehensive section about the Perceived Restorativeness Scale (PRS) is included. This section investigates the extent to which the various green spaces are perceived as restorative by students. The PRS is Part C of the questionnaire and as such all questions in Part C were utilised in addition to questions 6 and 12.

The primary reason for presenting the results thematically and not sequentially as they appear on the questionnaire is to ensure a conceptually logical flow. It should be noted that the questionnaire was not laid out in the manner discussed below as it would likely have resulted in leading participants to provide socially desirable answers.

## 5.2 Opinions of Green Spaces on Campus

As mentioned above, this first section included the responses to questions 8, 9 and questions 14 to 21 (see Appendix A). Both closed and opened ended questions were used to obtain an enhanced understanding of the thoughts of the sampled students regarding the green spaces on UP's Hatfield campus.

Questions 8 and 9, which were opened ended questions, were analysed first. The researcher found a considerable correspondence between responses to question 8 ("what is your opinion of the aesthetics of campus?") and question 9 ("what is your opinion of the landscaping on campus?"). The reason for this correspondence could potentially be that participants did not completely understand either (or both) question(s) and therefore simply wrote the same answer twice. As such, the results of question 9 were omitted. The responses to question 8 were captured and then analysed manually to determine the most

popular responses. Frequencies were determined by using the "Find" action in Microsoft Office Word (2010), which displays the amount of times a word or phrase appears. This data was then imported to SPSS to create a new data set in order to generate a frequency table. These results are presented next.

### 5.2.1 Question 8

This open-ended question (see Appendix A) required participants to express their opinions regarding the aesthetics of UP's Hatfield campus. As mentioned, there was a considerable correspondence between responses to question 8 and question 9 and therefore only the responses to question 8 are displayed here.

*Table 5.1: Frequency Distribution of Responses to Question 8*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| Responses not included | 39 | 27.1 | 27.1 | 27.1 |
| Good | 24 | 16.7 | 16.7 | 43.8 |
| Beautiful | 23 | 16.0 | 16.0 | 59.7 |
| Well-maintained | 16 | 11.1 | 11.1 | 70.8 |
| Pleasing | 12 | 8.3 | 8.3 | 79.2 |
| Nice | 7 | 4.9 | 4.9 | 84.0 |
| Relaxing | 5 | 3.5 | 3.5 | 87.5 |
| Average | 5 | 3.5 | 3.5 | 91.0 |
| Calm and tranquil | 4 | 2.8 | 2.8 | 93.8 |
| Pretty | 3 | 2.1 | 2.1 | 95.8 |
| Clean | 3 | 2.1 | 2.1 | 97.9 |
| Neat | 3 | 2.1 | 2.1 | 100.0 |
| Total | 144 | 100.0 | 100.0 | |

As can be seen in Table 5.1, there appears to be a generally positive perception of the green spaces on campus. The most popular responses were positive terms such as "good" (16.7%), "beautiful" (16%), and "well-maintained" (11.1%). Apart from the term "average" (3.5%), all other responses indicated a largely positive perception of the aesthetics of on-campus green spaces.

The closed ended questions included in this section were questions 14 to 21 and were analysed by conducting frequency analyses on SPSS. This type of analysis assesses the properties of a distribution of scores in a data set and determines the number of times a value or response appears in a set of responses (Field, Miles & Field, 2012). It should be noted that for questions 14 to 17, the response options 1 – 5 are related to the extent to

which participants agree with the statement made. Option 1 indicates a response of 'strongly disagree', option 2 means they agree somewhat, option 3 indicates a neutral opinion, option 4 is indicative of agreeing somewhat, and option 5 expresses that they strongly agree.

### 5.2.2 Question 14

This closed-ended question (see Appendix A) required participants to indicate the extent to which they agreed with the statement "I enjoy spending time sitting on open green spaces on campus". Table 5.2 presents the descriptive statistics for this question.

*Table 5.2: Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 14*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 246 | 40 | 4.24 | 4.00 | 0.892 | 4 | 1 | 5 |

After calculating the descriptive statistics for Question 14, a frequency distribution was computed to determine the responses of the question by participants. The result of this distribution is displayed in Table 5.3.

*Table 5.3: Frequency Distribution of Responses to Question 14*

| Response | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 4 | 1.4 | 1.6 | 1.6 |
| 2 | 5 | 1.7 | 2.0 | 3.7 |
| 3 | 36 | 12.6 | 14.6 | 18.3 |
| 4 | 84 | 29.4 | 34.1 | 52.4 |
| 5 | 117 | 40.9 | 47.6 | 100.0 |
| Total | 246 | 86.0 | 100.0 | |
| Missing | 40 | 14.0 | | |
| Total | 286 | 100.0 | | |

Table 5.3 indicates that more than half of the sample (70.3%) indicated that they enjoy spending time sitting in open green spaces on campus.

### 5.2.3 Question 15

This closed-ended question (see Appendix A) required participants to indicate the extent to which they agreed with the statement “I enjoy spending time in areas where the green space is aesthetically pleasing”. Table 5.4 presents the results of this question.

*Table 5.4: Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 15*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 243 | 43 | 4.49 | 5.00 | 0.840 | 4 | 1 | 5 |

*Table 5.5*: *Frequency Distribution of Responses to Question 15*

| Response | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 4 | 1.4 | 1.6 | 1.6 |
| 2 | 4 | 1.4 | 1.6 | 3.3 |
| 3 | 19 | 6.6 | 7.8 | 11.1 |
| 4 | 59 | 20.6 | 24.3 | 35.4 |
| 5 | 157 | 54.9 | 64.6 | 100.0 |
| Total | 243 | 85.0 | 100.0 | |
| Missing | 43 | 15.0 | | |
| Total | 286 | 100.0 | | |

Table 5.5 confirms that more than three quarters of the sample (75.5%) enjoyed spending time in green areas that are aesthetically pleasing.

### 5.2.4 Question 16

This closed-ended question (see Appendix A) required participants to indicate the extent to which they agreed with the statement “I think the amount of green space on campus is sufficient.”

*Table 5.6: Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 16*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 246 | 40 | 3.40 | 3.00 | 1.108 | 4 | 1 | 5 |

*Table 5.7: Frequency Distribution of Responses to Question 16*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 13 | 4.5 | 5.3 | 5.3 |
| 2 | 40 | 14.0 | 16.3 | 21.5 |
| 3 | 71 | 24.8 | 28.9 | 50.4 |
| 4 | 80 | 28.0 | 32.5 | 82.9 |
| 5 | 42 | 14.7 | 17.1 | 100.0 |
| Total | 246 | 86.0 | 100.0 | |
| Missing | 40 | 14.0 | | |
| Total | 286 | 100.0 | | |

According to Table 5.7, only 42.7% of students were of the opinion that there are sufficient green spaces on campus. Moreover, only 14.7% of participants strongly agreed with this statement.

### 5.2.5 Question 17

This closed-ended question (see Appendix A) required participants to indicate the extent to which they agreed with the statement “I think the green spaces of campus form an important part of the overall appeal of UP.”

*Table 5.8: Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 17*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 246 | 40 | 4.51 | 5.00 | 0.809 | 4 | 1 | 5 |

*Table 5.9: Frequency Distribution of Responses to Question 17*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 5 | 1.7 | 2.0 | 2.0 |
| 2 | 3 | 1.0 | 1.2 | 3.3 |
| 3 | 11 | 3.8 | 4.5 | 7.7 |
| 4 | 55 | 19.2 | 22.4 | 30.1 |
| 5 | 172 | 60.1 | 69.9 | 100.0 |
| Total | 246 | 86.0 | 100.0 | |
| Missing | 40 | 14.0 | | |
| Total | 286 | 100.0 | | |

It is evident from Table 5.9 that almost eighty percent (79.3%) of students believe that the green spaces on UP's Hatfield campus form an important part of the university's overall appeal.

### 5.2.6 Question 18

This closed-ended question (see Appendix A) required participants to rate the cleanliness of the green spaces on UP's Hatfield campus. It is worth nothing that for both question 18 and question 19, a response of 1 indicates a rating of 'very poor', option 2 indicates 'poor', a neutral or average opinion is indicated by option 3, 'good' is indicated by option 4 and option 5 is indicative of a very good rating.

*Table 5.10*: *Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 18*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 245 | 41 | 4.08 | 4.00 | 0.814 | 4 | 1 | 5 |

*Table 5.11: Frequency Distribution of Responses to Question 18*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 3 | 1.0 | 1.2 | 1.2 |
| 2 | 5 | 1.7 | 2.0 | 3.3 |
| 3 | 39 | 13.6 | 15.9 | 19.2 |
| 4 | 121 | 42.3 | 49.4 | 68.6 |
| 5 | 77 | 26.9 | 31.4 | 100.0 |
| Total | 245 | 85.7 | 100.0 | |
| Missing | 41 | 14.3 | | |
| Total | 286 | 100.0 | | |

From Table 5.11, it is affirmed that more than two thirds (69.2%) of the participants are of the opinion that the on-campus green spaces are very clean.

### 5.2.7 Question 19

This closed-ended question (see Appendix A) required participants to rate the maintenance by management of the green spaces on UP's Hatfield campus.

*Table 5.12: Mean, Median, Standard Deviation, Range, Minimum and Maximum scores for Question 19*

| N | Missing | Mean | Median | SD | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| 246 | 40 | 4.15 | 4.00 | 0.822 | 4 | 1 | 5 |

*Table 5.13: Frequency Distribution of Responses to Question 19*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| 1 | 4 | 1.4 | 1.6 | 1.6 |
| 2 | 4 | 1.4 | 1.6 | 3.3 |
| 3 | 31 | 10.8 | 12.6 | 15.9 |
| 4 | 119 | 41.6 | 48.4 | 64.2 |
| 5 | 88 | 30.8 | 35.8 | 100.0 |
| Total | 246 | 86.0 | 100.0 | |
| Missing | 40 | 14.0 | | |
| Total | 286 | 100.0 | | |

According to Table 5.13, 72.4% of participants believed the green spaces on UP's Hatfield campus are well-maintained.

### 5.2.8 Question 20

This closed-ended, multiple response question (see Appendix A) required participants to indicate which types of landscapes they would prefer to be exposed to during their free time. Students were permitted to select as many types as they wished. Students' responses are indicated in Table 5.14.

*Table 5.14: Frequency Distribution of Responses to Question 20*

| Landscape Types | Responses | | Percentage of Cases |
|---|---|---|---|
| | N | Percentage | |
| Grass | 115 | 27.4% | 46.7% |
| Water | 80 | 19.0% | 32.5% |
| Trees | 130 | 31.0% | 52.8% |
| Bushes | 17 | 4.0% | 6.9% |
| Flowers | 71 | 16.9% | 28.9% |
| Other | 7 | 1.7% | 2.8% |
| Total | 420 | 100.0% | 170.7% |

Table 5.14 demonstrates that the most popular choice of landscape vegetation is trees (31%). Grass is the second most popular choice (27.4%), followed by water (19%). Flowers and bushes were least popular (16.9% and 4% respectively).

### 5.2.9 Question 21

This open-ended question (see Appendix A) was a follow-up question to determine whether green spaces could be improved. In the event that students answered yes, Question 21 required participants to provide suggestions for the improvement of the green spaces on UP's Hatfield campus. Similarly to the manner in which the data for question 8 was analysed, responses were captured, and then frequencies were determined using the "Find" function in Microsoft Office Word (2010). The data was then imported into SPSS to create a frequency table. The results are presented in Table 5.15 below.

*Table 5.15: Frequency Distribution of Responses to Question 21*

| Responses | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Responses not included | 22 | 9.1 | 9.1 | 9.1 |
| More water features | 30 | 12.4 | 12.4 | 21.5 |
| More seating | 28 | 11.6 | 11.6 | 33.1 |
| More flowers | 28 | 11.6 | 11.6 | 44.6 |
| More trees (all types) | 19 | 7.9 | 7.9 | 52.5 |
| Better design and maintenance of green areas | 19 | 7.9 | 7.9 | 60.3 |
| More plant variety | 16 | 6.6 | 6.6 | 66.9 |
| More green spaces | 14 | 5.8 | 5.8 | 72.7 |
| More grass | 14 | 5.8 | 5.8 | 78.5 |
| More shade | 14 | 5.8 | 5.8 | 84.3 |
| Better maintenance of grass | 8 | 3.3 | 3.3 | 87.6 |
| Quiet and secluded areas | 8 | 3.3 | 3.3 | 90.9 |
| Improve smell | 6 | 2.5 | 2.5 | 93.4 |
| More plants | 5 | 2.1 | 2.1 | 95.5 |
| More gardens | 4 | 1.7 | 1.7 | 97.1 |
| More colour | 4 | 1.7 | 1.7 | 98.8 |
| More dustbins | 3 | 1.2 | 1.2 | 100.0 |
| Total | 242 | 100.0 | 100.0 | |

According to Table 5.15, the most prominent suggestion for the improvement of green spaces on campus is to include more water features (12.4%). Providing more seating and more flowers were both mentioned 28 times (23.2%), followed by a desire for more trees (7.9%).

## 5.3 Spending Free Time on Campus

The next point of interest in this study was to determine where students spend their free time, and how much time they spend on campus when not attending lectures. The questions included in this section were questions 6, 7 and 12 (see Appendix A). Additionally, the researcher sought to determine whether students from the various departments would differ significantly in terms of where they spend their free time as well as how much time they spend on campus. As was mentioned in Chapter 4, students had been sampled from four different departments on campus. The original intention of the researcher was to obtain equal sample sizes for each department, although this was not practically possible. Resultantly, the Architecture group contained 78 participants, the Music department

contained 54, Plant Production and Soil Sciences comprised of 71 participants and the Psychology group consisted of 83 participants. This discrepancy is one of the reasons non-parametric statistics were used in some instances.

### 5.3.1 Where do Students Spend their Free Time?

The aim of this subsection is to determine where students spend their time, whether they spend time in the green areas around their departments and whether there were significant differences between departments in terms of where students spend their free time. Question 7 and 12 were analysed in this subsection.

Question 7 required students to indicate whether they prefer to spend their free time on campus indoors or outdoors. Table 5.16 indicates students' preferences.

*Table 5.16: Frequency Distribution of Responses to Question 7*

| Responses | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| Indoors | 54 | 18.9 | 19.0 | 19.0 |
| Outdoors | 230 | 80.4 | 81.0 | 100.0 |
| Total | 284 | 99.3 | 100.0 | |
| Missing | 2 | .7 | | |
| Total | 286 | 100.0 | | |

Most of the students (80.4%) indicated that they prefer to spend their free time outdoors when on campus.

Question 12 was a comparatively more specific question and required participants to indicate where exactly they choose to spend their free time on campus. Table 5.17 displays the results of these choices.

*Table 5.17: Frequency Distribution of Responses to Question 12*

| Chosen Green Space | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| Aula Grass (Option A) | 29 | 10.1 | 11.8 | 11.8 |
| Stone steps at Music (Option B) | 46 | 16.1 | 18.8 | 30.6 |
| Theology grass (Option C) | 20 | 7.0 | 8.2 | 38.8 |
| CSC grass (Option D) | 47 | 16.4 | 19.2 | 58.0 |
| IT grass (Option E) | 5 | 1.7 | 2.0 | 60.0 |
| Ou Merensky grass (Option F) | 15 | 5.2 | 6.1 | 66.1 |
| Manie van der Schijff botanical garden (Option G) | 20 | 7.0 | 8.2 | 74.3 |
| Other (Option H) | 63 | 22.0 | 25.7 | 100.0 |
| Total | 245 | 85.7 | 100.0 | |
| Missing | 41 | 14.3 | | |
| Total | 286 | 100.0 | | |

Figure 5.1 to Figure 5.7 below provide a visual explanation of the green spaces mentioned above.

*Figure 5.1: The Aula grass (Option A)*

*Figure 5.2: The stone steps at the Music department (Option B)*

*Figure 5.3: The Theology grass (Option C)*

*Figure 5.4: The Client Service Centre grass (Option D)*

*Figure 5.5: The IT grass (Option E)*

*Figure 5.6: The Ou Merensky grass (Option F)*

*Figure 5.7: The Manie van der Schijff botanical garden (Option G)*

It is evident from Table 5.17 that the most popular green space is the Client Service Centre (CSC) grass – this is a grassy shaded area behind the Client Service Centre (n=47). The second most popular area is “the stone steps at Music” (n=46). This area is directly outside the *Musaion* and overlooks a garden with a water feature. The *Aula* grass is the third most popular area (n=29). This grassy area is the largest continuous green space on campus with trees lining the perimeter of the grass. The lack of shade inside the perimeter could potentially be part of the reason why it is not a more popular area. Additionally, it was mentioned that this area is not often available due to the perceived constant presence of unpleasant smelling fertiliser.

Other than the green areas mentioned above, Table 5.17 expresses that the most popular response was “other”. This response was not included in the discussion above as it is not an identifiable green space in and of itself. Nonetheless, the popularity of this response led the researcher to conduct a frequency analysis in order to uncover other popular green areas. During the process of data capturing it became evident that not all students fully understand the concept of green space. One common response among architecture students was “the stone steps overlooking the parking lot outside *Boukunde*”. This area includes the entrance doors to the Architecture building, stone steps and a (usually full) parking lot. As such, it would not usually be classified as a green space. The importance of noting the inclusion of non-green spaces is expanded upon in Chapter 6, section 6.2.4. The results of the areas mentioned under the option “other” are displayed in Table 5.18 below.

*Table 5.18: Frequency Distribution of Responses to “Other” in Question 12*

| Chosen Green Space | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Options A – G on questionnaire | 223 | 78.0 | 78.0 | 78.0 |
| Any available green space | 1 | .3 | .3 | 78.3 |
| At *Erika* | 1 | .3 | .3 | 78.7 |
| In the Chapel | 1 | .3 | .3 | 79.0 |
| Behind Comm. Path on Lynwood road | 1 | .3 | .3 | 79.4 |
| Behind the Communication Pathology building | 1 | .3 | .3 | 79.7 |
| Botanical gardens by AE Annex | 1 | .3 | .3 | 80.1 |
| Grass behind technical building | 1 | .3 | .3 | 80.4 |
| Grass by the Chapel | 1 | .3 | .3 | 80.8 |
| Grass opposite *Oom Gert’s se Plek* | 20 | 7.0 | 7.0 | 87.8 |
| Grass outside *Boukunde* | 18 | 6.3 | 6.3 | 94.1 |
| Stone steps overlooking the parking lot outside *Boukunde* | 9 | 3.1 | 3.1 | 97.2 |
| In front of Admin building | 2 | .7 | .7 | 97.9 |
| Outside *A.E du Toit* | 1 | .3 | .3 | 98.3 |
| Roosmaryn | 1 | .3 | .3 | 98.6 |
| Side of the church - *Kloostersaal* | 2 | .7 | .7 | 99.3 |
| South campus lawn | 1 | .3 | .3 | 99.7 |
| Succulent garden next to *Boukunde* | 1 | .3 | .3 | 100.0 |
| Total | 286 | 100.0 | 100.0 | |

Figure 5.8 below provides a visual explanation of the "Grass opposite *Oom Gert's se Plek*". This green area is later included in analysis (please see section 5.4.4 below) and such is depicted below.

*Figure 5.8: The grass opposite Oom Gert's se Plek (in option "Other")*

Once the most popular green spaces had been determined, the researcher was required to investigate whether there would be any significant differences between departments in terms of where students spend their free time. This was done by conducting a *chi-square* test for independence. This analysis provides significance value which—if less than 0.05—indicates that there were statistically significant differences between the groups under study (Pallant, 2010).

*Table 5.19: Chi-square Test for Independence between Departments and Where Students Spend their Free Time*

| Chi-Square Tests | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 237.831[a] | 21 | .000 |
| Likelihood Ratio | 219.786 | 21 | .000 |
| Linear-by-Linear Association | .843 | 1 | .359 |
| N of Valid Cases | 245 | | |

[a]12 cells (37.5%) have expected count less than 5. The minimum expected count is 1.04

Table 5.19 indicates that there were significant differences between departments in terms of where students spend their free time, $\chi^2$ (21, n = 245), p = 0.000, Cramer's V = 0.569). However, these results should be interpreted with caution as there was a violation of the assumption of the required minimum expected cell frequency. The effect size related to the significant differences was large (see Table 5.20).

*Table 5.20: Effect Size Results of Chi-square Test in Table 5.19*

| Symmetric Measures | | | |
|---|---|---|---|
| | | Value | Approx. Sig. |
| Nominal by Nominal | Phi | .985 | .000 |
| | Cramer's V | .569 | .000 |
| N of Valid Cases | | 245 | |

Effect size refers to the strength of association and provides an indication of the extent of differences between medians. A greater effect size increases the confidence one can have in interpreting statistically significant results (Pallant, 2010). Cramer's V was used for this analysis and was interpreted by using Cohen's criteria (Pallant, 2010).

In addition to the *chi-square* test, cross-tabulations were calculated to gain deeper insight into the variables under study. This type of analysis provides a frequency distribution of two or more variables at the same time and determines the amount of responses there were on each level of the variables. The results of the cross-tabulation are displayed in Table 5.21.

*Table 5.21*: *Cross- Tabulation of Departments and Where Students Spend their Free Time*

| Departments | | Chosen Green Space | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Aula* Grass | Stone steps at Music | Theology grass | CSC grass | IT grass | *Ou Merensky* grass | *Manie van der Schijff* botanical garden | Other | |
| Architecture Department | N | 13 | 3 | 4 | 10 | 0 | 3 | 6 | 33 | 72 |
| | % within Departments | 18.1% | 4.2% | 5.6% | 13.9% | 0.0% | 4.2% | 8.3% | 45.8% | 100.0% |
| | % within Where do you spend this free time? | 44.8% | 6.5% | 20.0% | 21.3% | 0.0% | 20.0% | 30.0% | 52.4% | 29.4% |
| | % of Total | 5.3% | 1.2% | 1.6% | 4.1% | 0.0% | 1.2% | 2.4% | 13.5% | 29.4% |
| Music Department | N | 1 | 41 | 5 | 0 | 0 | 0 | 1 | 3 | 51 |
| | % within Departments | 2.0% | 80.4% | 9.8% | 0.0% | 0.0% | 0.0% | 2.0% | 5.9% | 100.0% |
| | % within Where do you spend this free time? | 3.4% | 89.1% | 25.0% | 0.0% | 0.0% | 0.0% | 5.0% | 4.8% | 20.8% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | % of Total | 0.4% | 16.7% | 2.0% | 0.0% | 0.0% | 0.0% | 0.4% | 1.2% | 20.8% |
| Plant Production and Soil Sciences Department | N | 6 | 1 | 3 | 7 | 5 | 6 | 4 | 23 | 55 |
| | % within Departments | 10.9% | 1.8% | 5.5% | 12.7% | 9.1% | 10.9% | 7.3% | 41.8% | 100.0% |
| | % within Where do you spend this free time? | 20.7% | 2.2% | 15.0% | 14.9% | 100.0% | 40.0% | 20.0% | 36.5% | 22.4% |
| | % of Total | 2.4% | 0.4% | 1.2% | 2.9% | 2.0% | 2.4% | 1.6% | 9.4% | 22.4% |
| Psychology Department | N | 9 | 1 | 8 | 30 | 0 | 6 | 9 | 4 | 67 |
| | % within Departments | 13.4% | 1.5% | 11.9% | 44.8% | 0.0% | 9.0% | 13.4% | 6.0% | 100.0% |
| | % within Where do you spend this free time? | 31.0% | 2.2% | 40.0% | 63.8% | 0.0% | 40.0% | 45.0% | 6.3% | 27.3% |
| | % of Total | 3.7% | 0.4% | 3.3% | 12.2% | 0.0% | 2.4% | 3.7% | 1.6% | 27.3% |
| Total | N | 29 | 46 | 20 | 47 | 5 | 15 | 20 | 63 | 245 |
| | % within Departments | 11.8% | 18.8% | 8.2% | 19.2% | 2.0% | 6.1% | 8.2% | 25.7% | 100.0% |
| | % within Where do you spend this free time? | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| | % of Total | 11.8% | 18.8% | 8.2% | 19.2% | 2.0% | 6.1% | 8.2% | 25.7% | 100.0% |

Table 5.21 displays the results of the cross tabulation of departments and where students spend their free time. When studying Table 5.21, it seems that a pattern emerges regarding where students go in their free time. This pattern indicates that most students tend to spend their time in the green areas surrounding their departments.

More specifically, Table 5.21 indicates the following responses for each of the participating departments:

- The most frequent response associated with the Department of Architecture was “other” (n=33). Of this choice the most frequent response was “grass outside *Boukunde*” (n=18). The second most frequent response was “*Aula* grass”, for which n=13. For this department then, it appears that the most frequently used green spaces are grassy areas surrounding the department building.
- The most frequent response for those in the Music department was “stone steps at Music” (n=41, 80.4%). This area overlooks a grassy garden with a water feature and as such can be considered a green space. This is a clear indication that the majority of students in the Music department spend their time in the green space directly surrounding the department.
- Similarly to Architecture, the most frequent response for the department of Plant Production and Soil Sciences was “other” (n=23). Of these responses the most frequently mentioned green space was “the grass opposite *Oom Gert’s se Plek*” (n=20). When the campus map is consulted (see figure 5.9), it is evident that this area is the green space outside the department building. Once again, this indicates that the most popular green space is a grassy area directly outside the department where lectures take place;
- Finally, of the Psychology students sampled, the most frequent response was “the CSC grass” (n=30, 44.8%). The Human Sciences Building (HSB) where many psychology lectures take place also houses the Client Service Centre; the CSC forms the ground level floor of the HSB. As such, these results indicate that the most popular green space among psychology students is also the green grass directly next to their lecture halls.

### 5.3.2 How much Time do Students Spend on Campus?

This subsection investigated how much time students spend on campus and whether there exist significant differences between participating departments in this regard. Question 6 was used for analysis in this section (see Appendix A). Question 6 required all students to indicate how much time they spend on campus outside of lecture time. Table 5.22 indicates the amount of time students spend on campus.

*Table 5.22: Frequency Distribution of Responses to Question 6*

| Amount of Time Spent on Campus | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| None | 19 | 6.6 | 6.6 | 6.6 |
| 15 - 30 minutes | 39 | 13.6 | 13.6 | 20.3 |
| 30 minutes - 1 hour | 59 | 20.6 | 20.6 | 40.9 |
| 1-2 hours | 53 | 18.5 | 18.5 | 59.4 |
| 2+ hours | 116 | 40.6 | 40.6 | 100.0 |
| Total | 286 | 100.0 | 100.0 | |

It would appear the largest portion of students (40.6%) spends two or more hours on campus outside of lecture time. Just over 20% of students spend between 30 minutes and an hour on campus.

Once again, it was of interest to the researcher to determine whether there were significant differences between students in the various departments and the amount of time they spend on campus. As discussed, the *chi-square* test for independence determines whether there exist statistically significant differences between groups. The results of the *chi-square* analysis are presented in Table 5.23.

*Table 5.23: Chi-square Test for Independence between Departments and How Much Time Students Spend on Campus*

| Chi-Square Tests | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 27.351[a] | 12 | .007 |
| Likelihood Ratio | 28.938 | 12 | .004 |
| Linear-by-Linear Association | .707 | 1 | .400 |
| N of Valid Cases | 286 | | |

[a]Two cells (10.0%) have expected count less than 5. The minimum expected count is 3.59

The *chi-square* test for independence indicated that there were significant differences between departments with regard to the amount of time spent on campus, $\chi^2$ (12, n = 286) = 27.351, p = 0.007, Cramer's V = 0.179). The effect size in this instance pointed towards a medium effect (see Table 5.25).

*Table 5.24:* Effect Size Results of Chi-square Test in Table 5.23

| **Symmetric Measures** | | | |
|---|---|---|---|
| | | Value | Approx. Sig. |
| Nominal by Nominal | Phi | .309 | .007 |
| | Cramer's V | .179 | .007 |
| N of Valid Cases | | 286 | |

A cross-tabulation was conducted to gain deeper insight into the amount of time students from each department spend on campus. Table 5.25 displays the results of this analysis.

*Table 5.25: Cross-Tabulation of Departments and Amount of Time Spent on Campus*

| Departments | | Amount of Time | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | None | 15 - 30 minutes | 30 minutes - 1 hour | 1-2 hours | 2+ hours | |
| Architecture Department | Count | 3 | 16 | 20 | 11 | 28 | 78 |
| | % within amount of time | 15.8% | 41.0% | 33.9% | 20.8% | 24.1% | 27.3% |
| Music Department | Count | 2 | 5 | 3 | 12 | 32 | 54 |
| | % within amount of time | 10.5% | 12.8% | 5.1% | 22.6% | 27.6% | 18.9% |
| Plant Production and Soil Sciences Department | Count | 8 | 6 | 12 | 15 | 30 | 71 |
| | % within amount of time | 42.1% | 15.4% | 20.3% | 28.3% | 25.9% | 24.8% |
| Psychology Department | Count | 6 | 12 | 24 | 15 | 26 | 83 |
| | % within amount of time | 31.6% | 30.8% | 40.7% | 28.3% | 22.4% | 29.0% |
| Total | Count | 19 | 39 | 59 | 53 | 116 | 286 |
| | % within amount of time | 100.0 % | 100.0% | 100.0% | 100.0% | 100.0 % | 100.0 % |

Table 5.25 indicates that for the majority of the students from the respective departments, they spend two or more hours on campus. There appears to be a general trend of the number of responses increasing as the amount of time category increases.

## 5.4 Green Space Use Purpose

In addition to determining where students spend their time, the researcher wanted to investigate how the students used these green spaces. Question 2 and 13 were analysed in this section. Question 13 was a closed-ended, multiple response question (see Appendix A) and required participants to indicate the purpose for which they used the green spaces on campus. Students were permitted to select as many purposes as they wished. The results of this analysis are displayed in Table 5.26 below.

*Table 5.26: Frequency Distribution of Responses to Question 13*

| Purposes | Responses | | Percentage of Cases |
|---|---|---|---|
| | N | Percentage | |
| Relaxation | 171 | 41.6% | 70.1% |
| Studying | 61 | 14.8% | 25.0% |
| Social | 152 | 37.0% | 62.3% |
| Sports | 3 | 0.7% | 1.2% |
| Other | 24 | 5.8% | 9.8% |
| Total | 411 | 100.0% | 168.4% |

The most popular use of green spaces on campus by students is relaxation (41.6%), followed closely by socialisation (37%). Studying was the third most popular choice (14.8%). As a result of the relatively large number of responses to the option “other”, the researcher then analysed the responses indicated in this option. The results are displayed in Table 5.27.

*Table 5.27: Frequency Distribution of Responses to “Other” in Question 13*

| Purpose for use of green space | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|---|---|---|---|---|
| Option A – D on questionnaire | 261 | 91.3 | 91.3 | 91.3 |
| Eating | 13 | 4.5 | 4.5 | 95.8 |
| Lunch | 1 | .3 | .3 | 96.2 |
| Obsession with plants | 1 | .3 | .3 | 96.5 |
| Play guitar and smoke | 1 | .3 | .3 | 96.9 |
| Reading | 2 | .7 | .7 | 97.6 |
| Serious discussions | 1 | .3 | .3 | 97.9 |
| Smoking | 2 | .7 | .7 | 98.6 |
| To get out of *Boukunde* | 1 | .3 | .3 | 99.0 |
| Waiting between classes | 3 | 1.0 | 1.0 | 100.0 |
| Total | 286 | 100.0 | 100.0 | |

Of those that selected "other", 13 students indicated that they use the green spaces for eating. Waiting between classes, smoking and reading were also mentioned more than once by students.

Speake *et al.* (2013) investigated whether there were significant differences between gender and the reasons why students use green spaces. It was therefore of interest to determine whether such differences would exist in the South African context. To this end, Table 5.28 below displays the results of the *chi-square* test for independence.

*Table 5.28: Chi-square Test for Independence between Gender and Green Space Use Purpose*

| Pearson Chi-Square Test | Gender |
|---|---|
| Chi-square | 8.913 |
| Df | 5 |
| Sig. | .113 [a] |

*Note:* Results are based on nonempty rows and columns in each innermost sub-table

[a]More than 20% of cells in this sub-table have expected cell counts of less than 5. *Chi-square* results may be invalid.

The *chi-square* test for independence indicated that there were no significant differences between males and females regarding the purposes of using green spaces, $\chi^2$ (5, n = 244) = 8.913, p=0.113). A cross-tabulation was then conducted to gain more insight into the reasons each gender use the on-campus green spaces. The results are displayed in Table 5.29.

*Table 5.29: Cross Tabulation of Green Space Use Purpose and Gender*

| Purposes | Male | | Female | |
|---|---|---|---|---|
| | Count | Column N % | Count | Column N % |
| Relaxation | 70 | 74.5% | 101 | 67.3% |
| Studying | 20 | 21.3% | 41 | 27.3% |
| Social | 55 | 58.5% | 97 | 64.7% |
| Sports | 3 | 3.2% | 0 | 0.0% |
| Other | 11 | 11.7% | 13 | 8.7% |
| Total | 94 | 100.0% | 150 | 100.0% |

For both genders, the most popular use of green spaces was relaxation (74.5% for males and 67.3% for females). This was closely followed by socialisation (58.5% for males and 64.7% for females respectively).

## 5.5 The PRS

The PRS comprised the final part of the questionnaire. As discussed in section 4.4.3 of Chapter 4, it is a 24-item scale designed to determine the extent to which students perceive green spaces on campus as restorative. The reliability rating of the scale when used in the current study was α=0.92. The aim with the statistical analysis was to determine the extent to which each of the green spaces is perceived as restorative. Note that the total PRS score (a score out of 120) was used in all analyses.

### 5.5.1 Descriptive Statistics of the PRS

Each item of the PRS is closed-ended and students were required to indicate the extent to which they agree or disagree with each of the statements listed. The PRS formed part C of the questionnaire (see Appendix A). Table 5.30 displays the descriptive statistics of the scale.

*Table 5.30: Mean, Median, Variance, Standard Deviation, Minimum, Maximum scores, Range, Skewness and Kurtosis of the PRS*

| | | | Statistic | Std Error |
|---|---|---|---|---|
| PRS | Mean | | 85.4854 | .99014 |
| | 95% Confidence Interval for Mean | Lower Bound | 83.5348 | |
| | | Upper Bound | 87.4359 | |
| | 5% Trimmed Mean | | 85.7529 | |
| | Median | | 86.0000 | |
| | Variance | | 234.310 | |
| | SD | | 15.30718 | |
| | Minimum | | 42.00 | |
| | Maximum | | 120.00 | |
| | Range | | 78.00 | |
| | Interquartile Range | | 19.00 | |
| | Skewness | | -.277 | .157 |
| | Kurtosis | | .176 | .314 |

Descriptive statistics of the PRS displayed in Table 5.30 above revealed that the mean is 85.49 and SD=15.31. The results of the *Kolmogorov-Smirnov* test indicated that the data was normally distributed (p=0.687). This finding means that the results of the subsequent analyses can be interpreted with a fair amount of confidence (Levin & Fox, 2011).

### 5.5.2 Non-parametric Correlation between the Amount of Time spent on Campus and PRS score

A non-parametric (Spearman's) correlation was conducted to determine whether there was a correlation between the amount of time spent on campus (question 6) and total PRS score of participants (see Appendix A). Correlation analyses are used to determine the strength and direction of the relationship between two variables (Pallant, 2010). In this instance a non-parametric correlation was used because one of the variables (Q6) was an ordinal variable.

*Table 5.31: Spearman's Correlation Analysis*

| | | | Amount of time on campus | PRS |
|---|---|---|---|---|
| Spearman's rho | Amount of time on campus | Correlation Coefficient | 1.000 | .099 |
| | | Sig. (2-tailed) | . | .126 |
| | | N | 245 | 239 |
| | PRS | Correlation Coefficient | .099 | 1.000 |
| | | Sig. (2-tailed) | .126 | . |
| | | N | 239 | 239 |

The results of the Spearman's correlation analysis revealed no significant correlations between the amount of time spent on campus and PRS scores.

### 5.5.3 Descriptive Statistics of PRS scores for Newly Grouped Green Spaces

During the planning of this study it was hoped that each green space would attract an equal amount of responses regarding where students spend their free time. This would have allowed for comparisons between the different green spaces listed on the questionnaire. In reality however, there was little homogeneity in responses with one green space having only five responses (see Table 5.17). This unequal division of responses also prevented the researcher from exploring the data further. As a result, the researcher decided to create new groups where the green spaces were grouped together based on their location. The only green spaces not included in these new groups were "option D" (the CSC grass) and "option G" (the Manie van der Schijff botanical garden) as they are both geographically independent from other spaces listed and there were a sufficient number of responses per category to use in an analysis. Figure 5.9 on the following page provides a visual explanation of how these spaces were grouped.

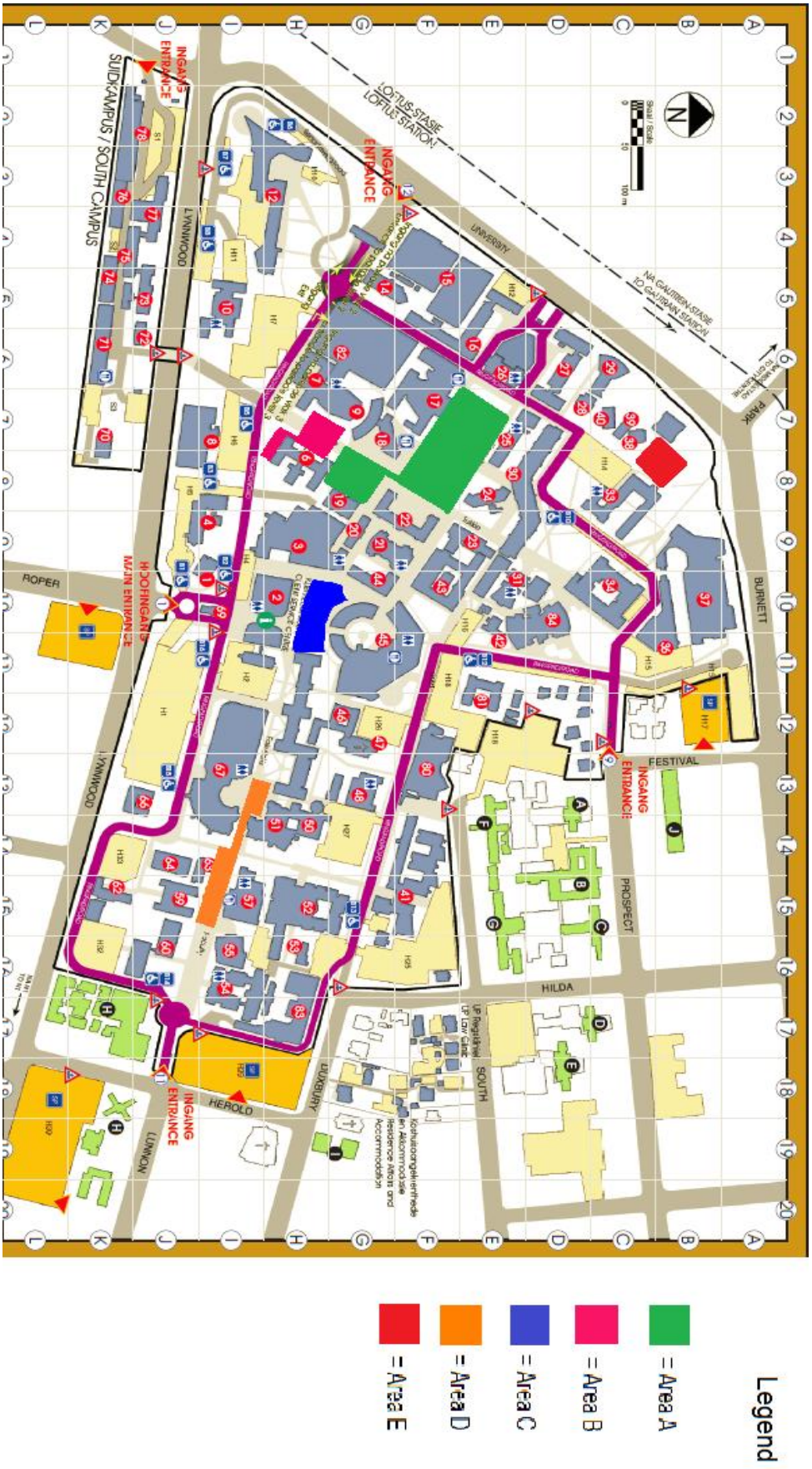


*Figure 5.9: Visual explanation of the grouping of green spaces on campus*

Ultimately, five new groups were formed. The new areas were grouped as follows:

- Area A = The *Aula* grass + The *Ou Merensky* grass;
- Area B = The stone steps at the Music department + the Theology grass;
- Area C = The CSC grass;
- Area D = The IT grass + the grass outside *Oom Gert's se Plek*;
- Area E = The *Manie van der Schijff* botanical garden.

The remaining statistical analyses were then conducted on these newly grouped green spaces. The following table displays the results of the basic descriptive statistics of the PRS conducted on these newly grouped green spaces.

*Table 5.32: Basic Descriptive Statistics of Newly Grouped Green Spaces*

| Newly Grouped Green Spaces | PRS Mean Score | N | SD |
|---|---|---|---|
| Area A | 86.9091 | 44 | 13.48525 |
| Area B | 86.2656 | 64 | 14.72202 |
| Area C | 86.4222 | 45 | 12.89378 |
| Area D | 85.4000 | 25 | 12.31530 |
| Area E | 95.7895 | 19 | 14.02608 |
| Other | 77.1905 | 42 | 18.94825 |
| Total | 85.4854 | 239 | 15.30718 |

As indicated in Table 5.32 the means of the newly grouped green spaces ranged between 77.19 and 95.79 from a possible total score of 120. Following on from this, a one-way analysis of variance (ANOVA) was conducted to determine whether there were significant differences between groups based on their PRS scores.

### 5.5.4 One way ANOVA of Green Spaces and PRS scores

One way ANOVAs are used to compare the mean scores of more than two groups. Of these two groups, one is conceptualised as the independent variable (PRS scores) that comprise of many levels/factors (green spaces). The F-test which forms part of the ANOVA tests the mean differences between groups simultaneously and allows one to determine whether there are statistically significant differences between groups. This type of analysis was conducted to first establish whether significant differences occurred between green spaces and their mean PRS scores.

*Table 5.33: One way ANOVA*

| Perceived Restorativeness Scale | | | | | |
|---|---|---|---|---|---|
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 5074.966 | 5 | 1014.993 | 4.665 | .000 |
| Within Groups | 50690.733 | 233 | 217.557 | | |
| Total | 55765.699 | 238 | | | |

Table 5.33 indicates significant differences on PRS scores between green areas on campus. As a result, *post-hoc* tests were conducted to determine where these differences had occurred (Randolph & Myers, 2013). The results are reported in Table 5.34.

*Table 5.34: Post-hoc Multiple Comparisons between Groups*

| Newly Grouped Green Spaces | | Mean Difference (I-J) | Std Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Area A | Area B | .64347 | 2.88856 | 1.000 | -7.9234 | 9.2103 |
| | Area D | 1.50909 | 3.69415 | 1.000 | -9.4469 | 12.4651 |
| | Area C | .48687 | 3.12715 | 1.000 | -8.7875 | 9.7613 |
| | Area E | -8.88038 | 4.04905 | .439 | -20.8890 | 3.1282 |
| | Other | 9.71861* | 3.18189 | .038 | .2819 | 19.1554 |
| Area B | Area A | -.64347 | 2.88856 | 1.000 | -9.2103 | 7.9234 |
| | Area D | .86562 | 3.47873 | 1.000 | -9.4515 | 11.1828 |
| | Area C | -.15660 | 2.86948 | 1.000 | -8.6668 | 8.3536 |
| | Area E | -9.52385 | 3.85353 | .213 | -20.9525 | 1.9048 |
| | Other | 9.07515* | 2.92904 | .033 | .3883 | 17.7620 |
| Area C | Area A | -.48687 | 3.12715 | 1.000 | -9.7613 | 8.7875 |
| | Area B | .15660 | 2.86948 | 1.000 | -8.3536 | 8.6668 |
| | Area D | 1.02222 | 3.67925 | 1.000 | -9.8896 | 11.9340 |
| | Area E | -9.36725 | 4.03546 | .317 | -21.3355 | 2.6010 |
| | Other | 9.23175 | 3.16457 | .058 | -.1537 | 18.6171 |
| Area D | Area A | -1.50909 | 3.69415 | 1.000 | -12.4651 | 9.4469 |
| | Area B | -.86562 | 3.47873 | 1.000 | -11.1828 | 9.4515 |
| | Area C | -1.02222 | 3.67925 | 1.000 | -11.9340 | 9.8896 |
| | Area E | -10.38947 | 4.48917 | .323 | -23.7033 | 2.9244 |
| | Other | 8.20952 | 3.72588 | .428 | -2.8406 | 19.2596 |
| Area E | Area A | 8.88038 | 4.04905 | .439 | -3.1282 | 20.8890 |
| | Area B | 9.52385 | 3.85353 | .213 | -1.9048 | 20.9525 |
| | Area D | 10.38947 | 4.48917 | .323 | -2.9244 | 23.7033 |
| | Area C | 9.36725 | 4.03546 | .317 | -2.6010 | 21.3355 |
| | Other | 18.59900* | 4.07802 | .000 | 6.5045 | 30.6935 |
| Other | Area A | -9.71861* | 3.18189 | .038 | -19.1554 | -.2819 |
| | Area B | -9.07515* | 2.92904 | .033 | -17.7620 | -.3883 |
| | Area D | -8.20952 | 3.72588 | .428 | -19.2596 | 2.8406 |
| | Area C | -9.23175 | 3.16457 | .058 | -18.6171 | .1537 |
| | Area E | -18.59900* | 4.07802 | .000 | -30.6935 | -6.5045 |

* The mean difference is significant at the 0.05 level.

There were significant differences between option “other” (M=77.19, SD=18.95) and Area A (M=86.91, SD=13.49), Area B (M=86.27, SD=14.72) and Area E (M=95.79, SD=14.03). The effect size, calculated using eta-squared was 0.09, which, according to Cohen (1988) is considered a medium effect size.

### 5.5.5 Multiple Regression Analysis

Multiple regression analysis is mainly concerned with prediction. It is a "family of techniques" that explore the relationship between a continuous dependent variable and numerous independent variables (Pallant, 2010, p. 148). Essentially, standard multiple regression aids in determining how much variance in a dependent variable can be explained by each of the independent variables. The goal of using this type of analysis was to further investigate which of the green spaces contributed most significantly to overall PRS scores. Ultimately, the aim was to determine which green area had the largest amount of variance in PRS scores and therefore could be considered as the 'most restorative'.

Preliminary analysis was conducted on the data to ensure that the assumptions of normality, linearity, multicollinearity and homoscedasticity had not been violated. Thereafter, the multiple regression analysis was conducted. Table 5.35 provides information on the amount of variance explained by the independent variables (the green spaces on campus).

*Table 5.35: Model Evaluation*

| Model | R | R Square | Adjusted R Square | Std Error of the Estimate |
|---|---|---|---|---|
| 1 | .302[a] | .091 | .071 | 14.74981 |

[a]Predictors: (Constant), Area E, Area D, Area A, Area C, Area B

Table 5.35 indicates that only 9.1% of the variance in the PRS scores was explained by the independent variables.

*Table 5.36: Statistical Significance of Model Evaluation Results*

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 5074.966 | 5 | 1014.993 | 4.665 | .000[b] |
| | Residual | 50690.733 | 233 | 217.557 | | |
| | Total | 55765.699 | 238 | | | |

[a]Dependent Variable: Perceived Restorativeness Scale

[b]Predictors: (Constant), Area E, Area D, Area A , Area C, Area B

Table 5.36 demonstrates that all of the independent variables entered into the model were significant predictors of PRS. Table 5.37 indicates the variables that were the significant predictors.

*Table 5.37: Evaluation of Each of the Independent Variables*

| Coefficients[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Unstandardised Coefficients | | Standardised Coefficients | | | Correlations | | |
| Model | | B | Std Error | Beta | t | Sig. | Zero-order | Partial | Part |
| 1 | (Constant) | 77.190 | 2.276 | | 33.916 | .000 | | | |
| | Area A | 9.719 | 3.182 | .247 | 3.054 | .003 | .044 | .196 | .191 |
| | Area B | 9.075 | 2.929 | .263 | 3.098 | .002 | .031 | .199 | .194 |
| | Area C | 9.232 | 3.165 | .236 | 2.917 | .004 | .030 | .188 | .182 |
| | Area D | 8.210 | 3.726 | .164 | 2.203 | .029 | -.002 | .143 | .138 |
| | Area E | 18.599 | 4.078 | .329 | 4.561 | .000 | .198 | .286 | .285 |

[a]Dependent Variable: Perceived Restorativeness Scale

The greatest contributor was Area E (beta=0.329, p<0.05), followed by Area B (beta=0.263, p<0.05). In the third place was Area A (beta=0.247, p<0.05), followed by Area C (beta=0.236, p<0.05). Area D contributed the least to the PRS score (beta=0.164, p<0.05).

## 5.6 Conclusion

This chapter contains the results of the statistical analysis of the data collected during the course of the study. Results were presented by using four sections that addressed opinions of green space on campus, where and how much time people spend in green spaces, what they use these green spaces for, and how the PRS relates to some of those questions, respectively. Results indicated that there is a generally positive perception of the green spaces on UP's Hatfield campus. Students tend to spend time in the green areas surrounding their departments, and these areas are mainly used for relaxation and socialisation. All green areas addressed in this study make a significant contribution to overall PRS scores, although the *Manie van der Schijff* botanical garden was discovered to be the most restorative green space on campus. These results are discussed in more detail in Chapter 6.

# CHAPTER 6: DISCUSSION OF FINDINGS, LIMITATIONS OF STUDY, RECOMMENDATIONS FOR FUTURE RESEARCH AND CONCLUSION

## 6.1 Introduction

This chapter presents the discussion and interpretation of the results presented in Chapter 5. The discussion follows the same format as Chapter 5. The discussion of the results is followed by a conceptualisation of the results in the context of the research problem and the objectives set for the study. A list of suggestions for the improvement of green spaces on the UP campus as informed by the students' responses is also provided. The limitations of the study are then addressed, followed by recommendations for future research. The conclusion draws significant findings together.

## 6.2 Discussion of Results

### 6.2.1 Opinions of Green Spaces on Campus

Closed ended questions 14 to 21 related to students' perceptions of the green spaces on the campus of the University of Pretoria (see Appendix A). Question 14 investigated the extent to which students enjoy spending time in green open spaces on campus and the most popular response was 5, which is equivalent to strongly agree (n=117, 40.9%). Furthermore, when asked to respond to the extent to which they enjoy spending time in areas where the green space is aesthetically pleasing (question 15), 54.9% of participants said they strongly agree (n=157). Participants also tended to describe the aesthetics of campus as either "good" (n=24) or "beautiful" (n=23). This indicates a general tendency towards appreciation of aesthetically appealing green spaces on campus. Home, Bauer and Hunziker (2010) found similar results in their study that investigated the cultural and biological determinants involved in the evaluation of urban green areas. Seventeen participants were interviewed and a clear tendency of attraction to aesthetically appealing landscapes was found. The present results also confirm Speake *et al.*'s (2013) findings. In her study, the researchers investigated students' perceptions and use of green spaces on a popular university campus. It was concluded that the choice of a favourite place on campus was linked to the aesthetic appeal of such a place. Participants tended to favour places that were described as "beautiful/pretty" (Speake, 2013, p. 25).

Twenty-eight percent of participants agreed that there is a sufficient amount of green space on campus, and 60% believed these green spaces form an important part of the overall appeal of the campus. This result has also been found internationally. Speake *et al.* (2013) found that 77% of the participants in their study believed that their campus's green spaces were very important for the image of the university.

When the cleanliness and maintenance of green spaces on campus (questions 18 and 19) was considered, most of the participants agreed that the green spaces are clean and well-maintained (see Tables 5.10 and 5.12). In Speake *et al.*'s (2013) study, 80% of students rated the cleanliness and tidiness of campus as very good. Maintenance and management of green spaces were rated "very good" by 72% of Speake *et al.*'s (2013) participants. It can be concluded that it appears that management of the respective tertiary institutions take the cleanliness of green spaces on their campuses seriously.

In terms of the type of landscape, participants indicated a preference for trees (31%) while 27.4% preferred "grass". It was noted that water features (19%) and "flowers" (16.9%) were somewhat less popular (See Table 5.13). Amin, Ali and Khan (2011) conducted a study in Pakistan with students at the University of Peshawar. The aim of the study was to analyse the uses of on-campus green spaces and the ways they can be improved. These researchers found that a combination of shrubs and trees was the most popular choice of landscape vegetation among students. Participants in Speake *et al.'s* (2013) study also indicated a desire to see more trees, flowers and water features on campus. It would appear that trees are a popular vegetation choice among both local and international students.

When asked to provide suggestions for improvement of the green areas on campus, "more water features" was the most popular suggestion (n=30). Students also reported a desire for more flowers (n=28) and more seating (n=28). The desire for the provision of more seating in green areas is a concern that is often raised in studies addressing green space design. In an informal discussion with the Head of Department of Architecture about the present study, he spontaneously mentioned that more seating needs to be prioritised in the landscaping of campus (K. Bakker, personal communication, 2 July 2013). Speake *et al.* (2013) similarly found that the provision of more seating on campus was a prominent suggestion from participants in their study. Outside of the university context it has also been found that the provision of seating encourages the use of green spaces (Nordh, & Østby, 2013; Shaftoe, 2008).

### 6.2.2 Spending of Free Time on Campus

#### *6.2.2.1 Where do Students Spend their Free Time?*

At a basic level, it seems that students are inclined to spend time outdoors (see Table 5.16). Question 7 did not differentiate between soft and hard landscapes but indicated a general desire of wanting to spend time outdoors. Moreover, as indicated by the cross-tabulation (see Table 5.20) there appears to be a general trend among students to spend their free time in the green areas directly surrounding their departments. This trend was also found by Speake *et al.* (2013). When students were asked to explain their reasons for choosing a particular green space as a favourite, a common response emerged and was documented as “convenience”.

#### *6.2.2.2 How much Time do Students Spend on Campus?*

Most of the participants (40.6%) (see Table 5.22) indicated that they spend two or more hours on campus outside of lecture time. This is a fairly significant amount of time. However, this question did not account for whether this time was spent voluntarily (i.e. for pleasure) or whether it was out of necessity due to being unable to go home between lectures.

Nonetheless it was interesting to determine whether the four departments would differ significantly with regard to the amount of time spent on campus. The results indicated that there were statistically significant differences in this regard. The cross-tabulation revealed that all departments seem to follow a similar trend. It appears as though the number of participants of each group tends to increase as the amount of time increases. There exists no known literature that has investigated this phenomenon and more research on this topic is therefore required.

The implication of the above results is largely directed towards the landscapers of UP. Students evidently spend a large amount of time on campus, and when viewed in conjunction with the numerous benefits of green spaces discussed in section 3.2 of Chapter 3, it is beneficial to both students and UP to ensure that green spaces are well-maintained. These outdoor spaces are well-utilised and should therefore be conserved and well looked after.

### 6.2.3 Green Space Use Purpose

The next point of interest determined the purpose for which students use the green spaces on campus. The first most popular response was relaxation. A study conducted by Speake *et al*. (2013) indicated that most of their participants used green spaces for relaxation. It can therefore be concluded that it is highly important that the green spaces on campus provide the escape and relaxing experience students reportedly desire. This will benefit not only students but also the university.

The second most popular response was socialisation. Not only did the participants in Speake *et al.*'s (2013) study also cite socialisation as a use for green space, but Abu-Ghazeh (1999) found that an "overriding pattern was an attraction to outdoor social interaction…participants associated activities such as socialising, sitting, people-watching, and studying to the presence of landscape" (p.784).

The next point of interest was related to the gender of participants. Speake *et al.* (2013) found no significant differences between gender and the use of green spaces and consequently it was of interest to determine whether these findings would be consistent in the South African context. The result of the *chi-square* test of independence reported similar findings: there were no significant differences between gender and green space use purpose (see Table 5.28).

In addition to determining that green spaces contribute to relaxation and the promotion of socialisation, the study aimed to determine whether these spaces would contribute to the restoration of attention.

### 6.2.4 The PRS

The first point of interest with the PRS was to investigate whether there was any relation between the amount of time students spend on campus (question 6) and their overall PRS scores. It was theorised that students would report higher overall PRS scores when spending large amounts of time on campus. The results of the Spearman's correlation indicated that there were no significant correlations between the amount of time spent on campus and PRS scores. There are no previous studies that have addressed this relationship and as such, further research on the topic is needed.

The one-way ANOVA analysis (see Table 5.35) revealed that there were significant differences between on the PRS scores (p=0.000) between green spaces. *Post-hoc*

analyses revealed that these differences lay between “other” and Area A, between “other” and Area B and between “other” and Area E.

The final set of analyses conducted was standard multiple regression to determine the extent to which each of the green spaces contribute to overall PRS scores. The dependent variable used was the PRS scores and the independent variables were each of the green spaces. The model evaluation confirmed that 9.1% of the variance in PRS scores was attributed to the independent variables.

Despite the small percentage of variance explained, it should be noted that all green areas made a statistically significant unique contribution to PRS scores. The greatest contributor to PRS scores was Area E, the *Manie van der Schijff* botanical garden (beta=0.247, p=0.000). Botanical gardens have a tendency to incorporate the four factors of ART that comprise restorative settings (Primack & Miller-Rushing, 2009). The large amount of plant variety, greenery and tranquillity afforded by botanical gardens tends to make them more restorative than most other green and non-green areas (Ballantyne, Packer & Hughes, 2008; Packer, 2010). It is therefore not surprising that this area made the greatest contribution to PRS scores. Area B made the second largest contribution (beta=0.263, p=0.002). The highly restorative presence of a water feature serves as a possible explanation for why this area makes such a high contribution to PRS scores (White et al., 2010). The area making the third greatest contribution was Area A (beta=0.247, p=0.003). This area contains the large lawn outside the *Aula* building, but it also does not offer much shade or trees, which is possibly why it did not make a larger contribution. Area C made the fourth largest contribution (beta=0.236, p=0.004). While this area outside the CSC is grassy and contains numerous trees it is a very busy area. There are often campus events that take place in the food court right next to this green area. The noise and high traffic experienced as a result of this could possibly explain why this green space was not rated as more restorative. The area making the smallest contribution was “Area D” (beta=0.164, p=0.029). This area is intersected by a busy walkway and is opposite the local campus pub. It is possible that the lack of tranquillity one is afforded in this area contributes to the reason why this area makes the smallest contribution to perceived restorativeness.

## 6.3 Recommendations based on the results of the present study

There are many conclusions that can be drawn from the results of the study. These conclusions might serve as recommendations to the University of Pretoria and include the following:

- Incorporate more seating into natural green areas. This could take the form of benches, tables or steps. The crucial point is for students to be able to have the choice between sitting on the grass or on elevated seating;
- Incorporate more water features where possible. It is acknowledged by Mr Dunstan, UP's head landscaper, that students are not always responsible with such features (e.g. pouring bubble bath into fountains etc.) (N. Dunstan, personal communication, 20 August 2012). Nonetheless, it is possible to design water features that can be seen and heard but that are not easily accessible. For example, one could surround a fountain with a large enough radius of water that students cannot reach the center without having to wade through water and get wet;
- Plant a wider variety of natural vegetation. One need not plant expensive flowers or trees; simply placing grass, flowers, shrubs and trees in the same area can create the illusion of plant variety;
- Where possible, include more flowering plants. This increase in colour will improve aesthetic appeal and can be attained using hardy plants such as daisy bushes;
- Prioritise the maintenance of green spaces on campus. Not only does this imply that the current green spaces should be well-maintained, it also means that green spaces should be prioritised when considering campus development;
- Should it not be possible to apply the aforementioned suggestions to all green spaces on campus, an alternative is to design another botanical garden. Ideally it should be located in an area that is easily accessible to students.

## 6.4 Limitations of the Study

Research does not always conclude in the manner that it is planned. Hence certain limitations are associated with the present study. Firstly, the study made use of non-probability convenience sampling. While the benefit of this type of sampling meant that a

larger sample size could be obtained, it compromised external validity and did not allow for the generalisability of results (Babbie, 2013).

Secondly, this study used only one university as its point of reference. This means that the results can only be interpreted within the context of UP and cannot be generalised to other tertiary institutions. Some general inferences can be made where the findings correspond with international research, but these too should be interpreted with caution.

With regard to the measurement instrument, hindsight revealed that placing the questions in a different order could have garnered better results. For instance, students were asked in Question 12 where they prefer to spend their free time. The PRS commenced on Question 22 and students were asked to visualise the green space they indicated in Question 12. However, the nine questions between Question 12 and Question 22 were related to on-campus green spaces in general and it is possible that when answering the PRS students no longer had a clear mental image of their chosen green space.

A final limitation is related to group sizes. Theoretically, the goal was to obtain a final sample size of 300. Divided between the four chosen departments this equates to 75 participants per group. Unfortunately, the Music department is a much smaller department than the remaining groups of students. Despite nearly full attendance of lectures from which students were sampled, the resulting sample size was only 54 students. Conversely, the resulting sample size of the Psychology department was 83 students. When comparing green spaces, the group sizes ranged from 19 to 64. This is a substantial difference and despite the robustness of the statistical analyses, it would have been preferable to work with groups of similar sizes.

## 6.5 Recommendations for Future Research

Firstly, effectively addressing the limitations discussed above will greatly improve future research on this topic. Simply using probability sampling and more than one tertiary institution would greatly improve the scientific soundness of results.

Future work should incorporate research on the topic concerning the link between attention restoration and academic achievement. This could potentially allow links to be made between green spaces, attention restoration and academic achievement. If such links were found, the implications would be of significant value to academic institutions.

Additionally, there exists a large gap in literature related to the quantification of green spaces on campuses. Quantification of the amount of green spaces would allow for the reporting of "how much" green space a campus has, and would allow for accurate comparisons between universities. This type of study would more likely be undertaken by those in the field of horticulture, landscaping or human geography, but it would fill a necessary gap upon which further studies of this nature could base their results.

Lastly, future research could take more of a positive psychological approach and investigate the ways in which green spaces induce positive emotions/affect over and above an already neutral mood state. Both ART and Stress Reduction Theory inherently assume a negative psychological state as a starting point and hypothesize that exposure to green spaces assist in the return to a neutral/positive state. It is arguably not unreasonable to assume that the benefits of green spaces could enhance already present positive mood states. The results of such research could have positive implications for students in addition to the benefits mentioned in this study.

## 6.6 Conclusion

Chapter 6 included the discussion and interpretation of the results of the study. Broadly speaking, there appeared to be a generally positive perception of the green spaces on the UP campus. These areas are well-utilised and are perceived as being clean and well-maintained. Moreover, all green spaces included in this study are perceived as restorative by students. The *Manie van der Schijff* botanical garden is considered the most restorative area. This is due to the fact that the plant variety and tranquillity the garden offers provides the tendency to incorporate the four factors of ART that promote restoration (Ballantyne, Packer & Hughes, 2008; Packer, 2010; Primack & Miller-Rushing, 2009).

Part of representing students' perceptions involves allowing the freedom of expression and as such, suggestions for the improvement of green spaces were made, based directly on students' responses. Despite the contextually specific nature of this study, many of the results correspond with international literature on the topic. This is encouraging as it suggests that there is a level of similarity between university campuses worldwide.

The findings of this study have provided a conceptual platform upon which numerous further studies can be conducted. As discussed, there is a paucity of research in the field of on-campus green spaces and numerous recommendations for future research were subsequently discussed. By using variations of the variables included in this study there exists a realm of possibilities in the field of green space research.

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# APPENDIX A: RESEARCH QUESTIONNAIRE

## STUDENTS' PERCEPTIONS OF GREEN SPACE ON A UNIVERSITY CAMPUS

### Part A: Demographics

**1. What is your age?**

a. 19
b. 20
c. 21
d. 22
e. 23
f. 24
g. 25
h. Other (please specify):

_____

**2. What is your gender?**

a. Male
b. Female

**3. What is your race? (For statistical purposes only)**

a. Asian
b. Black
c. Coloured
d. Indian
e. White

**4. What degree are you presently enrolled for?**

a. B.Soc.Sci Psychology Honours
b. BA Own Choice
c. BMus
d. BSc Plant Production and Soil Science
e. BSc Architecture
f. Other (please specify):

_____

**5. What is your degree level?**

a. 1st year
b. 2nd year
c. 3rd year
d. 4th year (Honours)

## Part B: Green space usage

6. **How much time do you spend on campus (other than during lectures)?**
    a. None, other than the time I spend walking on and off campus for my lecture
    b. 15 – 30 minutes
    c. 30 minutes – 1 hour
    d. 1 – 2 hours
    e. 2+ hours

7. **Do you prefer to spend your free time on campus indoors or outdoors?**
    a. Indoors
    b. Outdoors

8. **What is your opinion of the aesthetics of campus?**

_____

_____

9. **What is your opinion of the landscaping on campus?**

_____

_____

10. **Are you familiar with the term 'green spaces'?**
    a. Yes
    b. No

11. **Do you voluntarily spend your free time on campus in green spaces? (If no, your participation is no longer required and you need not complete the rest of the questionnaire. If yes, please continue to question 12)**
    a. Yes
    b. No

12. **Where do you spend you spend this free time on campus? (Please choose the one in which you spend most of your free time)**
    a. On the Aula grass
    b. On the stone steps overlooking the water feature outside the Music department building
    c. On the grass around the Theology building
    d. On the grass outside the Client Service Centre
    e. On the grass opposite the IT building
    f. On the grass outside the Ou Merensky Library
    g. In the The Manie van der Schijff Botanical Garden (opposite the Chemistry building)
    h. Other green space (please specify):

_____

13. **For what purpose do you use this green space? (Circle all those applicable to you)**
    a. Relaxation
    b. Studying
    c. Social purposes
    d. Sports
    e. Other (please specify):

_____

**Please answer by ticking the box which you feel most closely expresses your opinion (1 = strongly disagree, 5 = strongly agree):**

**14. I enjoy spending time sitting on open green spaces on campus**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**15. I enjoy spending time in areas where the green space is aesthetically pleasing**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**16. I think that the amount of green space on campus is sufficient**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**17. I think the green spaces of campus form an important part of the overall appeal of the University of Pretoria**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**18. Please rate the cleanliness of the green spaces on campus (1 = very poor, 5 = very good)**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**19. Please rate the maintenance by management of the green spaces on campus (1 = very poor, 5 = very good)**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

**20. Which type of landscape would you prefer to be exposed to during your free time?**

a. Grass
b. Water
c. Trees
d. Bushes
e. Flowers
f. Other (please specify):

_____

**21. Do you think green spaces on campus can be improved?**

a. Yes
b. No

**21a. If yes, please provide some suggestions:**

_____

_____

## Part C: The Perceived Restorativeness Scale

**Please visualise the green space you marked in question 12 (where you spend your free time on campus) when answering the following questions. For all questions please indicate your response by ticking the box which you feel most closely expresses your opinion (1 = strongly disagree, 5 = strongly agree):**

1. **Being here is an escape experience**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

2. **Spending time here gives me a break from my day-to-day routine**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

3. **It is a place to get away from it all**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

4. **Being here helps me to relax my focus from getting things done**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

5. **Coming here helps me to get relief from unwanted demands on my attention**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

6. **This place has fascinating qualities**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

7. **My attention is drawn to many interesting things**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

8. **There is much to explore and discover here**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

9. **I want to spend more time looking at the surroundings**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

10. **This place is boring**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

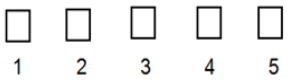
11. **The setting is fascinating**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

12. **There is nothing worth looking at here**

☐ ☐ ☐ ☐ ☐
1 2 3 4 5

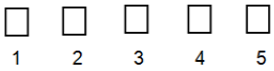
13. **It is a confusing place**




14. **There is a great deal of distraction**

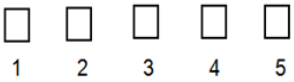

15. **It is chaotic here**


16. **Being here suits my personality**

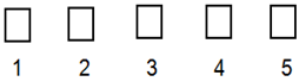



17. **I can do things I like here**


18. **I have a sense that I belong here**

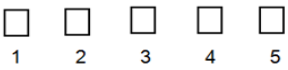



19. **I can find ways to enjoy myself here**



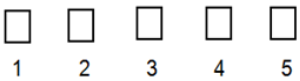

20. **I have a sense of oneness with this setting**


21. **There are landmarks to help me get around**




22. **I could easily form a mental map of this place**


23. **It is easy to find my way around here**




24. **It is easy to see how things are organised**