Comparison of body mass index, eating behaviour and eating attitude between dietetic- and non-dietetic female undergraduate students at a South African University

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DEDICATION

This thesis is dedicated to my mom, Elaine Barnard, for her unfailing love and support, throughout my studies, but also throughout my life.

She gave me roots and wings.

And to Dr Wayne Morgenrood, for his invisible presence during this time, and in hope for his return one day from the Château d'If.

ABSTRACT

Background

The prevalence of disordered eating among female university students is not very prevalent in developed countries, especially at undergraduate level. However, those with disordered eating often go undiagnosed due to the clinical criteria used for diagnostic purposes that are not necessarily sensitive enough to enable the diagnosis of an eating disorder. The available body of evidence alludes to the fact that there is a higher prevalence of eating disorders among dietetic- than non-dietetic students, despite studies rendering conflicting results. Few published studies that investigated the eating behaviour of dietetic students in developing countries are available. Hence, the motivation for this study was that there is a paucity of published South African studies describing eating behaviour, eating attitude and Body Mass Index (BMI) of dietetic- versus non-dietetic students.

Aim

To determine and compare the BMI, eating behaviour and eating attitude of a sample of first-, third- and fourth year dietetic students and compare the study variables of the first year dietetic students to that of first year non-dietetic students. In addition, the study also aimed to determine whether there was a significant difference between groups in terms of the above variables and whether the aquisition of nutrition knowledge across years of study among dietetic majors had an impact on eating behaviour. It was proposed that the outcome of the study findings would make a contribution towards the screening process of prospective dietetic students at universities across South Africa by identifying those with characteristics of an eating disorder so that they can receive timeous intervention after enrolment in dietetics as a study major.

Methods

The measurement of weight in kilograms and height in meters was conducted to facilitate the calculation of BMI, after participants completed the self-administered questionnaires. Eating behaviour was determined by means of the 'Sick, Control, One stone, Fat, Food' (SCOFF) and the behavioural questions of the Eating Attitude Test-26 (EAT-26) questionnaire to screen for the presence of an eating disorder. Eating attitude was determined by means of the Three Factor

Questionnaire (TFEQ), which assessed perceived hunger, disinhibition of eating and dietary restraint and the EatScore of the EAT-26 questionnaire.

Statistical analysis was conducted by means of the Statistical Package for Social Science (SPSS) version 21. Descriptive statistics, independent samples t-tests and chi-square tests were performed to facilitate comparison between dietetic- and non-dietetic students for the study variables as well as comparison of dietetic majors across years of study. In addition, correlations were conducted between subquestions of the SCOFF- and EAT-26 questionnaires in order to determine their association. Additionally, it was determined whether subscales of the questionnaires had similar predictive positive values for identifying subscores that were most likely to identify the presence of an eating disorder. Sensitivity, specificity and predictive positive value of both questionnaires were also calculated to determine which of the two were more sensitive in the identification of an eating disorder.

Results

The cross sectional survey questionnaires were completed by 62 first-, third- and fourth year female dietetic- and 83 first year female non-dietetic undergraduate majors. The mean BMI of first year non-dietetic students (24.2 ± 5.3 kg/m^2) was statistically higher than that of first year dietetic students (23.2 ± 4.3 kg/m^2), as well as the mean BMI of a pooled sample of first-, third- and fourth year dietetic students. In terms of results generated by subquestions of the SCOFF questionnaire, the prevalence for first year non-dietetic students was higher than for dietetic students for SCOFF 1 (Bulimia Nervosa) (11%; 4.2%), SCOFF 2 (binge eating) (53.7%; 2.5%), SCOFF 3 (weight loss) (20.7%; 12.5%), SCOFF 4 (feeling fat) (50%; 41.7%) and EAT A (binge eating) (22.9%; 12.5%). While first year dietetic students had a higher prevalence than first year non-dietetic students for SCOFF 5 (food) (41.7%; 30.5%), EAT B (Bulimia Nervosa) (4.2%; 3.6%), EAT C (diet pills) (16.7%; 7.2%) and EAT D (treated for an eating disorder) (8.3%; 3.6%), there were no significant difference in eating attitude (TFEQ) of disinhibition and hunger between first-, third- and fourth year dietetic students and compared to first year non-dietetic students. A significant difference was found for the subscale restraint of the TFEQ between first year dietetic- (11.29 ± 5.0) and first year non-dietetic students (7.40 ± 4.24). There was a significant difference ($p < 0.05$) between normal eating behaviour and the prevalence of an ED for the study sample (N = 144) for the SCOFF questionnaire (1.40 ± 1.06 and 2.25 ± 1.11) and the EatScore questions (7.38 ± 5.05 and 28.32 ± 7.40). No significant difference was found between the mean scores of the SCOFF questionnaire and the EatScore

questions for the first- (1.63 ±1.01 and 14.54 ± 12.18, respectively), third- and fourth year dietetic- (1.42 ± 1.11 and 11.21 ± 10.26, respectively) and first year non-dietetic students (1.68 ± 1.12 and 10.66 ± 9.10, respectively).

A significant difference was found when a correlation was performed between the EatScore and EAT A (r value 0.24), EAT D (r value 0.25) and SCOFF 1 question (r value 0.23). A highly significant difference was found when EAT B (r value 0.44), EAT C (r value 0.37), the SCOFF questionnaire (r value 0.39), SCOFF 2 (r value 0.33) and SCOFF 4 questions (r value 0.29) were correlated. A significant difference was found for the SCOFF questionnaire when correlated with the EAT A- (r value 0.24) and EAT C questions (r value 0.20), while a highly significant correlation was found for the SCOFF questionnare when correlated to the EatScore questions (r value 0.39) and EAT B question (r value 0.33).

Conclusions

First year non-dietetic students had a higher mean BMI than dietetic students studying at UKZN. To determine eating behaviour, the SCOFF questionnaire and behavioural questions of the EAT26-questionnaire were used. This gave an indication of the prevalence or development of an eating disorder. Findings were that where Bulimia Nervousa, binge eating, food dominating your life, above normal weight loss and the perception of being fat (which could also be an indication of Anorexia Nervousa, together with other factors) were higher in first year dietetic students than first year non-dietetic students. The overall conclusion reached by each of the questionnaires administered, were similar for all students, irrespective of what their study majors were, but that it was necessary for the students to be screened for the risk of developing an eating disorder or if they had been previously diagnosed with an eating disorder. Hence, when administering a combined screening tool (EAT-26 and SCOFF) developed for future use, it could be of value in the selection process of prospective dietetic- and non-dietetic students to determine if they suffer from an existing eating disorder that requires intervention. Eating attitude of students were determined by using the EAT-26 Score and the TFEQ. However, results generated did not allude to a significant difference between dietetic- and non-dietetic students, except for the subscale of restraint.

The results generated by the SCOFF-, EAT26 and TFE questionnaires as well as a new abbreviated screening tool (ED Questionnaire) compiled after incorporating significant correlations between results generated after correlating the results of sub sections generated by the three questionnaires, can be used for the development of an app for use on mobile phones and

computers. This app can then be connected to resources available in South Africa for screening prospective first year students who have an existing eating disorder or are at risk for the development of one.

PREFACE

The work presented in this dissertation is the original work of Jandri Elizabeth Barnard (student no. 213573763), under the supervision of Prof Frederick Veldman and co-supervision of Dr Suna Kassier, from Dietetics and Human Nutrition, School of Agricultural, Earth and Environmental Sciences, College of Agriculture, Engineering and Science, University of KwaZulu-Natal, Pietermaritzburg, South Africa.

The work contained in this study has not in any form for a degree or diploma been submitted to any other tertiary institution. Appropriate acknowledgement was given where use was made of external sources of information and authors.

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Ms Jandri E Barnard (Masters Candidate)

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Dr Suna Kassier (Co-Supervisor)

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CHAPTER 1

THE PROBLEM AND ITS SETTING

1.1 Introduction and motivation for the study

Dietetics is essentially the communication and explanation of the science of nutrition and the physiological responses of the body to the food that has been consumed (Universities and Colleges Admissions Service 2014). Dietitians are health care professionals who improve the health of individuals, communities and populations by applying an understanding of human nutrition. To do so, they assess, diagnose and treat dietary and nutritional problems, with the knowledge of biological, behavioural and social sciences (British Dietetic Association 2015; Griffith University 2015). Registered dietitians are responsible for assisting both healthy and sick individuals to make informed decisions based on recently published scientific research on food, health and disease. This knowledge can be translated into practical guidelines to enable people to make appropriate lifestyle and food choices within the public health sector (British Dietetic Association 2015; Universities and Colleges Admissions Service 2014). Treatment by a dietitian may be provided in the form of advice regarding dietary intake, designing a specialized diet that is disease specific, as well as the preparation of food within the food service sector. In addition, dietitians can also conduct research and give nutrition education to members of the public and other healthcare professionals involved in the health industry. They can be self-employed, or work in the private or public domain (ADSA 2015; Universities and Colleges Admissions Service 2014).

A qualification in dietetics can be obtained from various tertiary institutions worldwide. The course content of the degree may vary between institutions. Yet, to practise as a dietitian, the graduate must always be registered with the Health Professionals Council (HPC) of the country they practice in, and it is generally required to first complete placement in a clinical setting accredited for training purposes (British Dietetic Association 2015; Universities and Colleges Admissions Service 2014). In South Africa, dietetic students and dietitians must be registered with the Health Professions Council of South Africa (HPCSA) (ADSA 2015; HPCSA 2011).

Dietetic students at an undergraduate level, as well as those completing their dietetic internship, deal with a variety of pathophysiological conditions that require dietary management (Lordly 2007). In order to maintain a high level of service, educators should be willing to assist dietetic students to overcome challenges and succeed in managing personal problems, that could include the presence of an eating disorder (ED) (Lordly 2007). Eating disorders (EDs) and disordered eating are two very distinct conditions. The prevalence of disordered eating among female university students was found not to be an unusual phenomenon, especially at undergraduate level (Parham 2001). A clinical diagnosis of an early ED can be done by using a screening tool for detecting it among students (Kurth, Krahn, Nairn, Drewnowski 1995). Yet, large numbers of individuals that suffer from EDs go undiagnosed due to the clinical criteria used for its diagnosis (Parham 2001; Parham, Lennon, Kolosi 2001).

It has been documented that university students are a high-risk group for developing EDs. In addition, it is also estimated that a quarter of females (almost 25%) are likely to develop at least one ED across their lifespan. A possible explanation for this finding is that when women experience a lack of control, such as in their new study environments, they were often more susceptible to develop EDs and depression. This can be attributed to various biological, cultural and environmental factors including messages from the media, unrealistic beauty standards, peer pressure, ineffective coping mechanisms, a desire for acceptance and the need to control (Jackson 2008). Studies conducted on eating pathology, including EDs, are limited, but available studies alluded to the fact that this disorder is multi-factorial in terms of diagnosis. Clinical criteria used to document the prevalence of eating pathology is restricted to gender and ethnicity and do not take other potential risk factors into account. In addition, the data was derived from studies conducted in western industrial settings (Wade, Lowes 2002).

When making a career choice, the conceptualization of personality traits still play an important role (Hussain, Abbas, Shahzad 2012; Hughes, Desbrow 2005; Rosenberg 1999). International data suggests a higher prevalence of EDs among prospective dietetic students when compared to non-dietetic students (Drummond, Hare 2012; Kiziltan, Karabudak 2008; Kinzl, Traweger, Trefalt 1999). Obviously, this phenomenon has serious ethical consequences for the dietitian in practice. A healthy relationship is essential for a dietitian between him-/herself, his/her work and food.

According to Arroyo, Basabe, Serrano, Sanchez, Rocandio (2010) and Houston, Bassler, Anderson (2008), a dietitian who suffers from an ED and then counsels and works with patients who have similar problems, may exacerbate the dietitian's problem. This in turn can interfere with effective delivery of treatment plans to individuals with an ED (Arroyo et al. 2010; Houston et al. 2008).
Study results however, are conflicting. From the World Health Organisation (WHO) report on mental disorders, there were discrepancies regarding the prevalence of EDs due to the definitions regarding eating pathologies as well as ethnicity and culture and the impact of westernization on developing- and developed countries (WHO 2004). Currently there is little or no data available to investigate whether this relationship is also true for South African students (Drummond et al. 2012; Kiziltan, Karabudak 2008; Kinzl et al. 1999).

Hence, the motivation for this study was that there is a paucity of published South African studies investigating eating behaviour, eating attitude and body mass index (BMI) of dietetic students compared to non-dietetic students. A study conducted by the University of Pretoria (UP) focused on BMI and self-classified weight of first year dietetic students. Self-classified weight was determined from the Multidimensional Body-Self Relations Questionnaire (MBSRQ) and the Stunkard Figure Rating Scale (FRS), while BMI was calculated from measured weight and height. The study concluded that the majority of first year dietetic students had a normal BMI but distorted perceptions about their BMI. The students who indicated that they were of a normal weight were in fact underweight, while the students reporting to be 'somewhat overweight' were of a normal weight. These findings were based on a comparison to the FRS and MBSRQ and correlated with the self-classified weight measurements done by administering these questionnaires (White, Viviers 2014). A study conducted at the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth, compared the eating patterns, alcohol consumption and physical activity of all Health Science students (but not focusing on dietetic students) with other students, and concluded that Health Science students do not have a healthier lifestyle than other students at the same university (Gresse, Steenkamp, Pietersen 2015).

Studies by Korinth, Schiess, Westenhoefer (2009) have been conducted on eating behaviour and the prevalence of EDs of nutrition science students at various German universities. In their studies a cross-sectional comparative study was conducted between first year students and students in

subsequent years of study, using a questionnaire to compare dietary restraint, disinhibition, the tendency towards orthorexia nervosa and healthy food choices. It was found that orthorexic tendencies were lower among nutrition science students in subsequent years of study, while healthy food choices did not differ among students in their first year of study but improved among more senior nutrition students. In addition, the study indicated that the students surveyed had the tendency to restrict their food intake in order to control their weight, but they did not have more disturbed or disordered eating patterns than students in other fields of study. However, nutrition students adopted slightly healthier food choices in the course of their studies and decreased their tendency to be obsessive in their eating behaviour (Korinth et al. 2009).

1.2 Aim of the study

The aim of the study was to determine and compare the BMI, eating behaviour [Sick, Control, One stone, Fat, Food (SCOFF) questionnaire; Eating Attitude Test-26 (EAT-26)] and eating attitudes [Three Factor Eating Questionnaire (TFEQ)] of first-, third- and fourth year dietetic- and comparing these variables between first dietetic- and non-dietetic female undergraduate students at the University of KwaZulu-Natal, Pietermaritzburg Campus. This comparison was done to determine whether nutrition knowledge had an impact on eating behaviour and eating attitude and if eating behaviour was influenced by a chosen study major. The prevalence of EDs were investigated in order to broaden the data base regarding the prevalence of EDs and eating behaviour of dietetic- and non-dietetic students in South Africa. Based on the above study findings, the study also determined whether a self-administered screening questionnaire, based on the findings of the above study, should form part of the selection process of undergraduate dietetic students, especially within a South African context.

1.3 Study objectives

The study objectives were to determine and compare the following among dietetic- and non-dietetic female undergraduate students of the University of KwaZulu-Natal, Pietermaritzburg Campus:

1.3.1 The BMI of dietetic- versus non-dietetic female undergraduate students.

1.3.2 Eating behaviour of dietetic- versus non-dietetic female undergraduate students by means of the SCOFF- and EAT-26 questionnaires.

1.3.3 Eating attitude of dietetic- versus non-dietetic female undergraduate students by means of the TFEQ.

1.3.4 Whether subscales of the SCOFF- or EAT-26 questionnaire was more sensitive in identifying EDs among female undergraduate students.

1.4 Null hypothesis

For the purpose of this study, the following null-hypothesis were formulated:

1.4.1 BMI, eating behaviour (EAT-26 and SCOFF questionnaires) and eating attitude (TFEQ) of first year dietetic students will not differ from that of first year non-dietetic students.

1.4.2 First year dietetic students will not differ from a pooled sample of third- and fourth year dietetic students in terms of BMI, eating behaviour (EAT-26 and SCOFF questionnaires) and eating attitude (TFEQ).

1.5 Study design

A cross sectional descriptive survey was conducted to investigate the study variables stated in section 1.2, using validated self-administered questionnaires that were completed by a group of first-, third- and fourth year female undergraduate dietetic students as well as a group of first year female undergraduate students that were enrolled for study majors other than dietetics at the Pietermaritzburg campus, University of KwaZulu-Natal.

1.6 Subject inclusion and exclusion criteria

Inclusion criteria

- First year female undergraduate students, from non-dietetic majors, registered for study at the Pietermaritzburg Campus, University of KwaZulu-Natal.

- First-, third- and fourth year female dietetic students, registered for study at the Pietermaritzburg Campus, University of KwaZulu-Natal.

Exclusion criteria

- First year female students, from non-dietetic majors, registered for study at the Howard College, Westville and Nelson Madela Medical School, University of KwaZulu-Natal.
- Second year female dietetic students, registered for study at the Pietermaritzburg Campus, University of KwaZulu-Natal.
- Male dietetic students registered for study in their first, third or fourth year of study at the Pietermaritzburg Campus, University of KwaZulu-Natal.

1.7 Abbreviations used in study

ADSA	Association for Dietetics in South Africa
AN	Anorexia Nervosa
ARFID	Avoidant / Restrictive Food Intake Disorder
BED	Binge Eating Disorder
BMI	Body Mass Index
BN	Bulimia Nervosa
CEU	Continuing Education Units
CPD	Continuing Professional Development
DSM-5	Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders
EAT-26	Eating Attitude Test-26
ED	Eating Disorder
EDs	Eating Disorders
EDE-Q	Eating Disorder Examination Questionnaire
EDNOS	Eating Disorder Not Otherwise Specified
HPCSA	Health Professions Council of South Africa
ISAK	International Society for the Advancement of Kinanthropometry
KZN	KwaZulu-Natal
OSFED	Other Specified Feeding or Eating Disorder

SCOFF	Sick, Control, One stone, Fat, Food – Questionnaire
TFEQ	Three-Factor Eating Questionnaire
UFED	Unspecified Feeding or Eating Disorder
UKZN	University of KwaZulu-Natal
US	United States
WHO	World Health Organisation

1.8 Operational definitions

For the purpose of this study the following definitions were applied:

- **Body Mass Index (BMI):** A simple index of weight-for-height that is commonly used to classify the weight in adults. It is defined as a person's weight in kilograms divided by the square of their height in meters (kg/m^2) and is classified according to the result (WHO 2015).
- **Eating disorder (ED):** A range of psychological disorders characterized by abnormal or disturbed eating habits (Fairburn, Harrison 2003; Parham 2001).
- **Eating behaviour:** For the purpose of this study, it includes the investigation of restraint, disinhibition and hunger (Provencher, Bégin, Tremblay, Mongeau, Corneau, Dodin, Boivin, Lemieux 2009; Moreira, de Almeida, Sampaio 2005) identified by administering the SCOFF – (Morgan, Reid, Lacey 1999) and EAT-26 questionnaire (Garner, Garfinkel 1979).
- **Eating attitudes:** Beliefs, thoughts, feelings, behaviour and the relationship with food, which can influence people's food choices and health status (Alvarenga, Dos Santos, Koritar, Philippi 2012), measured by the TFEQ (Stunkard, Messinck 1984).
- **Student:** A person who is studying at a university or other place of higher education (Oxford University Press 2014).
- **Restraint / Cognitive restraint of eating:** The tendency to constantly and consciously restrict one's food intake, to control body weight and shape (Karlsson 2000), instead of using physiological cues like hunger and satiety as regulators (Anglé, Engblom, Eriksson, Kautiainen, Saha, Lindfors, Lehtinen, Rimpelä 2009).
- **Attitude to self-regulation:** The regulation of eating behaviour, the role of different body image components and the effects of obesity treatment on the attitude of self-regulation measured

according to restrictive eating and eating guilt (Carraça, Silva, Markland, Vieira, Minderico, Sardinha, Teixeira 2011; Adams, Leary 2007).

- **Restrictive eating:** The desire and effort to avoid eating certain food types (Adams, Leary 2007).
- **Eating guilt:** The tendency to feel guilty after eating unhealthily (Adams, Leary 2007).
- **Avoidance of fatty foods:** The behaviour of avoiding foods of high fat content and also higher palatability (Corwin, Grigson 2009).
- **Disinhibition of eating:** Loss of control or inhibition over eating, which is related to the fact that the self-control of restrained eaters may be inhibited by 'disinhibitors' (Oxford University Press 2014; Karlsson et al. 2000).
- **Disinhibitors:** Disinhibition stimuli that include the presence of palatable food, emotional stress or social eating cues (Stunkard, Messinck 1984).
- **Habitual susceptibility:** The condition or state of eating in response to habit and frequent overeating (Oxford University Press 2014; Preedy, Watson, Martin 2011).
- **Emotional susceptibility:** The condition or state of eating and being vulnerable or susceptible in response to emotions (Oxford University Press 2014; Preedy et al. 2011).
- **Situational susceptibility:** The inherent trait of eating in response to external cues or situations which arise (Preedy et al. 2011).
- **Hunger:** A feeling of discomfort or weakness caused by lack of food, coupled with the desire or craving to eat (Oxford University Press 2014).
- **Perceived hunger:** To be consciously aware or have the realization of being hungry and having food cravings (Karlsson et al. 2000; Stunkard, Messinck 1984).
- **Internal locus of hunger:** Internal triggers leading to the sensation of hunger including thinking and fantasising about food (Murray, Vickers 2009).
- **External locus of hunger:** Hunger that is initiated by external stimuli, such as the smell and the amount of food on a plate (Bond, McDowell, Wilkinson 2001).
- **Disordered eating:** A wide range of abnormal eating behaviours, such as chronic restrained eating, compulsive eating and habitual dieting. It includes, but not reflects, all symptoms of recognised eating disorders, like irregular, chaotic eating patterns which cause a level of discomfort or disruption to a person's life (Eating Disorders Victoria 2014).
- **Normal eating:** The ingestion of healthy foods, the intake of a mixed and balanced diet that contains enough nutrients and calories to meet the body's needs, and a positive attitude about

food. Normal eating fluctuates, but it should not fluctuate to the point of leading to a nutrient deficiency or excess weight loss or gain (Periera, Alvarenga 2007).

- **Orthorexia nervosa:** An obsession or obsessive-compulsive pattern of thinking and behaviour related to eating healthy food and avoiding unhealthy food (Korinth et al. 2009).

1.9 Structure of this dissertation

The structure of the dissertation is as follows:

Chapter 1: Introduction, problem statement and study objectives;

Chapter 2: Literature review;

Chapter 3: Methods and materials used for the study;

Chapter 4: Results;

Chapter 5: Discussion of results;

Chapter 6: Conclusions and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

According to the Health Professions Council of South Africa (HPCSA), dietetics is a health profession of which the theoretical training is conducted at a university while practical in-service training is conducted at training hospitals. Dietitians are members of the allied healthcare team and in order to practice, need to be registered with the HPCSA, as part of the Professional Board for Dietetics in South Africa (HPCSA 2014). The training of dietetic students are currently provided by nine Universities (ten sites) across South Africa (see table 2.1).

TABLE 2.1 DIETETIC STUDENT APPLICATIONS AND GRADUATES AT SOUTH AFRICAN UNIVERSITIES

University and location	Number of applicants	Number selected	Number registered	Number of graduates			
	2014			2013	2012	2011	2010
University of Cape Town (UCT), Western Cape	49	20	14	15	14	14	13
University of the Western Cape (UWC), Bellville, Western Cape	136	54	34	23	8	24	21
University of Limpopo (UL) , Turfloop Campus, Polokwane, Limpopo Province	258	39	39	39	34	25	25
University of Limpopo (UL) , Medunsa Campus, Pretoria, Gauteng	53	46	33	28	11	21	18
University of KwaZulu-Natal (UKZN), Pietermaritzburg Campus, KwaZulu-Natal	1591	40	24	N/A*	23	32	36
University of the Free State (UFS), Bloemfontein, Free State Province	210	11	11	13	7	18	18
North-West University (NWU), Potchefstroom, North West Province	80	51	41	24	22	26	26
Stellenbosch University (SU), Belville, Western Cape	104	55	38	34	32	24	18

TABLE 2.1 *(CONTINUED)* DIETETIC STUDENT APPLICATIONS AND GRADUATES AT SOUTH AFRICAN UNIVERSITIES

University and location	Number of applicants	Number selected	Number registered	Number of graduates			
	2014			2013	2012	2011	2010
Nelson Mandela Metropolitan University (NMMU), Port Elizabeth, Eastern Cape Province	42	30	26	N/A*	N/A*	N/A*	N/A*
University of Pretoria (UP), Pretoria, Gauteng	N/A*	N/A*	N/A*	N/A*	17	20	27

Adapted from: HPCSA 2014

**Information not available from the HPCSA data*

In 2014, UKZN had the largest number of applicants (n = 1591) for dietetics, however only 40 students were eventually selected for the programme. The second and third most applicants were from UL Turfloop (n = 258) and UFS (n = 210), whereas the largest number of dietetic students were selected at SU (n = 55) and UWC (n = 54). The lowest number of applicants were at NMMU (n = 42), with 30 of these applicants being selected for the course. From the available data of dietetic students graduating at Universities across South Africa from 2010 to 2013, in 2010 (n = 36) and 2011 (n = 32) the most students graduated from UKZN, while in 2012 (n = 34) and 2013 (n = 39) more students graduated from UL Turfloop (HPCSA 2014).

In 2015, 1418 dietetic students were registered across South African Universities, whereas 2734 qualified dieticians were registered with the HPCSA (HPCSA 2014). The selection procedures differ between universities. However, as universities move towards using the services of the Central Applications Offices, it is envisaged that more standardised and generic selection procedures will be used. Inclusion of screening for the presence of an ED as part of the selection process can also help to reduce the number of students qualifying as dieticians who suffer from disordered eating or an ED, to have a lower prevalence of disorderd eating or EDs as the necessary intervention can be implemented once enrolled, to assist undergraduates who have an unhealthy relationship with food.

2.2 The prevalence of eating disorders among dietetic- versus non-dietetic students

It has been suggested that female students with EDs are more likely to engage in a career in nutrition (Worobey, Schoenfeld 1999). However, other studies have not found a difference between dietetic students and other study majors regarding the risk of developing EDs and/or suffering from an existing ED (Fredenberg, Berglund, Dieken 1996; Johnston, Christopher 1991). In addition, other studies have found that the completion of a dietetic internship is beneficial for dietetic students from an academic, professional and personal perspective, as it will enable them to be more capable of assisting individuals with EDs. During an internship educators can assist students with the challenges of suffering from an ED or individuals whom they need to assist with an ED. This can contribute to success in their future career as dietitians and decrease the prevalence of EDs, once they have qualified (Lordly 2007).

The outcome of a prevention programme targeting EDs, including obesity, among female university students who are at risk for developing these outcomes because of body image concerns were investigated. The results of follow-ups conducted after one and two years respectively, were that the effects of symptoms related to an ED and BMI, were greater for students with elevated ED symptoms and BMI at the pre-test. Thus it was recommended that the latter category of students need to be targeted in future trials or studies (Stice, Rhode, Shaw, Nathan 2013). A new approach to interventions targeting ED and body image concerns on university campuses can be implemented with the Body Image programme. As the Body Image programme is an evidence-based, comprehensive screening and intervention platform for identifying students at various levels of risk for developing symptoms indicative of an ED (Jones, Kass, Trockel, Glass, Wilfey, Taylor 2014).

In Canada, dietetics is percieved as one of many female dominated professions. It is possible that this phenomenon could be influenced by the diet industry and media, which has a powerful influence on women. As a result, the prevalence of EDs and disordered eating was investigated within the dietetics profession, as dietetic students are often exposed to food, ideas and opinions about food, as well as weight and its place in health. The study concluded that further research regarding this topic was needed (Mahn, Lordly 2015).

A Spanish study reported that dietetic students are more prone to body weight- and body image dissatisfaction, despite the fact that all students in the study sample had a normal BMI. However, the study findings established that BMI was not a reliable variable for the topic under investigation. More specific anthropometric indicators would have been fat- and muscle mass (Arroyo et al. 2010). While a survey conducted in Austria on dietitians found that 12.8% of the study sample showed four or more symptoms of orthorexia nervosa, as well as the existence of a previous or concurrent ED such as AN, BN or BED. Therefore it was concluded that nutrition and dietetics students could start their studies with the motivation to deal with thier own dietary problems and disordered eating patterns (Korinth et al. 2009).

A German study investigating the presence of EDs among sport students when compared to commerce students, found that students who majored in sports had a significantly higher drive for thinness when compared to commerce students. In commerce and science students, body dissatisfaction was higher than in sport students. Thus, according to the study findings, sport students did display behaviours associated with EDs more frequently than students from other study majors (Franzia, Braun, Schänzer, Köhler 2013). Another study conducted at various German universities involving nutrition- and non-nutrition study majors, concluded the following: 1) nutrition majors tend to restrict their food intake in order to control their body weight by using potentially problematic rigid control behaviours as well as favourable and healthy flexible control behaviours; 2) nutrition students do not have more disturbed or disordered eating patterns than other non-nutrition study majors; 3) the increasing nutrition knowledge of nutrition majors is associated with slightly healthier eating behaviours and food choices (Korinth et al. 2009). The limitations of the German studies were that it was only conducted at specific German universities, hence it is questionable whether the results could be generalised to different countries and different cultural contexts, as Germany is seen as a developed country (Korinth et al. 2009).

According to a study conducted in China from 2006 to 2008 to determine the eating attitudes, EDs and BMI of male and female medical students, the results generated by the EAT-26 was indicative of distorted eating attitudes and eating behaviour. However, the study concluded that female medical students showed a significantly higher prevalence of EDs and distorted eating attitudes

when compared to males over the study period (Liao, Liu, Cheng, Wang, Deng, Hao, Chen, Xu, Wang, Tang 2013).

A sample of Turkish female dietetic- and non-dietetic students were investigated for the prevalence of abnormal eating, nutrition education and eating attitudes. The study variables that were used for this study included BMI, EAT-26 questionnaire, Bulimic Inventory Test Edinburg (BITE), psychological factors measured by the Rosenberg Self-Esteem Scale (RSES) and a State-Trait Anxiety Inventory (STAI). The results in the study indicated that the majority of the dietetic students had a normal BMI and a positive relationship regarding eating attitudes and dieting behaviour. In addition the authors did not find a significant degree of disordered eating among the sample of students (Kiziltan et al. 2008).

Currently South Africa is classified as a middle-income transitional country (Finucane, Stevens, Cowan, Danaei, Lin, Paciorek, Singh, Gutierrez, Lu, Bahalim, Farzadfar, Riley, Ezzati 2011), but the data and findings from Turkey and Brazil can be compared to South Africa, as they are all categorised by the UN as developing countries (United Nations 2013). Studies have also been conducted on the eating attitudes of female university students in Brazil (Alvarenga et al. 2012). In contrast to the global research conducted, only a few local published studies exist about the prevalence of ED pathology among students in South Africa.

2.3 Types of eating disorders

The American Dietetic Association (ADA) acknowledges that disordered eating and its symptoms are important in identifying the range of EDs that range from food restrictions to fully fledged ED syndromes. Therefore, the importance of defining and differentiating between, as well as the identification of disordered eating behaviour is imperative to the possible prevention, treatment and education regarding a particular disorder (Ozier, Henry 2011). EDs are an important cause of physical and psychosocial morbidity in especially adolescent girls and young adult women, but is less frequently diagnosed in men (Fairburn et al. 2003).

After the updated 2013 publication of the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), Binge Eating Disorder (BED) and its diagnosis was also included as an eating disorder by the American Psychiatric Association (De Zwaan, Herzog 2011; Call, Walsh, Attia 2013). DSM-5 is seen as the official diagnostic criteria for mental health diagnosis, to ensure that standardised terminology is used when speaking about a specific disorder (American Psychiatric Association 2013). In 1994 when the previous version (DSM-IV) was released, binge eating was only listed and could only be diagnosed as part of the non-specific EDNOS (Eating Disorder Not Otherwise Specified). However, numerous research papers over the years supported the fact that BED is a specific diagnosis that has validity and consistency (Knoll, Föcker 2014). Other changes and updates in DSM-5 included the removal of the category known as EDNOS and replacing it with two new categories: 'Other Specified Feeding or Eating Disorder' (OSFED) and 'Unspecified Feeding or Eating Disorder' (UFED). These new categories are not indicative of a less severe ED, but simply a constellation of symptoms, intended to more appropriately recognise and categorise conditions that do not fit the criteria to be diagnosed as Anorexia Nervosa (AN), Bulimia Nervosa (BN), BED or other feeding and EDs (Hoek, Van Elburg 2014; American Psychiatric Association 2013).

Table 2.2 summarizes the primary feature, severity and duration, associated features as well as subtype classifications of EDs (BED, AN, BN, Avoidance / Restrictive Food Intake Disorder (AFRID), OSFED) adapted from the DSM-5 classification (American Psychiatric Association 2013; Call et al. 2013).

BED is defined by the American Psychiatric Association as recurring episodes of eating significantly more food within a short period of time than most people would eat under similar circumstances, with episodes marked by feelings of lack of control. However, there is a substantial difference between BED and the more common phenomenon of overeating (American Psychiatric Association 2013). BED is also associated with an increased frequency of weight fluctuation, depression, perceived barriers to weight loss, anxiety, emotional distress and substance abuse (Swanson, Crow, Le Grange, Swendson, Merikangas 2011; Heatherton, Baumeister 1991). Individuals usually binge on highly palatable, energy-dense food that is typically high in fat, sugar or often both. Although most people with obesity do not suffer from BED, two thirds of those with BED are obese and also have medical complications associated with it (Swanson et al. 2011). BED is motivated by a desire

to escape from self-awareness and attempt the cognitive response of narrowing attention to the immediate stimulus environment by disengaging from normal inhibitions (Heatherton et al. 1991).

TABLE 2.2 KEY FEATURES OF DIAGNOSIS OF EATING DISORDERS ADOPTED FROM THE DSM-5 CLASSIFICATION

Feature	BED (Binge Eating Disorder)	AN (Anorexia Nervosa)	BN (Bulimia Nervosa)	ARFID (Avoidance / Restrictive Food Intake Disorder)	OSFED (Other Specified Feeding or Eating Disorder)
Primary Feature	Eating more food in a short period of time.	Refusal to maintain body weight.	Binge Eating Compensatory Behaviour	Failure to meet appropriate nutritional or energy needs	Feeding or eating disorders not otherwise stated.
Minimum Duration / Severity	Once a week over three months.	Maintains less than 85% of expected body weight.	Binging and compensatory behaviour at least once a week. Present for 3 months.	Not attributed to a medical condition but interference with psychosocial functioning evident	Varies
Associated Features	Feelings of quilt, embarrassment and disgust.	Intense fear of gaining weight / becoming fat Disturbances in body image.	Self-evaluation unduly influenced by body image.	Significant weight loss and nutritional deficiency. Dependence on enteral feeding or nutritional supplements.	Varies
Subtypes	Absence of regular compensatory behaviours (purging).	Restricting Binging / Purging	Purging Non-purging	AN BN	Atypical AN Lower frequency of BED BN of lower frequency & duration Purging (without Binging) Night Eating Syndrome

Adapted from: American Psychiatric Association (2013)

According to the American Psychiatric Association, AN is characterised by a distorted body image and excessive dieting that leads to severe weight loss with a pathological fear of becoming fat (American Psychiatric Association 2013). It primarily, but not exclusively, affects adolescent girls and young women, which in turn causes neuro-endocrine changes associated with menstrual abnormalities, especially amenorrhea (American Psychiatric Association 2013; Mitan 2004). An update of the diagnostic criteria focuses on behaviours such as restricting kilojoule intake and no longer includes the word 'refusal' in terms of weight maintenance since that implies intention on

the part of the patient and can be difficult to assess (American Psychiatric Association 2013). BN can be characterized by frequent episodes of binge eating, followed by inappropriate behaviours such as self-induced vomiting to avoid weight gain, to be exhibited at least once a week (De Zwaan et al. 2011).

An individual diagnosed with ARFID must display an eating or feeding disturbance as manifested by persistent failure to meet appropriate nutritional and or energy needs. This should be combined with one or more of the following characteristics: a significant loss of weight, a significant nutritional deficiency, dependence on enteral feeding or oral nutritional supplements or marked interference with psychosocial functioning. AN and BN can also fall under it as subtypes (American Psychiatric Association 2013).

To be diagnosed with an OSFED, a person must present with a feeding or eating behaviour that causes clinically significant distress and impairment in areas of functioning, but still does not meet the full criteria for any of the other feeding and eating disorders. Other examples of OSFED include: Atypical AN, lower frequency of BED, BN of low frequency and / or limited duration, Purging Disorder in the absence of binge eating and Night Eating Syndrome, which includes recurrent episodes of night eating (Knoll et al. 2014; American Psychiatric Association 2013).

The UFED category only applies to situations where behaviours cause clinically significant distress or the impairment of functioning, but does not meet the full criteria of any of the Feeding or ED criteria according to the DSM-5. It can only be used by clinicians where a clinician chooses not to specify why criteria are not met due to specific circumstances (American Psychiatric Association 2013).

2.4 Diagnosis of eating disorders by means of eating behaviour questionnaires

In recent years the prevalence of EDs have been steadily increasing, this has led to a growing sense of recognition that measuring instruments are necessary for the early detection of EDs (Rueda, Martinez, Campo-Arias, Barros, Avila, Oróstegui 2005). EDs are among the most common psychiatric disorders in young women, hence the early detection and treatment can improve the

prognosis. The ability to diagnose the condition varies and can be inadequate, as existing questionnaires for detection are lengthy and may require specialist interpretation (Morgan et al. 1999). Available questionnaires used to conduct an evaluation of EDs include: the Anorectic Behaviour Observation Scale (Salbach-Andrae, Klinkowski, Holzhausen, Frieler, Bohnekamp, Thiels, Bender, Vandereycken 2009), the Body Attitudes Questionnaire (BAQ) (Ben-Tovim, Walker 1991), the Body Attitudes Test (BAT) (Probst, Van Coppenolle, Vandereycken 1997), the Eating Attitudes Test (EAT-26) (Garner, Garfinkel 1979), the Eating Disorder Examination (EDE) Interview (Fairburn, Cooper, Doll, Davies 2005), the Eating Disorder Inventory (EDI) (Garner, Marion, Olmstead 1983), the Minnesota Eating Behaviour Survey (MEBS) (Von Ranson, Klump, Lacono, McGue 2005), the SCOFF questionnaire (Rueda et al. 2005; Morgan et al. 1999) as well as the TFEQ (Stunkard et al. 1984).

The Anorectic Behaviour Observation Scale is a thirty item diagnostic questionnaire devised to be answered by the parents, spouse or other family member of an individual suspected of having an ED. Thus it cannot be used as a screening tool to be completed by an individual suspected of having an ED. Valid versions of the questionnaire are available in German, Japanese and as the Eating and Activity Questionnaire for Parents (EAQP) (Salbach-Andrae et al. 2009). The Body Attitudes Questionnaire (BAQ) is a 44 item self report questionnaire divided into six subscales (overall fatness, self disparagement, strength, salience of weight, feelings of attractiveness, consciousness of lower body fat) that measures a women's attitude towards their own body, to assess the prevalence of EDs. It is also translated and available in Portuguese and Japanese, for use in both males and females (Ben-Tovim et al. 1991).

The Body Attitudes Test (BAT) was designed for the assessment of EDs in women, measuring subjective body experience and attitudes towards one's own body and compromising of twenty items focusing on AN and BN (Probst et al. 1997). The Eating Attitudes Test (EAT) questionnaire, consisting of 40-items, is used as a standardized self-report measure of symptoms and characteristics of EDs. EAT-26 questionnaire can be used in non-clinical settings (schools, athletic programmes, fitness centers) as well as clinical settings (infertility clinics, pediatric practices, general practice settings, outpatient psychiatric departments), to be administered by mental health professionals, school counselors, coaches, camp counselors and an individual who would need to

be refered to a specialist for evaluation of an ED. It is primarily intended for adolescents and adults, thus making it an ideal ED measurement tool when assessing students, whom are seen as young adults (Garner et al. 1979).

School-based screenings and early identification of those at risk, before university placement applications are made, can greatly impact the trajectory of eating disorders. Across the United States (US), seen as a developed country, brief attitudinal and behavioural survey items identify adolescents at risk. This national eating disorders screening initiative in US High Schools drew data from the National Eating Disorder Screening Program, using the EAT-26 behavioural questions to assess the frequency of vomiting and binge eating among students over the past three months. Thus, High School administrators should include items that assess both preoccupation with thinness as well as behavioural items dealing with EDs in student health surveys (Haines, Ziyadeh, Franko, McDonald, Mond Austin 2011).

The Eating Disorder Examination Interview (EDE), is a semi-structured interview that should be conducted by a trained clinician to assess the psychopathology associated with the diagnosis of an ED and scored for restraint, eating concern, shape concern and weight concern (Fairburn et al. 2005). While the Eating Disorders Examination Questionnaire (EDE-Q) was adapted from the EDE, the EDE-Q is a 41 item self-report questionnaire which consists of 22 items, and can be used for screening cases for EDs, especially for young adult women in a primary care setting. It assesses behaviours over a 28 day time period. The measurement of the EDE-Q was more robust to the effects related to the validity of age and weight compared to the advantage of SCOFF in terms of its brevity (Mond, Myers, Crosby, Hay, Rodgers, Morgan, Lacey, Mitchell 2008; Fairburn et al. 2005).

The Eating Disorder Inventory (EDI) is a self-reporting questionnaire that can be completed in 20 minutes, consisting of 64 questions, used to assess the presence of EDs, including AN (restricting and binge eating or purging type), BN and EDNOS (including BED). There has been two subsequent resulting in the Eating Disorder Inventory-two (EDI-2) and Eating Disorder Inventory-three (EDI-3) used for both males and females (McLaughlin, Karp, Herzog 1985; Garner et al. 1983). The Minnesota Eating Behaviour Survey (MEBS) is a 30-item self-reporting questionnaire used to assess the presence of an ED, for both males and females aged ten years and older (Von Ranson, Cassin,

Bramfield, Fung 2007; Von Ranson et al. 2005). It includes items taken from the EDI (Garner et al. 1983) but rewritten in a simpler manner of four subscales namely body dissatisfaction, weight preoccupation, binge eating and compensatory behaviour (Von Ranson et al. 2007; Von Ranson et al. 2005).

Although, a number of factors have been identified as contributing to the development of an eating disorder, questionnaires focusing on eating behaviour have been identified to measure eating disorders in students which includes the SCOFF questionnaire (Morgan et al. 1999), the EAT-26 questionnaire (Garner et al. 1979) and the TFEQ (Stunkard et al. 1984).

2.5 Eating behaviour

Eating behaviour is referred to in the description of key features of the diagnosis of eating disorders in Table 2.2 (American Psychiatric Association 2013; Call et al. 2013) and can be measured by using the SCOFF questionnaire (Morgan et al. 1999) and the TFEQ (Stunkard et al. 1984). Eating behaviour includes the investigation of restraint, disinhibition and susceptibility to hunger (Moreira, de Almeida, Sampaio 2005; Provencher, Bégin, Tremblay, Mongeau, Corneau, Dodin, Boivin, Lemieux 2009). The TFEQ (Stunkard et al. 1984) was used to assess dietary restraint, disinhibition and perceived hunger and used to study eating behaviours in normal-weight and obese subjects as well as those with EDs (Paradis, Godin, Lemieux, Pérusse, Vohl 2009). However the questionnaire was originally developed for the assessment of obese subjects but can also be used for normal weight subjects. The questionnaire consists of 51 items that cover three dimensions of human eating behaviour, namely cognitive restraint (21 items); disinhibition (16 items); and hunger (14 items) (Anglé et al. 2009; Bond et al. 2001; Karlsson, Perrson, Sjöström 2000). The response to each question is rated as zero or one and added together. Higher scores denote higher levels of restrained eating, disinhibition and predisposition to hunger, respectively (Bond et al. 2001).

An eating behaviour study conducted by Provencher, Drapeau, Tremblay (2003) investigated eating behaviours that included restraint, disinhibition and susceptibility to hunger. In addition to the investigation of appetite ratings (the desire to eat, hunger, fullness and prospective food consumption) and anthropometric and metabolic variables (Provencher, Bégin, Tremblay,

Mongeau, Corneau, Dodin, Boivin, Lemieux 2009), an additional study conducted on 380 university students, of which 60% were female, investigated the association of restraint (low or high) and disinhibition (low or high) with dietary intake (Moreira et al. 2005). Among the female students, high restrainers reported a lower consumption of high energy pastry and starchy foods, with a higher consumption of vegetables and fish reported in low restrainers. The major food pattern in female restrainers aggregated, thus indicating a higher consumption of legumes and fruit; and a lower consumption of pastry, sugar and starchy foods (Moreira et al. 2005).

Findings confirmed the construct validity of the cognitive restraint and hunger factors of the TFEQ across different samples, including obese subjects, while disinhibition and hunger were unstable and require further investigation (Karlsson et al. 2000). Dimensions of eating behaviour as per the TFEQ and the constructs of eating behaviour categorised under it, are summarised in Table 2.3 below (Bond et al. 2001).

TABLE 2.3 ADAPTED DIMENSIONS AND CONSTRUCTS OF EATING BEHAVIOUR FROM THE TFEQ

Dimensions of eating behaviour	Constructs of eating behaviour
1. Cognitive restraint of eating	Strategic dieting behaviour
	Attitude to self-regulation
	Avoidance of fatty foods
2. Disinhibition of eating	Habitual susceptibility
	Emotional susceptibility
	Situational susceptibility
3. Hunger	Internal locus of hunger
	External locus of hunger

Source: Bond et al. (2001)

Different eating behaviours are learned by children modelling their eating behaviours on that of their parents. Therefore, parents shape the development of their children's eating behaviours (Paradis et al. 2009). Evidence indicates that dietary habits acquired during childhood, persist through to adulthood, thereby laying the foundation for the eating habits and behaviour of students, whom are classified as young adults (Paradis et al. 2009).

2.6 Cognitive restraint of eating

Cognitive restraint refers to the tendency of some individuals to consciously restrict their food intake in order to control body weight and shape (Paradis et al. 2009; Karlsson et al. 2000; Stunkard et al. 1984). Positive correlations were observed between rigid restraint and some anthropometric variables in both genders, whereas flexible restraint was negatively associated with body fat and waist circumference in females. Thus, unclear relationships between cognitive dietary restraint and BMI could be explained by the differing effects of rigid and flexible restraint (Paradis et al. 2009).

The balance between the desire to eat and the effort to resist that desire, referred to as restraint, affects eating behaviour (Canetti, Bachar, Berry 2002). The restraint theory proposes that attempts to regulate food intake in order to control body weight and body shape cause episodic overeating. The model proposes a causal role of frequent dieting in the development of eating disorders and obesity (Herman, Polivy 1980). Restraint also refers to the tendency to constantly and consciously restrict one's food intake instead of using physiological cues like hunger and satiety as regulators (Anglé et al. 2009). However, restrained eating is not the same as dieting (Lowe, Timko 2004), as restrained eaters consume less food than they would like to eat, but not necessarily less than they need to maintain energy balance (Stice, Cooper, Schoeller 2007). Restrained eaters constantly worry about what they eat and chronically restrict their food intake in order to prevent weight gain. However, restrained eaters are most often those that engage in weight loss behaviour (Murray et al. 2009). The ratings for the desire to eat, liking and craving a particular food, were higher in restrained eaters after exposure to the smell and thought of that food than for unrestrained eaters (Federoff, Polivy, Herman 1997). Restrained eaters ate significantly more after pre-eating exposure to smell and thought cues of the same food than unrestrained eaters. Thus, a consistent pattern emerged that subjects who score highly on dietary restraint consume more kilojoules and fat when under stress (Wardle, Steptoe, Oliver 2000), whereas intake is the same or lower in unrestrained eaters (Rutledge, Linden 1998). It would therefore seem that when under stress, female restrained eaters shift their food choices away from meal type foods such as meat and vegetables towards snack-type foods. A possible explanation for this phenomenon is a neuro-hormonal mechanism for stress-induced preferential selection of sweet, fatty foods in that highly palatable foods can relieve

stress through release of endogenous opiods (Murray et al. 2009). These findings could be indicative of the fact that restrained eaters or dieters are less in touch with their feelings of fullness after eating, whereas unrestrained eaters eat freely and do not worry about their food intake or its consequences (Murray et al. 2009).

A study that was conducted to assess the dietary restraint and self-esteem as predictors of weight change over a period of eight years, found that subjects on average, gained an estimated six kilograms over the eight year period. Although neither dietary restraint nor self-esteem predicted weight change on its own, their interaction did. It was therefore concluded that dietary restraint was predictive of subsequent weight gain but in a more complex way than was previously assumed (Tiggemann 2004).

2.6.1 Strategic dieting behaviour

Strategic dieting behaviour uses cognitive dietary restraint and disinhibition where eating and dieting is concerned. This was measured in Latina women and their children by using the TFEQ and using a food frequency questionnaire. The mothers' cognitive restraint was associated with more healthy food choices for themselves and lesser for their children, while dietary disinhibition was associated with less healthful choices for themselves and their children (Contento, Zybert, Williams 2005). Diet behaviour and disordered eating behaviour can thus be defined by using questionnaires like the TFEQ (Bond et al. 2001). Unusual eating patterns are likely to develop as a result of the stress associated with chronic dietary restraint with the choices of specific foods (Herman et al. 1980). By strategically trying to create a balance, the cognitive processes override physiological hunger and satiety cues (Bond et al. 2001).

2.6.2 Attitude to self-regulation

Successful weight management involves the regulation of eating behaviour, the role of different body image components and the effects of obesity treatment on the attitude of self-regulation (Carraça et al. 2011). The effect of disinhibition can be measured according to the two components of rigid restrained eating, namely restrictive eating and eating guilt. Specific individual differences in attitude suggest that reduced distress and attenuated eating coincide with self-regulation (Adams et al. 2007). Binge eaters are usually suffering from high standards and expectations,

especially in relation to an acute sensitivity to the perceived demands of others. When they fall short of these standards, they are motivated by a desire or attitude to escape from self-awareness and self–regulation (Heatherton et al. 1991).

2.6.3 Avoidance of fatty foods

The avoidance of fatty foods is the behaviour of avoiding foods with a high fat content and a higher palatability (Corwin et al. 2009). The presence of fat in food is very enjoyable and is associated with a pleasurable mouth-feel. Foods with a high energy density tend to be associated with high palatability, and vice versa. Thus, energy dense foods are palatable but not necessarily satiating. Whereas foods with a low energy density are more satiating but less palatable. Foods with a low energy density, are typically those that contain the most water and the least fat. Thus, reducing the energy density while maintaining palatability, is a continuing challenge for the food industry. Nevertheless, sweetened foods with a high fat content are expected to promote excess energy intake since palatability is enhanced by both sweetness and mouth-feel and fat only has a limited appetite suppressive effect (Drewnowski 1998). However, it has also been proposed that some foods are more addictive than others, especially those high in fat and / or sugar. These are typically the foods that are viewed as forbidden, are often energy dense and are those that people binge on. Although these foods are highly palatable, but not addictive, it can become so following a restriction or binge pattern of consumption (Corwin et al. 2009).

2.7 Disinhibition of eating

Disinhibition refers to a loss of control over eating (Karlsson et al. 2000; Stunkard et al. 1984). It is related to the fact that the self-control of restrained eaters may be temporarily inhibited by disrupting events or 'disinhibitors' which include specific 'cognitions', i.e. the perception of having overeaten or the consumption of forbidden foods, alcohol or negative emotional states (such as anxiety or depression) that tend to interfere with self-control and that can result in overeating (Canetti et al. 2002).

It is explained, that when assessing the relationship between dietary restraint and obesity specifically, strict dietary restraint was shown to increase the risk of developing obesity when

compared to a more flexible approach to eating. The reason for the latter is related to the fact that flexible restraint has been shown to weaken the relationship between habitual inhibition and weight fluctuation. Strict restraint on the other hand, did not show a relationship (Hays, Roberts 2008). However, neither dietary restraint nor hunger has been consistently associated with BMI or weight change, in contrast to the strong associations reported for disinhibition (Bellisle, Cle'ment, Le Barzic, Le Gall, Guy-Grand, Basdevant 2004; Drapeau, Provencher, Lernieux, Després, Bouchard, Tremblay 2003; Provencher et al. 2003).

Within a population group, dietary restraint and disinhibition were related to differences in body mass and measured by using the TFEQ. Disinhibition was associated with an excessive amount of eating, an increased rate of eating, self-reports of eating disorder symptomatology and perceived hunger. Thus, actual eating behaviour was significantly influenced by disinhibition (the ingestive motivational factor), but not by the cognitive factor of dietary restraint (Smith, Geiselman, Williamson, Champagne, Bray, Ryan 1998). Moreover, disinhibition and susceptibility to hunger, have been positively associated with BMI, body fat mass and waist circumference (Paradis et al. 2009). With regards to cognitive dietary restraint, associations with BMI or obesity are less consistent (Paradis et al. 2009).

2.7.1 Habitual susceptibility

This concept relates to the condition or state of eating in response to habits acquired over time, and the frequent overeating of larger portions (Preedy et al. 2011). Mothers seem to be particularly involved in shaping the eating behaviours of their children, since those with high levels of weight concerns and dieting behaviour, have children who are more likely to report similar concerns (Paradis et al. 2009). Parents largely define the environmental conditions to which their children are exposed to over time, however, genetics also seems to be implicated (Paradis et al. 2009). Some studies have even shown that eating behavioural traits are characterised by significant familial resemblance which suggests the importance of both environmental and genetic contributions (Paradis et al. 2009).

2.7.2 Emotional susceptibility (Internal Disinhibition)

Physiological mechanisms regulate hunger and satiety and it has been proposed that an error in this process may be responsible for the development of certain eating behaviours, especially if emotion is involved (Canetti et al. 2002). Internal triggers leading to the sensation of hunger, includes thinking and fantasising about food. On the other hand, the level of cognitive activity and the level of hunger sensations are also indirectly related to each other. For example, an individual who is bored with a low cognitive activity level, is more likely to experience hunger sensations. An inherent preference for a specific food also leads to increased hunger sensations (Murray et al. 2009). It has been documented that emotion and factors other than hunger, such as stress, need for affinity, depression, worry or fatigue affects a person's eating habits (Adolfsson, Carlson, Undén, Rössner 2002).

2.7.3 Situational susceptibility (External Disinhibition)

Situational susceptibility can be seen as the inherent trait of eating in response to external cues (Preedy et al. 2011). The situational susceptibility to disinhibition and susceptibility to hunger, using a Health-At-Every-Size (HAES) intervention focuses on eating behaviours, appetite sensations, physical activity levels, metabolic and anthropometric variables in women which significantly decreased at six month intervals and one year within the commencement of the study (Provencher et al. 2009).

2.8 Perceived hunger

Hunger is a feeling of discomfort or weakness caused by a lack of food and coupled with the desire to eat (Oxford University Press 2014), while perceived hunger is seen as being consciously aware of being hungry and having food cravings (Karlsson et al. 2000; Stunkard et al. 1984). The susceptibility to hunger refers to food intake in response to feelings and perceptions of hunger and has been divided into two specific subscales, namely internal and external locus of hunger. Physiological mechanisms regulate hunger and satiety and it has been proposed that an error in this process may be responsible for the development of obesity (Stunkard et al. 1984). The relationship between emotion and eating behaviour is stronger in the obese than the non-obese and is stronger in individuals following weight loss diets than non-dieters (Canetti et al. 2002). Unusual eating

patterns are proposed to develop as a result of the stress associated with chronic dietary restraint, with food intake being determined by a balance between the desire to eat and the aspiration to lose weight (Ruderman 1985). Then this cognitive processes override physiological hunger and satiety cues (Bond et al. 2001).

2.8.1 Internal locus of hunger

Internal triggers leading to the sensation of hunger includes thinking and fantasising about food. The level of cognitive activity and the level of hunger sensations are indirectly related to each other. Thus an individual who is bored (low cognitive activity level), is more likely to experience hunger sensations. An inherent preference for a specific food also leads to increased hunger sensations (Murray et al. 2009). A qualitative evaluation documented how subjects that were enrolled in a weight loss intervention, described how emotion and factors other than hunger such as stress, need for affinity, depression, worry or fatigue affected their eating habits. The only participant to describe hunger as the only reason for eating, reached the greatest weight loss after two years. As a result, it was concluded that if emotions and factors other than hunger that are associated with eating habits that lead to obesity are not addressed, treatment needs will never be met (Adolfsson et al. 2002).

2.8.2 External locus of hunger

External locus of hunger refers to hunger that is initiated by an external stimuli, such as smell and the amount of food on a plate. The lower levels of the external locus of hunger was found to be related to a lower BMI (Bond et al. 2001). This relates to the amount of food on a plate or in a bowl may implicitly suggest what might be considered as a “normal” or “appropriate” amount (Fisher et al. 2003). This amount may influence how much individuals expect to consume and how much they end up consuming (Wansink, Painter, North 2005). 54% of American adults generally claim that they eat until they “clean their plates”, according to EPM-Communications (2003). Thus a visual cue of a clean plate has been established as a benchmark and eating continues until the benchmark is reached or until satiety sets in (Wansink et al. 2005). This can cause individuals more heavily to rely on easy-to-monitor visual cues that are related to their consumption expectations. In addition, a distracting environment can reduce the ability to accurately monitor consumption (Herman et al. 1980). This may lead to overtly relying on visual cues to determine when to stop eating (Wansink et

al. 2005). The palatability of food can evoke pleasure and the endless variety of freely available food at a reasonable price, can contribute to a higher energy intake, due to the fact that individuals tend to eat more when offered a variety of choices than when limited options are available (Wansink et al. 2005).

2.9 Eating Attitude

Eating attitude can be defined as beliefs, thoughts, feelings and the relationship with food, which in turn can influence people's food choices and consequently their health status (Alvarenga et al. 2012). The eating attitudes of female university students from different regions of Brazil were compared by answering the Eating Attitude Scale questionnaire. The possible correlation between nutritional status, age, individual income and parental education were considered. It was found that the profile of the university students was similar in most regions and that the data could assist to elucidate dietary patterns and nutritional differences between specific groups (Alvarenga et al. 2012). Data about eating attitude can then be compared between the 139 developing countries registered with the United Nations, as Brazil and South Africa are classified as developing countries (United Nations 2013).

2.10 Summary

It has been established that eating behaviour and eating attitude can be determined for students means of various available questionnaires. Understanding the possibility of the development of ED or pre-existing ED, can assist in the selection process of prospective students, especially dietetic students at universities in South Africa. Unfortunately there is currently a lack of current and accurate published data available in South Africa. In addition, the researcher used scientifically published, peer-reviewed literature for the literature review of this study. This led to a cross-sectional descriptive study to be conducted at a South African university (UKZN, Pietermaritzburg campus), to determine the BMI, eating behaviour and eating attitude of both undergraduate dietetic- and non-dietetic female students.

In Chapter 3, the material and methods that were used to collect data for this study will be discussed in detail.

CHAPTER 3

METHODS AND MATERIALS

3.1 Introduction

This chapter will describe the study methods and materials that were used, including measuring instruments and tools that were used as well as the data collection methods. In addition, the study sample, sampling method and pilot study will be elaborated on as well as how data quality was ensured. The study variables, data capturing and statistical analysis will also be discussed as well as how ethics approval for the study was obtained.

3.2 Study design

A cross-sectional descriptive survey was conducted. (Leedy, Ormrod 2010). Cross-sectional studies are carried out at one time point or over a short period, to estimate the prevalence of the outcome of interest for a given population. Repeated cross-sectional studies may be carried out to give a pseudolongitudinal study, where the individuals included in the study are either chosen from the same sampling frame or from a different one. A cross-sectional study design is used when the purpose of the study is descriptive, often in the form of a survey or questionnaire (Levin 2006).

The advantages of using a cross-sectional study includes that i) it is relatively inexpensive, ii) can be completed in a relatively short period of time, iii) can be used to estimate the prevalence of the outcome of interest, iv) more than one outcome and risk factors can be assessed at the same time, v) can be useful for public health planning and for the generation of hypotheses and vi) there is no loss to follow-up. The disadvantages and limitations of cross-sectional studies are that i) it only provides a single snapshot in time – the situation may provide different results if another time-frame had been chosen, ii) it is difficult to make causal inference, as there is no indication of the sequence of events, and iii) does not provide information on incidence, and iv) can be prone to confounding (Levin 2006).

Nevertheless, a cross-sectional descriptive survey can indicate associations that may exist and are therefore useful in generating hypotheses for future research and follow-up surveys or questionnaires.

3.3 Study population and sample selection

The study population included all first year female undergraduate students from the University of KwaZulu-Natal, Pietermaritzburg campus as well as all female first- third- and fourth year dietetic undergraduates from the Pietermaritzburg campus. Convenience sampling was used to recruit a study sample of 145 female undergraduate dietetic- and non-dietetic students. This included a sample of 62 dietetic students made up of 24 first-, 20 third- and 18 fourth year dietetic students, to be part of the study. The 83 first year female non-dietetic students, representing law, psychology, drama and biochemistry, were also conveniently sampled. All prospective participants were invited to participate, both verbally and via e-mail.

After the students were invited to voluntarily participate, prospective participants were informed regarding the survey dates and and pre-determined venues, that were easy to access and were quiet and free from unnecessary distractions. Before students were allowed to participate, they had to sign an informed consent form detailing the aim and study objectives (see *Appendix A* page xi). This was followed by the completion of the following self-administered questionnaires: (i) SCOFF-; (ii) EAT-26 questionnaire; and (iii) TFEQ. The questionnaires were only available in English and not translated into isiZulu, as all students registered at UKZN require an understanding of the English language as it is the formal language of instruction. However, trained field workers were available to assist students with completion of the questionnaires. Once students had completed the self-administered questionnaires, their height and weight were measured according to standardised techniques to facilitate calculation of BMI. This sequence of data collection was deliberate as the researcher did not want student's BMI to influence their response to the survey questionnaires.

3.4 Pilot study

A pilot study was conducted on a random sample (n=10) of non-dietetic students to ensure that the instructions of the self administered questionnaires were easy to understand and none of the questions posed were ambiguous. After the pilot study was completed, no subsequent changes were made to the validated measuring instruments.

3.5 Measuring instruments

Measuring instruments were used in the study to determine BMI, eating behaviour and eating attitude of the students. Anthropometric measurements were done using the International Society for the Advancement of Kinanthropometry (ISAK) guidelines to calculate the BMI of the students (ISAK 2015). Determining the prevalence and risk of developing EDs was done by using the SCOFF- (Morgan et al. 1999) and EAT–26 questionnaire (Garner, Olmsted, Bohr, Garfinkel 1982), focusing on four behavioural questions (EAT A, EAT B, EAT C, EAT D) for this study. The validated TFEQ (Bond et al. 2001; Karlsson et al. 2000) was used as a measuring instrument to assess student eating attitude.

3.5.1 Body Mass Index (BMI)

The anthropometric measurements of weight and height of the students were done as per ISAK standards by trained field workers (ISAK 2015), after completing the measuring instruments of the study.

Weight was measurement by using a calibrated electronic scale placed on an even, stable surface at the survey venue in Pietermaritzburg. The scale was calibrated with a known weight of 5kg after each measurement. Participants were weighed without shoes and with light indoor clothing while standing in the middle of the scale platform with body weight evenly distributed on both feet and with their hands next to their sides. Weight was then recorded in kilograms to one decimal place. The weight was measured twice and the mean was recorded (ISAK 2015).

Participants had to remove their socks and shoes for their height measurement with a stadiometer, which was placed on an even surface at the survey venue. Their hair had to be tied up if it was untied and all head gear removed, and complicated hairstyles such as weaves or extensions flattened. Participants had to stand with their heels together, arms to the side, legs straight, shoulders relaxed and head in a Frankfort horizontal plane. Just before the measurement was taken, the participant was asked to take a deep breath and hold it while maintaining an erect posture. The sliding headpiece was then lowered upon the highest point of the head with adequate pressure to compress the hair of the participant. Subsequently the sliding headpiece was locked in place and the reading was taken. Height was measured to three decimal points to the nearest millimetre. Two readings were taken and the mean recorded. A third reading was taken if there was a significant difference between the two measurements, after which the mean of the two closest measurements were taken (ISAK 2015).

BMI was then calculated for each participant, after measuring weight (in kilograms) and height (in meters). Calculations was done by the weight in kilograms divided by the square of the height in metres (kg/m^2) and the weight status classified by using the index of weight-for-height following below in table 3.1 (WHO 2015; WHO 2004).

TABLE 3.1 THE INTERNATIONAL CLASSIFICATION OF BMI FOR UNDERWEIGHT, OVERWEIGHT AND OBESE ADULTS

Classification	**BMI (kg/m^2) cut-off points**
Underweight	<18.50
Normal range	18.50 – 24.99
Overweight	25.0 – 29.99
Obese	≥30.00

Adapted from: WHO 2015, 2004

3.5.2 SCOFF Questionnaire

The SCOFF (Sick, Control, One stone, Fat, Food) questionnaire (see *Appendix B* page xiii) that consists of five questions which was used in this study to screen for EDs. It was effective as a screening instrument for detecting EDs among university women in the US (Rueda et al. 2005; Morgan et al. 1999). Its advantages are that it is simple and easy to apply and score, as it was

designed to assess eating behaviour, and the possible risk an individual has of developing an ED (Morgan et al. 1999).

Question one (S = Sick) determines if a person makes themselves sick, to the point of vomiting, because they are feeling uncomfortably full. The latter can then also be used as an indication of the development of the ED BN. Question two (C = Control) gives an indication if a person can lose control over how much they eat, thus resulting in binge eating. Question three (O = One stone = 14 pounds = 6.35kg) can give an indication if a person has recently, within the past three months of answering the questionnaire, lost more than 6.35kg whether done intentionally or unintentionally. Question Four (F = Fat) investigates if a person believes that they are fat, even when others say that they are thin, which can be seen as perceived body image. Question five (F = Food) gives an indication if food can dominate an individual's life. These five questions in the questionnaire were developed to address the core features of AN and BN, calculated by allocating one point for every "yes", as a score of ≥2 indicates a likely case of AN or BN (Morgan et al. 1999).

For the SCOFF questionnaire, further research is required to determine validity and reliability when administered to the general population, for those at risk of developing EDs. However, there is sufficient evidence of its validity for routine use in all patients considered to be at risk of developing EDs (Morgan et al. 1999). The Spanish version of the SCOFF questionnaire shows excellent psychometric properties for the early detection of EDs in primary care settings (Garcia-Campayo, Sanz-Carrillo, Ibaňez, Lou, Solano, Alda 2005). Results generated by the SCOFF questionnaire were used to determine possible interventions for the symptoms such as dieting, early onset of menarche, being overweight or obese, or suffering from constipation, to prevent the development of disordered eating behaviours among Israeli adolescent girls (Kaluski, Natamba, Goldsmith, Shimony, Berry 2008). The main conclusion by Botella, Sepulveda, Huiling, Gambara (2013) was that the five questions of the SCOFF questionnaire is a useful screening tool, which can be used in several languages and highly recommended for screening purposes.

3.5.3 Eating Attitudes Test-26 (EAT-26)

The EAT-26 questionnaire (see *Appendix C* page xiv) determines the prevalence of EDs and was developed as a screening tool for the diagnosis of eating attitudes characteristic of AN or

disordered eating attitudes (Garner et al. 1982). However, the questionnaire was not designed to make a diagnosis of an ED or to take the place of a professional diagnosis or consultation (Garner et al. 1983). It consists of 26 statements which an individual must rate on a frequency scale with a score of more than 20 indicating the possibility of an eating disorder (Kiziltan et al. 2008; Mintz, O'Halloran 2000; Garner et al. 1979). The statements are categorised as 'always', 'usually', 'often', 'some times', 'rarely', 'never' and then scored accordingly (Garner et al. 1979).

The EAT-26 questionnaire also consist of four behavioural questions (EAT A, EAT B, EAT C, EAT D), to assist in determining eating behaviour over the past 6 months prior to answering the questionnaire. The EAT A behavioural question investigates eating binges, indicating not being able to stop eating and eating more than most people under similiar circumstances. The EAT B behavioural question investigates whether a person has made themselves sick (vomiting) to change their weight; thus in the long term it can be viewed as being indicative of developing BN. The EAT C behavioural questions investigates if a person has used laxatives, diet pills or diuretics to assist in controlling their weight. The EAT D behavioural question investigates whether the person has ever been treated for an eating disorder within the past 6 months, at the time of answering the quesionnaire (Garner et al. 1982).

3.5.4 Three Factor Eating Questionnaire (TFEQ)

The TFEQ (see *Appendix D* page xv) is a validated questionnaire used to assess eating attitude and used to assess cognitive eating restraint, disinhibition of eating and perceived hunger. The questionnaire consists of 51 items arranged into three dimensions of eating behaviour which includes: 1) cognitive eating restraint (21 items); 2) disinhibition of eating (16 items); and 3) perceived hunger (14 items) and can be used to study individuals as well as to detect differences in group eating behaviour (Anglé et al. 2009; Bond et al. 2001; Karlsson et al. 2000), such as university students.

Cognitive eating restraint reflects the extent to which food intake is cognitively restricted (by thought and will power in order to control body shape and weight). Disinhibition reflects the extent of the inability to control food intake in response to the presence of palatable food which may result in over-consumption. Other disinhibiting stimuli such as emotional stress or social

eating cues may contribute to the inability to resist food intake when not hungry. Perceived hunger is to have the realization of being hungry and having food cravings (Karlsson et al. 2000; Stunkard et al. 1984).

Higher scores denotes higher levels of restrained eating, disinhibited eating and predisposition to hunger, respectively (Bond et al. 2001). According to Bellisle et al. (2004) and Provencher et al. (2003) the results generated by the TFEQ were a frequent feature of treatment-seeking individuals, especially for weight management interventions, and seen as a possible indicator of impaired eating behaviour.

3.6 Data collection procedures

The participants had to complete open ended, self-administered questionnaires (which included the SCOFF- (Morgan et al. 1999), EAT-26 questionnaire and TFEQ (Bond et al. 2001; Karlsson et al. 2000; Garner et al. 1979), to determine the presence of an ED and eating behaviour. Subsequently weight and height was measured by trained fieldworkers according to standard ISAK techniques to calculate the BMI of the participants (ISAK 2015; WHO 2004). The measurements were done twice and the mean recorded. A third reading was taken if there was a significant difference between the first two measurements, after which the mean of the two closest measurements were determined. Weight was measured to one decimal place and recorded in kilograms, while height was measured to three decimal points to the nearest millimetre and recorded in meters. Anthropometric measurements were deliberately taken after the completion of the self-administered questionnaires to prevent participant's weight from influencing their responses to the questionnaires.

3.7 Statistical Analyses

The BMI of participants was calculated and the responses to the questionnaires of all participants were entered into a Microsoft database (©MS Excel 2010) by means of double data entry. A unique identification number for each participant was used to ensure anonymity. The data of the

Excell spreadsheet was transferred onto a Statistical Package for Social Science (SPSS) version 21 (2012) spreadsheet for analysis. The p-value for statistical significance was set at $p < 0.05$.

Descriptive statistics, independent samples t-tests and chi-square tests were performed to facilitate comparison between the different participant groups (first-, third- and fourth year dietetic students and first year non-dietetic students) as well as the responses to the different questionnaires (SCOFF, EAT-26 questionnaire, TFEQ). Descriptive statistics were conducted to determine the following information about a data set: points of central tendency, amount of variation, and the extent to which different variables are related to one another (Leedy et al. 2010). Descriptive statistics were presented as means and standard deviation (SD) for continuous variables. The study objectives, corresponding variables and statistical analyses used in the study is summarized in table 3.2 below.

In addition, correlations were done between subscales of the EAT 26 and SCOFF questionaires in order to determine whether they had similar predictive positive values for identifying certain subscores of EDs. Sensitivity, specificity and predictive positive value of both questionnnaires were also calculated to determine which subscales of the two questionnaires were more sensitive in the identification of an ED.

TABLE 3.2 STUDY OBJECTIVES AND CORRESPONDING VARIABLES USED FOR STATISTICAL ANALYSES

OBJECTIVES	CORRESPONDING VARIABLES	STATISTICAL ANALYSES
1. To determine and compare the BMI of dietetic- versus non-dietetic female undergraduate students.	BMI – weight and Height	Descriptive statistics eg. means, SD, frequency distribution. Independent samples t-test.
2. To determine and compare the eating behaviour of dietetic- versus non-dietetic female undergraduate students by means of the SCOFF- and EAT-26 questionnaires.	SCOFF related variables EAT-26 related variables	Descriptive statistics Chi-square tests
3. To determine and compare the eating attitude of dietetic- versus non-dietetic female undergraduate students by means of the TFEQ.	TFEQ variables	Descriptive statistics Chi-square tests
4. To determine and compare wheter the SCOFF- or EAT-26 questionnaire was more sensitive in identifying EDs among female undergraduate students at a South African university.	SCOFF related variables EAT-26 related variables	Descriptive statistics Chi-square tests

3.8 Data quality control

3.8.1 Reliability

Reliability is the consistency with which a measuring instrument yields a certain result when the entity being measured is the same, thus the same questionnaire being repeatedly used for various subjects for the same measuring result. Reliability can take different forms, all depending on the research problem of the study, the methodology used for the research problem and the nature of the data collected (Leedy et al. 2010).

To enhance the reliability of the study data, the mean value of height and weight was recorded to calculate the BMI of the study participants. In addition, reliability was ensured through the training of the fieldworkers on the process of data collection and taking anthropometric measurements.

3.8.2 Validity

The validity of a measurement instrument (questionnaires in this study) is the extent to which the instrument measures what it is intented to measure, in this case the eating behaviour and eating attitudes of female undergraduate students. Even if the interpersonal dynamics within the study population have remained constant, measurements can only be conducted accurately when the measure is done consistently. However, measuring something consistently does not mean that it was measured accurately. Thus reliability is necessary but an insufficient condition for validity. Both validity and reliability reflect the degree to which there may be error in measurements (Leedy et al. 2010).

3.8.3 Reduction of bias

A measuring instrument can allow measurement of a characteristic indirectly, allowing a variety of biasing factors (e.g. people's responses on a rating scale measuring instrument can be influenced by interpretations, prejudices, memory lapses, etc.). This can lead to error due to the imperfect validity of the measurement instrument. In contrast, reliability errors reflect the use of the meauring instrument and can vary unpredictably from one occasion to the next (Leedy et al. 2010).

To reduce the study bias, the anthropometric measurements were only taken after the completion of the study questionnaires as the researcher tried to eliminate the possibility that if participants knew their weight status, it would influence their responses to the survey questionnaires. Finally the results were checked by the investigator before being sent for analysis and re-checked by the statistical supervisor before analysis. The methods used in this study were concurrent with the methods needed to assume that reliability and validity were achieved and maintained throughout this research study.

3.9 Ethics approval

Ethics approval for this study was obtained from the Humanities and Social Science Research Ethics Committee (Protocol Reference Number: HSS/0289/012M) (see *Appendix E*) of the University of KwaZulu-Natal. Participants signed an informed consent form after they were informed of the nature and scope of the study, that their participation was voluntary, that they could exit from the study at any time without any negative consequences and that their anonymity in reporting the study findings will be ensured. All the questionnaires will be stored in a secure place at Dietetics and Human Nutrition, School of Agricultural, Earth and Environmental Sciences, Pietermaritzburg campus, UKZN, for a period of five years after the completion of the study. After the five year period has lapsed, questionnaires will be shredded and disposed of.

3.10 Conclusion

A cross-sectional descriptive survey was conducted to determine and compare the difference in BMI, eating behaviour and eating attitude in dietetic- and non-dietetic female undergraduate students attending the Pietermaritzburg campus, UKZN. The study population (N = 145) included female undergraduate students studying dietetics-, as well as law, psychology, drama and biochemistry as study majors. The SCOFF- , EAT-26 questionnaire and TFEQ were used for data collection. Subject's weight and height was measured by trained fieldworkers in order to calculate BMI. Reliability and validity was ensured throughout the study and the data analysed using SPSS. Ethics approval was obtained from the Humanities and Social Sciences Ethics Research Committee at UKZN.

In chapter four, the study results will be presented in accordance with the study objectives that were presented in chapter one.

CHAPTER 4

RESULTS OF THE STUDY

4.1 Introduction

Chapter four presents the results of this study in accordance with the study objectives presented in chapter one. The four study objectives were formulated in order to achieve the study aim, namely to determine whether there is a significant difference in BMI, eating behaviour and eating attitude of dietetic- versus non-dietetic female undergraduate students.

4.2 Socio-demographic characteristics of the study sample

Socio-demographic characteristics of the study sample (N = 145) included age, study major and year of study. The mean age of the study sample was 19.3 ± 3.8 years. This included 83 first year non-dietetic students from four different study majors (57.2% of the study sample), while dietetic students (n = 62) comprised 42.8% of the study sample. The group of dietetic students consisted of 24 first year (16.6% of the study sample and 38.7% of the dietetic student group), 20 third year- (13.8% of the study sample and 32.3% of the dietetic student group) and 18 fourth year female dietetic students (12.4% of the study sample and 29.0% of the dietetic student group). The pooled sample of third- and fouth year dietetic students, represented 26.2% of the study sample and 61.3% of the dietetic student group.

The BMI and ages were compared between first year dietetic- and first year non-dietetic students (see Table 4.1 following). In addition, first year dietetic students were compared to a pooled sample of third- and fourth year dietetic students.

TABLE 4.1 BMI AND AGES OF 1ST-, 3RD- AND 4TH YEAR DIETETIC STUDENTS AND 1ST YEAR NON-DIETETIC STUDENTS

N = 145	1st Year Dietetic Students n = 24		3rd and 4th Year Dietetic Students n = 38		1st Year Non-Dietetic Students n = 83	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Age (years)	19.5*	1.8	21.4*#	4.0	19.0#	1.4
Weight (kg)	58.6*	11.9	59.3#	15.4	63.5*#	13.9
Height (m)	1.59*	0.08	1.57	0.27	1.65*	0.34
BMI (kg/m^2)	23.2*	4.3	23.2#	3.7	24.2*#	5.3

***#:** *variables with the same symbol differ significantly between years of study for the same variable (independent t-test: p< 0.05)*

There was a significant difference between the age of the study sub samples (Table 4.1). A significant difference was measured between the age of both the first year non-dietetic (19.0 ± 1.4 years) and first year dietetic (19.5 ± 1.8 years) students when compared to a pooled sample of third- and fourth year dietetic students (21.4 ± 4.0 years).

The mean height of the first year dietetic students (1.59 ± 0.08 m) was significantly lower when compared to first year non-dietetic students (1.65 ± 0.34m), while there was not a significant difference when height was compared to a pooled sample of third- and fourth year dietetic students (1.57 ± 0.27 m).

There was a significant difference between the weight of both the first year non-dietetic students (63.5 ± 13.9 kg) and a pooled sample of third- and fourth year dietetic students (59.0 ± 14.1 kg), when compared to that of the first year dietetic students (58.6 ± 11.9 kg). A comparison of BMI between the student subsets of the study sample, followed a similar pattern.

4.3 BMI compared to eating behaviour of dietetic- and non-dietetic students

The eating behaviour of the entire study sample (N = 144) of dietetic- and non-dietetic students were compared to the BMI and age in Table 4.2 below. Eating behaviour was presented as normal (n = 116) or as ED behaviour (n = 28). Eating behaviour was also presented based on the results generated by the SCOFF questionnaire and the EatScore questions of the EAT-26 questionnaire to

distinguish between the prevalence of normal eating behaviour and the presence of an ED among the study sample.

TABLE 4.2 PREVALENCE OF NORMAL VERSUS EATING DISORDERS AMONG THE STUDY SAMPLE BY COMPARING AGE, BMI, SCOFF AND EATSCORE OF STUDY SAMPLE (N = 144)

Study variables	Normal n = 116		Eating Disorder (ED) n = 28		p-value
	Mean	**SD**	**Mean**	**SD**	
Age	19.9	2.2	19.6	1.5	NS
Weight	62.3	13.1	58.9	17.6	NS
Height	1.63	0.29	1.56	0.32	NS
BMI	23.9	5.0	23.2	3.7	NS
SCOFF	1.40#	1.06	2.25#	1.11	p<0.05
EatScore**	7.38*	5.05	28.32*	7.40	p<0.05

**# variables with the same symbol differ significantly between normal and ED of the SCOFF questionnaire and EatScore answers for the same variable (independent t-test: p<0.05), eventhough it is variable*
NS – Non-Significance
** The first 26 questions of the EAT-26 questionnaire

There was not a statistically significant difference between the means for age (19.9 ± 2.2 years and 19.6 ± 1.5 years), weight (62.3 ± 13.1 kg and 58.9 ± 17.6 kg), height (1.63 ± 0.29 m and 1.56 ± 0.32 m) or BMI (23.9 ± 5.0 kg/m^2 and 23.2 ± 3.7 kg/m^2) of the study sample, irrespective of whether they were diagnosed as having normal eating behaviour or classified as having an ED (Table 4.2). However, there was a significant difference ($p < 0.05$) between the means of the SCOFF questionnaire and the EatScore questions of the EAT-26 questionnaire (1.40 ± 1.06 and 2.25 ± 1.11; 7.38 ± 5.05 and 28.32 ± 7.40, respectively) of the study sample when those with normal eating behaviour were compared to those with eating disordered behaviour.

4.4 Comparison of the SCOFF- and EAT-26 questionnaires of dietetic and non-dietetic students

In Table 4.3 the results generated by the SCOFF and EATScore across years of study are presented. The SCOFF questionnaire and EatScore questions (first 26 questions of the EAT-26 questionnaire) were compared for first- (n = 24), third- and fourth year (n = 38) dietetic students, as well as first year non-dietetic students (n = 83).

TABLE 4.3 SCOFF AND EATSCORE RESULTS OF 1ST-, 3RD- AND 4TH YEAR DIETETIC STUDENTS AND 1ST YEAR NON-DIETETIC STUDENTS (N=144)

Study Variables	1st Year Dietetic Students n = 24		3rd and 4th Year Dietetic Students n = 38		1st Year Non-Dietetic Students n = 83	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
SCOFF	1.63	1.01	1.42	1.11	1.68	1.12
EatScore**	14.54	12.18	11.21	10.26	10.66	9.10

** variables with the same symbol differ significantly between years of study for the same variable (independent t-test: p<0.05);* ** The first 26 questions of the EAT-26 questionnaire

There was no significant difference (see Table 4.3 above) between the mean scores of the SCOFF questionnaire and EatScore questions for the first- (1.63 ±1.01 and 14.54 ± 12.18, respectively), third- and fourth year dietetic- (1.42 ± 1.11 and 11.21 ± 10.26, respectively) and first year non-dietetic students (1.68 ± 1.12 and 10.66 ± 9.10, respectively).

4.5 Correlation of responses of EAT-26 questionnaire

The EAT-26 questionnaire consist of 26 questions collectively known as the EatScore, followed by four eating behavioural questions (EAT A, EAT B, EAT C, EAT D), used for the screening of an existing ED. Table 4.4 is used to report the relationship between the responses of the EatScore and the EAT behavioural questions of the EAT-26 questionnaire. All of the EAT groups showed a correlation with the overall EatScore, which mainly serves as a tool for measuring internal validity of the method itself.

TABLE 4.4 THE EATSCORE COMPARED TO THE EAT BEHAVIOURAL QUESTIONS OF THE EAT-26 QUESTIONNAIRE (N = 144)

Variables		r value	Significance*
EatScore	**EAT A**	0.24	0.004
	EAT B	0.44	0.000
	EAT C	0.37	0.000
	EAT D	0.25	0.003

*Pearson correlation at p <0.05 accepted as significant

In the current study, the EAT-26 questionnaire (first 26 questions) showed a significant correlation when their relationship was compared to that of the four eating behavioural questions (EAT A, EAT B, EAT C, EAT D) (forming part of the EAT-26 questionnnaire), that are used to screen for an existing ED.

4.6 Correlation of eating behaviour response (EAT-26) and the SCOFF questionnaire

The first 26 questions of the EAT-26 questionnaire is known as the EatScore, followed by four eating behavioural questions (EAT A, EAT B, EAT C, EAT D). The SCOFF questionnaire consists of five questions (SCOFF 1, SCOFF 2, SCOFF 3, SCOFF 4, SCOFF 5). Due to the significant correlation between the EatScore and eating behavioural questions of the EAT-26 (as was illustrated in Table 4.4), the relationship between the behavioural questions of the EAT-26 and SCOFF was investigated (see table 4.5) to determine whether the relationship between the two was significant for the study sample as a whole (N = 144).

TABLE 4.5 THE EATSCORE OF THE EAT-26 COMPARED TO THE SCOFF QUESTIONNAIRE, AND THE SCOFF QUESTIONNAIRE COMPARED TO THE EATSCORE AND BEHAVIOURAL QUESTIONS OF THE EAT-26 (N = 144)

Variables		r value	Significance*
EatScore	**SCOFF (all five questions)**	0.39	0.000
	SCOFF 1	0.23	0.006
	SCOFF 2	0.33	0.000
	SCOFF 4	0.29	0.000
SCOFF	**EatScore (all 26 questions)**	0.39	0.000
	EAT A[!]	0.24	0.004
	EAT B[!]	0.33	0.000
	EAT C[!]	0.20	0.020

*Pearson correlation at $p<0.05$ accepted as significant

From Table 4.5 it is evident that there was a significant correlation when the overall EatScore was compared to the SCOFF and its certain individual components (SCOFF 1, 2 and 4). A highly significant correlation was found between the overall SCOFF when compared to the EatScore and certain individual components (EAT A, B and C).

4.7 Frequency distribution of answers related to the SCOFF and eating behaviour questions of the EAT-26

The frequency of responses (yes or no) for the eating behaviour questionnaires (SCOFF- and eating behaviour questions of the EAT-26 questionnaire) are presented in Table 4.6 below. The behavioural questions (EAT A, EAT B, EAT C, EAT D) of the EAT-26 questionnaire were compared to the results of the SCOFF questionnaire. The responses of the study sample (N = 144), which included first- (n = 24), third- and fourth year dietetic students (n = 38) and first year non-dietetic students (n = 83), were then compared.

TABLE 4.6 COMPARISON OF SCOFF- AND EAT-26 QUESTIONNAIRE FOR 1ST-, 3RD- AND 4TH YEAR DIETETIC STUDENTS AND 1ST YEAR NON-DIETETIC STUDENTS

Eating Behaviour	**1st Year Dietetic Students n = 24**		**3rd and 4th Year Dietetic Students n = 38**		**1st Year Non-Dietetic Students n = 83**	
N = 144	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
SCOFF 1 *Make yourself sick(vomit)/ Bulimia Nervosa*	1 (4.2%)*#	23 (95.8%)	1 (2.6%)*	37 (97.4%)	9 (11%)#	73 (89%)
SCOFF 2 *Lost control over eating/ Binge Eating*	15 (62.5%)*#	9 (37.5%)	16 (42.1%)*	22 (57.9%)	44 (53.7%)#	38 (46.3%)
SCOFF 3 *Lost more than one stone (15 pound / 6.35kg)*	3 (12.5%)*	21 (87.5%)	2 (5.3%)*#	36 (94.7%)	17 (20.7%)#	65 (79.3%)
SCOFF 4 *Believe yourself to be fat*	10 (41.7%)	14 (58.3%)	17 (44.7%)	21 (55.3%)	41 (50%)	41 (50%)
SCOFF 5 *Food dominates your life*	10 (41.7%)	14 (58.3%)	13 (34.2%)	25 (65.8%)	25 (30.5%)	57 (69.5%)
EAT A** *Binge eating*	3 (12.5%)*#	21 (87.5%)	10 (26.3%)*	28 (73.7%)	19 (22.9%)#	63 (75.9%)
EAT B** *Make yourself sick(vomit) Bulimia Nervosa*	1 (4.2%)*	23 (95.8%)	6 (15.8%)*	32 (84.2%)	3 (3.6%)	79 (95.2%)
EAT C** *Laxatives, diet pills, diuretics*	4 (16.7%)*	20 (83.3%)	5 (13.2%)	33 (86.8%)	6 (7.2%)*	76 (91.6%)
EAT D** *Treated for Eating Disorder previously*	2 (8.3%)	22 (91.7%)	2 (5.3%)	36 (94.7%)	3 (3.6%)	78 (94%)

** The behavioural questions of the EAT-26 questionnaire

*X^2 (chi-square) $p < 0.05$ was accepted as significant; *,#: differ significantly between groups within the same variable*

SCOFF 1 (making yourself vomit) was higher for first year non-dietetic students (11%) compared to first- (4.2%) and the pooled sampe of third- and fourth year dietetic students (2.6%). However, more first year dietetic students (62.5%) than first year non-dietetic students (53.7%) admitted to binge eating (SCOFF 2), while only 42.1% of the pooled sample of third- and fourth year dietetic students admitting to engaging in this practice. A weight loss of more than 6.35kg (one stone) over the past six months (SCOFF 3) was reported by 20.7% of first year non-dietetic students, followed by 12.5% of the first year dietetic students and only 5.3% of the pooled sample of third- and fourth year dietetic students. A half of first year non-dietetic students, followed by 44.7% of third- and fourth year dietetic students and 41.7% of first year dietetic students believed themselves to be fat (SCOFF 4). These percentages however, did not differ statistically significantly between the three groups. SCOFF 5, namely that food dominates your life, was reported by 41.7% of first year dietetic students, followed by 34.2% of the pooled sample of third- and fourth year dietetic students and 30.5% of first year non-dietetic students.

Although not always denoted by a statistically significant difference, for SCOFF 1 to SCOFF 5, the trend was that more first year dietetic students reported to binge eat and admitted to food dominating their lives. In contrast, more first year non-dietetic students reported to induce vomiting, have lost more than 6.35kg over the past six months and believed themselves to be fat. Therefore the largest number of affirmative responses generated by SCOFF 1 to SCOFF 5, were either first year dietetic- or first year non-dietetic students.

Binge eating (EAT A), was reported by 26.3% of the pooled sample of third- and fourth year dietetic students, followed by 22.9% of non-dietetic first years and 12.5% of first year dietetic students. In response to EAT B, 15.8% of the pooled sample of third- and fourth year dietetic students reported to induce vomiting in order to lose weight, followed by 4.2% dietetic first years and 3.6% non-dietetic first years. These differences however, were not statistically significant due to the small sample sizes. In contrast, 16.7% of first year dietetic students, followed by 13.2% third and fourth year dietetic students and 7.2% first year non-dietetic students had previously used laxatives or diet pills to facilitate weight loss (EAT C). When it came to having previously received treatment for an eating disorder (EAT D), 8.3% of the first year- and 5.3% of combined sample of third- and fourth

year dietetic students, responded affirmative to this question, whereas 3.6% first year non-dietetic students met this criterium.

Although the differences between study sample groups were not always statistically significant, within groups the majority of the pooled sample of third and fourth year dietetic students indicated that they engaged in binge eating (EAT A) and induced vomiting (EAT B), while the majority of first year dietetic students used laxatives, diet pills and diuretics (EAT C) and were previously treated for an eating disorder (EAT D). Therefore the largest number of affirmative responses generated by EAT A to EAT D, were either first year dietetic- or a pooled sample of third and fourth year dietetic students.

4.8 Specificity and sensitivity for diagnosing eating behaviour by means of the SCOFF- and EAT-26 questionnaire

For each of the questions forming part of the SCOFF and EAT-26 questionnaires, the specificity and sensitivity for successfully identifying the presence of an eating disorder is reported in Table 4.7. Sensitivity refers to the ability of a diagnostic or screening test to successfully diagnose those with the disease as having the disease, whereas specificity is the extent to which a diagnostic test measures those without the disease as having the disease (Leedy, Ormrod 2010). In the current study (see Table 4.7), a significant difference was measured in sensitivity, specificity, and positive predictive value of the different screening tools. The specificity of identifying the presence of an eating disorder was higher for SCOFF 1 (making yourself vomit) (95.1%). However, the scores for EAT B (making yourself vomit) (97.5%) and EAT D (treated for an eating disorder) (97.5%), was slightly higher and followed by EAT C (using laxatives, diet pills and diuretics) (95.1%). In terms of sensitivity, SCOFF 3 (weight loss of more than 6.35kg) and EAT D (being treated for an eating disorder) was highest at 87.5%.

The predictive positive value (PPV) was the highest for EAT B (making yourself vomit) (90.3%) and EAT D (previously treated for an eating disorder) (90.3%), followed by SCOFF 1 (making yourself vomit) (82.4%) and EAT C (using laxatives, diet pills and diuretics) (82.4%). A highly significant difference ($p = 0.000$) was found for no eating disorder compared to having an eating disorder for

SCOFF 2, EAT B and EAT C, while a significant difference ($p < 0.05$) was documented for SCOFF 1, SCOFF 4 and EAT D.

TABLE 4.7 COMPARISON OF THE SENSITIVITY AND SPECIIFICITY BETWEEN THE SCOFF- AND EAT-26 QUESTIONNAIRES

Eating Behaviour	No eating disorder n = 116		Specificity (%)	Eating disorder (ED) n = 28		Sensitivity (%)	PPV	p-value
N = 144	**Yes**	**No**		**Yes**	**No**			
SCOFF 1 *Make yourself sick (vomit) / Bulimia Nervosa*	$6^{!}$ (5.2%)	$110^{\$}$ (94.8%)	95.1% (0.95)	$5^{!}$ (17.9%)	$23^{\$}$ (82.1%)	84.8% (0.85)	82.4% (0.82)	*Sd*
SCOFF 2 *Lost control over eating / Binge Eating*	53* (45.7%)	$63^{\#}$ (54.3%)	68.6% (0.69)	22* (78.6%)	$6^{\#}$ (21.4%)	56% (0.56)	34.6% (0.35)	*HSd*
SCOFF 3 *Lost more than one stone(15 pounds/6.35kg)*	18 (15.5%)	98 (84.5%)	86.6% (0.87)	4 (14.3%)	24 (85.7%)	87.5% (0.88)	60.9% (0.61)	*NS*
SCOFF 4 *Believe yourself to be fat*	$48^{!}$ (41.4%)	$68^{\$}$ (58.6%)	70.7% (0.71)	$20^{!}$ (71.4%)	$8^{\$}$ (28.6%)	58.3% (0.58)	36.8% (0.37)	*Sd*
SCOFF 5 *Food dominates your life*	36 (31%)	80 (69%)	76.3% (0.76)	12 (42.9%)	16 (57.1%)	70% (0.7)	43.8% (0.44)	*NS*
EAT A** *Binge eating*	24 (20.7%)	92 (79.3%)	82.9% (0.83)	8 (28.6%)	20 (71.4%)	77.8% (0.78)	53.8% (0.54)	*NS*
EAT B** *Make yourself sick (vomit) / Bulimia Nervosa*	3* (2.6%)	$113^{\#}$ (97.4%)	97.5% (0.97)	7* (25%)	$21^{\#}$ (75%)	80% (0.8)	90.3% (0.90)	*HSd*
EAT C** *Laxatives, diet pills, diuretics*	6* (5.2%)	$110^{\#}$ (94.8%)	95.1% (0.95)	9* (32.1%)	$19^{\#}$ (67.9%)	75.7% (0.76)	82.4% (0.82)	*HSd*
EAT D** *Treated for Eating Disorder previously*	$3^{!}$ (2.6%)	$112^{\$}$ (96.6%)	97.5% (0.97)	$4^{!}$ (14.3%)	$24^{\$}$ (85.7%)	87.5% (0.88)	90.3% (0.90)	*Sd*

** The behavioural questions of the EAT-26 questionnaire; PPV – Predictive Positive Value; *#!$ *presents* X^2 *(chi-square) with* p *< 0.05 considered significant; NS – Non-Significant*; *Sd – Significant difference; HSd – (p = 0.000)*

The predictive positive value (PPV) was the highest for EAT B (making yourself vomit) (90.3%) and EAT D (previously treated for an eating disorder) (90.3%), followed by SCOFF 1 (making yourself vomit) (82.4%) and EAT C (using laxatives, diet pills and diuretics) (82.4%). However, it should be remembered that the number of particpants responding in the affirmative for sensitivity was very low and ranged from three to six. A highly significant difference ($p = 0.000$) was found for no eating disorder compared to having an eating disorder for SCOFF 2, EAT B and EAT C , while a significant difference ($p < 0.05$) was documented for SCOFF 1, SCOFF 4 and EAT D.

4.10 Prevalence of the subscales of eating attitude according to the TFEQ

The responses to the TFEQ (N=145) broken down into the subscales of dietary restraint, disinhibition of eating and perceived hunger is reported in table 4.9 following.

TABLE 4.8 PREVALENCE OF RESPONSES TOWARDS SUBSCALES OF EATING ATTITUDE ACCORDING TO THE TFEQ

TFEQ N = 145	1st Year Dietetic Students n = 24		3rd and 4th Year Dietetic Students n = 38		1st Year Non-Dietetic Students n = 83	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
TFEQ – RESTRAINT	11.29*	5.0	9.71	4.99	7.40*	4.24
TFEQ – DISINHIBITION	7.17	3.03	6.60	3.72	7.01	2.71
TFEQ – HUNGER	6.04	3.50	6.60	3.20	7.24	2.99

** variables with the same symbol differ significantly between years of study for the same variable (independent samples t-test: p<0.05)*

A significant difference was measured between the subscale of dietary restraint for first year dietetic students (11.29 ± 5.0) compared to first year non-dietetic students (7.40 ± 4.24). However, this finding was not evident when compared to a pooled sample of third- and fourth year dietetic students (9.71 ± 4.99) (in table 4.9 above). For the subscale disinhibition, there was no significant difference between any of the study samples namely first year dietetic students (7.17 ± 3.03), a pooled sample of third- and fourth year dietetic students (6.60 ± 3.72) and first year non-dietetic students (7.01 ± 2.71). There was also no significant difference for the hunger subscale of the TFEQ for first year (6.04 ± 3.50), a pooled sample of third- and fourth year dietetic students (6.60 ± 3.20) and first year non-dietetic students (7.24 ± 2.99).

4.11 Conclusion

The study results provided evidence that the mean weight of first year non-dietetic students (63.5 ± 13.9 kg) was statistically higher than that of first year dietetic students (58.6 ± 11.9 kg), with a significant difference in BMI (24.2 ± 5.3 kg/m^2 versus 23.2 ± 4.3 kg/m^2) also being documented for first year dietetic versus non-dietetic students. There was a statistically significant difference (p <

0.05) for the study sample (N = 144) in terms of normal eating behaviour and the prevalence of having an ED for both the EatScore and SCOFF ($p<0.05$). In addition, there was also a highly significant correlation between the EatScore, SCOFF, as well as SCOFF 1, 2 and 4. Highly significant correlations were also found between SCOFF, EAT26 and EAT A to C. Therefore, if an abbreviated version of the SCOFF and EAT26 is compiled in order to screen for eating disorders, especially among dietetic students, SCOFF 1, 2 and 4 in combination with EAT A, B and C, would be a good, more succinct screening tool. However, when it comes to the specificity and predictive positive value of these questions, referred to above, it is evdent that SCOFF 1, 2 and 4 should indeed be included in a succinct screening tool that tests for the presence of an eating disorder due to the significant and highly significant p-value generated by their specificity. However, due to similar findings related to only EAT B, the final screening questionnaire should consist of SCOFF 1, 2 and 3, as well as EAT B. In other words, EAT A should be eliminated based on the non-significant p-value.

In addition, SCOFF 1 and EAT A assess similar concepts (inducing vomiting), while SCOFF 2 and EAT B assesses the presence of binge eating. However, the specificity of identifying the presence of an eating disorder was more evident for SCOFF 1 (95.1%), EAT B (97.4%), as well as for EAT C (95.1%) and EAT D (97.5%). The sensitivity of the eating behaviour questionnaires was higher for the SCOFF 1 (84.8%), SCOFF 3 (87.5%), EAT B (80%) and EAT D (87.5%). The positive predictive value (PPV) was the highest (90.3%) for EAT B (the possibility of Bulimia Nervosa) and EAT D (previously treated for an eating disorder).

A significant difference was also measured for the subscale of restraint according to the TFEQ for first year dietetic students (11.29 ± 5.0) compared to first year non-dietetic students (7.40 ± 4.24), but not for the pooled sample of third- and fourth year dietetic students. Yet, for the subscale of disinhibition and hunger of the TFEQ there was no significant difference between the first year-, third- and fourth year dietetic students and first year non-dietetic students.

In chapter 5, which follows, the main results from the data in chapter 4, will be discussed in comparison to relevant and comparable literature.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

Dietetics is a predominantly female profession (Worobey, Schoenfeld 1999) and the question has been posed as to whether there would be a higher prevalence of ED among dietetic students when compared to other study majors (Worobey, Schoenfeld 1999; Fredenburg et al. 1996; Johnston, Christopher 1991). Studies conducted in developed countries ath university campuses (Jones et al. 2014) indicate that body weight dissatisfaction may be higher in dietetic- than non-dietetic students, especially among females (Mahn et al. 2015; Franzia et al. 2013; Liao et al. 2013; Arroyo et al. 2010; Korinth et al. 2009; Kiziltan et al. 2008), with fewer studies having been conducted in developing countries (Kassier, Veldman 2014; White et al. 2014; Alvarenga et al. 2012). Should the prevalence of ED be higher among dietetic majors and practicing dietitians, it could have a negative impact on the professional conduct of a dietitian (Lordly 2007). Hence, it would be prudent for the diagnosis of an ED during the selection process of prospective dietetic students to facilitate intervention and support while they undergo training. In the current study, the data of dietetic- versus non-dietetic students were collected to gain insight into the prevalence of disordered eating and EDs among dietetic versus non-dietetic majors enrolled for study at the Pietermaritzburg campus of UKZN, South Africa.

The aim of this study was to determine whether there was a difference in BMI, eating behaviour and the prevalence of EDs according to the SCOFF- and EAT-26 questionnaires, in addition to eating attitude as determined by the TFEQ, of dietetic- versus non-dietetic female undergraduate students. In Chapter 4, results regarding BMI, eating behaviour and eating attitude of first- and a pooled sample of third- and fourth year dietetic students as well as first year non-dietetic students were reported. The results of the study will be discussed in this chapter, in relation to the objectives stated in chapter 1 and the literature presented in chapter 2.

5.2 Significant findings in relation to the study objectives stated

5.2.1 To determine and compare the BMI of dietetic- versus non-dietetic female undergraduate students

While the students in a Spanish study sample reported a normal BMI (Arroyo et al. 2010) and a study in China determined the BMI of males and females (Liao et al. 2013), this study only investigated the BMI of female undergraduate students, whom formed part of the selected study population. Findings were that regarding the BMI of first year dietetic- and non-dietetic students, there was a statistically significant difference. Dietetic students (first- year dietetics students and a pooled sample of third- and fourth year dietetic students) had a normal mean BMI of 23.2 ± 4.3 kg/m^2 and 23.2 ± 3.7 kg/m^2 respectively. The first year non-dietetic students also had a normal mean BMI of 24.2 ± 5.3 kg/m^2, but this was closer to the range of being overweight.

5.2.2 To determine and compare the eating behaviour of dietetic- versus non-dietetic female undergraduate students by means of the SCOFF- and EAT-26 questionnaires

Eating behaviour is referred to in the description of key features (divided into primary feature, severity and duration, associated features of EDs and the subtype classifications of EDs) of the diagnosis of EDs (BED, AN, BN, AFRID, OSFED), according to table 2.2 (American Psychiatric Association 2013; Call et al. 2013) and can be measured by using the SCOFF- (Morgan et al. 1999) and EAT-26 questionnaire (Garner et al. 1979). There has also been an increase in the prevalence of EDs, which made the use of measuring instruments necessary for early detection of EDs (Rueda et al. 2005), especially in young women (Morgan et al. 1999).

According to the findings of the SCOFF questionnaire (Morgan et al. 1999), there was a higher prevalence of first year non-dietetic students with the possible diagnosis of BN (making themselves vomit to assist in weight loss), having significant weight loss over the past six months and believing themselves to be fat, than first year dietetic students. BN can be characterized by frequent

episodes of binge eating, followed by different inappropriate behaviours including self-induced vomiting to avoid weight gain, which can be exhibited at least once a week (De Zwaan et al. 2011).

When the responses to the SCOFF questionnaire was compared to first year non-dietetic students, first year dietetic students reported a higher prevalence for having lost control over eating, which can be indicative of binge eating and indiated that food dominated their lives. Binge eaters usually suffer from high standards and expectations, and when they fall short of these standards which they perceive as demands of others, they are motivated by a desire or attitude to escape from self-awareness and self–regulation by adjusting their eating behaviour (Heatherton et al. 1991). When comparing the responses of the first year dietetic to the pooled sample of third and fourth year dietetic students for responses to the SCOFF questionnaire, the geneneral trend was that there was a decrease in the prevalence of vomiting, losing control over eating, having lost more than 6.35kg and food dominating their lives. However, there was an increase, although not statistically significant, among older dietitians believing themselves to be fat. AN can mostly affect young women, but not exclusively, when restricting their kilojoule intake and also characterised by a distorted body image when excessive dieting can lead to severe weight loss (American Psychiatric Association 2013; Mitan 2004).

Findings generated by the EAT-26 questionnaire behavioural questions (Garner et al. 1979), indicated that for the EAT A, first year dietetic students had a lower prevalence of binge eating when compared the pooled sample of more senior dietetic students as well as first year non-dietetic students. This differed significantly when first year dietetic students were compared to their more senior counterparts, as well as when compared to first year non-dietetic students. Binge eating or BED is associated with an increased frequency of weight fluctation, depression, perceived barriers to weight loss, anxiety, emotional distress and substance abuse in individuals and students (American Psychiatric Association 2013; Swanson et al. 2011; Heatherton, Baumeister 1991). Third and fourth year dietetic students also had a higher prevalence for EAT B (making yourself sick) when compared to the other two groups. However, when it came to EAT C (using laxatives, pills and diuretics) and EAT D (having previously been treated for an eating disorder), first year dietetic students had the highest score. For EAT C, the difference between first year dietetic versus non-

dietetic students was statistically significant. However, the differences between the groups were not statistically significant for EAT D.

No significant difference were documented between the mean scores of the SCOFF questionnaire and EatScore questions of the EAT-26 questionnaire for the first-, pooled sample of third- and fourth year dietetic- as well as the first year non-dietetic students.

A significant difference was found when the EatScore questions of the EAT-26 questionnaire were compared to the possibility of making yourself sick to loose weight (SCOFF 1 question), and with a highly significant difference when compared to the SCOFF questionnaire (SCOFF 1, SCOFF 2, SCOFF 3, SCOFF 4, SCOFF 5 combined), as well as to loose control over eating (SCOFF 2 question) and to believe yourself to be fat (SCOFF 4 question).

5.2.3 To determine and compare the eating attitude of dietetic- versus non-dietetic female undergraduate students by means of the TFEQ

Eating attitude can be defined as beliefs, thoughts, feelings and the relationship with food, which in turn can influence people's food choices and consequently their health status (Alvarenga et al. 2012). This can then be determined by using the TFEQ, as in this South African study or the Eating Attitude Scale questionnaire, as done to female university students from Brazil (Alvarenga et. Al. 2012), which can be compared to data of other developing countries. The questions in the TFEQ (Anglé et al. 2009; Bond et al. 2001; Karlsson et al. 2000; Stunkard et al. 1984) are divided into subscales of restraint, disinhibition and perceived hunger (Moreira et al. 2005; Provencher et al. 2009; Bond et al. 2001), to assist in conducting an evaluation of eating attitudes of female dietetic and non-dietetic undergraduate students in this study. Previously it has been used to study the eating behaviours in normal weight and obese subjects as well as those diagnosed with EDs (Paradis et al. 2009; Karlsson et al. 2000). Other studies investigated appetite ratings (Provencher et al. 2009; Provencher et al. 2003) and the association of restraint and disinhibition with dietary intake among university students, whom were predominantly female (Moreira et al. 2005).

But from the results in this study it was evident that there was a significant difference for the subscale of restraint between first year dietetic students (11.29 ± 5.0) and first year non-dietetic students (7.40 ± 4.24). No significant difference was found for eating attitude between first year dietetic- and first year non-dietetic students for the subscales of disinhibition and perceived hunger.

5.2.4 To determine whether the SCOFF- or EAT-26 questionnaire was more sensitive in identifying EDs among female undergraduate students at a South African university

It is imperative to identify EDs in individuals as EDs are an important cause of physical and psychosocial morbidity in especially young adult women (Fairburn et al. 2003). Therefore, the importance of defining and differentiating between, as well as the identification of disordered eating behaviour is important to the possible prevention, treatment and education regarding a particular disorder (Ozier, Henry 2011) as identified by the American Psychiatric Association 2013. Early in live different eating behaviours are learned by children modelling their eating behaviours on that of their parents. Therefore, parents shape the development of their children's eating behaviours, which lay the foundation for the eating habits and behaviour of students or young adults (Paradis et al. 2009).

Sensitivity gives an indication of the ability of a diagnostic or screening test, such as the SCOFF- and EAT-26 questionnaire, to successfully diagnose an ED among female undergraduate students. In the current study, the SCOFF- and EAT-26 questionnaires were both used to identify the prevalence of EDs among female undergraduate dietetic- and non-dietetic students. The sensitivity was higher in the SCOFF questionnaire for SCOFF 1 (84.8%) (to make yourself sick or having BN) and SCOFF 3 (87.5%) (to lose more than 6.35kg/one stone). For the behavioural questions of the EAT-26 questionnaire, the sensitivity of EAT B (80%) (to make yourself sick or having BN) and EAT D (87.5%) (previously treated for an ED) was higher. Therefore, between the SCOFF- and EAT-26 questionnaire the sensitivity of the two questionnaires could be used to determine specific aspects of an ED. However, further research is advised. Table 5.1 provides a summary of the combination of questions, based on this study results, that can be used as a good screening questionnaire to determine the presence of an ED (see *Appendix F* page xxiv).

TABLE 5.1 SUGGESTED ED SCREENING TOOL

PREVIOUS QUESTION	*MEANING OF QUESTION*	**NEW COMBINED QUESTION**
SCOFF 1 / EAT B	*Make yourself sick (vomit) / BN*	**ED 1**
SCOFF 2 / EAT A	*Lost control over eating / Binge Eating*	**ED 2**
SCOFF 3	*Lost more than one stone (15 pounds / 6.35kg)*	**ED 3**
SCOFF 4	*Believe yourself to be fat*	**ED 4**
SCOFF 5	*Food dominates your life*	**ED 5**
EAT C	*Laxatives, diet pills, diuretics*	**ED 6**
EAT D	*Treated for ED*	**ED 7**

5.3 Summary

It was concluded that the first year non-dietetic students had a higher mean BMI than the dietetic students (first-, third- or fourth year). The prevalence was higher in first year non-dietetic students than dietetic students for SCOFF 1 (BN), SCOFF 2 (binge eating), SCOFF 3 (weight loss) and SCOFF 4 (feeling fat). While first year dietetic students had a higher indication over first year non-dietetic students for SCOFF 5 (food), EAT C (diet pills) and EAT D (treated for an ED).

EAT B (BN) It was highest indicated in third- and fourth year dietetic students combined for EAT B (BN) and only slightly higher in first year dietetic students than first year non-dietetic students; and with EAT A (binge eating) when the prevalence of first year non-dietetic students was higher than first year dietetic students. While for eating attitude a significant difference was found for restraint, but no significant difference was found for disinhibition and perceived hunger for first-, third- or fourth year dietetic students compared to first year non-dietetic students, by using the TFEQ.

In the last chapter, chapter 6, the conclusion of the study will be discussed as well as the recommendations for use at other universities.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS OF THE STUDY

6.1 Introduction

Global studies have indictated that the prevalence of disordered eating behaviour is higher in female undergraduates. In the current study, attention was focused on the possible relationship between disordered eating and choice of study, giving special attention to dietetics as a choice of study. In order to investigate this relationship, eating behaviour and eating attitude of female undergraduate students was assessed by means of qualitative methods, that included questionnaires as a screening tool for EDs.

A small number of similar studies have been conducted in both developed and low-income countries, but data from South Africa is very limted. Currently, a total of 1418 students are registered for a dietetics qualification at one of the local universities. A total of 2734 qualified dieticians are currently registered with the HPCSA in the country. Although different selection procedures are being used at universities across South Africa, it would be more helpful if a standardized screening tool could be used to select prospective dietetic students, to help determine if they suffer from an existing or pre-diagnosed ED. The usage of a screening tool, like the 'ED questionnaire' developed to assist in the selection process of students can be perceived as a measure to assure that those students that will eventually be selected for the degree, themselves have a healthy food intake. It should be emphasised that the core task of the dietititian is to help others with their eating habits.

6.2 Conclusion of the study

It was concluded from the study that the first year non-dietetic students had a higher mean BMI when compared to dietetic students, registered at UKZN. To determine the eating behaviour of the students the SCOFF questionnaire and behavioural questions of the EAT26-questionnaire were used. These two questionnaires indicate the prevalence or development of EDs. Findings from these questionnaires include factors such as BN, binge eating, food domination in your life, above

normal weight loss and the perception of being fat (which could also be an indication of AN, together with other factors). The overall findings of the SCOFF and EAT-26 were very similar, from a statistical point of view.

According to the findings of the SCOFF questionnaire there was no significant difference in the prevalence of Eating Disorders under first year dietetic students, when compared to non-dietetic students. However, the presence of eating disorders seems to decrease over the study years of dietetic students, which is suspected to be directly linked to their improved knowledge. In contrast, the EAT-26 questionnaire indicates a lower prevalence of disordered eating behaviour for first year non-dietetic students compared to their dietetic counterparts. A number of third- and fourth year dietetic students claimed to have been binge eating in the past, as well as making themselves vomit to lose weight (a possible indication of BN), but overall, findings of the EAT-26 questionnaire as aligned with that of the SCOFF, which indicates a decline in disordered eating with study progression.

Both the SCOFF and EAT-26 questionnaires have sub-questions. Results from this study however, show that even though the overall results of the SCOFF and EAT-26 results do not differ significantly, it has been shown that some of the sub-questions correlate weaker. This, eventually, brings us to the conclusion that a single questionnaire that contains a selection of questions from both questionnaires, would serve as a more reliable screening tool for ED. The eating attitude of the students were determined by using the EATScore (first 26 questions of the EAT26-questionnaire) and the TFEQ, but the results did not conclude any significant difference between the dietetic- and non-dietetic students, even though it is obvious that there exist differences in specific areas related to Eating Disorders. It is hypothesised that the inclusion of the SCOFF-categories could possibly address this limitation, but requires further investigation.

6.3 Study limitations

The limitation of this study was that the study had been conducted exclusively with students at the UKZN and not at one of the other 15 Universities in South Africa, where dietetic students are studying. The study need to be expanded to more groups of first year dietetic and non-dietetic

students. The sample study used need to be followed-up, to indicate if there has been any changes over the years of study, to be able to increase the study population at UKZN. This can then also be expanded to other universities within South Africa.

From using the TFEQ, no clear indication was found between the eating attitudes of dietetic- and non-dietetic students (only for the restraint of eating) and thus the use of this questionnaire should be reconsidered or aimed at a larger population group. The TFEQ consisted of 51 questions, added to the other questionnaires answered, and the length of this questionnaire could induce respondent fatigue and influence the answers of the participants.

6.4 Recommendations for improvement

Data collected from other campuses and students of UKZN could provide a better insight into the BMI, eating attitude and eating behaviour of students. A follow-up of the students used in the study, especially dietetic students, can provide a better range of data and would also add value and weight to the study. Dietetic students studying at other universities within South Africa can also be used to use data for a comparative study in the future.

6.5 Recommendations for nutrition practice

The SCOFF- and EAT-26 questionnaire behavioural questions can be combined as a screening tool (see *Appendix F*) to be more sensitive and specific diagnosing EDs, consisting of only seven questions, as indicated in table 6.1. This shorter, compact version can also help to save time and used as a screening tool for both dietetic- and non-dietetic prospective students.

This screening tool (ED Questionnaire) can assist to detect possible EDs in prospective students and from the results of the questionnaire answered, treatment and counselling can be given to these students before starting their studies at the respective universities in South Africa. The ED Questionnaire needs to be tested on a study sample of students at UKZN before it can be recommended and used at other tertiary institutes within South Africa.

TABLE 6.1 ED QUESTIONNAIRE

QUESTIONS	*MEANING OF QUESTION*
ED 1	*Do you make yourself sick (vomit)?*
ED 2	*Have you lost control over eating or donebinge eating in the past?*
ED 3	*Have you lost more than 6kg or one clothing size in the past three months?*
ED 4	*Do you believe yourself to be fat?*
ED 5	*Does food dominate your life?*
ED 6	*Have you taken laxatives, diet pills or diuretics in the past to assist with weight loss?*
ED 7	*Have you been previously treated for an eating disorder?*

This screening tool can also be translated into an app for use on Smartphones, Tablets, Laptops or other Computers. This app can then be used for teachers, parents and students to detect the possibility of an ED in a specific person, and not only prospective students. It is then easy to use and more excessible to students and anyone with technology at hand. A list of counsellors in your immediate area can then be available and help via the internet to be used if an ED is detected, after answering the questions on the app. Currently the apps found on the internet give information concerning a specific ED or where to get help when diagnosed with an ED, but no specific information was found to link questionnaires or screening tools to the possible diagnosis of an ED in the South African context.

6.6 Implications for future research

Further research from this study can be done to validate the ED Questionnaire, as suggested in table 6.1. The focus of this study was to determine the prevalence of existing EDs or the possibility of the development of EDs in students. This can be done by screening prospective students, which may assist them in coping with EDs, especially when studying. The design of this study can then be used as a basis for further studies to validate the use of a screening tool at UKZN and other universities in South Africa. But this screening tool also need to be tested on a study sample of students at UKZN before it can be recommended and used at other tertiary institutes within South Africa.

The information and questions from existing questionnaires (SCOFF-, EAT26-questionnaire and TFEQ) and a new shortened screening tool (ED Questionnaire) can be used for the development of

an app, which can be downloaded after its development. This app can then be connected to resources available in South Africa, for the user to connect for assistance when diagnosed with the possibility of an ED.

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APPENDICES

Appendix A: Informed Consent Document

Participant code: _____

Consent to participate in a research study

TITLE OF RESEARCH PROJECT:
Comparison of body mass index, eating behaviour and eating attitude between dietetic- and non-dietetic female undergraduate students at a South African University.

PRINCIPAL INVESTIGATOR:
Jandri Elizabeth Barnard

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You are hereby invited to participate in the above study conducted by JE Barnard (student no. 213573763) from the Department of Dietetics and Human Nutrition. This study aims to investigate the eating attitude, eating behaviour and BMI (Body Mass Index) of female dietetics students compared to female students from other majors.

Why have you been invited to participate?

The study will include a sample of first year and fourth year female students that are studying dietetics as well as first year female students from other study majors that include Psychology, Law, Drama and Biochemistry. As a result, you were eligible to participate in this study.

What procedures will be involved in the study?

All participants will be required to complete the following questionnaires that are estimated to take up no more than 15 minutes of your time:

- The Three Factor Eating Questionnaire (TFEQ)
- The Eating Attitudes Test-26 (EAT 26)
- The SCOFF questionnaire

Fourth year dietetics students will be asked to complete an additional open ended questionnaire.

All students participating in the study will also have their weight and height assessed, while wearing light indoor clothing, in order to calculate BMI

There are a few things we would like you to know:

1. This project was approved by the relevant ethics committee at UKZN to assure that the research is acceptable (relevant reference will be quoted once ethics approval is obtained).
2. Your opinion will be treated as private and confidential as the researcher will identify you with a code number only.
3. Your participation is voluntary.
4. The results of this study could be published for scientific purposes but will not reveal your name or include any identifiable reference to you.

If you have any questions or concerns regarding the research, please feel free to contact Prof F Veldman on 033 2605597 or Dr Suna Kassier on 033 2605431.

Declaration by participant:

By signing below I (full name) _____ agree to take part in this study. I understand that I can withdraw from the study at any time without any negative consequences.

I declare that I have read this information and consent form. I have had a chance to ask questions and all my questions have been adequately answered. I understand that participation in this study is voluntary and I have not been pressurised to take part.

_____ _____ _____

Signature of participant Signature of witness Date

Appendix B: SCOFF questionnaire

Please indicate your study major:
Dietetics 1st year:_____ Psychology:_____ Drama:_____ Law:_____
Biochemistry:_____ Dietetic PG Dip:_____

Weight	kg
Height	cm
Age	yrs
BMI	kg/m^2

Kindly answer 'yes' or 'no' to the following questions:

S

Do you make yourself SICK (vomit) because you feel uncomfortably full?
Yes _____ No_____

C

Do you worry that you have lost CONTROL over how much you eat?
Yes _____ No_____

O

Have you recently lost more than ONE stone (15 pounds) in a 3-month period?
Yes _____ No_____

F

Do you believe yourself to be FAT when others say you are thin?
Yes _____ No_____

F

Would you say that FOOD dominates your life?
Yes _____ No_____

Appendix C: Eating Attitude Test-26

✓	Please choose one response by marking a check to the right for each of the following statements:	Always	Usually	Often	Some times	Rarely	Never	Score
1.	Am terrified about being overweight.	_	_	_	_	_	_	
2.	Avoid eating when I am hungry.	_	_	_	_	_	_	
3.	Find myself preoccupied with food.	_	_	_	_	_	_	
4.	Have gone on eating binges where I feel that I may not be able to stop.	_	_	_	_	_	_	
5.	Cut my food into small pieces.	_	_	_	_	_	_	
6.	Aware of the calorie content of foods that I eat.	_	_	_	_	_	_	
7.	Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)	_	_	_	_	_	_	
8.	Feel that others would prefer if I ate more.	_	_	_	_	_	_	
9.	Vomit after I have eaten.	_	_	_	_	_	_	
10.	Feel extremely guilty after eating.	_	_	_	_	_	_	
11.	Am preoccupied with a desire to be thinner.	_	_	_	_	_	_	
12.	Think about burning up calories when I exercise.	_	_	_	_	_	_	
13.	Other people think that I am too thin.	_	_	_	_	_	_	
14.	Am preoccupied with the thought of having fat on my body.	_	_	_	_	_	_	
15.	Take longer than others to eat my meals.	_	_	_	_	_	_	
16.	Avoid foods with sugar in them.	_	_	_	_	_	_	
17.	Eat diet foods.	_	_	_	_	_	_	
18.	Feel that food controls my life.	_	_	_	_	_	_	
19.	Display self-control around food.	_	_	_	_	_	_	
20.	Feel that others pressure me to eat.	_	_	_	_	_	_	
21.	Give too much time and thought to food.	_	_	_	_	_	_	
22.	Feel uncomfortable after eating sweets.	_	_	_	_	_	_	
23.	Engage in dieting behavior.	_	_	_	_	_	_	
24.	Like my stomach to be empty.	_	_	_	_	_	_	
25.	Have the impulse to vomit after meals.	_	_	_	_	_	_	
26.	Enjoy trying new rich foods.	_	_	_	_	_	_	
						Total Score =		

Behavioral Questions:			
In the past 6 months have you:		**Yes**	**No**
A.	Gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances) If you answered yes, how often during the worst week: _____		
B.	Ever made yourself sick (vomited) to control your weight or shape? If you answered yes, how often during the worst week: _____		
C.	Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape? If you answered yes, how often during the worst week? _____		
D.	Ever been treated for an eating disorder? When: _____		

EAT-26 From: Garner et al. 1982, *Psychological Medicine, 12*, 871-878); adapted by D. Garner with permission.

Appendix D: Three Factor Eating Questionnaire

Three-Factor Eating Questionnaire

Instructions

- Please answer **ALL** the questions by making a cross (X) in the block ☐ next to your choice for each question.
- **Think of the past few weeks when you complete this questionnaire.**
- Remember that we want to know about present and recent habits, not those you had in the past.

1.	When I smell a sizzling steak or see a juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal	True ☐ False ☐
2.	I usually eat too much at social occasions, like parties and picnics.	True ☐ False ☐
3.	I am usually so hungry that I eat more than three times a day.	True ☐ False ☐
4.	When I have eaten my quota of kilojoules, I am usually good about not eating any more.	True ☐ False ☐
5.	Dieting is so hard for me because I just get too hungry.	True ☐ False ☐
6.	I deliberately take small helpings as a means of controlling my weight.	True ☐

		False ☐
7.	Sometimes things just taste so good that I keep on eating even when I am no longer hungry.	True ☐ False ☐
8.	Since I am often hungry, I sometimes wish that while I am eating, an expert would tell me that I have had enough or that I can have something more to eat.	True ☐ False ☐
9.	When I feel anxious, I find myself eating.	True ☐ False ☐
10.	Life is too short to worry about dieting.	True ☐ False ☐
11.	Since my weight goes up and down, I have gone on reducing diets more than once.	True ☐ False ☐
12.	I often feel so hungry that I just have to eat something.	True ☐ False ☐
13.	When I am with someone who is overeating, I usually overeat too.	True ☐ False ☐
14.	I have a pretty good idea of the number of kilojoules in common food.	True ☐ False ☐

15.	Sometimes when I start eating, I just can't seem to stop.	True ☐ False ☐
16.	It is not difficult for me to leave something on my plate.	True ☐ False ☐
17.	At certain times of the day, I get hungry because I have gotten used to eating then.	True ☐ False ☐
18.	While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it.	True ☐ False ☐
19.	Being with someone who is eating often makes me hungry enough to eat also.	True ☐ False ☐
20.	When I feel blue, I often overeat.	True ☐ False ☐
21.	I enjoy eating too much to spoil it by counting kilojoules or watching my weight	True ☐ False ☐
22.	When I see a real delicacy, I often get so hungry that I have to eat right away.	True ☐ False ☐

23.	I often stop eating when I am not really full as a conscious means of limiting the amount that I eat.	True ☐ False ☐
24.	I get so hungry that my stomach often seems like a bottomless pit.	True ☐ False ☐
25.	My weight has hardly changed at all in the last ten years.	True ☐ False ☐
26.	I am always hungry so it is hard for me to stop eating before I finish the food on my plate.	True ☐ False ☐
27.	When I feel lonely, I console myself by eating.	True ☐ False ☐
28.	I consciously hold back at meals in order not to gain weight.	True ☐ False ☐
29.	I sometimes get very hungry late in the evening or at night.	True ☐ False ☐
30.	I eat anything I want, any time I want.	True ☐

		False ☐
31.	Without even thinking about it, I take a long time to eat.	True ☐ False ☐
32.	I count kilojoules as a conscious means of controlling my weight.	True ☐ False ☐
33.	I do not eat some foods because they make me fat.	True ☐ False ☐
34.	I am always hungry enough to eat at any time.	True ☐ False ☐
35.	I pay a great deal of attention to changes in my figure.	True ☐ False ☐
36.	While on a diet, if I eat a food that is not allowed, I often then splurge and eat other high kilojoule foods.	True ☐ False ☐
37.	How often are you dieting in a conscious effort to control your weight? 1) Rarely ☐; 2) Sometimes ☐; 3) Usually ☐; 4) Always ☐	
38.	Would a weight fluctuation of 2 kg affect the way you live your life?	

	1) Not at all ☐; 2) Slightly ☐; 3) Moderately ☐; 4) Very much ☐
39.	How often do you feel hungry? 1) Only at mealtimes ☐; 2) Sometimes between meals ☐; 3) Often between meals ☐; 4) Almost always ☐
40.	Do your feelings of guilt about overeating help you to control your food intake? 1) Never ☐; 2) Rarely ☐; 3) Often ☐; 4) Always ☐
41.	How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours? 1) Easy ☐; 2) Slightly difficult ☐; 3) Moderately difficult ☐; 4) Very difficult ☐
42.	How conscious are you of what you are eating? 1) Not at all ☐; 2) Slightly ☐; 3) Moderately ☐; 4) Extremely ☐
43.	How frequently do you avoid 'stocking up' on tempting foods? 1) Almost never ☐; 2) Seldom ☐; 3) Usually ☐; 4) Almost always ☐
44.	How likely are you to shop for low kilojoules foods? 1) Unlikely ☐; 2) Slightly unlikely ☐; 3) Moderately likely ☐; 4) Very likely ☐
45.	Do you eat sensibly in front of others and splurge alone? 1) Never ☐; 2) Rarely ☐; 3) Often ☐; 4) Always ☐

46. How likely are you to consciously eat slowly in order to cut down on how much you eat?

1) Never ☐; 2) Rarely ☐; 3) Often ☐; 4) Always ☐

47. How frequently do you skip dessert because you are no longer hungry?

1) Almost never ☐; 2) Seldom ☐; 3) At least once a week ☐; 4) Almost every day ☐

48. How likely are you to consciously eat less than you want?

1) Unlikely ☐; 2) Slightly likely ☐; 3) Moderately likely ☐; 4) Very likely ☐

49. Do you go on eating binges though you are not hungry?

1) Never ☐; 2) Rarely ☐; 3) Sometimes ☐; 4) At least once a week ☐

50. On a scale of 0 to 5, where 0 means no restraint in eating (eating whatever you want, whenever you want it) and 5 means total restraint (constantly limiting food intake and never 'giving in') what number would you give yourself (choose only one statement of the following five by make a cross (X) in only one block ☐)?

0 eat whatever you want, whenever you want it ☐

1 usually eat whatever you want, whenever you want it ☐

2 often eat whatever you want, whenever you want it ☐

3 often limit food intake, but often 'give in' ☐

4 usually limit food intake, rarely 'give in' ☐

5 constantly limiting food intake, never 'giving in' ☐

51.	To what extent does this statement describe your eating behaviour? 'I start dieting in the morning, but because of any number of things that happen during the day, by evening I have given up and eat what I want, promising myself to start dieting again tomorrow'. 1) Not like me ☐; 2) Little like me ☐; 3) Pretty good description of me ☐; 4) Describes me perfectly ☐

Appendix E: Ethical Consent

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

21 June 2012

Mrs Carissa C Raja (200275790)
School of Agricultural, Earth and Environmental Sciences

Dear Mrs Raja

Protocol reference number: HSS/0289/012M
Project title: Eating behavior and attitude of female dietetic students attending the University of KwaZulu-Natal, Pietermaritzburg

In response to your application dated 10 May 2012, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steven Collings (Chair)
Humanities & Social Science Research Ethics Committee
/ms

cc Supervisors: Susanna M Kassier and Dr Frederick Veldman
cc Academic Leader: Professor D Jaganyi
cc School Admin: Ms Michelle Francis

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Appendix F: ED Questionnaire

Please answer 'Yes' or 'No' to the following questions:

ED 1

Do you make yourself sick, by vomiting, because you feel uncomfortably full, to control your weight or shape, over the past 6 months?

YES _____ NO _____

ED 2

Do you worry that you have lost control over how much you eat (feel that you may not be able to stop eating) and regularly go on eating binges?

YES _____ NO _____

ED 3

Have you recently lost more than 6 kg (or one clothing size), intentionally or unintentionally, in a 3 month period?

YES _____ NO _____

ED 4

Do you believe yourself to be fat, even when others say that you are thin?

YES _____ NO _____

ED 5

Would you say that food dominates your life?

YES _____ NO _____

ED 6

Have you used laxatives, diet pills or diuretics (water pills) to control your weight during the past 6 months?

YES _____ NO _____

ED 7

Have you ever been treated or diagnosed for an eating disorder?

YES _____ NO _____